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DIMENSION



EUROTHERM
CONTROLS

The
DIMENSION®
User's
Manual

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Dimension®

Control System

User's Manual

Publication No. HA094616U001
March 1998

Covering Models 8705e and 8725e and Models 8705 and 8725



EUROTHERM
CONTROLS

Eurotherm Controls Inc
11485 Sunset Hills Road
Reston, Virginia 20190-5286

Phone: 703-471-4870, Fax: 703-787-3436
Fax-On-Demand: 703-787-3444
BBS: 703-787-3441
http://www.eurotherm.com

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IMPORTANT: Battery Backup for Random Access Memory and Memory Cards

The Dimension controller uses a Lithium battery to retain the information in its internal random access memory (RAM) during power down periods. The battery will retain the information in the RAM memory for about 3 years without power. When the Dimension is powered up, no power drain occurs form the battery. When the battery fails, the Dimension will lose the current time and da5e and any custom names that have been created. Additionally, the I/O patching and PIOD values will revert to the defaults.

The 8705 and the 8703 have one battery which is located in the operator interface. The 8725 has two batteries, one in the operator interface and one on the CUP card in the analog I/O processor box. The two batteries,in the 8725 are the same. These batteries are soldered onto the circuit board. When replacing them, it is necessary to take the controller out of service, disassemble the unit, unsolder the old battery and solder in the new one. Care must be taken so that the circuit boards are not exposed to electrostatic discharge that could damage them. The battery used in all Dimension models is Panasonic type CR2477, 3Volt. The Eurotherm part number for the battery is PA079468U001.

The Dimension plug in memory card also has a battery. The battery fits into the end of the card and is accessed by opening a small door. The memory card battery will last about 3 years. The memory card does not get any power from the Dimension controller so this battery is used continuously. When the battery runs down, the memory card will lose its retained data. The memory card battery is type DL2016. The Eurotherm part number is PA079379U001.

In general, these batteries will need periodic changing. You may contact Eurotherm Controls technical support with any questions that you may have. You will find the contact information listed on the last page of the manual.

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Preface

This preface:

- Briefly describes the scope, organization, and contents of this manual.
- Identifies and describes related documentation.
- Lists and defines the conventions and terminology used in Dimension® documentation and software.
- Explains how to get help.

Manual Scope

This manual contains information on the following Eurotherm Controls Inc products:

- Dimension System Analog Input/Output Models 8705 and 8725
- Dimension Graphic Operator Interface
- Digital Input/Output Expansion Kits Models 8781-XX
- Analog to Solid State Converter Model 8782

Your system may or may not include all of the products and features discussed in this manual. If your system includes components other than those listed above, refer to related documentation shipped with your system.

Manual Organization and Contents

This manual contains information you will need in order to install, configure, operate, and maintain the Dimension Model 8705 or 8725 Dimension Control System manufactured by Eurotherm Controls Inc. Manual contents are as follows:

Section 1. Introducing Dimension Control System

Describes Dimension system hardware, software, functions, and features.

Section 2. Hardware Installation and Field Wiring

Explains how to install and set up Dimension system hardware, and how to make external field wiring and communication connections.

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Section 3. Graphic Operator Interface

A descriptive overview of Dimension's Graphic Operator Interface, including Operation and Configuration screens, description of graphic icons and menu screens, how to navigate the Graphic Operator Interface, and terminology related to Graphic Operator Interface.

Section 4. Process Control Loops and Monitor Inputs

Definition of PID process control loops, terminology related to configuration and operation of PID process control loops, how to configure a control loop, how to configure monitor or data acquisition analog inputs, plus the operation of control loops.

Section 5. Real-Time Programmer

Describes Dimension Programmer functions and capabilities, includes Programmer terminology, and explains how to configure the Programmer.

Section 6. Process Alarms

Describes alarm capabilities and terminology, explains how to configure alarms and monitor their status.

Section 7. Logic Functions

Describes Dimension logic capabilities and terminology, explains how to configure and set up logic functions.

Appendix A. Graphic Operator Interface Terminology

Appendix B. Communications

Explains how to communicate with Dimension via a serial link. Includes all parameters needed for communications. Also describes IEEE-488 communications.

Appendix C. Worksheets

Contains worksheets and forms to be used in the installation and wiring of your Dimension, in configuring Dimension parameters, and in diagnostics/troubleshooting.

Appendix D. Diagnostics and Troubleshooting

Explains how to diagnose and correct Dimension operation and communication problems.

Appendix E. Examples

Provides examples of typical Dimension applications.

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Appendix F. Verification/Calibration Procedure

Provides procedures for calibration of your Dimension and verification of inputs.

Note: *If you discover undocumented, incomplete, or apparently wrong information about the Dimension system in this manual or related documentation, please call or write our Dimension Product Manager at the address below. We plan to offer periodic updates to the documentation and hope to include relevant "field" information from you, the day-to-day user of Dimension.*

Eurotherm Controls Inc.
11485 Sunset Hills Road
Attn: Dimension Product Manager
Phone: (703) 471-4870

Conventions

In Dimension documentation and on-screen instructions, you will be instructed to enter various system commands and information using Graphic Operator Interface front panel controls. The following conventions are used:

- Pressing the operator interface rotary key has the same effect as pressing the Enter or Return key on a computer keyboard. When you see "press **ENTER**" printed in an instruction, press the rotary selector key to enter a selection or command into the system.
- The term **recipe** refers to a setpoint program where the setpoint changes over time based on preconfigured information. For purposes of this manual, the term **recipe** and **program** are interchangeable.
- The operator interface rotary key can be turned clockwise or counterclockwise to scroll through or select information. In the documentation, CW = clockwise and CCW = counterclockwise.
- The Graphic Operator Interface (OI) continuously displays a set of graphic icons on the right-hand side of the screen. The meanings and use of these graphic symbols are defined in section 3 of this manual.
- The operator interface displays a graphic CURSOR which indicates the currently active data entry field or selection on a screen. In its "home" position, the cursor is displayed as a blinking square graphic object between the screen title and time indicator on the top line of the screen.
- When a window is displayed on a screen, the cursor disappears and another box with a smaller box inside is displayed.
- When an icon or data entry field is displayed in reverse video on a screen, that icon or field is currently selected.

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- When an alarm becomes active, the alarm icon begins to blink. When all alarms are acknowledged on the Alarm Status screen, the icon stops blinking.
- Dimension display parameters are shown in bold type. Example: **Configur_Select**.

How to Get Help

On many operator interface displays, messages are displayed that will tell you how to proceed or how to correct an error. Also, pop-up "help" windows can be called up by simply pressing the **Help** key (?). Press the Help key again, or the knob, to make the window disappear.

If you can't find the answer you need on a specific display or "help" window, refer to the appropriate section of your manual (including Appendix D, *Diagnostics and Troubleshooting*).

If you need assistance from Dimension technical support personnel, call:

Dimension Technical Support
Eurotherm Controls Inc, Reston, Virginia
Phone: (703) 471-4870
Fax: (703) 787-3436
Fax on demand: (703) 787-3441 (Automated Document Fax Server)
Internet: http://www.eurotherm.com

e-mail: *sales@controls.eurotherm.com (for sales)*
publications@controls.eurotherm.com (for literature)
dimensions.support@controls.eurotherm.com (for technical support)

Before requesting assistance, refer to Appendix C-4, Worksheets, for a Dimension Technical Support Phone/Fax Cover Sheet.

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Section 1

Introducing Dimension Control System

What is Dimension? **1-2**
Hardware Description **1-4**

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Introducing Dimension Control System

This section describes Dimension:

- Functional capabilities and features
- Software and hardware

What is Dimension?

A powerful, easy to use control system from Eurotherm Controls Inc, Dimension features a wide range of configuration, control, setpoint programming, monitoring and alarming capabilities for applications such as crystal growing, environmental test, composite curing, semi-conductor, heat treating, vacuum furnace, miscellaneous furnace and kilns, and test stands. The systems described in this manual are designed to provide superior digital PID control in general-purpose control applications. Standard as well as specialized thermocouple, RTD, and linear inpatients be used to provide complete closed-loop control of temperature and other variables.

The Dimension Models 8705 and 8725 are functionally identical but offer two different hardware configurations to satisfy various physical installation requirements:

- The Model 8725 is designed for a standard rack installation with an attached front-panel operator interface or detached front panel operator interface.
- The Model 8705 is designed for flexible bulkhead installation with the operator interface mounted remotely, up to ten feet away.

Both hardware configurations feature identical I/O cards with plug-in field wiring terminals and standard cabling with plug-in jacks. Also, Dimension features an auto-select power supply that can be plugged into a standard power source (85–264 VAC, 47–63 Hz) with no voltage adjustments required. A maximum of three I/O cards can be installed in the 8725; each card contains six analog inputs, four analog outputs and two low level relay inputs/outputs or a high speed serial communications link to the Model 8781 Digital I/O Expansion Kit. The 8705 allows a maximum of one analog card.

Dimension real-time programmer functions permit the use of programs up to 750 segments, with segment times from .2 second to 99 hours. Also, you can assign analog outputs for either process control or retransmission of

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profile characteristics. Time-proportioned outputs are also configurable, and a wide variety of alarm and event schemes are user-selectable.

An intelligent unit equipped with its own microprocessor, the Dimension 8700 series graphic operator interface features a unique backlit display, highly visible in the most adverse lighting conditions. Large, easily readable characters and a wide range of graphic displays give operators the information they need with clarity and precision. To move from screen to screen, the front panel is equipped with a large diamond shaped four-way display select key used to select graphic icons representing a full range of configuration and operation functions. For parameter selection and data entry, a rotary selector key is available.

Other Dimension features include:

- User-selectable graphic displays (X-Y graphs, bar graphs, numeric)
- User-defined scaling and screen display terminology
- Event and setpoint programming with graphic profile displays
- Automatic or manual start/stop of stored batch programs
- Up to eight control loops with auto-tuning, setpoint ramping and part temperature control
- Up to eighteen analog inputs for both monitoring and control
- Up to twelve analog outputs for retransmitting and control
- Up to eight real-time programmers (configurable to run synchronously or asynchronously)
- PID control with direct, reverse, or bi-modal control action
- PID control with "step/response" auto-tuning
- Bumpless transfer for manual/auto modes
- Full set of high, low, and deviation alarm functions
- Instant alarm display and response capabilities
- Three levels of system security with passcode control
- Large, easy to use rotary selector key for data entry and parameter selection
- Large diamond shaped four-way display select key and graphic icons for quick screen access
- Dedicated "help" key for on-screen display of messages and operating instructions
- Two user-programmable "macro keys" for simple one-key activation of user-defined command strings
- EIA-232, serial communications, and optionally, EIA-422 and IEEE -488
- Electronic storage of system configuration files and programs on compact, removable memory cards
- Supervisory control of multiple controllers via a PC-based host software package such as SpecView, Wonderware and LabView software package

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Hardware Description

The Dimension systems described in this manual include the following hardware components:

Analog Input/Output Processor. The Model 8705 system analog input/output (I/O) processor is designed for panel mounting or bulkhead mounting. The Model 8725 conforms to a standard package for panel, rack-mount or bulkhead installation.

Analog I/O Cards. One of these cards is installed in the 8705 analog I/O processor and up to three of these removable cards can be installed in the 8725. Each module contains six analog inputs, four analog outputs, and two low level digital inputs, outputs or a high speed communications port to the Model 8781 digital I/O expansion kit. Plug-in field wiring terminals are located on the rear edge of the module.

Digital I/O. There are four Digital I/O Expansion packages. Model 8781-00 (required to add digital I/O) can accommodate up to four contact input modules and four contact output modules (solid state or mechanical). Model 8781-03 can accommodate up to four contact input modules. Models 8781-04 and 8781-05 can accommodate up to four contact output relays (solid state and mechanical, respectively).

Power Supply. The Dimension power supply is installed in a vented compartment in the Model 8725 analog I/O processor with a smaller version in the 8705. The power supply converts AC line voltage into regulated DC voltage and drives the system analog I/O internal circuits, relay drives, analog outputs, and the operator interface. The power supply automatically senses the AC input voltage level (85–264 VAC, 47–63 Hz) and adapts to that level with no need for mechanical adjustment. The 8705 power supply card also contains the communications ports.

Graphic Operator Interface. The Dimension graphic operator interface can be fully integrated with the 8725 system analog I/O or mounted remotely with both the 8705 and 8725. The operator interface is equipped with a 16-bit MC68000 microprocessor and communicates with the system analog I/O via a high-speed communication interface.

Memory Cards. The Dimension memory card can be used to read and store configuration data and programs off-line. These data-storage cards are inserted through a slot in the front panel into a card drive in the operator interface.

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Section 2

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Hardware Installation and Field Wiring

This section explains how to install, set up, and field wire the Dimension Control System to suit your application. The following topics are included:

- Unpacking and inspection
- Power supply line voltage rating
- Graphic operator interface installation
- Field wiring procedure and documentation
- External cable connections

Unpacking and Inspection

Before you perform the installation procedures in this section, carefully unpack Dimension system components in order to preserve the terms of your warranty. Remove the liner from the shipping box, then remove the Dimension from the liner. Verify that your Dimension system shipment contains all the items listed on your purchase orders and packing slips. Contact Eurotherm Controls Inc immediately if discrepancies or damage are discovered during unpacking.

! **Important:** Store Dimension shipping cartons and materials in a safe place after unpacking. You may need these items to reship the system to another plant or to the factory for service.

Power Supply Line Voltage Rating

Dimension Models 8705 or 8725 power supplies are equipped with a Voltage auto-select feature. You may connect the power supply to an external power source (85–264 VAC, 47–63 Hz) without making mechanical adjustments or changing jumper settings. The power supply automatically senses and adapts to the incoming AC power level and frequency.

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Installation, Dimension Model 8725 Hardware Platform with Attached Graphic Operator Interface

As shown in Fig. 2–1, Dimension Model 8725 is equipped with brackets and mounting rods for panel-mounting the unit in a standard hardware configuration. See Fig. 2–2 for physical dimensions.

Prepare the installation site and install the unit as follows:

1. Cut an opening in the panel where the Dimension is to be mounted. This cutout should be 5.4" (137 mm) wide and 5.6" (142 mm) high.
2. Insert the Dimension into the panel cutout from the front side with the mounting brackets and rods shown in Fig. 2–1 uninstalled.
3. Screw the two mounting rods into the brackets from the rear of the unit. Be sure that the slotted end of each rod faces the rear of the unit for screwdriver access.
4. Attach the two mounting brackets on the sides of the unit as shown in Fig. 2–1.
5. Holding the unit in place, continue turning the rods until they securely hold it to the mounting panel.

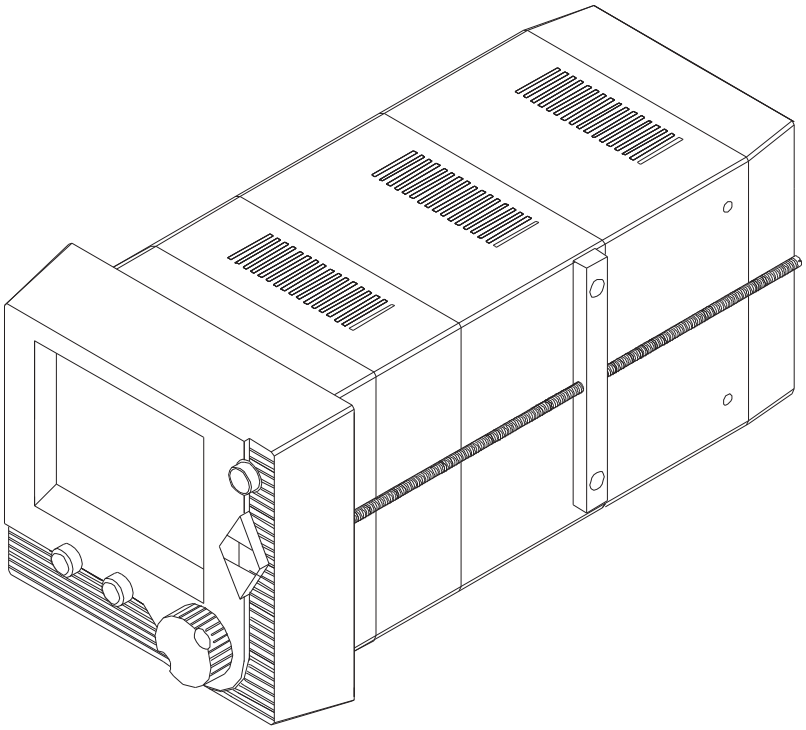
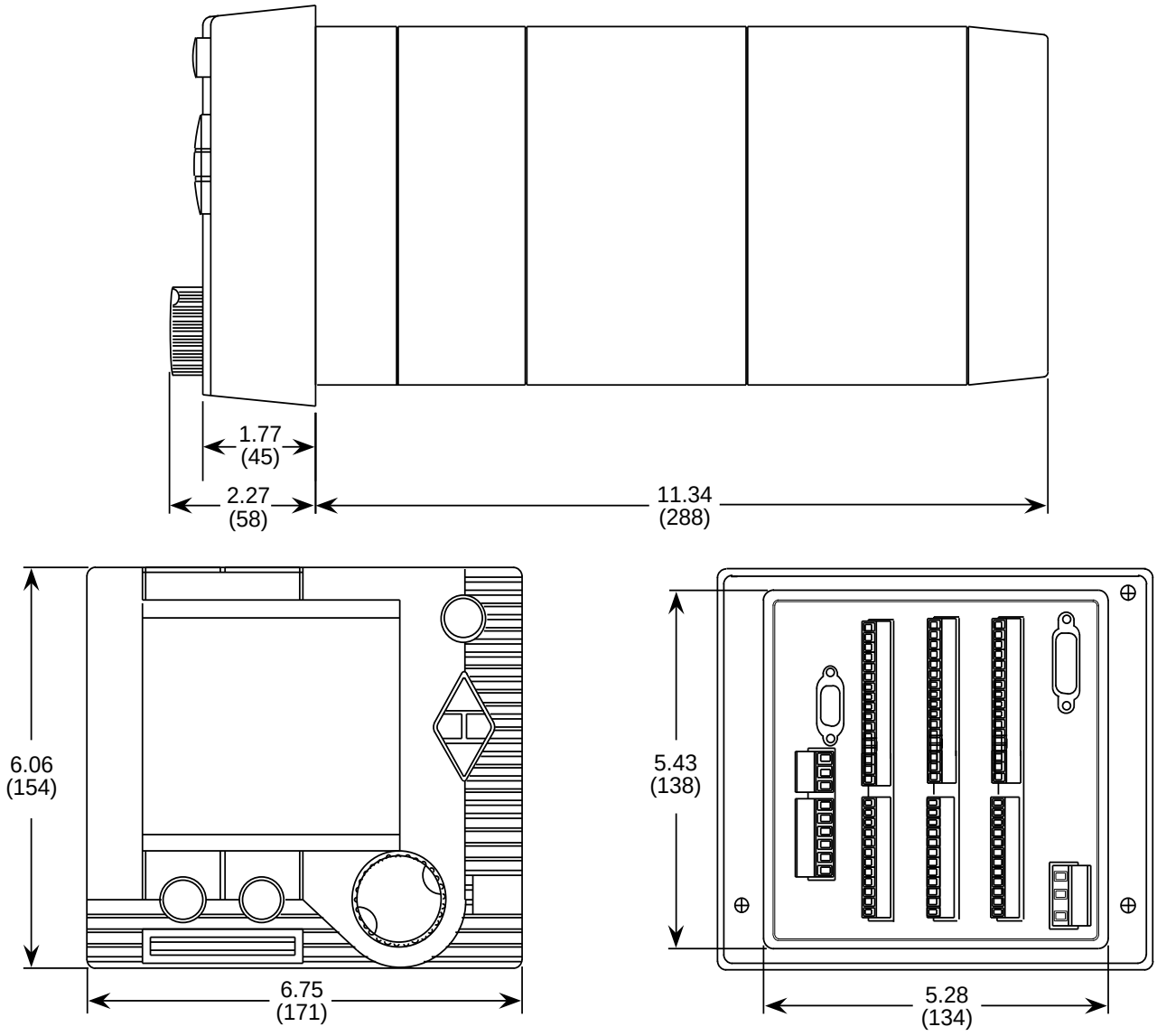


Figure 2–1. Dimension Model 8725 with Attached Graphic Operator Interface

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Figure 2–2.
Dimensions for Model 8725 with Attached Graphic Operator Interface



Dimensions in inches (mm)

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Installation, Dimension Models 8705 and 8725 Analog I/O with Remote Graphic Operator Interface

Refer to Fig. 2–3 for physical dimensions of the Model 8705/8725 analog I/O processor designed for bulkhead (partition or wall) installation. The graphic operator interface is mounted remotely. A standard 10 foot (3 meter) interconnecting cable is provided.

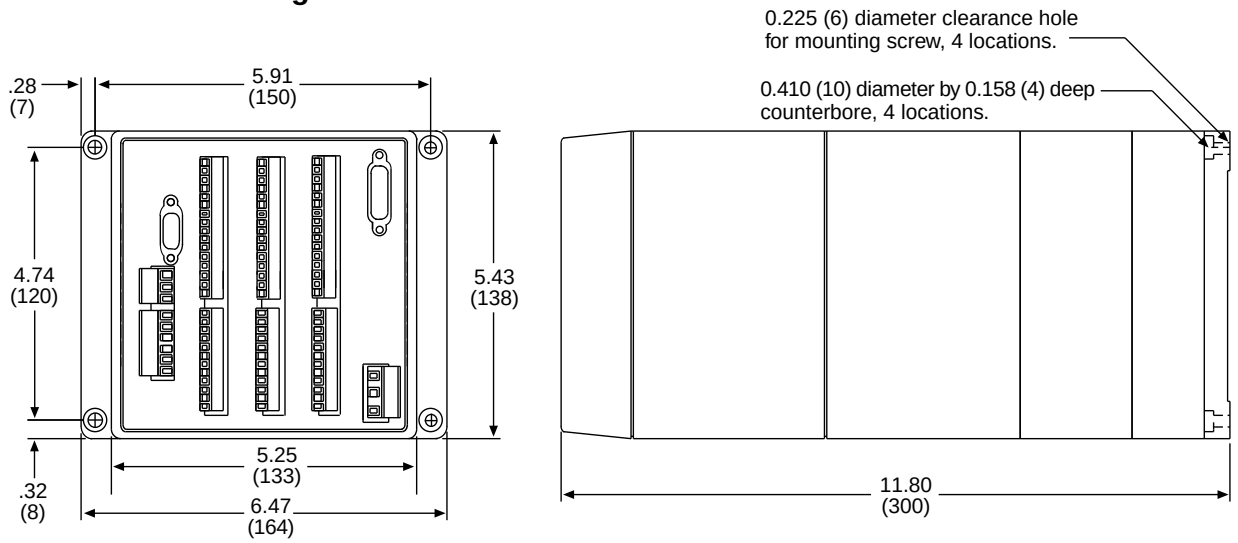
Prepare the installation site and install the analog input/output (I/O) processor as follows:

1. Referring to Fig. 2–3, mark and drill mounting holes in the partition or wall.
2. Position the unit's mounting flange over the mounting holes and attach securely with four mounting screws and other attaching hardware, if required.

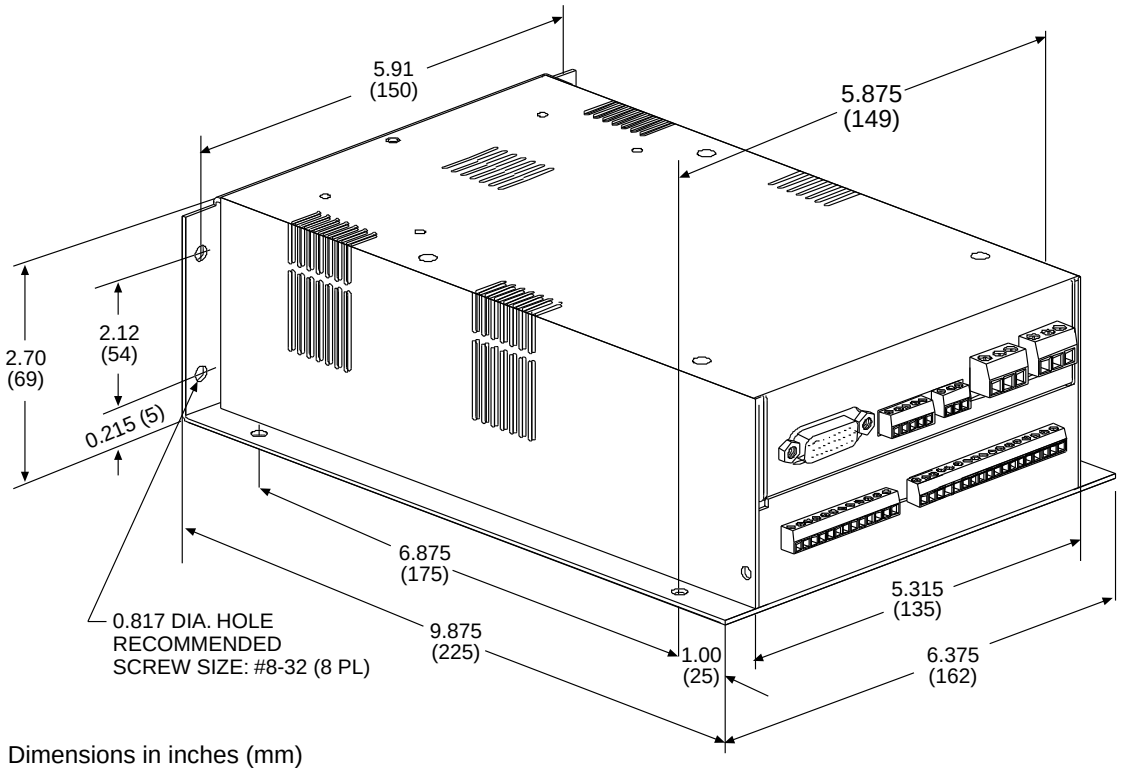
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Figure 2–3.
Dimensions for Models 8725 and 8705 with Remote Graphic Operator Interface

Dimension 8725 Analog I/O Processor



Dimension 8705 Analog I/O Processor



Dimensions in inches (mm)

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Installation, Graphic Operator Interface

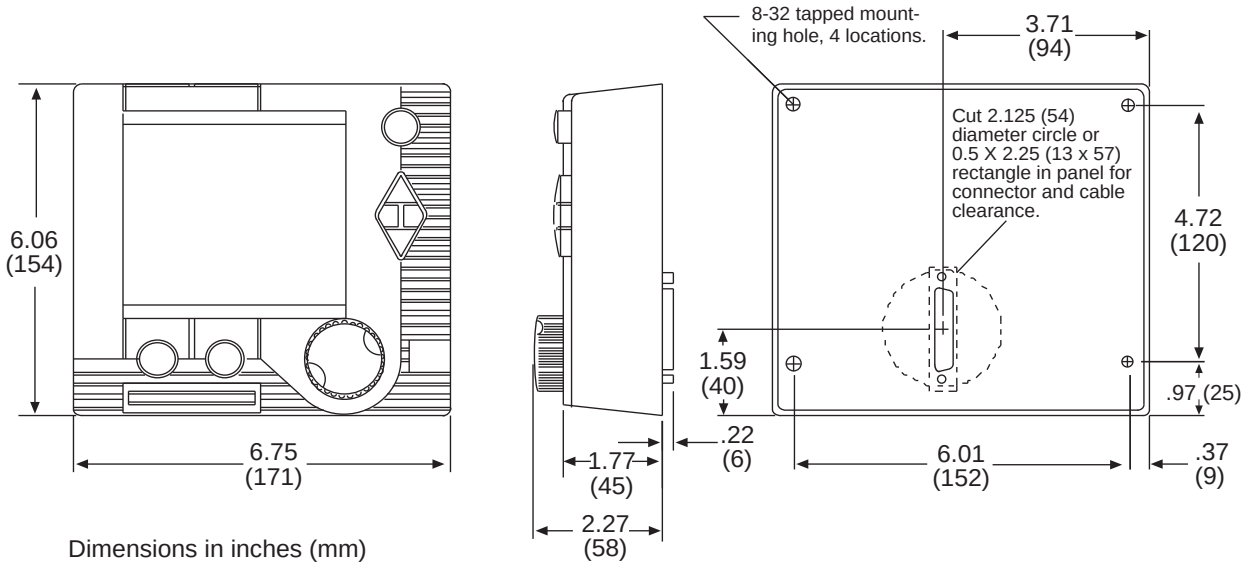
Fig. 2–4 shows the physical dimensions of the remote graphic operator interface (O/I). The Dimension graphic operator interface is designed to be mounted separately from the analog I/O processor. A 10 foot (3 meter) cable is standard.

Important: In this hardware configuration, the graphic operator interface rear panel must be accessible for cable connections.

Prepare the installation site and install the graphic operator interface as follows:

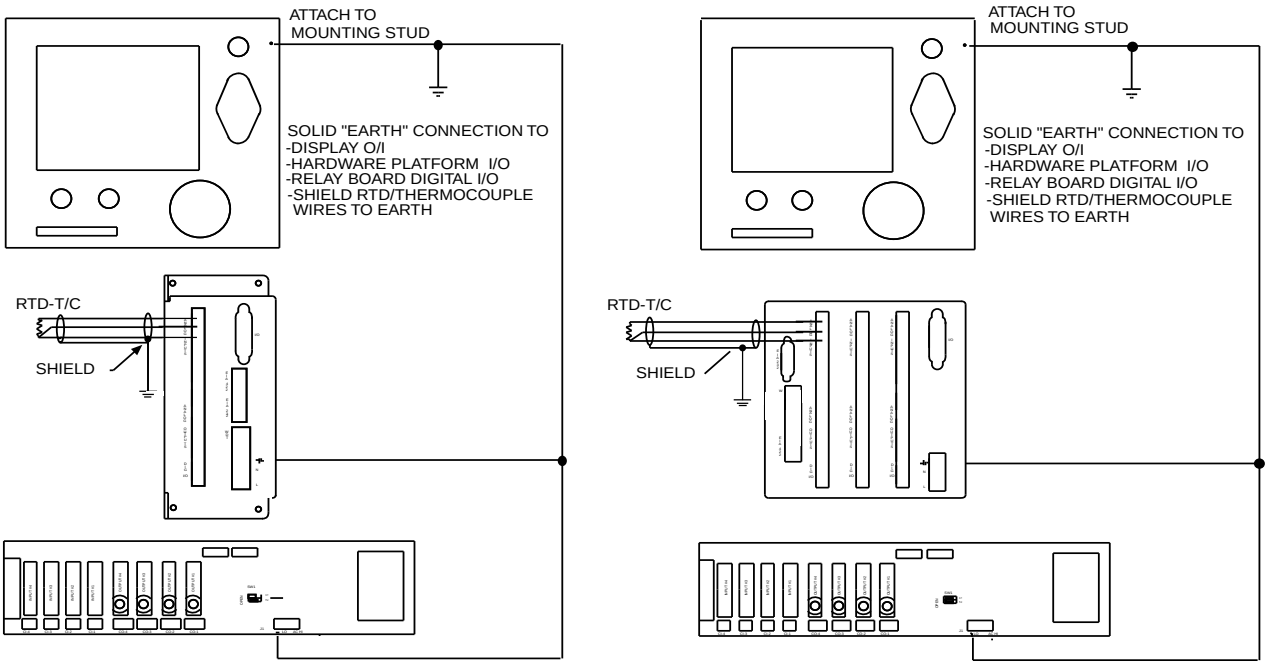
1. Referring to Fig. 2–4, make a cable access cutout and drill mounting holes in the panel.
2. Position the graphic operator interface over the panel cutout and align the mounting holes.
3. Use four 8-32 x 1/2 inch mounting screws to secure the graphic operator interface to the panel.
4. Install solid "earth" connection per Fig. 2–5 using one of the mounting screws.
5. Connect the 10-foot (3 meter) cable from the I/O connector on the analog I/O processor to the connector on the graphic operator interface rear panel.

Figure 2–4.
Graphic Operator Interface Dimensions



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Figure 2–5.
Dimension Recommended Installation Earth Grounding Procedures



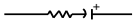
MODEL 8705
EARTH GROUND ALL COMPONENTS

MODEL 8725
EARTH GROUND ALL COMPONENTS

ELECTRICAL NOISE CONTAINMENT
INSTALLATION RECOMMENDATIONS

#1 ENSURE ALL COMPONENTS ARE ATTACHED TO SOLID "EARTH" GROUND POINT.
A SINGLE "EARTH" GROUND POINT IS RECOMMENDED.
USE 18GA. OR LARGER WIRE.
USE SHIELDED WIRES TO INSTALL ALL SENSORS.

#2 INSTALL "RC" FILTER DEVICES ON ALL SOENOIDES AND CONTACTOR COILS AS CLOSE AS POSSIBLE TO THE SOLENOIDS AND CONTACTOR COILS.



100-200 OHM, .01UF @ 600V

#3 WHEN CONTACTORS ARE OPERATING MOTORS IN EXCESS OF ONE HORSE POWER, INSTALL THE ABOVE "RC" FILTER ACROSS THE CONTACTOR CONTACTS AS WELL AS THE COIL.

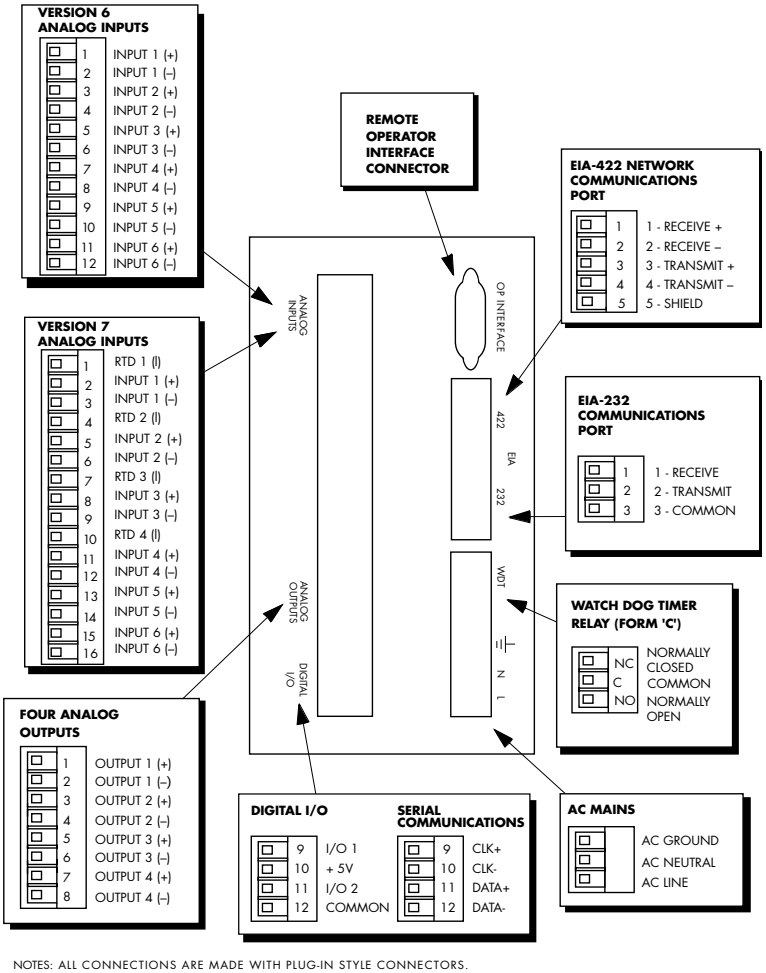
#4 SEPARATE CONTROLS SIGNAL WIRES (RTD, THERMOCOUPLE, ETC.) FROM POWER AND CONTROL WIRES.

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Field Wiring

Dimension Analog and Digital I/O field wiring terminals are made to pluggable terminal block connectors. Individual terminal assignments for the Analog and Digital I/O's are illustrated in Fig. 2–6 and Fig. 2–7 and listed in Table 2–1 and Table 2–2. Note that there are two different versions of analog cards, Version 6 and Version 7. The analog input wiring is different for these two versions. Version 6 cards are installed in models 8705 and 8725. This wiring is shown in Table 2–1. Version 7 cards are installed in models 8705e and 8725e. This wiring is shown in Table 2–2. Another method of determining the version of the analog card can be is by looking at the wiring terminals. Version 6 has 12 analog input terminals and Version 7 has 16 analog input terminals. The following paragraphs explain how to connect field wiring to the Dimension.

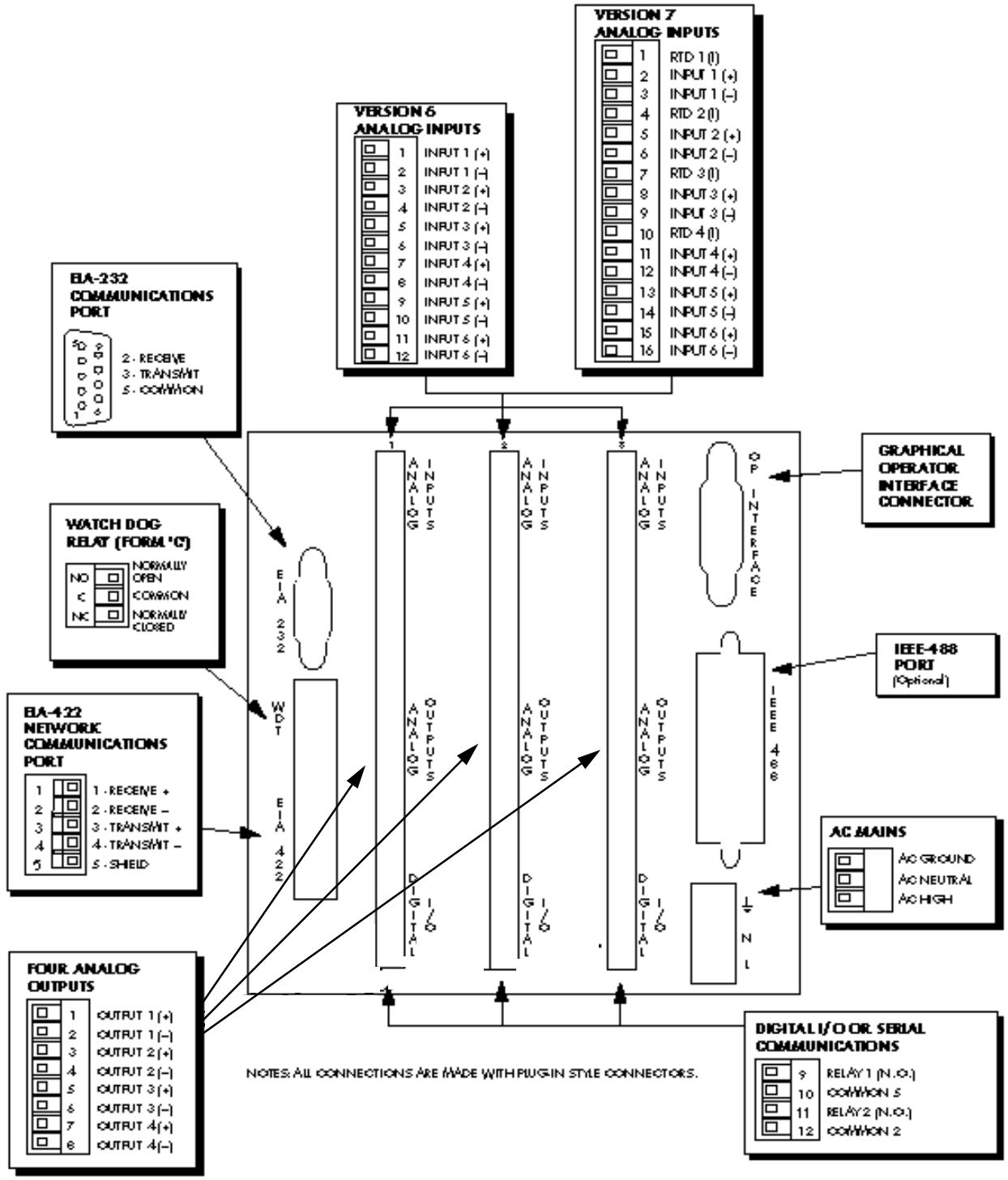
Figure 2–6.
Dimension 8705 Rear Panel



NOTES: ALL CONNECTIONS ARE MADE WITH PLUG-IN STYLE CONNECTORS.

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Figure 2–7.
Dimension Model 8725 Rear Panel



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Table 2–1. 8705 and 8725 (Version 6) Analog I/O Module Field Wiring Terminal Assignments

Connector	Terminal	* Assignment
Analog Input	1	Analog In 1+ RTD1 + IN
	2	Analog In 1– RTD1 – IN
	3	Analog In 2+ RTD2 + IN
	4	Analog In 2– RTD2 – IN
	5	Analog In 3+ RTD3 + IN
	6	Analog In 3– RTD3 – IN
	7	Analog In 4+ RTD4 + IN
	8	Analog In 4– RTD4 – IN
	9	Analog In 5+ RTD1 (I)
	10	Analog In 5– RTD2 (I)
	11	Analog In 6+ RTD3 (I)
	12	Analog In 6– RTD4 (I)
Not Used	1	
	2	
	3	
Analog Outputs	1	Analog Out 1 +
	2	Analog Out 1 –
	3	Analog Out 2 +
	4	Analog Out 2 –
	5	Analog Out 3 +
	6	Analog Out 3 –
	7	Analog Out 4 +
	8	Analog Out 4 –
Digital I/O (Contact In/Out) (Ref. Fig. 2-9)	9	Dig I/O 1 +
	10	Dig Out 1, 2 + 5 VDC
	11	Dig I/O 2 +
	12	Dig Input 1, 2 COM
Digital I/O (Communication to 8781)	9 (CLK +)	To J2 Terminal 1
	10 (CLK –)	To J2 Terminal 2
	11 (DATA +)	To J2 Terminal 3
	12 (DATA –)	To J2 Terminal 4
* Note: If RTD type input is used, inputs can be configured in the following combinations: 4 RTD inputs/0 other inputs; 3 RTD inputs/1 other input; 2 RTD inputs/3 other inputs; 1 RTD input/4 other inputs		

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Table 2–2. 8705 and 8725 (Version 7) Analog I/O Module Field Wiring Terminal Assignments

Connector	Terminal	* Assignment
Analog Input	1	Analog RTD 1 (I)
	2	Analog Input 1 (+)
	3	Analog Input 1 (-)
	4	Analog RTD 2 (I)
	5	Analog Input 2 (+)
	6	Analog Input 2 (-)
	7	Analog RTD 3 (I)
	8	Analog Input 2 (+)
	9	Analog Input 2 (-)
	10	Analog RTD 4 (I)
	11	Analog Input 4 (+)
	12	Analog Input 4 (-)
	13	Analog Input 5 (+)
	14	Analog Input 5 (-)
	15	Analog Input 6 (+)
	16	Analog Input 6 (-)
Analog Outputs	1	Analog Out 1 +
	2	Analog Out 1 –
	3	Analog Out 2 +
	4	Analog Out 2 –
	5	Analog Out 3 +
	6	Analog Out 3 –
	7	Analog Out 4 +
	8	Analog Out 4 –
Digital I/O (Contact In/Out) (Ref. Fig. 2-9)	9	Dig I/O 1 +
	10	Dig Out 1, 2 + 5 VDC
	11	Dig I/O 2 +
	12	Dig Input 1, 2 COM
Digital I/O (Communication to 8781)	9 (CLK +)	To J2 Terminal 1
	10 (CLK –)	To J2 Terminal 2
	11 (DATA +)	To J2 Terminal 3
	12 (DATA –)	To J2 Terminal 4

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Analog Card Input Wiring

As shown in Fig. 2–6 and Fig. 2–7, the Analog I/O card terminal strip consists of two separate terminal groups: inputs and outputs/digital I/O.

- Input terminals 1–16 provide connections for up to six analog inputs.
- Analog and digital I/O output terminals 1–12 provide connections for up to four analog outputs and either a high speed I/O expansion port (to Model 8781-00 Digital I/O Expansion Card) or two digital inputs/outputs.

Table 2–1 and Table 2–2 lists the pin assignments for each terminal connector, and wiring instructions are provided in the following paragraphs. When you are ready to make wiring connections, refer to the Analog and Digital I/O Field Wiring Terminal Assignments, Table 2–1 and Table 2–2

See Fig. 2–8 for location of the Analog Input Terminal Block on older 8705 (version 6) analog cards. See Fig. 2–9 for the location of analog inputs on 8705e(version 7) analog card. As shown in Table 2–1 and Table 2–2, the Analog Input Terminal Block can accommodate up to six input signals with a maximum of four RTD Analog inputs. Fig. 2–8 and Fig. 2–9 shows how to connect these field inputs to the Analog Input Terminal Blocks.



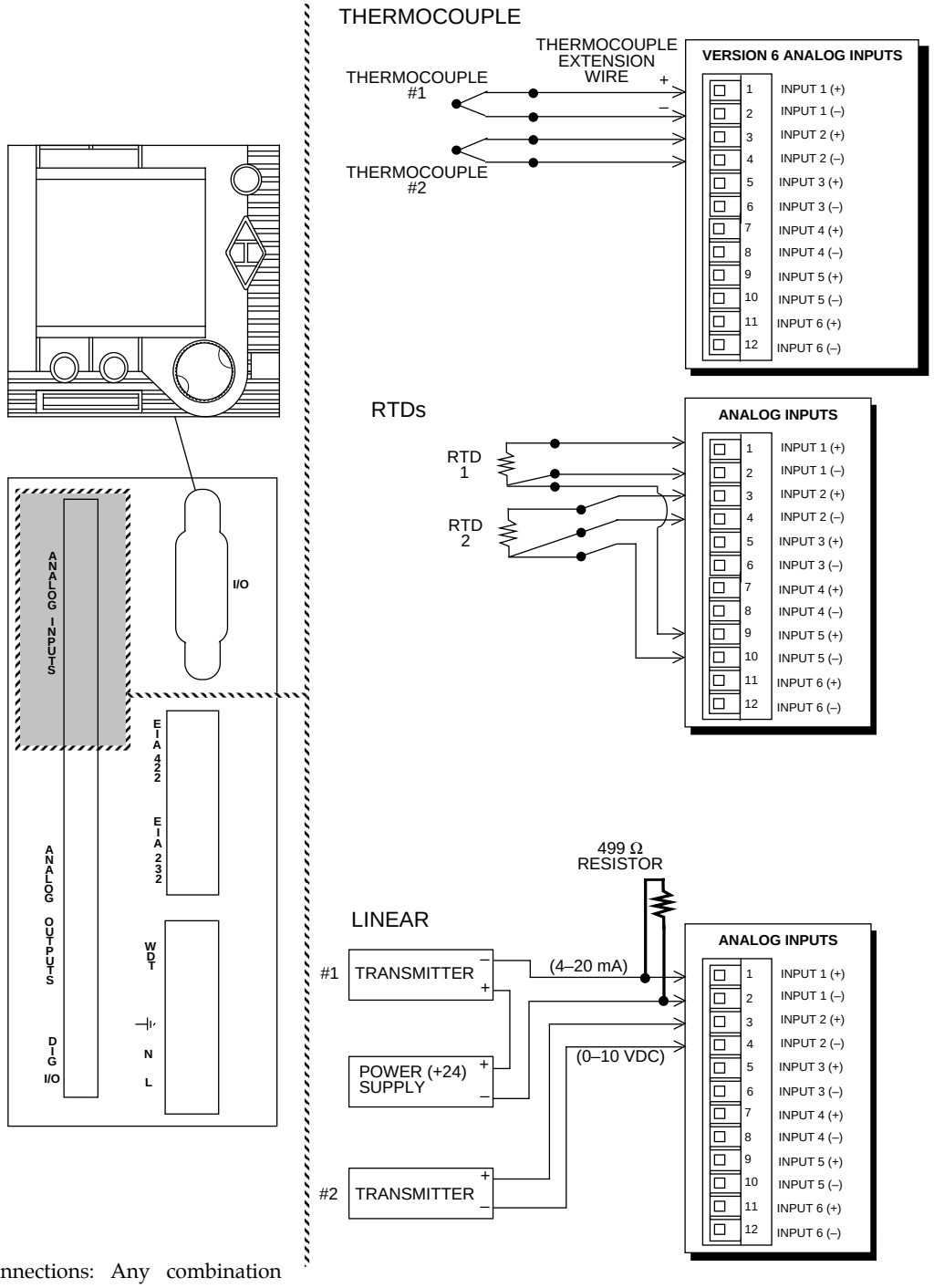
Note: *Use shielded twisted-pair cable to minimize noise pickup. The shield is passively connected directly to Dimension chassis ground. This provides a direct path for shield noise to dissipate harmlessly around critical circuitry.*

CAUTION!

Route all analog input and analog output signal wiring in a separate bundle from AC power and Digital I/O wiring.

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Figure 2–8.
8705 (version 6) Analog Input Wiring Diagram

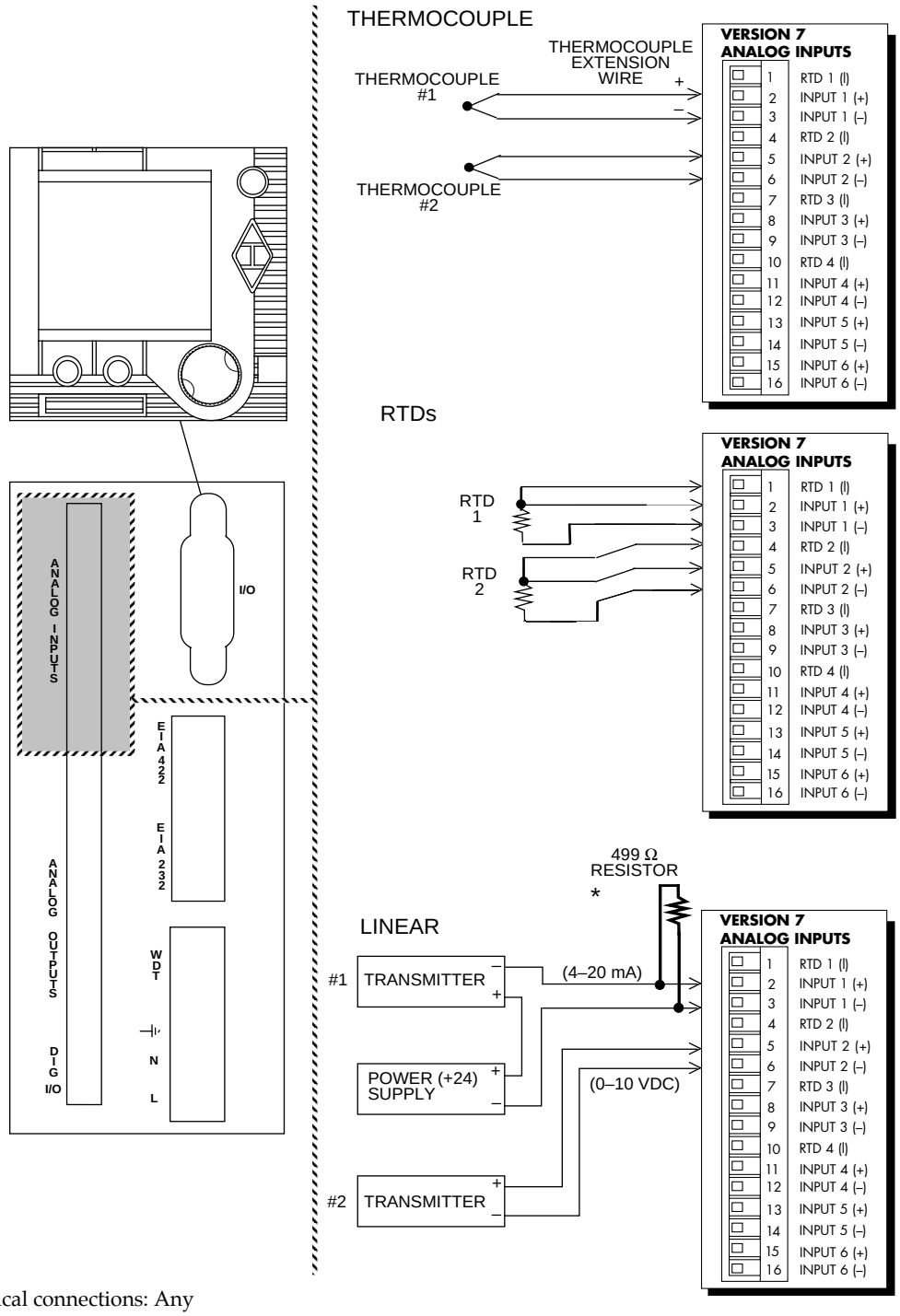


Typical connections: Any combination possible

*Note: Shunt resistor for current inputs (0-20 mA/4-20 mA). ohm 1%, metal film 1/4 watt @ 70 C

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Figure 2–9.
8705e (version 7) Analog Input Wiring Diagram



Typical connections: Any combination possible

*Note: Shunt resistor for current inputs (0-20 mA/4-20 mA). ohm 1%, metal film 1/4 watt @ 70 C

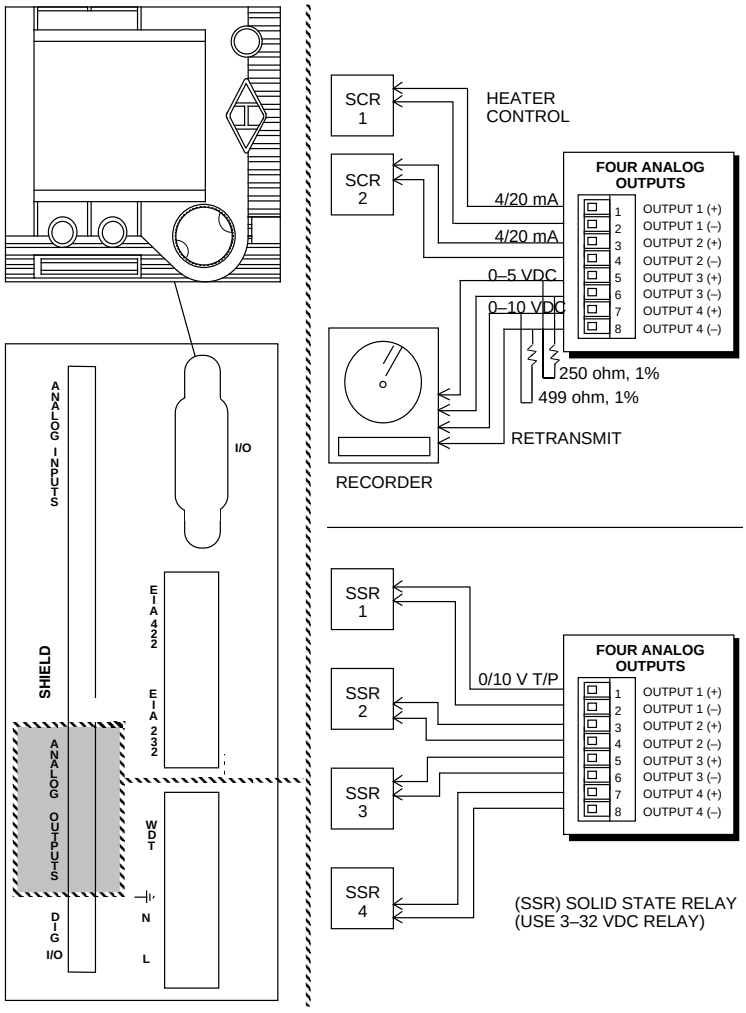
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Analog Output Wiring

The analog output wiring is the same on both Version 6 and Version 7 analog cards. This wiring is shown in Table 2–1 and Table 2–2. The terminal block "Analog Outputs" connector accommodates four analog outputs on terminals 1–8. See Fig. 2–10 for connector location. These four polarized terminal pairs can be assigned as control outputs or signed retransmission.

Each output can be factory configured for 0–10 VDC (600 ohms minimum load resistance), 4–20 mA (600 ohms maximum load resistance), 0–20 mA (600 ohms maximum load resistance), or as on/off time-proportioning.

Figure 2–10.
Analog Outputs Wiring Diagram



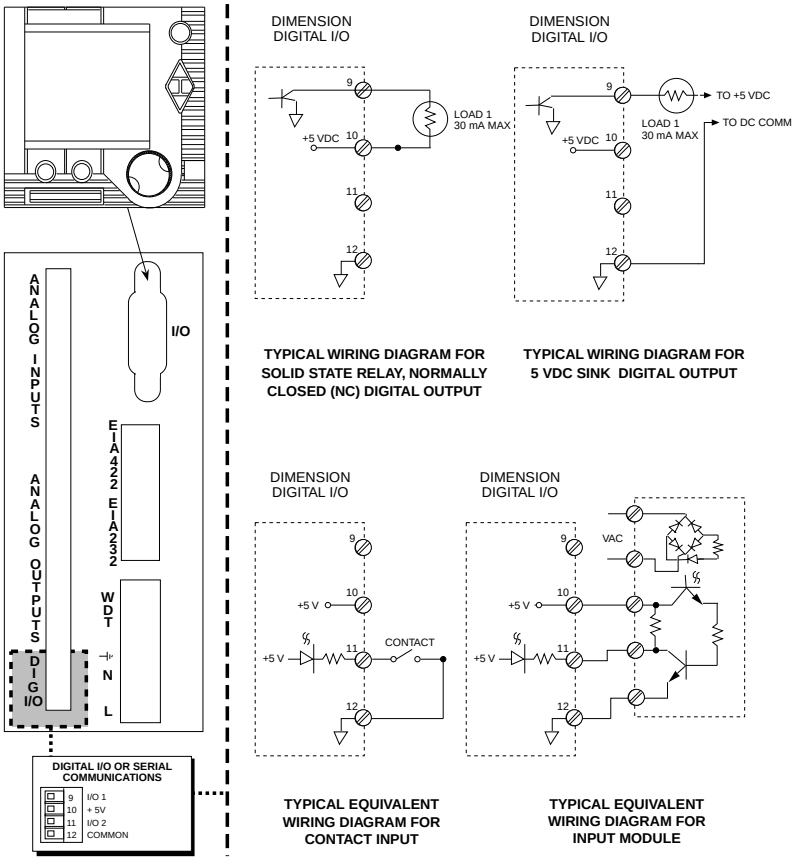
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Connector – Digital I/O

As shown in Table 2–1 and Table 2–2, the Digital I/O terminals are configured as standard, for communication to the Model 8781-00 digital I/O card (see Fig. 2–13). Optionallym these terminals can provide two inputs or outputs on terminals 9–12. See Fig. 2–11 for connector location.

Note: *The Digital I/O on the card supplied with the 8705eand 8725e hardware platforms is factory configured as a high speed communications port to model 8781-00 Digital Input/Output Expansion Kit. Analog expansion cards available for Model 8725 are configured with one digital input and one digital output (TTL level).*

Figure 2–11.
Version 7 Analog Outputs Wiring Diagram



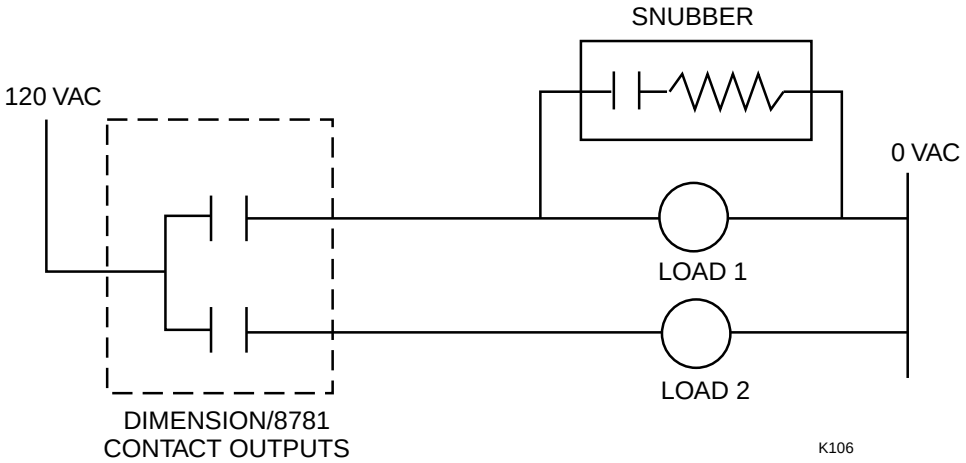
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CAUTION!

Route all input and analog output signal wiring in a separate bundle from Contact I/O and AC power wiring.

Important: In applications where inductive loads (e.g. solenoids, contactors, large relays) are used, large switching transients may be generated. To eliminate possible misoperation or damage of contact outputs from large switching transients, we recommend the installation of transient suppressors or snubbers, (e.g. Eurotherm Controls Inc part number CZ140398) across the load, as illustrated in Fig. 2–12. Suppressing the transient at the load is more effective than suppressing the transient at the controller.

Figure 2–12.
Sample Contact Output Wiring Diagram



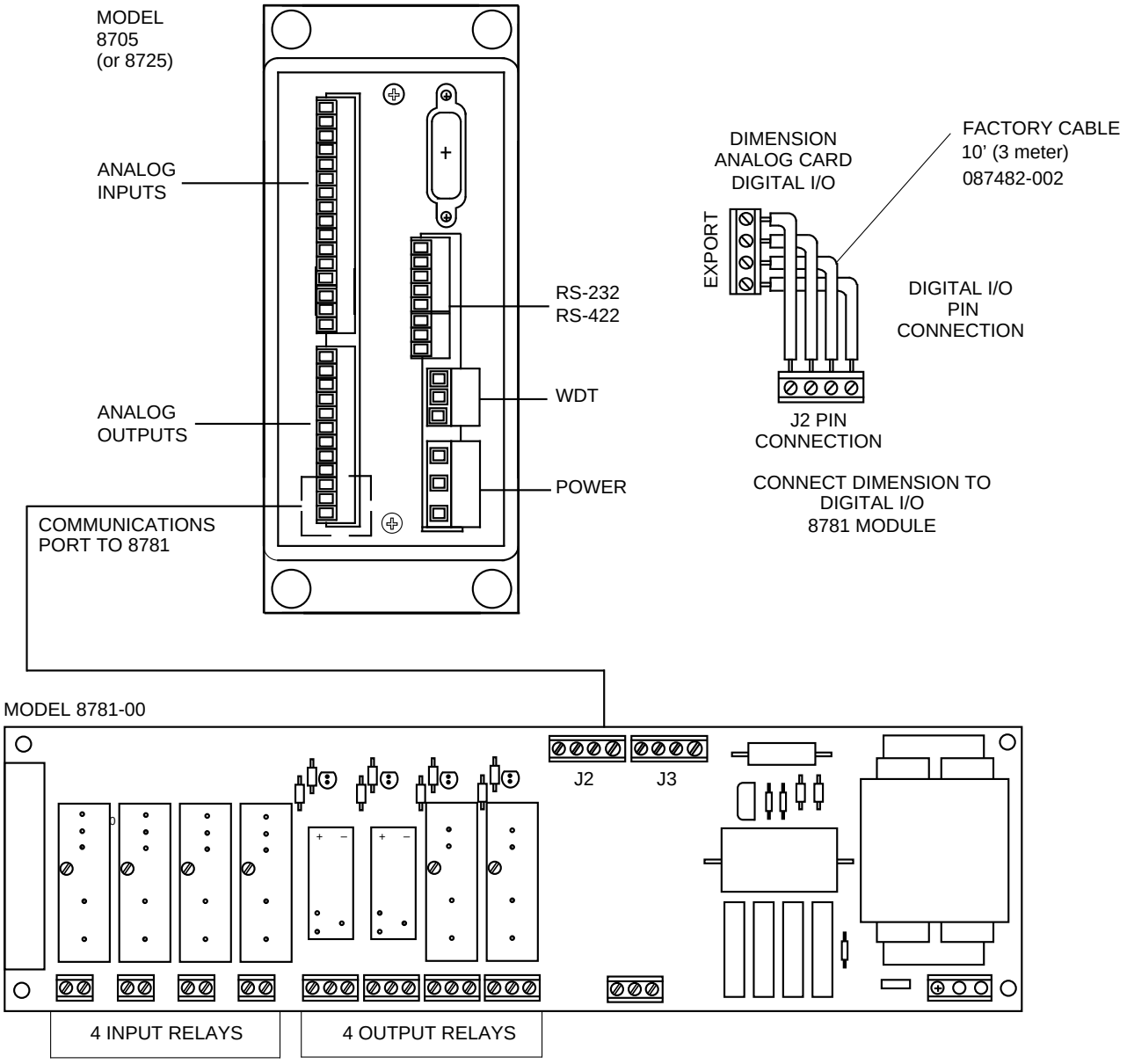
Connector – Digital I/O (Expansion Bus Communications)

As shown in Table 2–1 and Table 2–2 , the Digital I/O Terminals also may provide communications to a Remote Digital I/O module, Model 8781-00. See Fig. 2–13 for terminal locations on the 8781-00 Digital I/O card.

When Model 8781 Digital I/O expansion kit is ordered, up to 16 inputs and 16 outputs are available. The Model 8781-00 base unit handles four inputs and four outputs. Expander modules are available with four additional inputs or outputs.

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Figure 2–13.
Interconnection of the Digital Input/Output Module



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Field Wiring Documentation

Blank documentation forms are provided for Dimension field wiring documentation and are located in Appendix C, *Worksheets*.

Other relevant documentation is Input Type, i.e. T/C Type, millivolts, 4–20 mA, etc. Output Type, i.e. 4–20 mA out, 0–5 VDC out, Time Proportioned Output, etc.

Important: When you assign tag names to field inputs and outputs, we recommend that you use the same tag names assigned in system "glossaries."See Section 3.

Analog and Digital I/O Field Wiring Procedure

Use the following field wiring procedure to make wiring connections on Dimension Analog I/O modules. A sample wiring diagram for Digital I/O can also be found in Fig. 2–11.

Note: *The Digital I/O utilizes TTL signal levels. If signal levels over 5 VDC are used, they must be interfaced with solid state I/O modules or similar circuitry.*

Important: All field wiring connected to the Dimension analog I/O should be insulated, stranded, and no larger than 15 gauge.

1. Strip 3/8 inch (10 mm) of insulation from the wires you wish to connect.
2. Insert each stripped wire into the correct slot on the plug-in terminal block connector and secure with terminal screws.
3. Document each field wire on the appropriate worksheets in Appendix C.

Repeat this procedure for all terminal block connectors on all I/O modules.

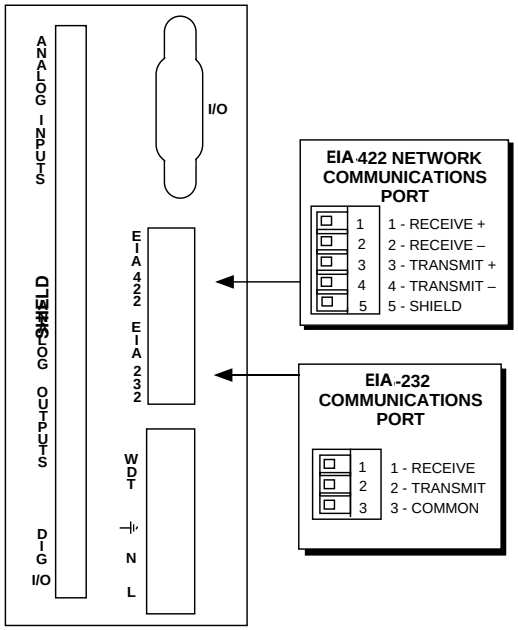
CAUTION!

Route all input and analog output signal wiring in a separate bundle from AC power wiring and Digital I/O wiring.

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Important: In applications where inductive loads (e.g. solenoids, contactors, large relays) are used, large switching transients may be generated. To eliminate possible misoperation or damage of contact outputs from large switching transients, we recommend the installation of transient suppressors or snubbers, (e.g. Eurotherm Controls Inc part number CZ140398) across the load, as illustrated in Fig. 2–12. Suppressing the transient at the load is more effective than suppressing the transient at the controller.

EIA-232/EIA-422 Communications



EIA-232 Communications Port

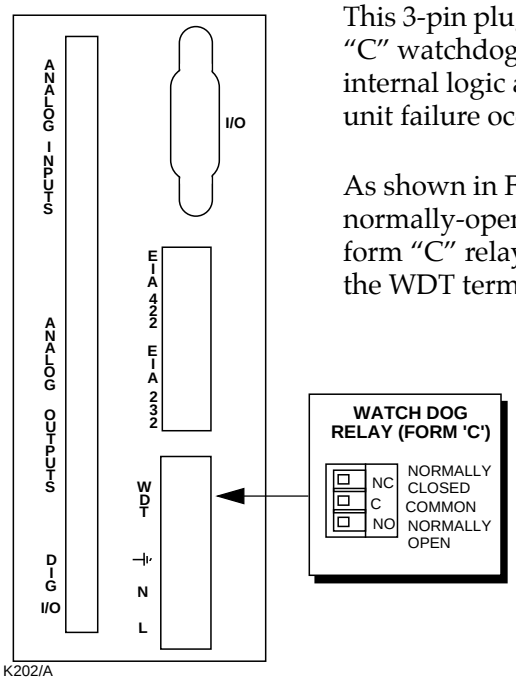
This digital communications terminal block connector port (3-pin for 8705, 9-pin for 8725) can be used for general-purpose EIA-232 point-to-point communications. Dimension communication functions are described in Appendix B.

EIA-422 Communications Port

This terminal block connector port (5-pin for 8705, 6-pin for 8725) can be used to connect Dimension to a supervisory PC. Dimension communication functions are described in Appendix B.

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Watchdog Relay



This 3-pin plug-in terminal block connector is for wiring to an internal form "C" watchdog relay. The watchdog relay can be used to monitor Dimension internal logic and program execution continuously during operation. If a unit failure occurs, the relay activates an alarm.

As shown in Fig. 2–14, the watchdog alarm can be wired for either normally-open or normally-closed operation. The alarm controls a set of form "C" relay contacts (one set N.O., one set N.C.), that are accessible at the WDT terminal block connector on the analog I/O.

Relay contacts are rated 3A (resistive) at 120 VAC/28 VDC at 25°C or 1A (resistive) at 240 VAC at 50°C.

The watchdog relay is activated during normal operation. Normally-open circuits are connected between the Normally Open and Common pins. Normally-closed circuits are connected between the Normally Closed and Common pins. If a failure occurs, the Normally Open contacts close and the Normally Closed contacts open.

Connect watchdog relay wires to the WDT terminal block connector as follows:

- The Watchdog relay contacts are shown in Fig. 2–16. This figure shows the state of the contacts when the Dimension is not powered. When powered and properly operating the contacts change state. The normally open and normally closed contacts are labeled NO and NC showing their operating state.
- Connect circuits for which a contact closure indicates an alarm between the Normally Open and Common pins.
- Connect circuits for which a contact opening indicates an alarm between the Normally Closed and Common pins.

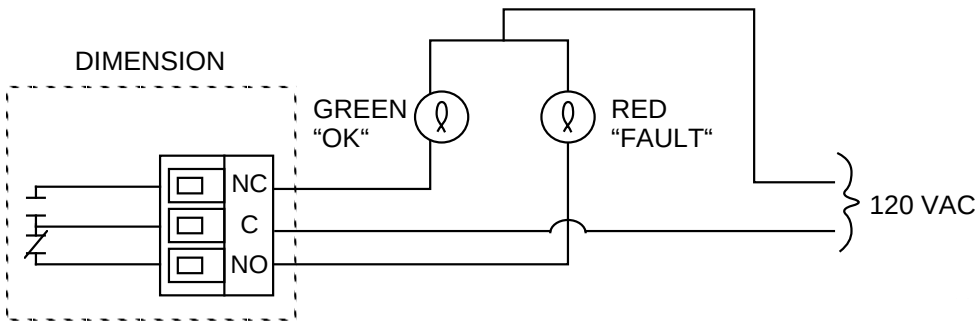
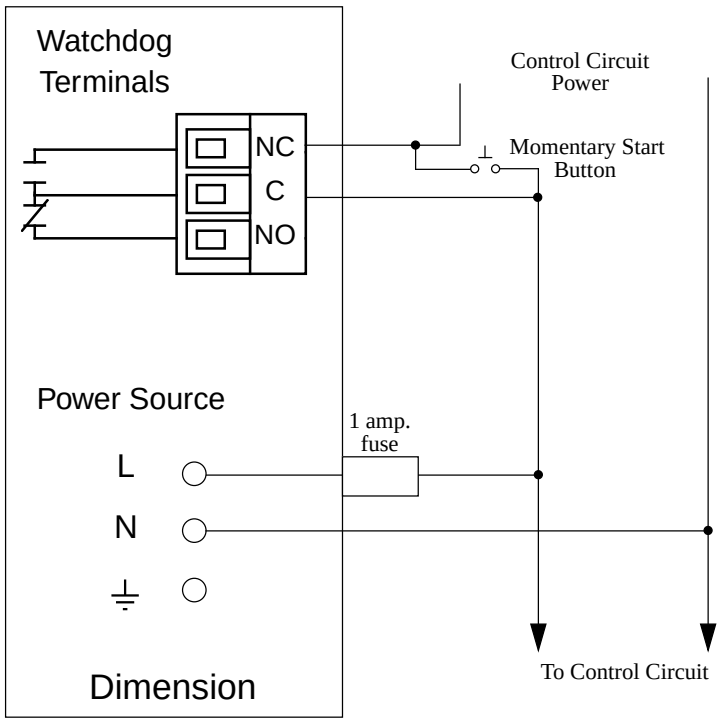


Figure 2–14. Connector WDT, Watchdog Alarm Connections (Shown in the OFF State)

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If the Controller is operating a process that could ruin costly material if it failed, the Wathcdog contacts should be wired as shown in Fig. 2–15. This circuit will interrupt power to the control circuit if the Demension should fail.

Figure 2–15.
Connector WDT, Watchdog Alarm Connections (Shown full view).



Contacts are shown in their unpowered or alarm state. When operating properly there is a closed circuit from the NC terminal to the C terminal.

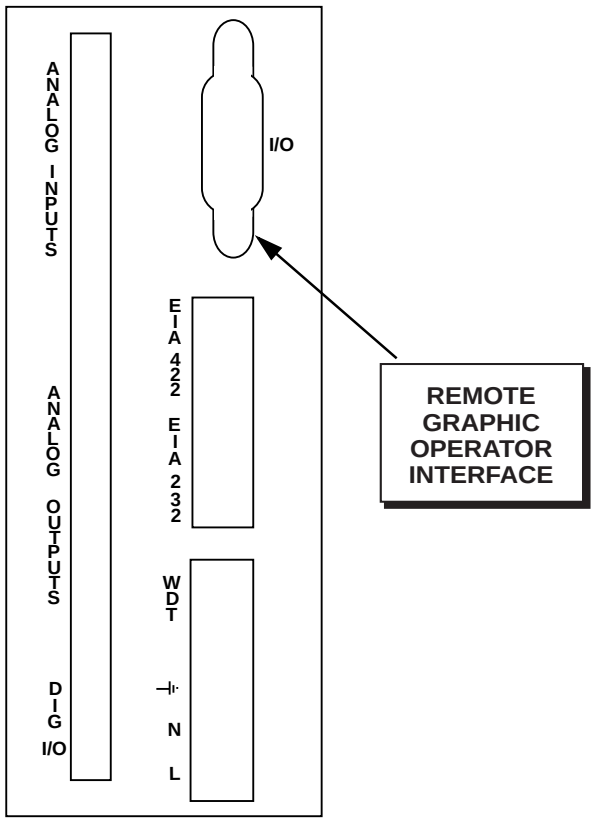
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Remote Graphic Operator Interface Communications

This 26-pin Sub D style connector is used for communications between the Model 8705/8725 analog input/output and remote graphic operator interface.

Attach the 10 foot (3 meter) cable included with the graphic operator interface from the OI connector on the analog I/O to the connector located at the center of the graphic operator interface rear panel. The cable connectors are two different sizes and will fit only one way

.



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AC Power Connection

This 3-pin plug-in terminal block connector is for wiring to an external AC power source (see Fig. 2–16).

Important: The analog I/O power supply is equipped with a voltage auto-select feature. You may connect any properly wired external power source (85–264 VAC, 47–63 Hz) to the AC terminal block connector without making mechanical adjustments or changing jumper settings. The power supply automatically senses and adapts to the incoming AC voltage level. AC power wiring should be installed by a qualified electrician to ensure that wiring meets all code requirements.

Connect external AC power wires to the AC terminal block connector as follows:

1. Connect the hot AC wire (usually black or brown) to pin "L."
2. Connect the neutral AC wire (usually white or blue) to pin "N."
3. Connect the AC ground wire (usually green) to the "⏚."

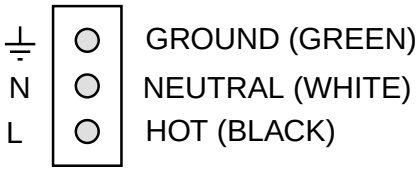
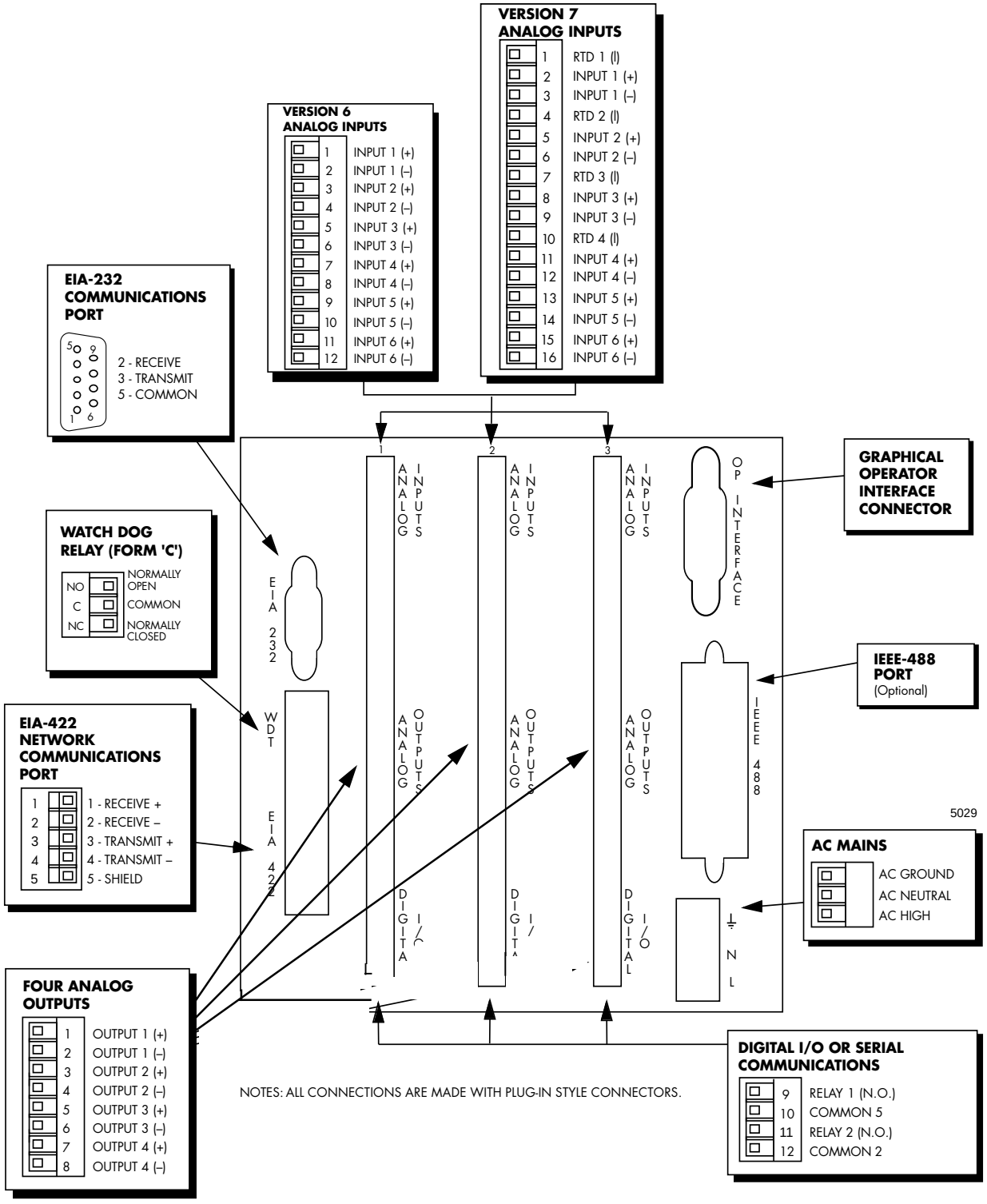


Figure 2–16.
Connector, AC Power Connections

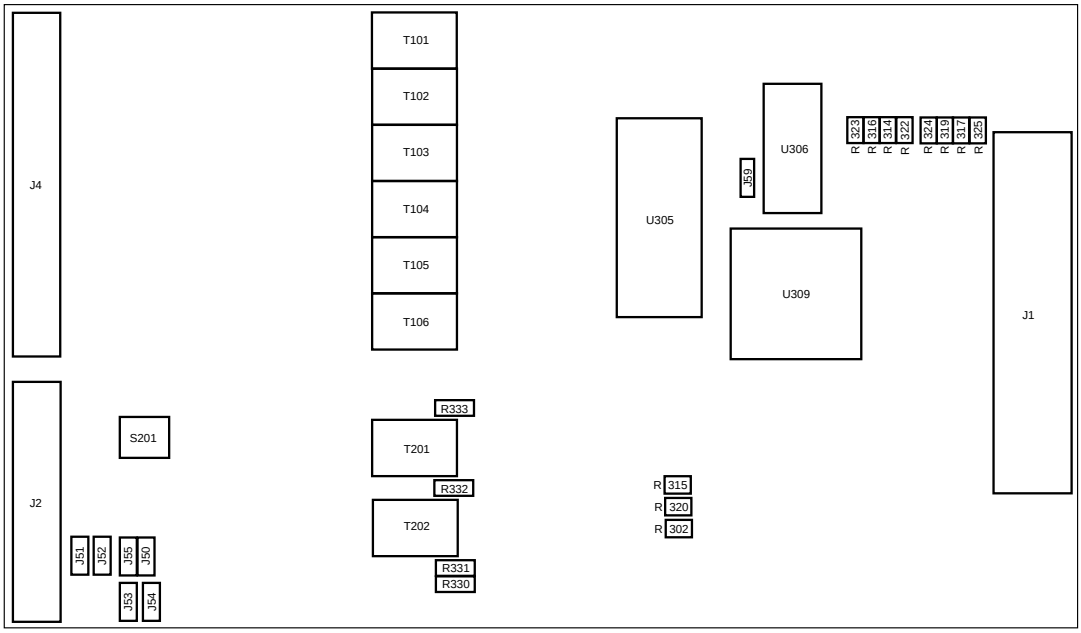
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Figure 2–17.
Dimension 8725 Rear Panel



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Figure 2–18.
Analog Card Configuration (version 7)



Version 7 Analog Card Configuration

This section covers the configuration of the Version 7 analog card installed in a newer (1998 models 8705e and 8725e) Dimension controller. If the Version 7 card is being installed into an older Dimension, See Version 7 Analog card installed into an older Dimension on the next page (see Table 2–3).

Version 7 analog card addressing for model 8725

Addressing of the Version 7 analog card is not necessary. This is taken care of in the revised (1998 model 8705e and 8725e) Dimension controller itself.

Version 7 Analog Card Input Configuration

Input configuration is accomplished via the Graphic Operator Interface. Refer to Section 4 (Fig. 4–17) of this manual for input configuration instructions.

Versions 7 Analog Card Output Configuration

The output of the version 7 analog card is set at the factory for 0-20 mA, 0-5VDC, 0-10VDC or 0-10 VDC time proportioning. The 0-20mA can be configured as 4-20 mA from the configuration area of the Graphic Operator Interface. It is possible to change the output type in the field by adding or removing resistors. Contact the Eurotherm factory for as assistance in doing this.

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A circuit board mounted switch, S201, is used to configure the outputs for analog or time proportioning. Opening one of the switches puts that output into time proportioning mode, closing the switch puts the output into analog mode. Switch A of S201 is for output 1, switch B is for output 2, etc. Refer to Table 2–3 for the settings for S201. Refer to Fig. 2–18 for the location of this switch.

Version 7 Analog Card Installed into an older (Pre 1998) Dimension

Table 2–3. Configuring the Output of a Version 7 Analog Card

Mode	Output1 (swA)	Output2 (swB)	Output3 (swC)	Output4 (swC)
Time proportioning	Open	Open	Open	Open
Analog	Closed	Closed	Closed	Closed

Power Supply Jumpers

When installing a Version 7 analog card into an older Dimension model 8705 or 8725 it is necessary to add 4 power supply jumpers (or zero ohm resistors). Locate the jumpers, R330-R333, in Fig. 2–18 and make connections as shown in Table 2–4. These connections can be made by soldering a piece of 28 gauge wire in the location of the four resistors.

Table 2–4. Power Supply Jumpers for Installing a Version 7 Analog Card into an older Dimension

R330	R331	R332	R333
Close	Close	Close	Close

Version 7 Card Address Settings for 8725

The Dimension model 8725 can have up to three analog cards installed. On the newer (1998) version of the 8725 the addressing is automatically taken care of. It is not necessary to set any address switches. If a Version 7 analog card is to be installed in an older model 8725 it will be necessary to set up the addressing. Locate the necessary jumpers, R322-R325 in Fig. 2–18 and make the connections as shown in Table 2–5.

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The spacing between the pads for these jumpers are very close together. The jumper can be made by making a solder bridge across the pads.

Table 2–5. Addressing of the Version 7 Analog Card when Installed into an older Version 8725

I/O Card Slot	R322	R323	R324	R325
Address1	Open	Closed	Closed	Closed
Address 2	Open	Open	Closed	Closed
Address 3	Closed	Closed	Open	Open

Configuration of Version 6 Analog I/O

The following seven pages contain information for configuring the older version 6 analog card. Configuration of the newer version 7 card is covered on pages the previous pages.

Each I/O card is equipped with a set of address switches (see Fig. 2–19). The function of these switches is to assign a unique hardware address to each I/O card installed in the analog I/O. Verify and reset, if necessary, the positions of these switches as follows:

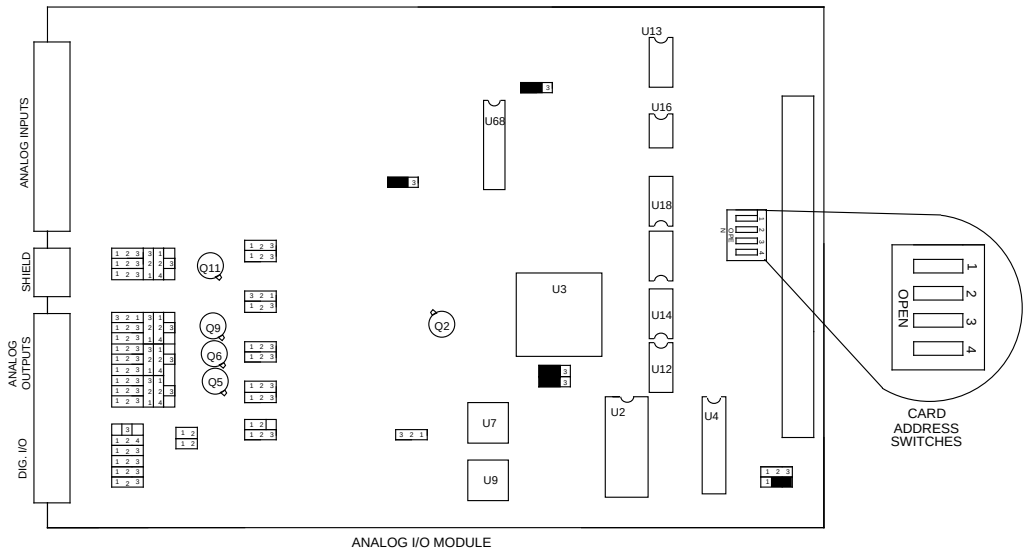
Caution!

It is not necessary to unmount the analog I/O from its mounting in order to remove and replace I/O cards, but be sure to perform all procedures using industry-approved static discharge protection methods.

1. Verify that system AC power is OFF.
2. Unplug all wire connector terminal blocks from the rear panel.
3. Choose and remove the four screws from the rear panel and remove the rear panel.
4. Grasp the analog I/O card at the top of the Analog Input connector and carefully pull the module until you feel it disconnect from the edge connector.
5. Gently remove the card from the analog I/O by sliding it out of the top and bottom guide rails.

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Figure 2–19.
Analog I/O Card Address Switches (version 6)



6. Carefully place the card, component-side up, on a clean, flat surface equipped to provide static discharge protection.
7. Switch locations are shown in Fig. 2–19. Using a small screwdriver or similar tool, change rocker switch positions as shown in Table 2–6.

Table 2–6. I/O Module Address Switch Settings

I/O Card Slot	Switch 1	Switch 2	Switch 3	Switch 4
1	OPEN or OFF	CLOSED or ON	CLOSED or ON	CLOSED or ON
2	OPEN or OFF	OPEN or OFF	CLOSED or ON	CLOSED or ON
3	CLOSED or ON	CLOSED or ON	OPEN or OFF	OPEN or OFF

When you have finished checking or changing switch positions, replace the card in the analog I/O as follows:

1. Carefully insert the card into both the upper and lower card guides and slowly push it into place.
2. Verify that the card is seated properly in the edge connector inside the analog I/O.
3. Reinstall the rear panel to the analog I/O with the four screws.

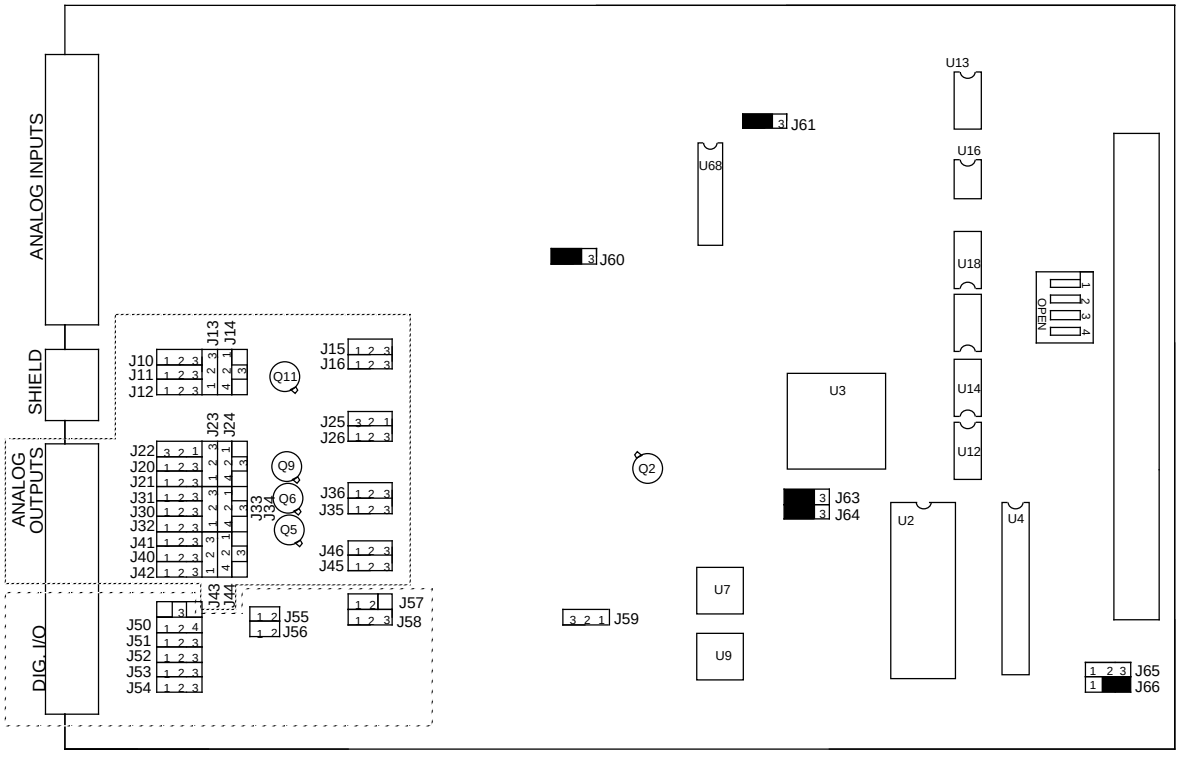
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Version 6 Analog Card Input Configuration

Input type configuration is accomplished via the Graphic Operator Interface. Refer to Section 3 of this manual for input configuration instructions.

The Analog I/O card can be configured to accommodate several different types of outputs. The following paragraphs explain how to reconfigure the module to suit your specific application. Reference Fig. 2–20 for configuration jumper locations.

Figure 2–20.
Analog I/O Card Configuration Jumper Locations



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Version 6 Analog Output Configuration

Important: Analog I/O cards are shipped preconfigured per the customer's order specifications. It is not typically necessary to reconfigure the module.

By changing the positions of the jumpers shown in Fig. 2–20 each of the four analog outputs on the Analog I/O card can be configured as one of the following output types: 0–20/4–20 mA, 0–5V, or 0–5V TP (5 volt time-proportioned relay drive).

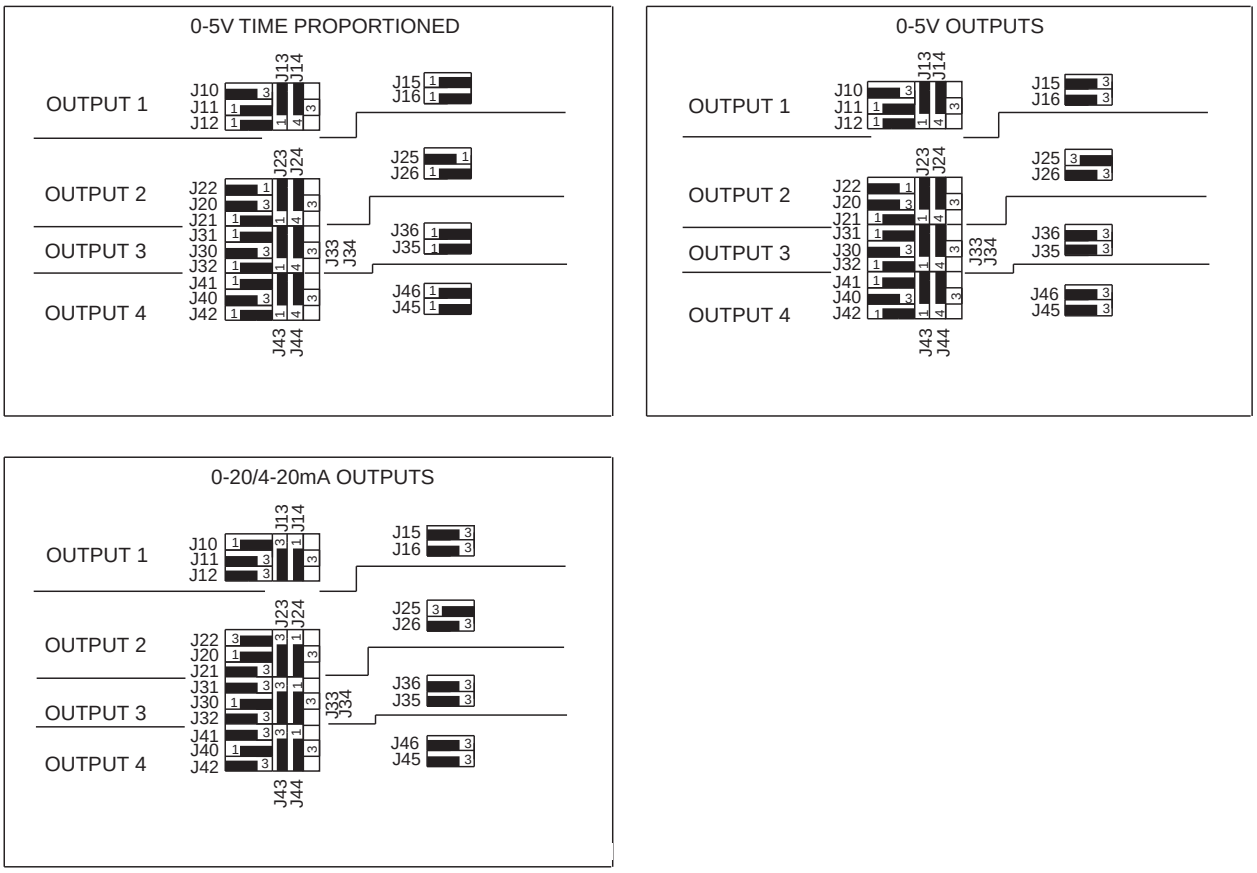
Depending on the types of analog outputs you wish to use, change jumper positions as shown in Table 2–7. Also, if 0–5V Time Proportioned is selected, the cycle time must be selected. See Output Configuration in Section 4.

Table 2–7. I/O Module Address Switch Settings

ANALOG OUTPUTS							
CHANNEL 1	J10	J11	J12	J13	J14	J15	J16
CHANNEL 2	J20	J21	J22	J23	J24	J25	J26
CHANNEL 3	J30	J31	J32	J33	J34	J35	J36
CHANNEL 4	J40	J41	J42	J43	J44	J45	J46
0–20/4–20 mA	2-3	1-2	1-2	1-2	2-4	1-2	1-2
0–5 V	1-2	2-3	2-3	2-3	1-2	1-2	1-2
0–5 V T.P.*	1-2	2-3	2-3	2-3	1-2	2-3	2-3
*Time Proportioning							
Note: Jumper layout is not identical for each output. Pay close attention to jumper configuration shown in Fig. 2–21.							

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Figure 2–21.
Analog I/O Card Output Type Configuration Jumper Locations



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Digital I/O Module Input and Output Type Configuration

The configuration of the analog card communications to the digital card (8781) is the same for Version 6 and Version 7 analog cards.

Dimension's Analog I/O card contains provisions for two low level TTL contact I/O or a high speed EIA-422 communications port to a remote digital I/O expansion Model 8781-00. The digital I/O may be configured in any one of the following four possible configurations.

1. Digital I/O 1: output
   Digital I/O 2: output
2. Digital I/O 1: input
   Digital I/O 2: input
3. Digital I/O 1: output
   Digital I/O 2: input
4. High speed communication port to the Model 8781-00 Remote Digital I/O expansion.

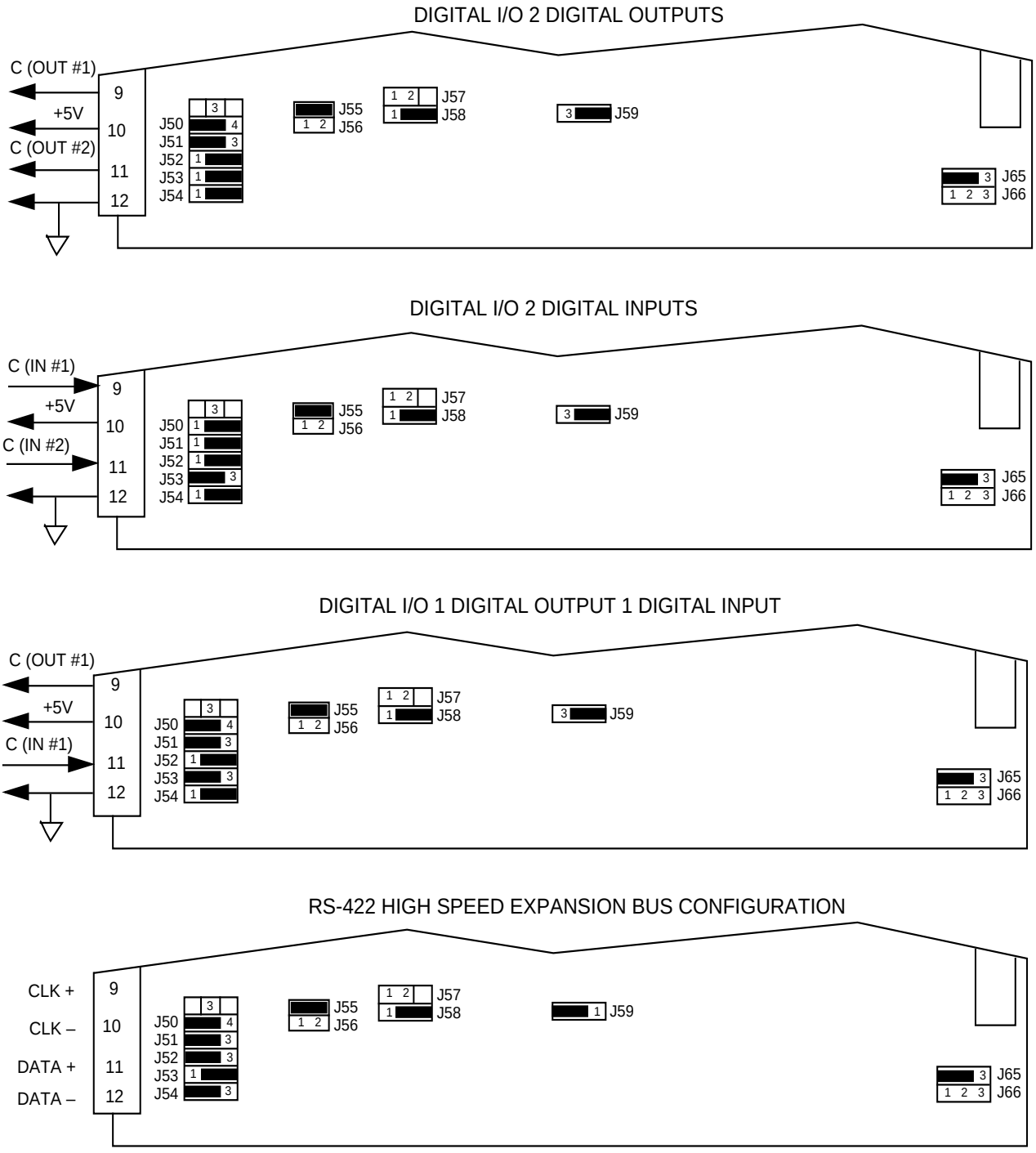
Depending on the configuration you wish to use for the Digital I/O, install the appropriate jumpers as described in Table 2–8. Reference Fig. 2–22 for jumper positions.

Table 2–8. Digital I/O Configuration Jumper Assignments

	Jumper	Pins	Jumper	Pins	Jumper	Pins
I/O 1 Output I/O 2 Output	J50 J51 J52 J53 J54	1–2 1–2 2–3 2–3 2–3	J55 J56 J57 J58 J59	Installed Not Used Not Used 2–3 1–2	J65	1–2
I/O 1 Input I/O 2 Input	J50 J51 J52 J53 J54	2–4 2–3 2–3 1–2 2–3	J55 J56 J57 J58 J59	Installed Not Used Not Used 2–3 1–2	J65	1–2
I/O 1 Output I/O 2 Input	J50 J51 J52 J53 J54	1–2 1–2 2–3 1–2 2–3	J55 J56 J57 J58 J59	Installed Not Used Not Used 2–3 1–2	J65	1–2
EIA-422 High Speed Expansion Bus	J50 J51 J52 J53 J54	1–2 1–2 1–2 2–3 1–2	J55 J56 J57 J58 J59	Installed Not Used Not Used 2–3 2–3	J65	1–2

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Figure 2–22.
Analog I/O Card Digital I/O Jumper Configuration



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Series 8781 Digital I/O Expansion Instructions

Connector – Digital I/O

Note: The Digital I/O terminals 9 through 12 on the 8705 and 8725 analog I/O cards are factory configured as a high speed communications port to model 8781-00 Digital I/O Expansion Kit. As an option these terminal can be custom configured at the factory as 2 digital inputs, 2 digital outputs, or one input and one output (called Local digital I/O). Fig. 2–6 and Fig. 2–7 show the electrical circuits if the terminals are configured for Local digital I/O.

Introduction

The 8781 Series Digital I/O Card is an intelligent digital I/O device designed exclusively to operate with the Eurotherm Controls Inc's Dimension Control System.

Model 8781-00 is an 8 point (4 input, 4 output) card that accommodates photo isolated digital power input modules, and output relay (solid state or mechanical) devices. A combination of digital input modules or output relays (up to 4 input and 4 output) may be plugged into an 8781-00. The 8781-00 may be expanded to accommodate up to 4 additional input modules and 4 output relays.

Note: *It is possible to connect up to two I/O cards to one Dimension, for a total of 16 Digital Inputs and 16 Digital Outputs.*

The 8781-00 communicates to the host Dimension analog card via a high speed EIA-422 communications serial multi-drop link. The serial link is composed of two twisted pairs of wires that connect from the host Dimension to the 8781-00.

The EIA-422 Link offers excellent noise immunity and long cable lengths (up to 1,000 feet [304.8 meters]). This reduces wiring costs and allows the Digital I/O to be located where the actual control is required.

Important: On older Dimensions, digital I/O cards must be wired to the Dimension unit and powered-up, ***BEFORE*** or ***WITH*** the Dimension unit. If not, the Dimension will not acknowledge or communicate with the Digital I/O.

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System Configuration

As stated previously, each Dimension can support two 8781-00 cards, with expanders, for a total of 32 I/O points (16 inputs and 16 outputs).

The Digital I/O cards should be placed as close to the process being controlled as possible, to eliminate costly field wiring. The Digital I/O communicate to the host Dimension series analog card over a high speed EIA-422 multi-drop series communication link. The last Digital I/O card in the link may be up to 1,000 (304.8 meters) feet from the host. Each Digital I/O card in the communications link must be assigned a unique address i.e. 1, 2, 3, or 4, via an address select dip switch.

When planning your system layout, plan to route your communication link cable past all points where you need control now or may need control in the future.

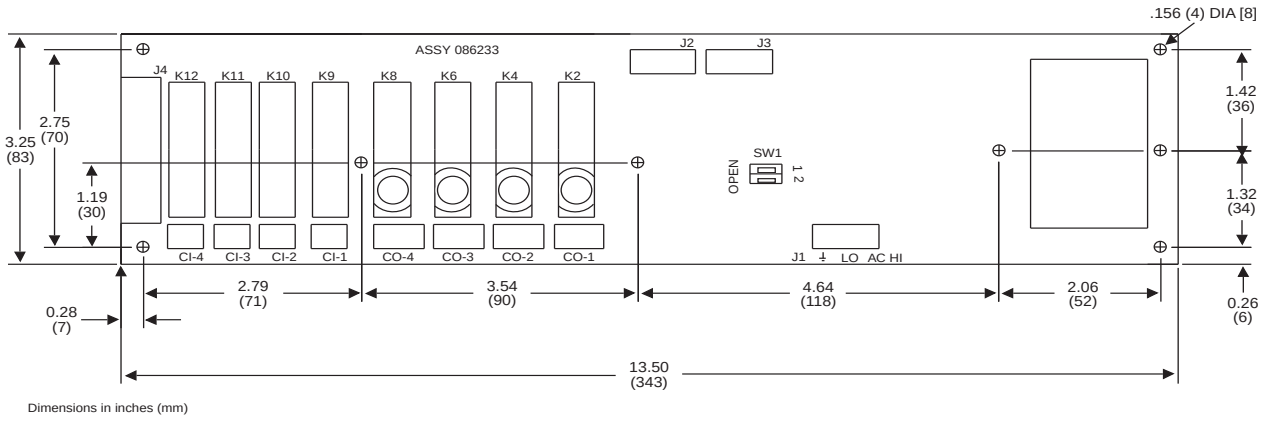
Provision must also be made for 120VAC or 240VAC (jumper selectable) supply to each Digital I/O card (see Fig. 2–29).

Installation

Physical Installation

The Digital I/O cards may be mounted in any position on a flat surface. Each card is supplied with 3.25 inch (82.6 mm) "SNAPTRACK®" molded plastic mounting track. Ensure that sufficient I/O wiring space between adjacent I/O cards is provided. Refer to Fig. 2–23 for overall dimensions.

Figure 2–23.
Model 8781-00 Dimensions

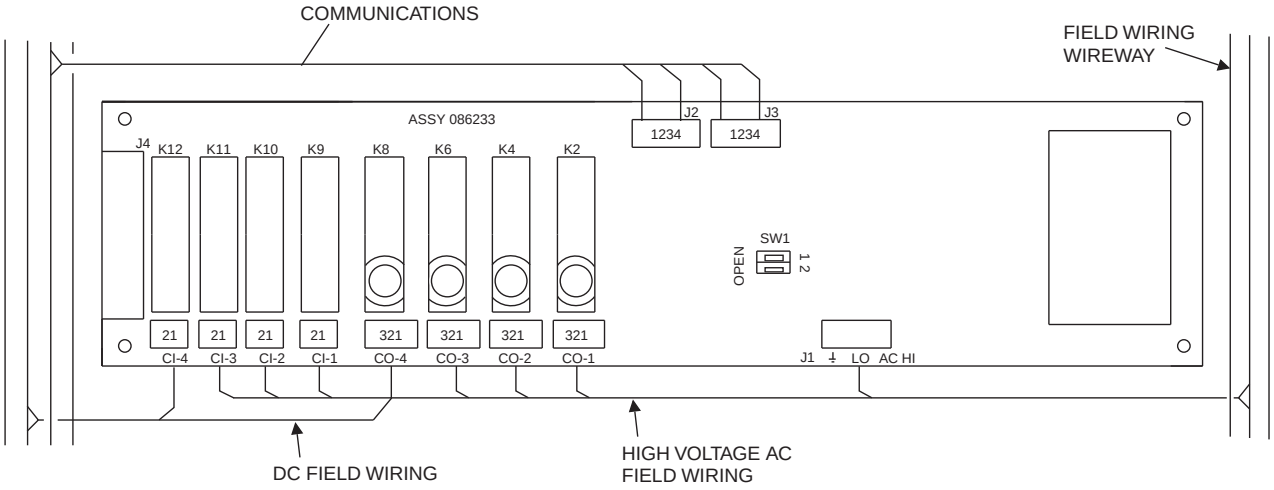


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To ensure reliable and trouble-free communications, the following is recommended:

- Twisted pair wires must be used for the communications wiring. The typical wire type is Belden part no. 9842 or equivalent.
- The communications and any DC wiring should be routed or kept separate from any high voltage AC field wiring. Refer to Fig. 2–24.

Figure 2–24.
Diagram for Communications and DC Wiring Hook-up



Communications Wiring

A complete Data Link connection at each Digital I/O card (except for the last one in the link) consists of two twisted pairs (four wires) coming from the host Dimension analog card or the previous Digital I/O card, and two twisted pair (four wires) going to the next Digital I/O card in the link. The last Digital I/O card in the link must have a 120 ohm terminating resistor between pins 3 and 4 of the unused communications terminal block (see Fig. 2–26).

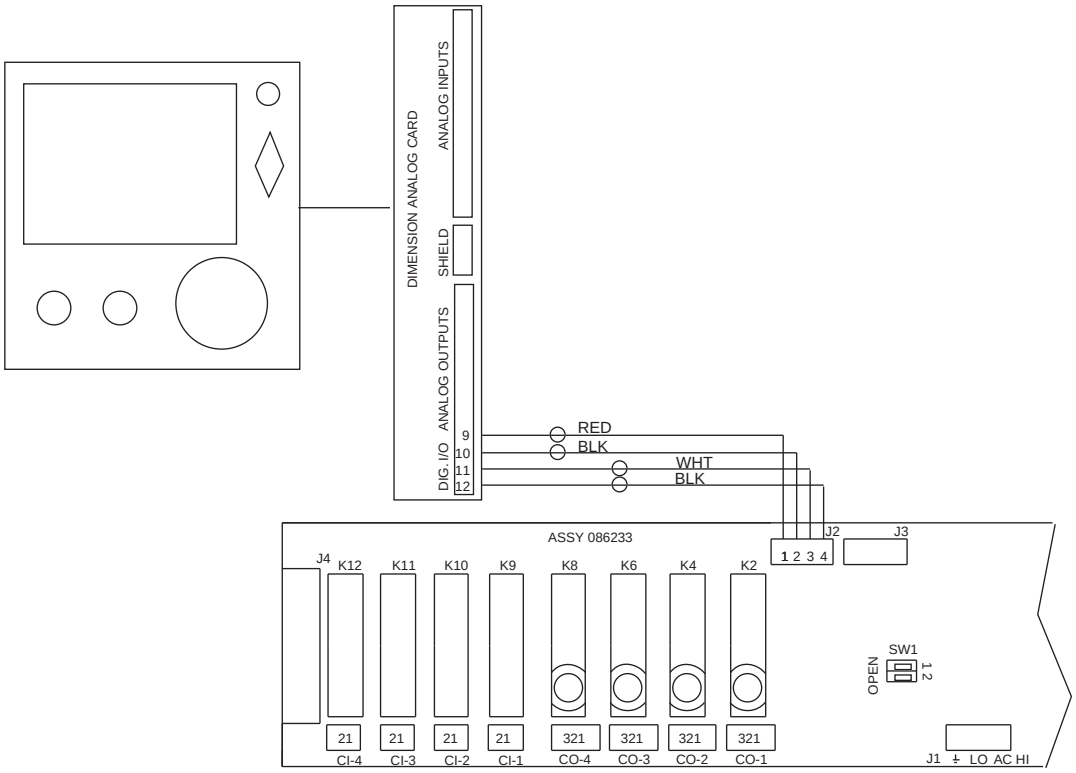
Dimension Analog Card to the First Digital I/O Card

Fig. 2–25 shows the connections from the Dimension analog card to the first Digital I/O card on the serial link. A suggested color code is shown to help prevent wiring errors.

Important: On older Dimensions, digital I/O cards must be wired to the Dimension unit and powered-up, ***BEFORE*** or ***WITH*** the Dimension unit. If not, the Dimension will not acknowledge or communicate with the Digital I/O.

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Figure 2–25.
Connections from Dimension Analog Card to the First Digital I/O Card

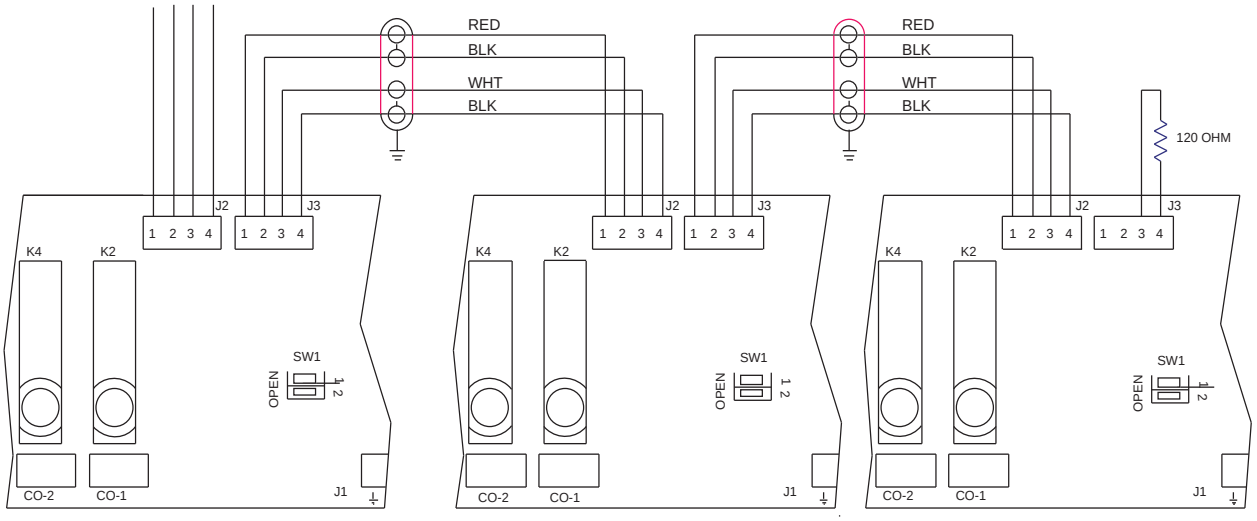


Digital I/O Card to Digital I/O Card

Fig. 2–26 shows the connection between the digital I/O cards on the EIA-422 serial link.

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Figure 2–26.
Wiring Diagram: I/O Card to I/O Card



Install Digital Input Modules and Output Relays

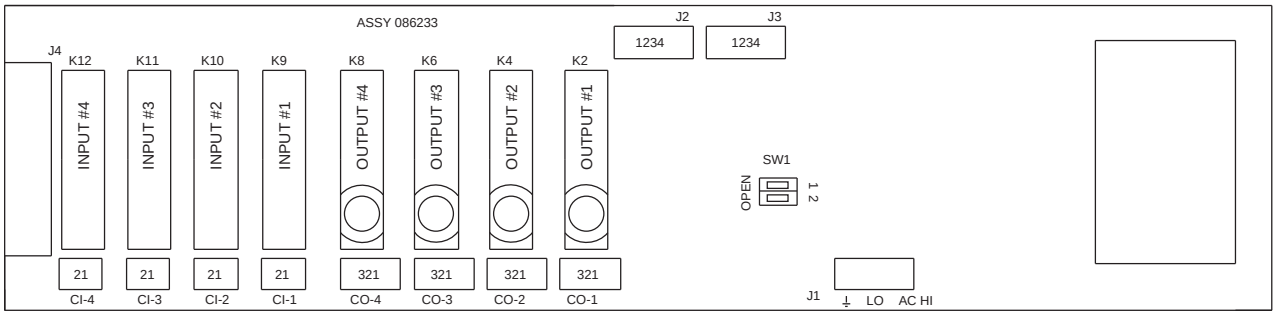
Caution

Ensure that all power is removed before installing or removing I/O devices.

The input module and output relay device positions on the 8781-00 card can accept any of the module and relay types listed in Table 2–9. The card has four dedicated input positions and four dedicated output positions, as shown in Fig. 2–27. Install the color coded power I/O modules and relays by inserting the module or relay pins into the sockets on the I/O card. Secure the module or relay with the captive Phillips Head screw. The electro-mechanical relays do not have the captive screw.

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Figure 2–27.
8781-00 I/O Card Dedicated I/O Position



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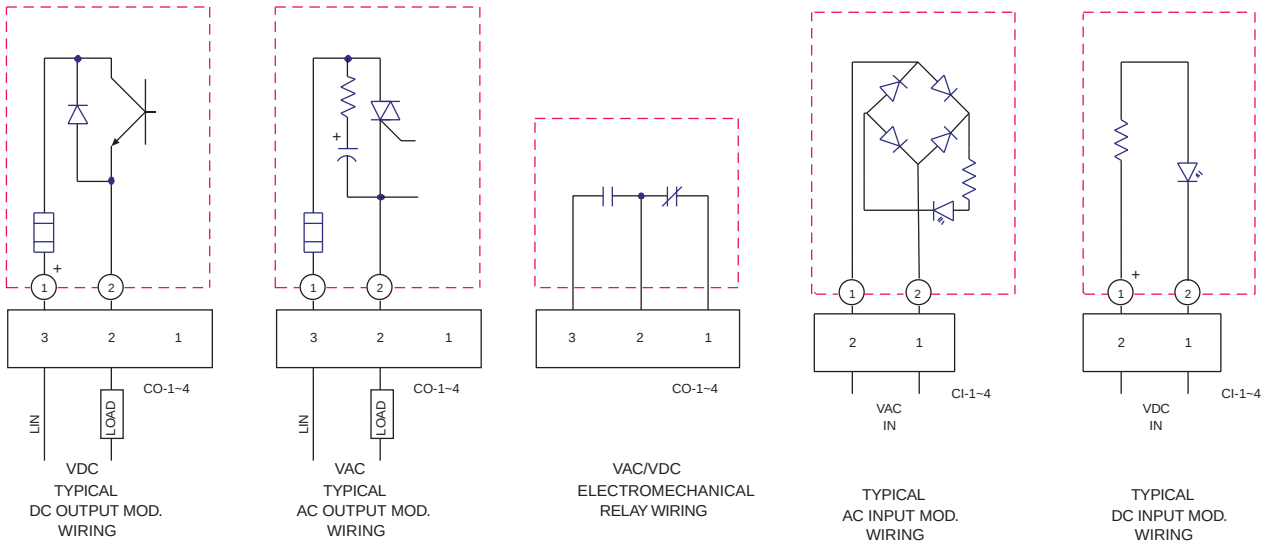
Table 2–9. I/O Module Selection Table

Device Description	Color Code	Part No.
AC input module 90–140VAC	yellow	086303-001
AC input module 180–280VAC	yellow	086303-002
DC input module 2.5–28VDC	white	086304-001
DC input module 10–32VDC	white	086304-002
AC output relay 12–140VAC 3A	black	086302-002
AC output relay 24–280VAC 3A	black	086302-001
DC output relay 5–200VDC 1A	red	086308-001
DC output relay 5–60VDC 3A	red	086308-002
Electro-mechanical relay 10A up to 240VAC/30VDC resistive		085501-002

Each power I/O device is connected to two terminal block terminals (see Fig. 2–28), while the electro-mechanical relay is connected to three terminals (NO-C-NC).

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Figure 2–28.
Basic Digital I/O Wiring Diagram



Power Supply Requirements

Each Digital I/O card contains its own power supply, which requires a 120VAC or 240VAC 1 phase 50/60 Hz supply. When routing the 120/240 volt supply wires, care should be taken to keep the AC wiring separate from the communication and DC wiring.

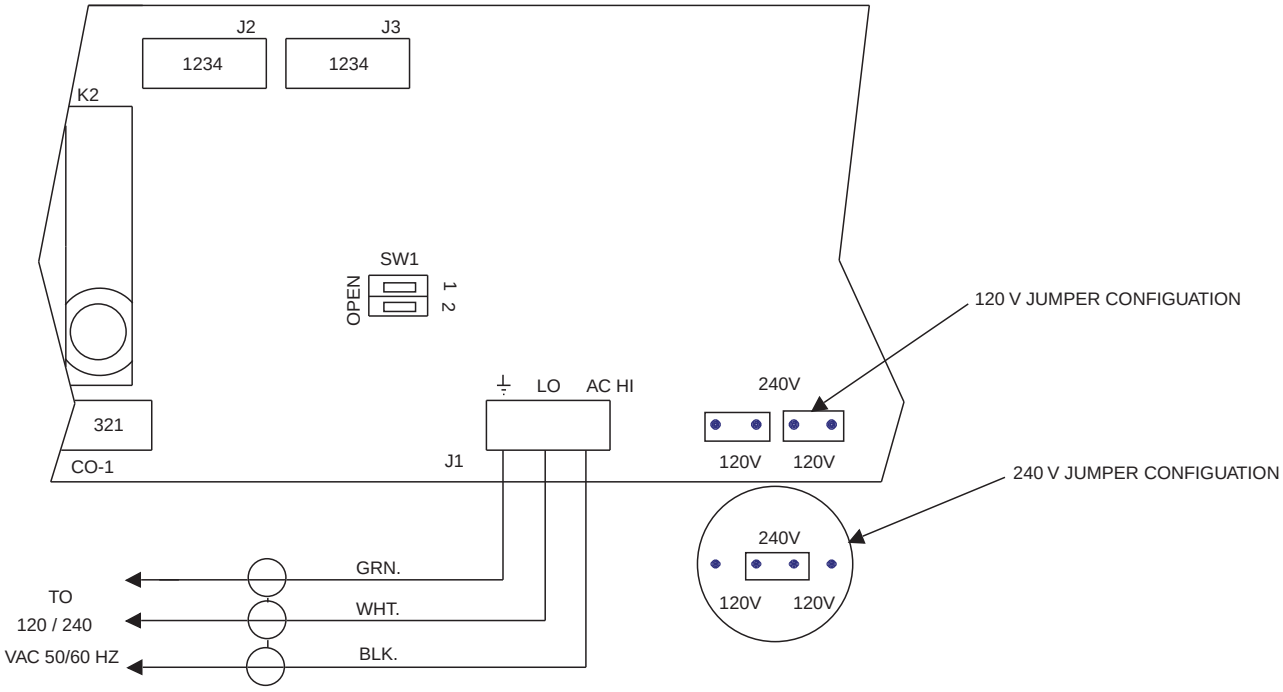
Connect the AC Power Supply

Fig. 2–29 shows the connections from the Digital I/O card to the AC power source.

Note: *The I/O card must be configured appropriately for the line voltage used. For 120VAC place two jumpers across the 120V pins as shown below. For 240VAC place one jumper across the 240V pins as shown. The Digital I/O card is factory configured for 120VAC.*

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Figure 2–29.
Connections from the Digital I/O Card to the AC Power Source



Selecting the Digital I/O Address

Each Digital I/O card in a communications link must have a unique address (i.e. 1–4). To select the desired address, set dip switches SW1-1 and SW1-2 as shown in Table 2–10. If only one I/O card exists it should be set to address 1. Any additional cards must be in sequential address order.

Table 2–10. Address Configuration Table

SW1-2	SW1-1	ADDRESS
CLOSED	CLOSED	1
CLOSED	OPEN	2
OPEN	CLOSED	3
OPEN	OPEN	4

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Digital I/O Expansion Cards

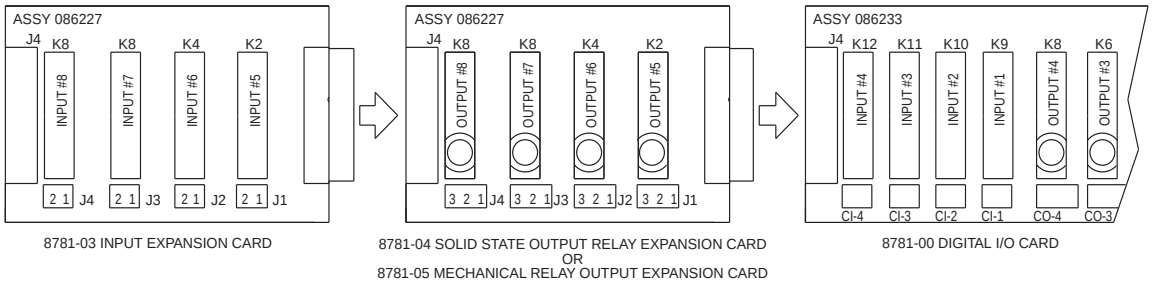
Overview

Each Digital I/O card may be expanded from 4 input and 4 output points to 8 input and 8 output points. This expansion capability is accomplished with the addition of plug-on expansion cards. The expansion cards consist of one 4 point card for inputs, one 4 point card for solid state outputs and one 4 point output card for electro-mechanical relay outputs. These expansion cards simply plug on to the end of the Digital I/O card or existing expander card, effectively extending the communications bus.

Physical Installation

The expansion I/O cards are installed similar to the Digital I/O card. Only one input expansion card and one output expansion card can be added to a Digital I/O card. The first expansion card is plugged onto the Digital I/O card, the second expansion card is then plugged onto the first expansion card. It does not matter which type of expansion card is added first. It does matter that only one input and one output expansion card is added.

Figure 2–30.
Series 8781 Physical Characteristics



Install I/O Modules

Each I/O expansion card is dedicated to either input modules or output relays. Any of the devices listed in Table 2–9 may be used. Install the device by inserting its pins into the sockets on the expansion card. Secure the device with the captive Phillips Head screw. The electro-mechanical relays do not have the captive screw.

Maintenance and Repair

Routine maintenance for the Digital I/O cards (including expansion cards) consists of periodic inspection and cleaning to ensure dirt and debris are removed from the cards to prevent overheating of the power supply components and I/O devices.

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Dimension Model 8782 Analog to Solid State Relay Output Kit Instructions

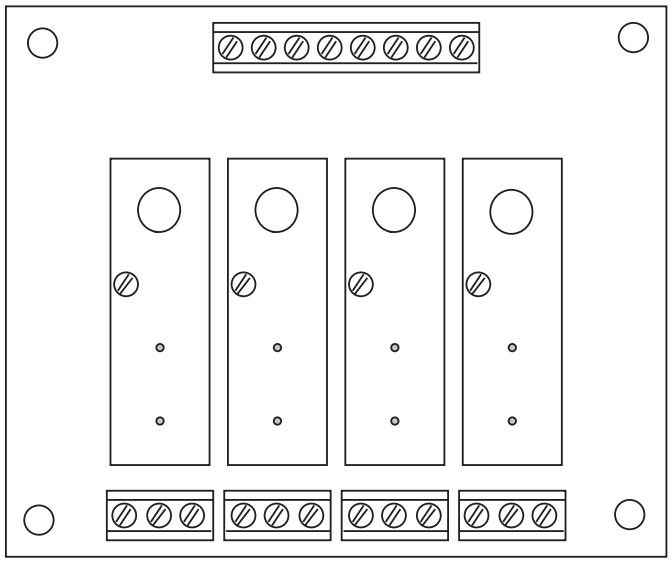
Introduction

The Dimension series Analog to Solid State Relay Output is designed to operate with the Eurotherm Controls Inc's Dimension Control System.

The Analog to Solid State Relay (SSR) Output Card (see Fig. 2–31) is a 4 point unit that accommodates Photo Isolated Digital Power Output Modules. Any combination of Digital Output module types may be plugged onto the SSR Output card.

The Analog to SSR Output Modules are turned on and off with a time proportioned 0–5VDC signal originating from the 4 analog outputs of a Dimension Analog Board.

Figure 2–31.
Model 8782 Analog to Solid State Relay Output Card



Installation

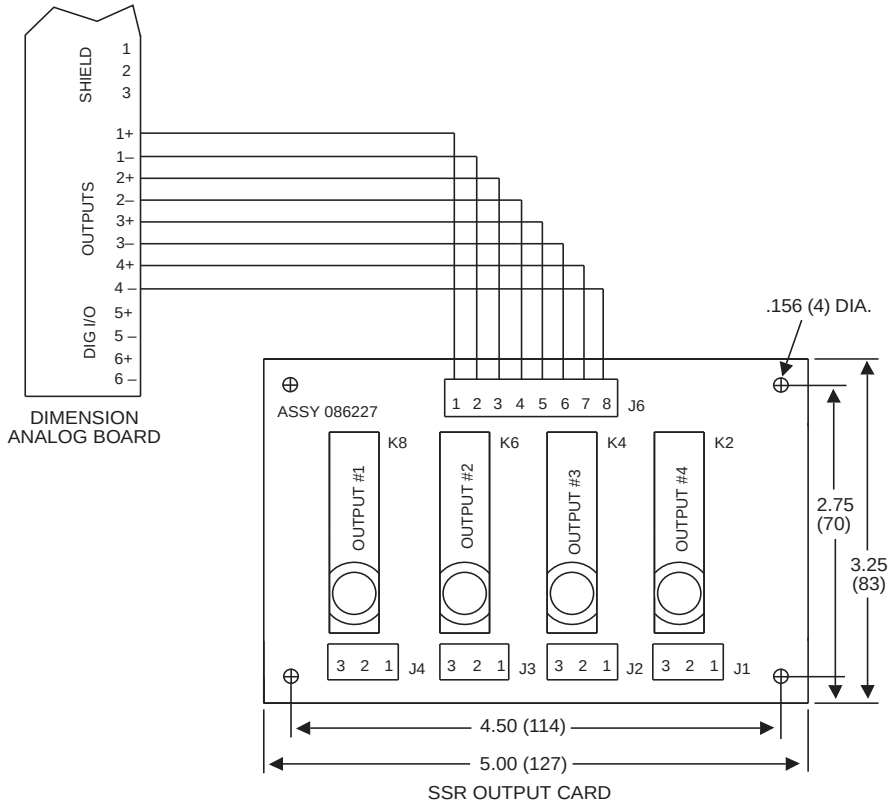
The SSR Output Module Card may be mounted in any position on any flat surface. It is supplied with 3.25 inch (82.6 mm) "SNAPTRAK" molded plastic mounting track. Insure that sufficient I/O wiring space between adjacent devices is provided.

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Dimension Analog Card to SSR Output Card

Fig. 2–32 shows the wiring connections from the Dimension Analog Card to the SSR Output Card.

Figure 2–32.
Wiring Connections from the Dimension Analog Board to the SSR Output Module Card



Dimensions in Inches (mm)

Installing Solid State Output Relays

Caution!

Insure that all power is removed before installing or removing Solid State Output Relays.

Each of the Output device positions on the SSR Output card can accept any of the Output relay types listed in Table 2–11. Install the color coded relay which performs the required function, on the SSR Output card by inserting the relay pins into the sockets on the card. Secure the relay with the captive Phillips-Head screw.

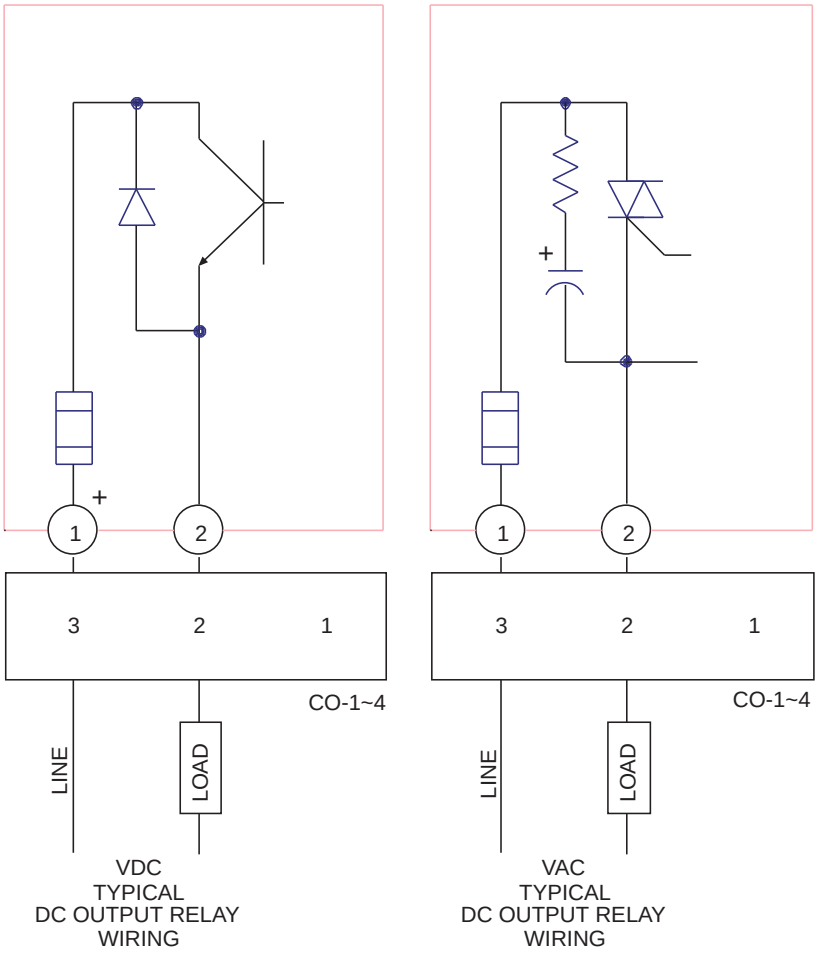
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Table 2–11. SSR Output Relay Selection Table

Device Description	Color Code	RI Part No.
AC Output Relay, 12–140VAC,3 Amp	Black	086302-002
AC Output Relay, 24–280VAC, 3 Amp	Black	086302-001
DC Output Relay, 5–200VDC,1 Amp	Red	086308-001
DC Output Relay, 5–60VDC, 3 Amp	Red	086308-002

Each Power Output Relay is connected to two terminal block terminals. Refer to the representative SSR Output relay schematic shown in Fig. 2–33 for wiring details.

Figure 2–33.
Basic Output Relay Wiring Diagram



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Operation

Control of the SSR Output Relay is accomplished from the Host Dimension. Ensure that the Host Dimension analog card's analog outputs are configured for 0–5VDC Time Proportioning. Refer to "*Version 6 Analog Output Configuration"* Section 2-33.

Maintenance and Repair

Routine maintenance for the SSR Output Kit consists of periodic inspection and cleaning to insure that dirt and debris is removed from the unit to prevent possible overheating of the Output relays and components. If you are experiencing trouble with your SSR, refer to the following table.

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Section 3

Graphic Operator Interface

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Graphic Operator Interface

Section Objectives

Section 3 provides the following information:

- Description of Dimension Graphic Operator Interface functions
- Functions of Interface graphic icons and menu screens
- How to navigate the Graphic Operator Interface
- Terminology related to Interface Operator and Configuration screens

Introduction

The Dimension Control System graphic operator interface is a self-contained, intelligent unit equipped with its own on-board microprocessor and memory. The operator interface provides all the tools needed for system configuration, operation, and monitoring of a Dimension Control System.

In all hardware configurations, operator interface functions and features are identical. Operator interface features include:

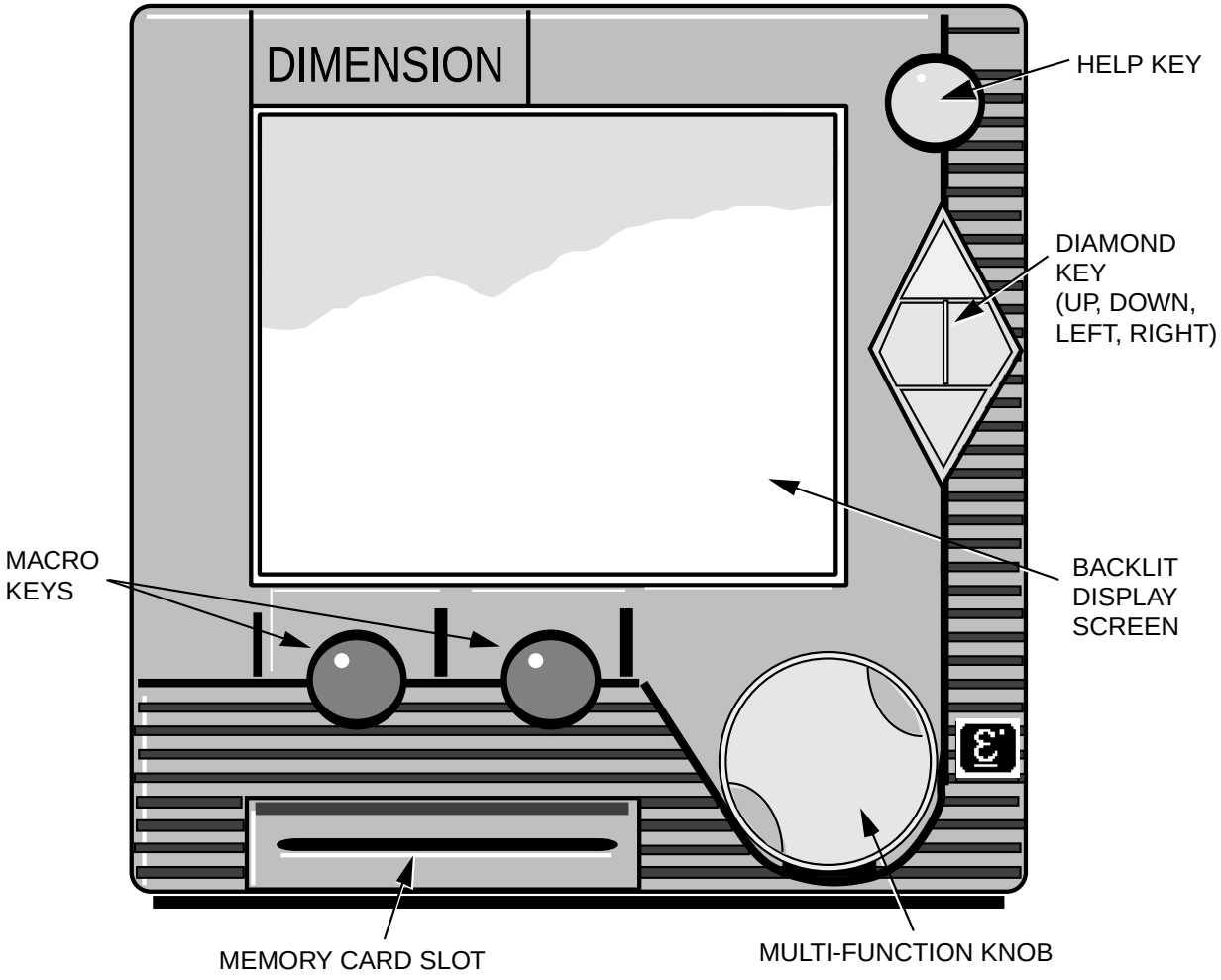
- An easy-to-use set of controls for both configuration and operation
- A set of highly readable, backlit screen displays using both text and graphics
- Dedicated "help" key
- Rotary selector key for data entry and parameter selection
- Two user-programmable "macro keys" for combining frequently used multiple steps into one function
- User definable displays
- Screens in text/numeric, X-Y charts, bar charts
- User definable screens and process terminology
- An integrated memory card slot that can read from and write to removable data storage memory cards

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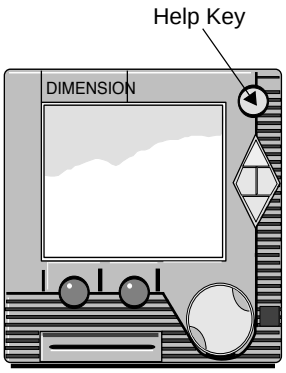
Front Panel Controls

The following paragraphs identify and describe the Dimension graphic operator interface front panel controls shown in Fig. 3-1.

Figure 3-1.
Dimension Graphic Operator Interface Front Panel



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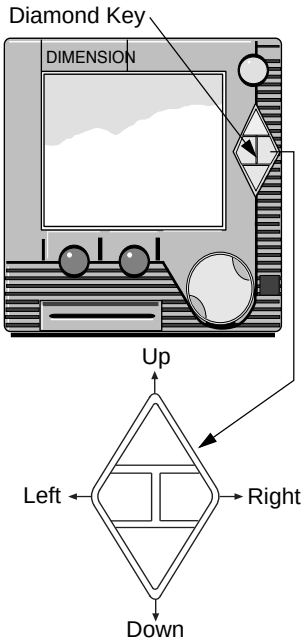
Help Key

Located in the upper right-hand corner of the front panel, the help key is designed to perform two functions:

- Cancel an entry. Pressing the help key when entering a value will cancel the entry.
- Provide on-screen help. Pressing the help key opens a "help" window containing instructions for the currently accessed field. Pressing the help key a second time, or the rotary selector key, closes the window.

Note: *During some operations, help messages are displayed automatically if you attempt to perform actions not permitted on the currently displayed screen.*

Most help messages are an integral part of system software and are not user-definable. However, on the Alarm Display Configuration screen, you may enter alarm-specific messages that will display when the help key is pressed at the Alarm Status screen.



Diamond Key (Four-way Keypad)

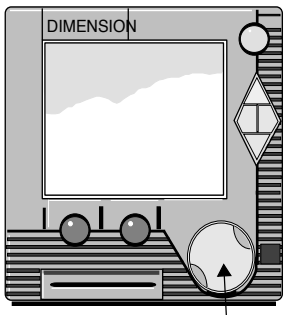
The graphic process display screen is organized in a horizontal/vertical hierarchy. A set of six graphic icons displayed on the right side of the screen shows where you are located vertically in the screen display hierarchy by displaying the icon in inverse video (see Fig. 3–2) .

The diamond key located directly below the help key is used to perform one function: to exit the currently displayed screen and call up another screen. The diamond key has four selections:

UP – Accesses the next icon up and displays the first screen for the icon.
DOWN – Accesses the next icon down and displays the first screen for the icon.
LEFT – Displays the next screen to the left.
RIGHT – Displays the next screen to the right.

See Section 3 *"Selecting Icons and Screens"* on page 3-25.

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Rotary Selector Key

The rotary selector key (often refered to as the knob) is used to move the graphic "cursor" from field to field on Dimension screen displays. In its "home" (inactive) position, the cursor is located between the screen title and time indicator on the top line of the screen. If a window is displayed, a second, smaller box is displayed inside another box to the left of the cursor (see Fig. 3–2).

The following sequence explains how you can make selections and enter or change information on Dimension screen displays.

1. When a screen is first displayed after being called up, the cursor is located in its "home" position on the top row of the screen.
2. If you press the **Help** key, a help window displays that describes screen and knob functions.
3. Press the **Help** key again, or the knob, to close the help window.
4. If any items on the screen are selectable, the knob can be turned CW to move the cursor to the first selectable item on the screen.
5. If the knob is pressed, the item is selected and one of two actions occurs:
   - A window opens for further input.
   - The selected item is displayed in inverse video and you can change the item in one of the following ways:

     CHARACTER ENTRY – Display one character at a time by turning the knob CW or CCW and press **ENTER** when the character you wish to select is displayed. This input method displays the full ASCII alphanumeric character set as the knob is turned.

     NUMBER ENTRY – Display one number at a time by turning the knob CW or CCW and press **ENTER** when the number you wish to select is displayed. This input method displays numbers in the correct format as the knob is turned. Parameters such as time, date, and passcodes are set with limits, as are control parameters and variables.

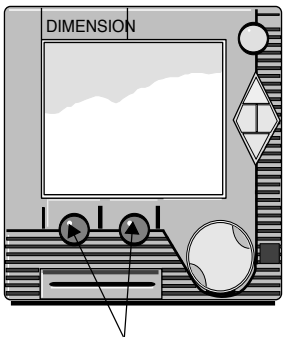
Note: *If a number is entered outside a field's designated range, the number will not be accepted. The previous value will redisplay in the data entry field. Length varies from field to field.*

PARAMETER SELECTION – As the knob is turned CW or CCW, a list of selectable items is displayed; for example, "`LOOP01, LOOP02, LOOP03.`" When the correct entry is displayed, press **ENTER** to select the item.

FUNCTION SELECTION – Some entries are functions that will be executed when **ENTER** is pressed. For example, scrolling to the `CLOSE` entry in a window and pressing **ENTER** closes the window.

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Note: If an item is selectable (cursor can be moved to it), the help key can be pressed and a help message for the item in the cursor will be displayed. If an item is selected by pressing **ENTER**, *a screen change cannot be made until the cursor reappears.*

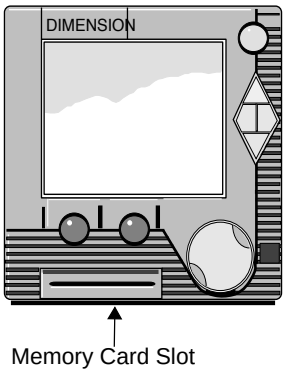


Macro Keys

The two "macro keys" located below the display screen can be programmed to execute a string of commands, (e.g. to start and stop specific control actions). Each key can be user-labeled (e.g. "START" and "STOP") and its function displayed directly above each key on the bottom row of the screen (see Fig. 3–2). The label and function assigned to each macro key are displayed and available on all system and operation screens.

Macro key functions are typically programmed by the control systems supervisor or administrator. If you are not sure which functions have been programmed into the macro keys on your unit, consult your supervisor before attempting to use the keys.

With the configuration group of screens (see Fig. 3–7), the macro keys are programmed as follows. The left macro key, labeled OVIEW_1 under configuration, will return the display to the operation group when pressed. The right macro key, labeled HOME under configuration, will return the display to the previously accessed configuration screen when pressed after a screen item has been selected.



Memory Card Slot

A slot is provided on the graphic operator interface front panel for insertion of a credit card-sized memory card. The operator interface can read from, write to, delete, or format memory cards.

Information that can be stored on Dimension memory cards includes:

- Programmer profile programs 1–15 (`Recipes`)
- Total memory image of Dimension configuration and operational parameters (`Mem_Img`)
- Display configuration (`DspConf_`)
- Macro key configuration (`MacroKy_`)
- Optional Custom Control Program (`CLCstart`)

See Section 3 *"Using Memory Cards"* on page 3-54.

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Screen Display Format

As shown in Fig. 3–2, every Dimension screen display includes the following common elements:

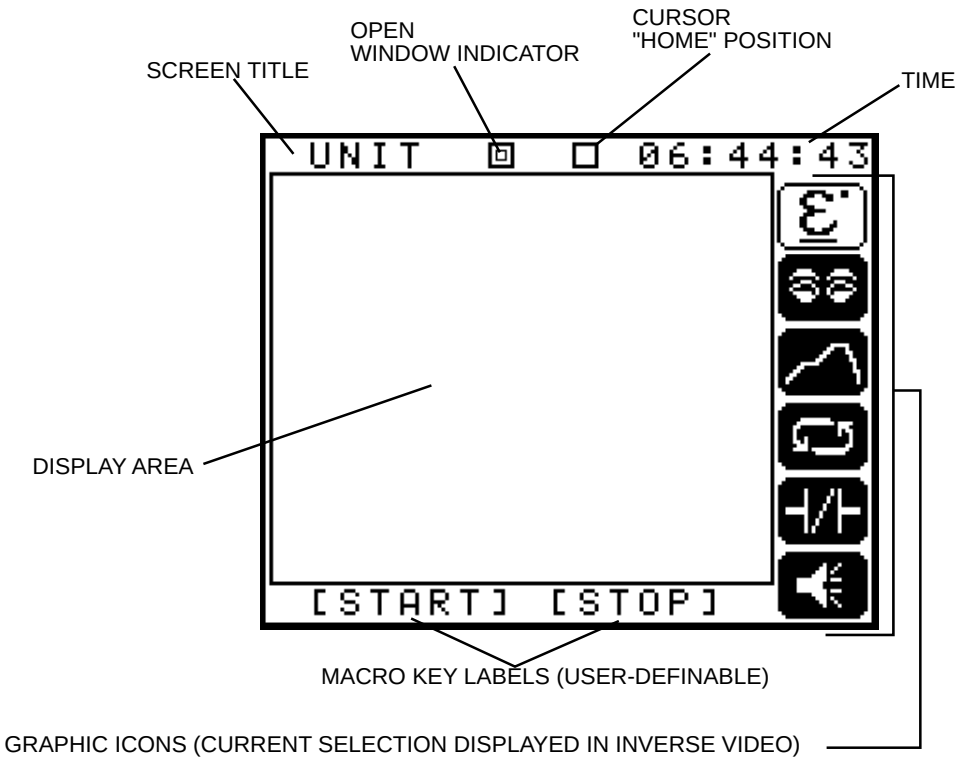


Figure 3–2.
Dimension Screen
Display Format

SCREEN TITLE—The title of the currently selected screen is displayed on the top row of the screen. (Most screen titles are user-definable.)

CURSOR "HOME" POSITION—A blinking graphic "box" displayed on the top row of the screen indicates that the cursor (controlled by turning the knob) is located in its "home" (inactive) position. Whenever you call up a new screen, the cursor is displayed in its home position.

OPEN WINDOW INDICATOR—A second, smaller box displayed inside another box to the left of the cursor "home" position indicates a window has been selected and is open in the display area. When the Open Window Indicator is active, the cursor home position indicator is not displayed (see Fig. 3–3).

CURRENT TIME—The current time is displayed in the upper right-hand corner. Current time is displayed in standard 24-hour (HH:MM:SS) format.

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GRAPHIC ICONS—The right-hand side of the screen displays six graphic icons, or symbols, which represent various system functions. The currently selected icon (selectable with diamond key) is displayed in inverse video.

MACRO KEY LABELS—The bottom row of the screen always displays user-definable labels for the two macro keys located directly below the screen.

DISPLAY AREA—The contents of the current screen are visible in the "display area" shown in Fig. 3–2. The location of the cursor (when away from the "home" position) is depicted by a graphic box or rectangle surrounding the currently selected data entry field or selection, as shown in Fig. 3–3.

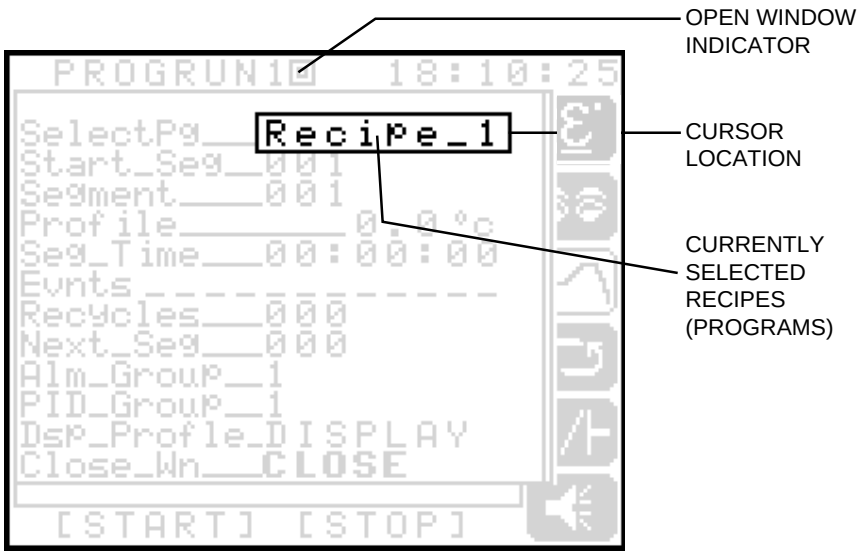


Figure 3–3. Cursor Location, in This Case in an Open Window. Note Open Window Indicator.

Making Configuration Selections

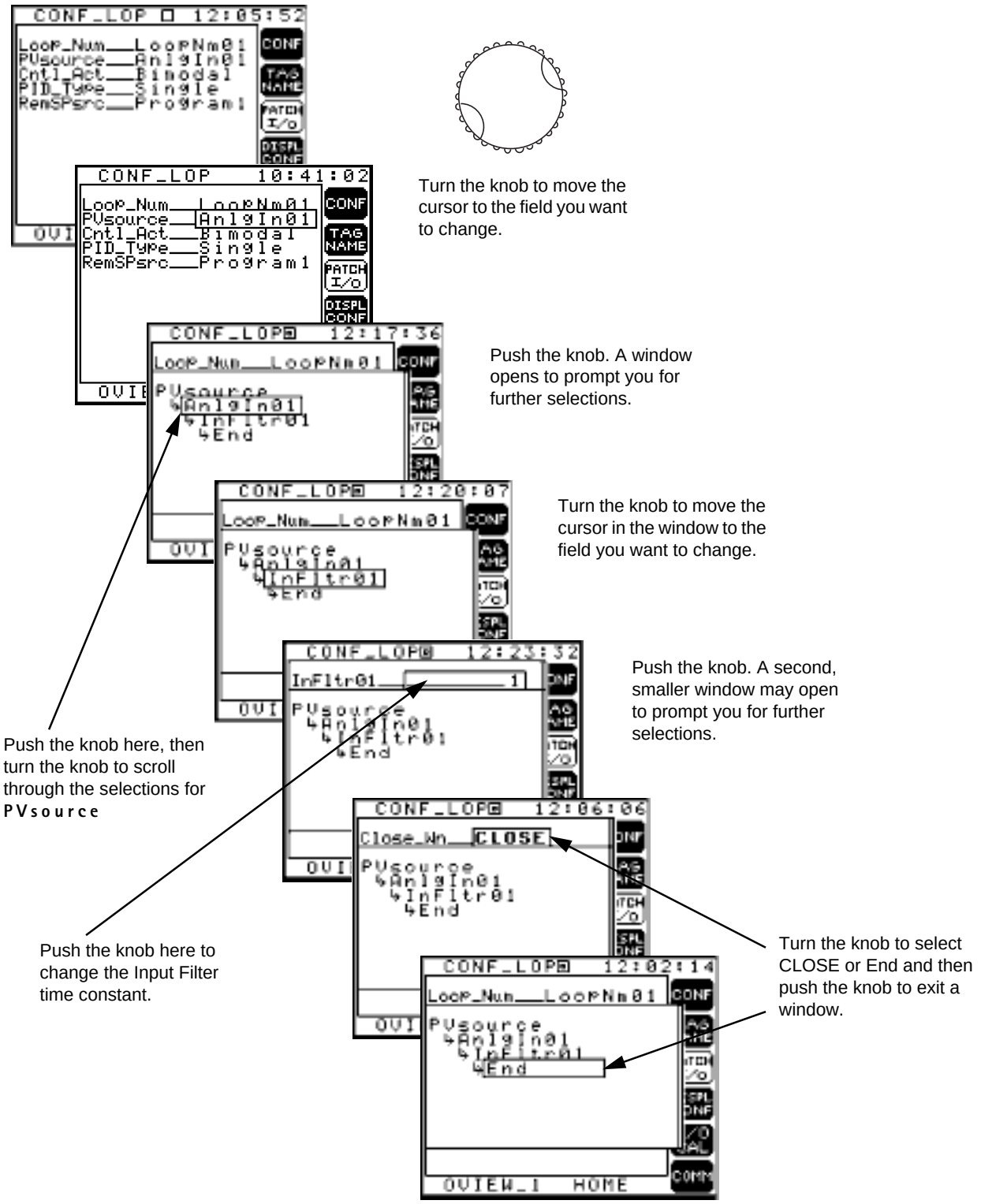
Making configuration selections is accomplished by entering information with the knob on the operator interface. The specific techniques for using the knob to enter or change configuration parameters are similar to the techniques used on the operation screens (see Fig. 3–4 and Fig. 3–5).

Some selections are made directly on the primary configuration screens. Other selections are made in "windows" that open in response to your specific parameter selections.

The configuration process is dynamic. As you enter selections, Dimension keeps track of your choices and prompts you for additional selections where needed. Dimension will also delete choices that are no longer necessary as you proceed. You may see the parameter list in the windows change as you enter selections as Dimension prompts you for the necessary information.

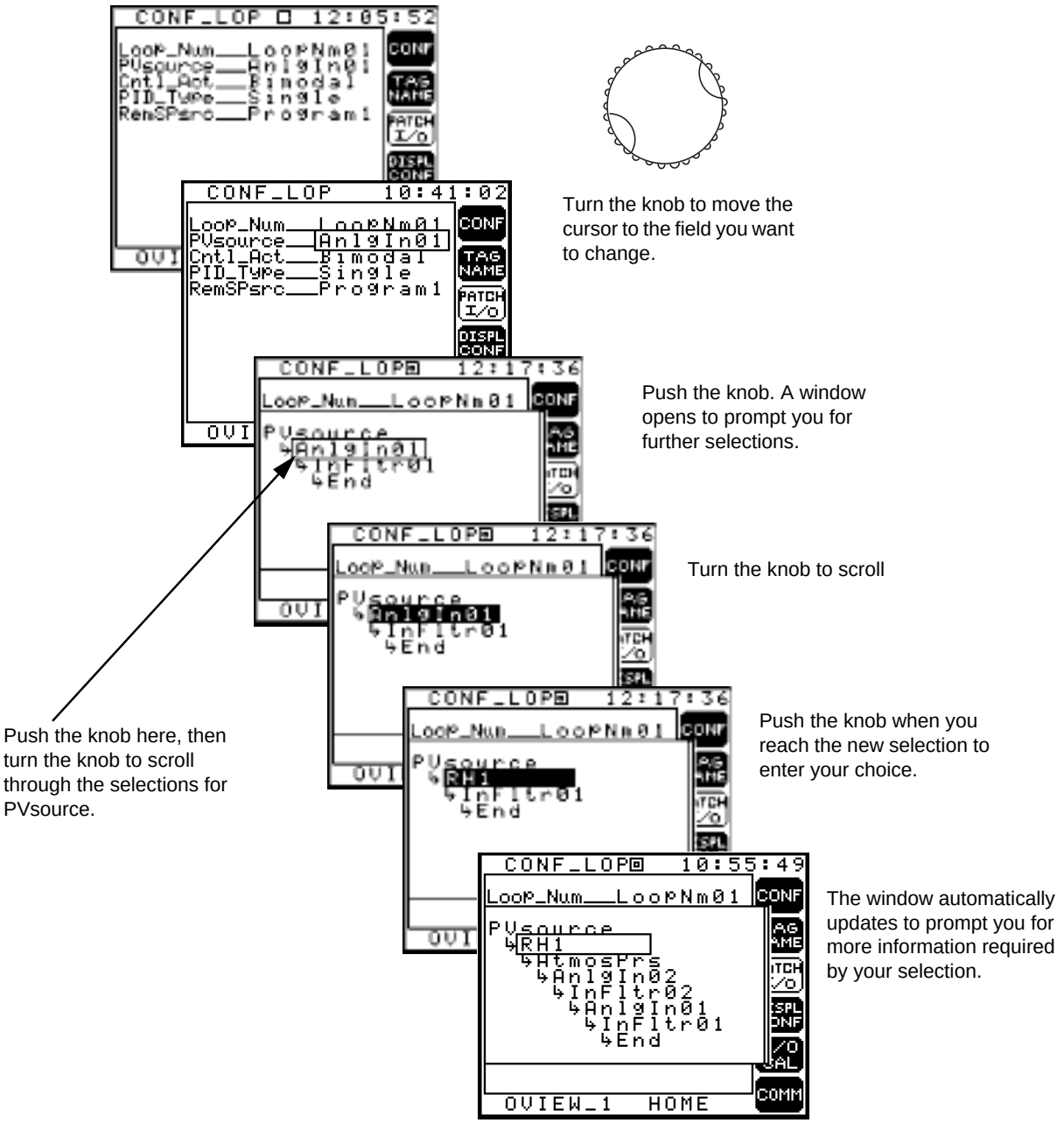
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Figure 3–4.
Selecting Parameters in Configuration Windows



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Figure 3–5.
Windows Update to Prompt for New Information as Selections Are Made



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Graphic Icons and Screen Display Groups

Dimension graphic operator interface display screens are divided into two groups: Operation screens and Configuration screens. Each group is further divided into six functional groups represented by graphic icons (see Fig. 3–6 and Fig. 3–7)

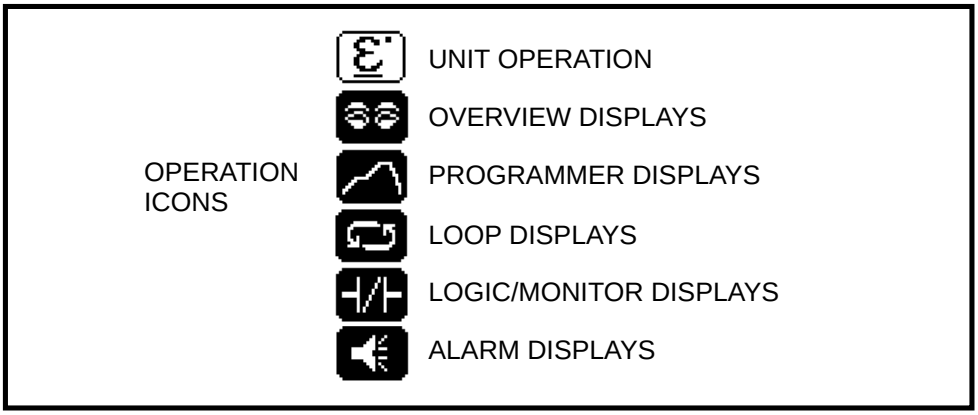


Figure 3–6. Operation Graphic Icon Titles and Screen Display Groups

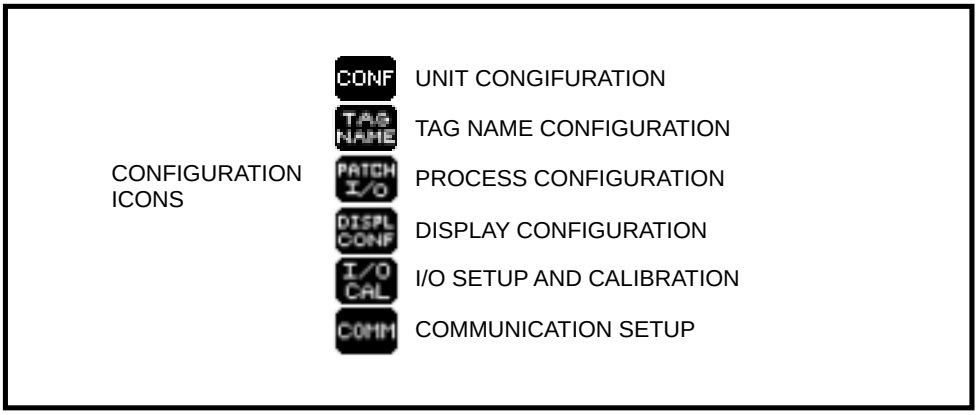


Figure 3–7. Configuration Graphic Icon Titles and Screen Display Groups

The first icon in each group represents the Unit screen. Upon power-up, the first screen displayed is always the Unit Operation screen. The following steps demonstrate how to switch between Operation and Configuration screens:

- Select the unit icon using the diamond key
- If you are not in Full access level, the Full passcode must be entered on the Unit Operation screen in order to access the Unit Configuration screen. See Section 3 *"Entering Your Passcode"* on page 3-15.
- Rotate the knob CW to select **Configur_Select**. Push the knob to enter. This switches the display to the Configuration screens.
- To return to Operation Screens, press the left macro key, which is now labeled **OVIEW_1**.

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Operation Screens

Selecting Icons and Screens

Display screens (Operation and Configuration) are organized in a horizontal/vertical software hierarchy:

A set of six graphic icons displayed on the right side of the screen shows where you are located vertically in the hierarchy. The currently active icon is always displayed in inverse video.

The Diamond Key is used to select Operation and Configuration icons and screens. Use the Diamond Key to move UP and DOWN (vertically) through the screen display hierarchy from icon to icon, and to move LEFT and RIGHT (horizontally) from screen to screen. See Section 3 *"Diamond Key (Four-way Keypad)"* on page 3-5

Refer to Fig. 3–8. The screens (and functions) accessible at each icon in the Operation area are as follows:



UNIT OPERATION – Change date/time, enter passcodes (access), change display screen contrast, memory card operation, set screen backlighting mode, and system mode (warm start or cold start). Also used to gain access to Configuration side of Dimension.



OVERVIEW DISPLAYS – 16 User-defined Overview displays are available, with ten different types (configurations) available.



PROGRAMMER DISPLAYS – Program Run and Build screens, Program Options window, Profile Display window. Up to eight Programmer Displays are available.



LOOP DISPLAYS – User-Defined Loop display screens, loop control windows, loop auto-tune windows. Up to eight Loop Display screens are available.



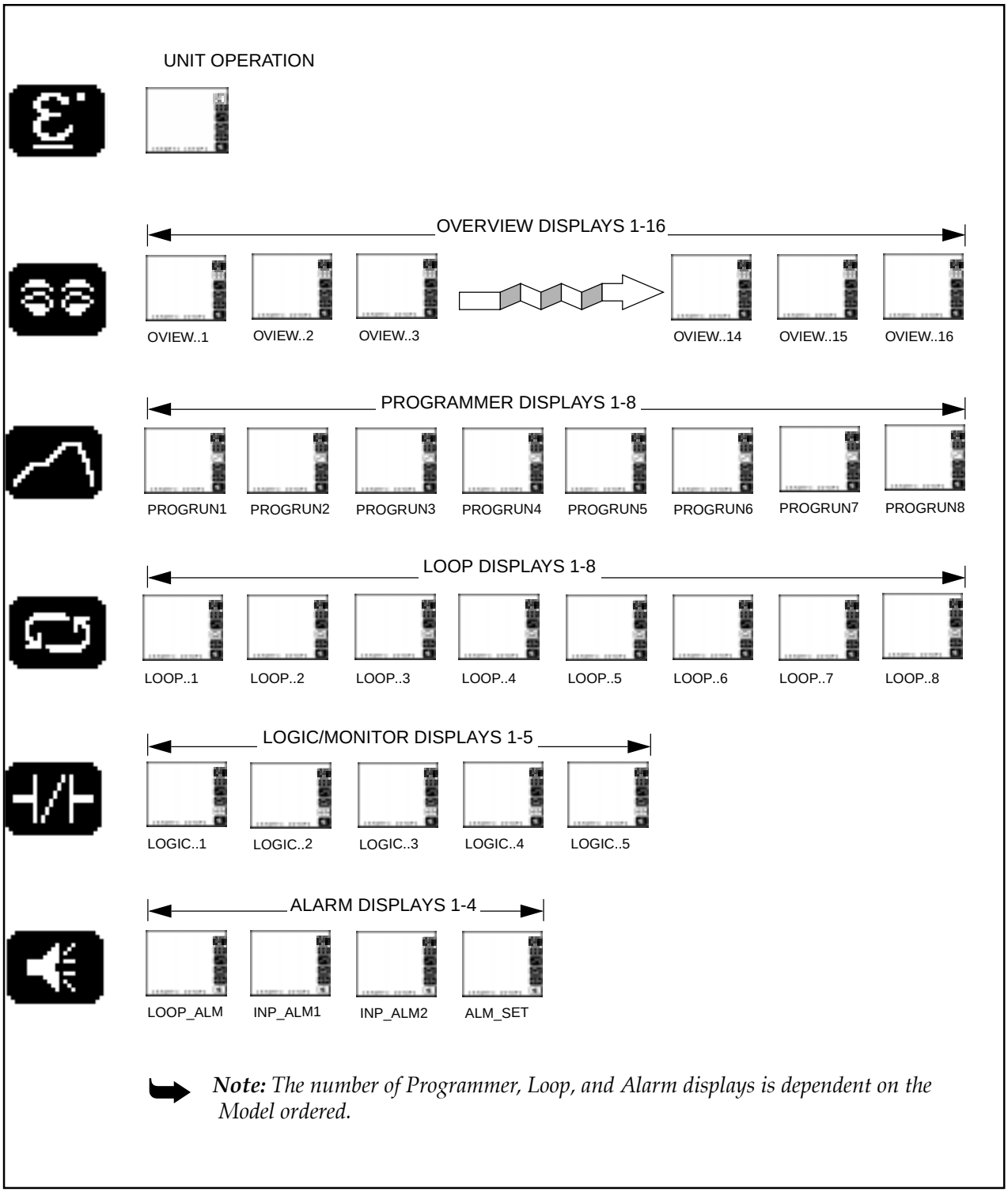
LOGIC/MONITOR DISPLAYS – Five Logic/status display screens are available.



ALARM DISPLAYS – Up to four Alarm Status and Limit Setting screens are available.

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Figure 3–8.
Map of Dimension Operations Screens



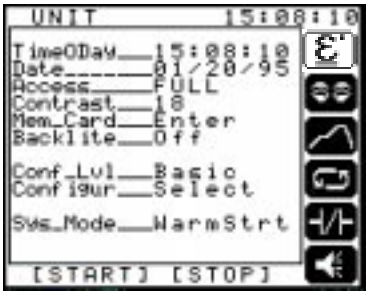
Note: *The number of Programmer, Loop, and Alarm displays is dependent on the Model ordered.*

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Unit Operation Screen

The Unit Operation screen shown in Fig. 3–9 is the first screen displayed when Dimension is powered up.

Figure 3–9.
Unit Operation Screen



The following information and functions are available at this screen:

`TimeODay` – Displays real time in standard 24-hour `HH:MM:SS` format. User-accessible.

`Date` – Displays current date in standard `MM/DD/YY` format. User-accessible.

`Access` – Displays current Access level (`FULL, LIMITED, NONE`). User-accessible. (A window permits passcode entry.)

`Contrast` – Displays value 8–25 (factory default = 18) representing the current display contrast/brightness level. User-accessible.

`Mem_Card` – Permits user to read from, write to, format, delete files, or read the directory of a memory card. See Section 3 *"Saving Unit Configuration Data"* on page 3-53.

`Backlite` – When selected, a window opens in which you may select `SET` and then select `ON` (backlight always on), `OFF` (backlight always off), or `CYCLE` (backlight turns on and off at specified times). The `ON` and `OFF` fields allow the user to set the on/off cycle times.

***Note**: To extend the life of the backlight, turn off when not needed.*

`Conf_Lvl` – Permits user to select basic or extended levels of configuration capabilities.

`Configur` – Allows user to switch between Operation and Configuration Screens.

`Sys_Mode` – Indicates system was powered up with a warm start or cold start (default factory configuration).

`OI_Version` - Displays software version of operator interface.

Entering Your Passcode

If passcodes have not been assigned to your system (`ACCESS = FULL` on Unit Operation screen), you may disregard this topic. If passcodes have been assigned, obtain your passcode from your operations supervisor and proceed as follows:

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1. When you attempt to access a restricted function or screen, the system will display a message instructing you to enter the correct passcode.
2. From any screen in the operation group, use the diamond key to access the Unit Operation icon, Fig. 3–9. To access this icon from the configuration group, press the left macro key OVIEW_1 to return to the operation group and then use the diamond key.
3. Select the **ACCESS** field and the window shown in Fig. 3–10 displays.
4. Use the knob to select the **Enter_** field.

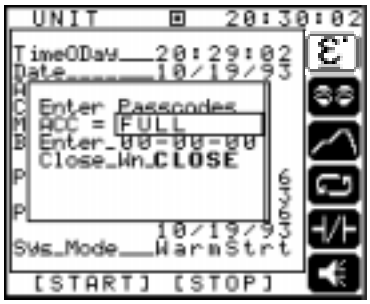


Figure 3–10.
Passcode Access Window

5. Press **ENTER**. The first two digits of a 6-digit passcode will be highlighted.
6. Turn the knob CW or CCW until the first two digits of your passcode display.
7. Press **ENTER**. The second two digits of the passcode will be highlighted.
8. Enter the correct number. Repeat this procedure for the final two digits.
9. If your passcode entry is correct, the system will display an **ACCESS GRANTED** message.

Note: *You may attempt to enter the correct passcode as many times as you wish.*

10. Close the window. The system will now display the new access level in the **ACCESS** field. You may now access functions and screens available under the access level you selected.

Overview Display Screens

Dimension can be configured to display up to 16 user-defined Overview displays. These screens permit viewing and control of your process in a variety of formats.

To access Overview displays, from the operation group press the diamond key until the Overview icon displays. To call up specific Overview displays, press the diamond key LEFT or RIGHT.

Overview displays can be configured in the form of X-Y graphs, horizontal or vertical bar graphs, or text displays in one, two, and three times normal size.

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Note: *See Section 3 "Overview Display Configuration" on page 3-43 for procedures in changing parameters, and Table 3–1 (on page 3-46) for a list of availabledisplay parameters.*

The following are default overview screens and types of screens that can be configured. They may have been changed for your application.

X-Y Chart Overview Display

As shown in Fig. 3–11, the X-Y chart Overview display option features an X-Y graph combined with information in text format. Up to four of these displays can be configured, with each display trending and displaying two user-selected variables. The time base for sampling is seconds, minutes, or hours, with a sampling rate from 1 to 100.

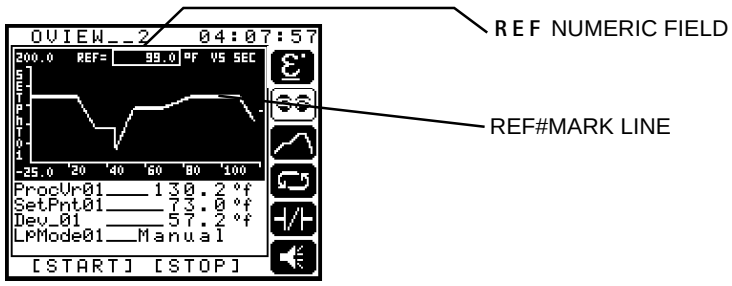


Figure 3–11.
X-Y Chart Overview Display

The horizontal axis displays one sample per pixel, with the cumulative time displayed every 20 pixels. The vertical limits are user-defined, and the vertical axis is 50 pixels high. The value of the reference mark and the units of the X and Y axes are displayed at the top of the graph. For example, the units displayed in Fig. 3–11 are degrees Fahrenheit (°F) and seconds.

By moving the cursor to the **REF** numeric field at the top of the graphic display and pressing **ENTER** (see Fig. 3–11), a horizontal reference mark on the right margin of the screen can be displayed and moved along the Y axis by turning the knob. As the reference mark moves up (CW) or down (CCW) on the graph, the precise value in the **REF** field changes accordingly. The graph itself can consist, for example, of the selected process variable; and, if selected, the associated setpoint versus time.

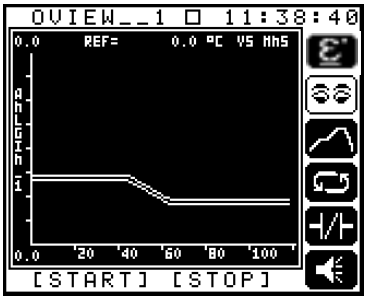
This screen also displays up to four lines of user-selectable information below the graph. If the cursor can be moved into a field, the variable can be selected and manipulated.

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This screen also displays up to four lines of user-selectable information below the graph. If the cursor can be moved into a field, the variable can be selected and manipulated.

X-Y Overview Display

Figure 3–12.
X-Y Overview Display



The X-Y Overview Display is identical to the X-Y Chart Overview display, except that no text is shown, thus providing increased graph display resolutions (see Fig. 3–12).

Horizontal Bar Graph Overview Display

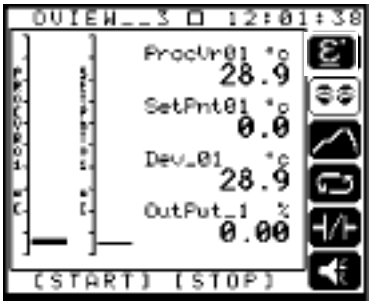
Figure 3–13.
Horizontal Bar Graph Overview Display



As shown in Fig. 3–13, the horizontal bar graph Overview displays two user-selectable variables in bar-graph format and up to five lines of variables in text format. The horizontal ranges are user-selectable. If the cursor can be moved into a text field, the variable can be selected and manipulated.

Vertical Bar Graph Overview Displays

Figure 3–14.
Vertical Two-Bar Graph Overview Display

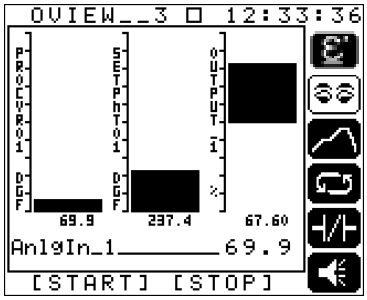


displays can be user-defined as two-, three-, or graph configurations include:

Two-bar Graph – On the two-bar graph, the vertical axis displays tick marks. The variable tag name is displayed to the left of the vertical axis of each bar, and numeric values are displayed in large characters to the right. Four lines of user-selectable text and variables can be displayed to the right (see Fig. 3–14).

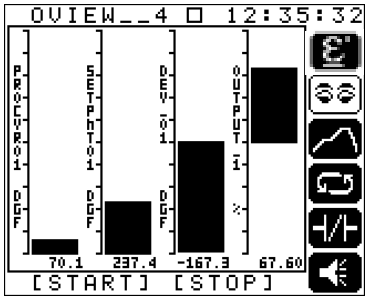
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Figure 3–15.
Vertical Three-Bar Graph Overview Display



Three-bar Graph – The three-bar graph displays three labeled bar graphs, numeric values below each graph, and one line of user-selectable text and variables (see Fig. 3–15).

Figure 3–16.
Vertical Four-Bar Graph Overview Display

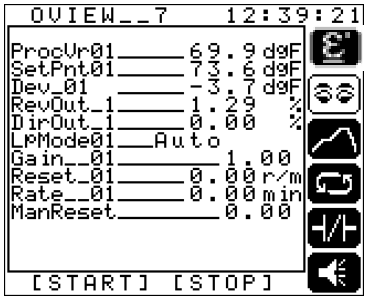


Four-bar Graph – The four-bar graph display is identical to the three-bar graph except that four bars with no user-selectable text and variables are displayed (see Fig. 3–16).

Mixed Numeric/Text Overview Displays

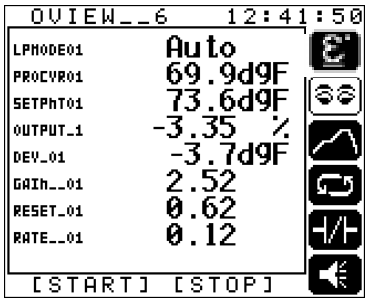
Mixed numeric/text Overview displays can be user-configured to display numeric values and text in four possible modes:

Figure 3–17.
1X Mixed Numeric/Text Overview Display



1X Text Mode – Displays up to 12 user-selectable variables in normal text mode. If the cursor can be moved into a text field, the variable can be selected and manipulated (see Fig. 3–17).

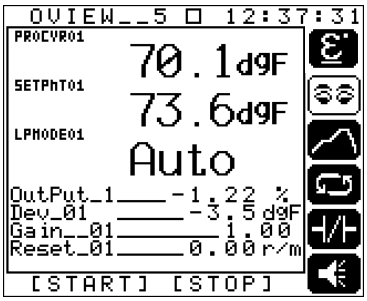
Figure 3–18.
2X Mixed Numeric/Text Overview Display



2X Text Mode – Displays up to eight user-selectable variables as numeric characters two times larger than normal text. Displays tag names at normal height (see Fig. 3–18).

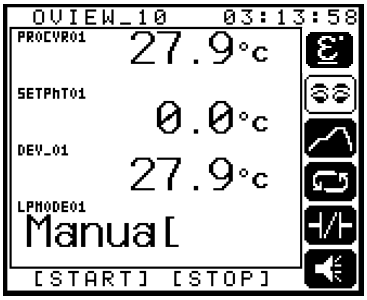
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Figure 3–19.
3X Mixed Numeric/Text Overview Display



3X Text Mode – Displays three user-selectable variables as numeric characters three times larger than normal text. Also displays tag names, engineering units, and up to seven lines of user-selectable text and variables. If the cursor can be moved into a text field, the variable can be selected and manipulated (see Fig. 3–19).

Figure 3–20.
3X Text 4 Mixed Numeric/Text Overview Display



3X Text 4 Mode – Displays four user-selectable variables as text or numeric data three times larger than normal text (see Fig. 3–20).

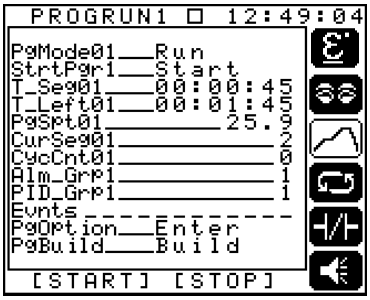
Programmer Display Screens

Programmer Terminology



From the operation group, press the diamond key UP or DOWN until the Program icon is displayed. The system will display a Program Run screen (see Fig. 3–21). The Program Run screen is used to select, start, hold, run, or modify a recipe.

Figure 3–21.
Program Status Display





Note: *Refer to Section 5,* Real-time Programmer*, for details on Programmer operation and configuration.*

Program Run screen functions are as follows:

PgMode# – Select **Run** or **HoldOper** mode. Other messages that are displayed are **Program End** or **Hold** (program hold)

StrtPgr# – Opens a window to select a recipe to start at a starting segment, select the recipe (which automatically selects the starting segment of the recipe), and to start the recipe.

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T_Seg# – Displays time into segment.

T_Left# – Displays time left in recipe.

Pg#Spt# – Displays program setpoint.

CurSeg# – Displays the number of the current segment.

CycCnt# – Displays the number of programmer recycles remaining.

Alm_Grp# – Displays the currently active alarm group (1–5).

PID_Grp# – Displays the currently active PID group (1-5).

Evnts – Displays status of the 12 events.

PgOption – Opens a window which allows the entry of parameters for Time Of Day Start, Start Date, Time of Day Start Segment, Time of Day Start Enable, Programmer Fast Forward, Abort, RemoteStart, Remote Start Segment, Profile Bias and Time Base selection.

PgBuild – Opens a window to access the program Build (**PgBuild**)screen.

Loop Display Screens

Dimension Loop displays are used to monitor process variables and control the operation of PID Control loops in your Dimension. Refer to Section 4, *Process Control and Monitor Loops*, for information on Control and Monitor Loop configuration/operation.

From the operation group, press the diamond key UP or DOWN until the Loop icon is displayed. To call up specific Loop displays, press the diamond key LEFT or RIGHT to scroll through the displays.

The following items are available on the **LOOP** display (see Fig. 3–22):



Figure 3–22.
X-Y Graph Loop Display

ProcVr# – Displays the *actual* value of the process.

SetPnt# - Used to view/alter the *desired* value of a control loop.

Dev_# - Displays the difference between the actual and desired values.

LpMode# - Used to view/alter the loop mode between Auto (closed loop) and Manual (open loop) control.

RevOut_# - Used to set the reverse (heating) output in manual mode, displays calculated value in auto mode.

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DirOut_# - Used to select the direct (cooling) output in manual mode, displays calculated value in auto mode.

Gain__# - Used to set the PID Gain parameter for the active PID group.

Reset_# - Used to set the PID Reset parameter for the active PID group.

Rate__# - Used to set the PID Rate parameter for the active PID group.

SptSrc# - Used to select the setpoint source. Can be either *Operator*, *Programmer*, or *Remote*.

Setup SetParms - Used to open a window that allows setup of additional loop parameters as shown in Fig. 3–23.

Note: Loop Displays may also be used configured as horizontal bargraphs, XY charts, or 3X_Text.



Figure 3–23.
X-Y Graph Loop Display

Loop Mode# – Used to view/alter the loop mode between Auto (closed loop) and Manual (open loop) control.

SptSrc# - Used to select the setpoint source. Can be either *Operator*, *Programmer*, or *Remote*.

ManRset# - Used to set a Manual Reset (or output bias) value.

PID Grp - Used to select which PID group (1-5) will be displayed/set in the next three parameters.

Gain - Used to set the PID Gain parameter for the selected group.

Reset - Used to set the PID Reset parameter for the selected group.

Rate - Used to set the PID Rate parameter for the selected group.

Autotune - Opens a window to allow access to the autotune function setup window.

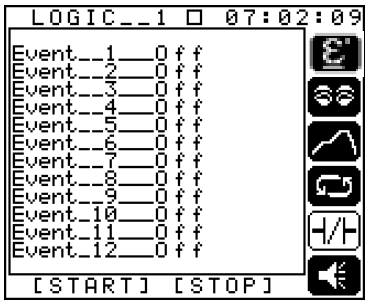
Logic Display Screens

Dimension Logic displays are used to monitor the on/off Events in your Dimension. Refer to page 3-49 and Section 7, *Logic Functions*, for details on Logic operations. Fig. 3–24 shows the five user-configurable Logic displays. Logic_1 Screen and Logic_2 Screen provide examples of a programmer event status and a digital input/output screen. Note that four sets of terminology for on/off may be defined. Default sets are On/Off, Open/Closed, True/False, and Run/Stop.

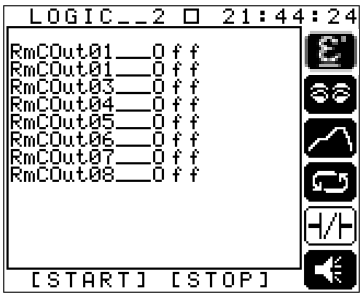
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Figure 3–24.
Logic Displays (5 Total)

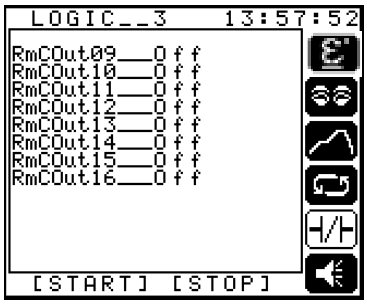
Logic_1 Screen



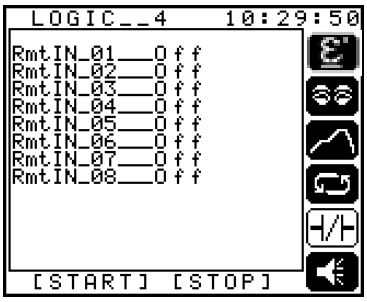
Logic_2 Screen



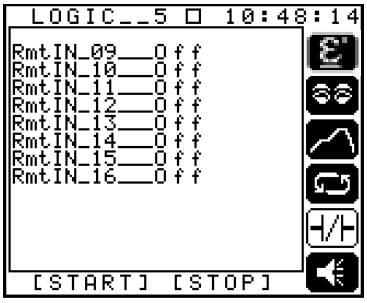
Logic_3 Screen



Logic_4 Screen



Logic_5 Screen



Note: *If your unit does not contain a Real-time Programmer, Logic screen 1 will be blank.*



From the operation group, use the diamond key to select the Logic icon. To call up specific Logic displays, press the diamond key LEFT or RIGHT.

As shown in Fig. 3–24, variable tag names are displayed on the left side of the screen and current status is displayed to the right.

Alarm Display Screens

The Dimension system includes two types of Alarm displays to help the operator with alarm handling during daily operation: Alarm Status displays and the Alarm Setup display.



To access Alarm displays use the diamond key to select the Alarm icon from the operation group. To call up specific Alarm displays, press the diamond key LEFT or RIGHT.

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Note: Refer to Section 6, Alarms, *for information on Dimension Alarm configuration/operation.*

Loop Alarm Status Display

Figure 3–25.
Loop Alarm Status Display



As shown in Fig. 3–25, the Loop Alarm status display is used to monitor process deviation alarms for control loops.

Input Alarm Status Display

Figure 3–26.
Input Alarm Status Display



As shown in Fig. 3–26, the Input Alarm status display is used to monitor high and low alarm limit status for analog inputs.

Alarm Setup Display

As shown in Fig. 3–27, Dimension alarm types are listed on the Alarm Setup screen. To check or modify specific alarm limits, first move the cursor to an alarm type in the list, press the knob, scroll through a list of input or loop numbers, and then press **ENTER** to display a window. At the FULL or LIMITED access level, alarm limits displayed in the window can be modified.

Figure 3–27.
Alarm Setup Display



For analog input alarms, high and low input alarm limits can be set for each input. For loop alarms, an alarm group number along with highhigh, high, and lowlow, low limits for both process variable and process deviation and process alarms can be selected. Five groups of alarm settings are provided for each control loop.

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Alarm Acknowledgment

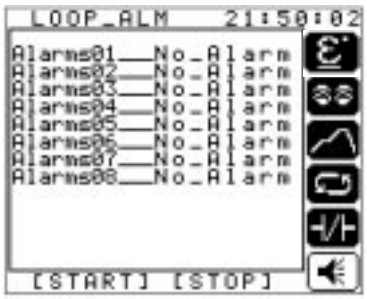
When an alarm becomes active the Alarm icon begins to flash, regardless of which Dimension screen is currently displayed. For unlatched alarms, the Alarm icon stops flashing when the condition that caused the alarm clears. Latched alarms require operator acknowledgment of the alarm to stop the flashing alarm icon.

Note: *On the Alarm Display Configuration screen, you may enter alarm-specific messages that will be displayed when the help key is pressed at the Alarm Status screen when an alarm is active. Refer to Section 6.*

Acknowledge alarms as follows:

1. From the operation group use the diamond key to access the Alarm Displays icon. The system will display the Alarm Status screen shown in Fig. 3–28.

Figure 3–28.
Alarm Status Display



2. If necessary to access the active alarm, use the diamond key to access the Input Alarm Status Display.
3. Use the knob to select the alarm you wish to acknowledge.
4. Press the **Help** key to display a user-entered help message, if any.
5. Press **ENTER** to acknowledge the alarm. If the alarm cannot be acknowledged (example: an open sensor), the alarm description will not change and the icon will continue to flash. If the alarm is acknowledged, the description will change to "NO ALARM" and the icon will stop flashing.

Configuration Screens

Selecting Icons and Screens

Configuration screens are organized in a horizontal/vertical hierarchy:

A set of six graphic icons displayed on the right side of the screen shows where you are located vertically in the hierarchy. The currently active icon is always displayed in inverse video.

Use the diamond keypad to select Configuration screens described in the following sections.

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Refer to Fig. 3–29. The screens (and functions) accessible at each icon in the Configuration area are as follows:



Unit Configuration Screen – From the operation group, the Unit Configuration screen is accessed by first pressing the diamond key UP or DOWN until the Unit icon is highlighted. Then turn the knob CW to select `Configur_Select` and press **ENTER**. (If the system access level is "`NONE`", or "`LIMITED`," you must also enter the correct passcode.)



The Unit Configuration screen is used to configure or perform a variety of unit or system level functions: passcode assignment, changing access level, building macro key functions, setting system power up mode, running built-in self diagnostics, enabling/disabling screens and displaying the model number and options installed in your unit.



Tag Name Configuration Screens – Tag Name Configuration screens are used to modify eight-character parameter tag names and screen titles. Whenever a tag name or screen title is changed, the change is reflected anywhere the tag name or title is used. On Tag Name Configuration screens, both the original (default) names and new names are displayed.



Process Configuration Screens (Patch I/O) – Process Configuration screens are used to configure and modify Dimension system control strategy including loops, real-time programmers, alarms, logic and I/O patching.



Display Configuration Screens – Display Configuration screens are used to select the format and configure the content of Dimension Operation displays. A variety of selections permits you to choose what information is displayed and how it is displayed.



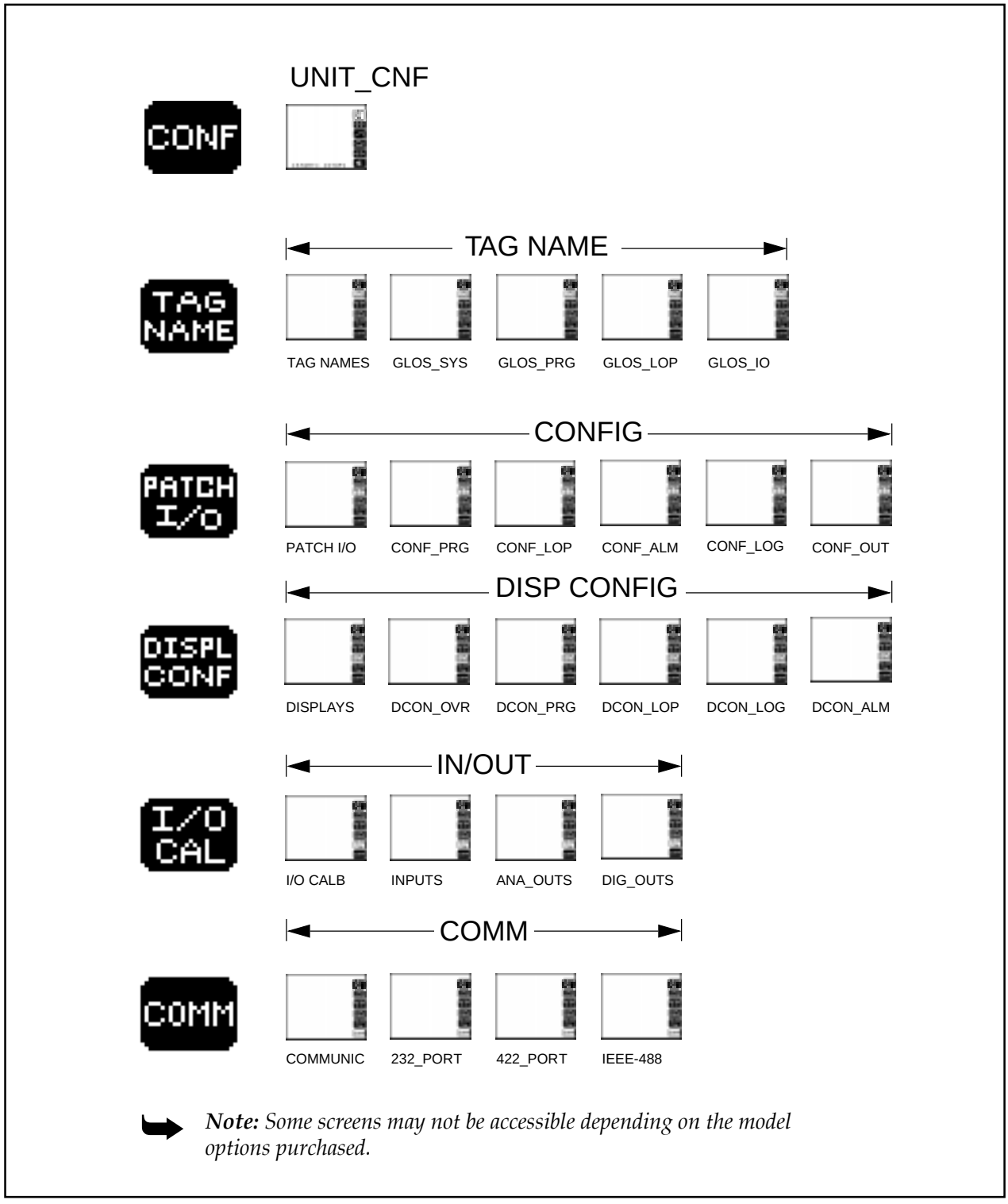
I/O Setup And Calibration Screens – These are used to set up and calibrate the inputs and outputs on the Dimension I/O modules. Functions performed on these screens include I/O type selection, zero/span adjustment, engineering units selection, decimal and mnemonic selection, time proportioned, cycle time, and high and low limits selection. Dedicated screens are provided for specific input and output types (analog inputs, analog outputs and digital outputs).



Communications Setup Screens – These screens are used to configure EIA-232, EIA-422, or IEEE 488 communications. If multiple Dimension systems are connected on a network to a supervisory PC, this screen is also used to assign a network address to theanalop I/O. (See Appendix B, *Serial Communications*, for more information.)

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Figure 3–29.
Map of Dimension Configuration Screens



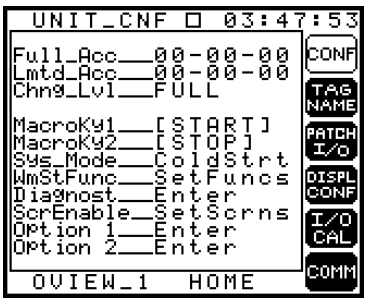
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Unit Configuration Screen



The Unit Configuration screen is shown in Fig. 3–30. A brief description of each parameter's function is provided here; the following sections provide more detailed instructions.

Figure 3–30.
Unit Configuration Screen



Full_Acc – Displays passcode for full access to all parameters. User-accessible.

Lmtd_Acc – Displays passcode for limited access to all parameters. User-accessible.

Chng_Lvl – Displays current Access level **(FULL, LIMITED, NONE)**. User-accessible.

MacroKy1, MacroKy2 – Opens a window to allow these keys to be user-defined macro functions.

Sys_Mode – Sets and displays system power-up mode. **WarmStrt** selected: all settings are saved. **ColdStrt** selected: only calibration saved.

WmStFunc – Opens window to allow the operator to set multiple functions to be executed on an **Auto_Restart-warmstart.**

Diagnost – Opens window to run diagnostic test of Dimension performance. Also displays Software revision level.

ScrEnable – Opens a window to allow turning on/off groups of screens.

Option 1, Option 2 – Used to display options that were purchased and are available with the current hardware.

Unit Configuration Screens

Setting Up Security Access Passcodes

You may configure your Dimension system for one of three security access levels:

- **FULL** – Full access granted (operation and configuration)
- **LIMITED** – Partial access granted (operation)
- **NONE** – No access granted (view-only)

With the **NONE** or **LIMITED** level set, system users must enter a 6-digit passcode (three 2-digit fields, 00–99 in each field) before they can gain full or partial access to the system. With no passcodes configured (**FULL** status), all users may access all system functions.

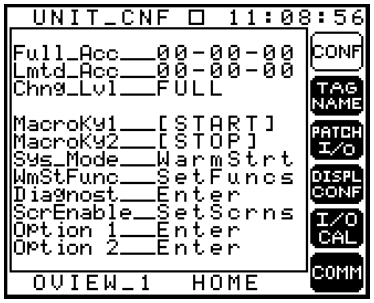
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Upon system power-up, the first screen displayed is always the Unit Operation screen. The currently active access level is displayed in the ACCESS field. If LIMITED or NONE is displayed, a user must enter at least one passcode in a window that appears when the ACCESS field is selected. If the correct passcode is entered, the desired access level is granted.

Security access passcodes are set up as follows:

1. With the unit in the default "FULL" access mode on the UNIT operation screen, use the knob to access the Configur_Select. The system will display the Unit Configuration screen shown in Fig. 3–31.
2. Use the knob to select the FULL_ACC field. (Default "FULL" = full access granted.)
3. Select the three 2-digit codes.
4. Move the cursor to the LMTD_ACC field and enter codes in the same manner.

Figure 3–31. Unit Configuration Display with Full Access



5. Move the cursor to the CHNG_LVL field. Select the access level you wish to activate: FULL, LIMITED, or NONE.
6. The access level you selected will be displayed in the CHNG_LVL field and the access codes you entered will be blanked out.
7. Press the OVIEW_1 button and the Diamond Key to access the Unit Operation screen (see Fig. 3–32). The access level you selected will be displayed in the ACCESS field.
8. To gain FULL or LIMITED access, select the ACCESS field, and enter the correct passcode in the window (see Fig. 3–33). When you close the window, the current access level will be displayed.

Figure 3–32. UNIT Operation Screen

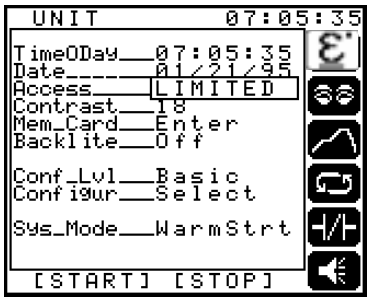
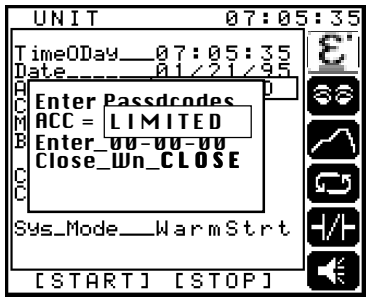


Figure 3–33. (R) Passcode Access Window



Important: To remove passcode protection from the NONE or LIMITED level, you must first enter the correct passcode in the ACCESS field on the Unit Operation screen. You must then access the

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Unit Configuration screen and enter six zeros (00-00-00) into the passcode field. Passcode protection will then be removed from the system and "FULL" access will be allowed.

Defining Macro Keys

The labels and functions of the two macro keys located directly below the display screen on the operation side may be redefined for any time during operation. With these keys, you have the ability to simplify operation by redefining each key to perform a selectable function for a specific loop.

Note: The macro keys on the operation side are labeled START *and* STOP *as factory defaults. However, the macro keys are not defined to perform any function under operation when supplied by the factory.*

Macro key labels are displayed on the bottom row of all operation screens. Configure macro key labels and functions as follows:

1. Use the diamond key to access the Unit Configuration icon from the configuration group. The system will display the Unit Configuration screen shown in Fig. 3–34a.
2. Use the knob to select the MacroKy1 field.
3. The system will display the macro key Setup window shown in Fig. 3–34b.
4. Use the knob to select the LpPgNmbr field shown in Fig. 3–34b. Select the number of the control loop and programmer to be activated. Multiple loop/programmer assignments can be made to one macro key.
5. To rename the key, select the **[START]** field. The cursor will highlight the first character field of the 8-character macro key label.

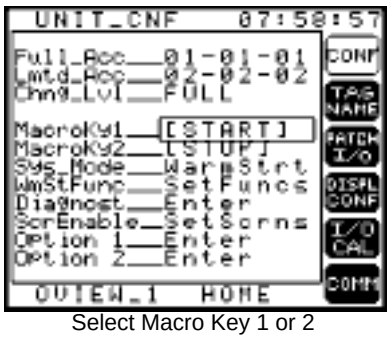
Note: *Each macro key label can consist of up to eight characters. All ASCII characters are available, including uppercase letters, lowercase letters, numbers, special characters, punctuation, and spaces.*

6. Use the knob to select the desired character and push to enter the selection. The character will be entered in the first field and the cursor will highlight the second character field. Repeat this procedure until you have entered a character (or space) in each character position in the label.
7. Use the knob to select the first function you wish to perform with the macro key, shown in Fig. 3–34c (PgStart in this example).

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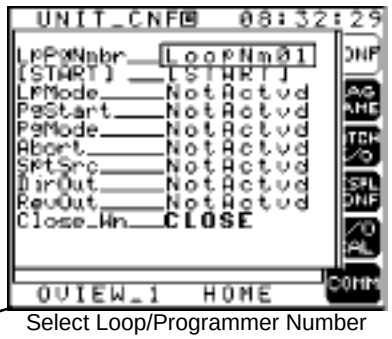
Figure 3–34.
Defining Macro Keys

Fig. 3–34a



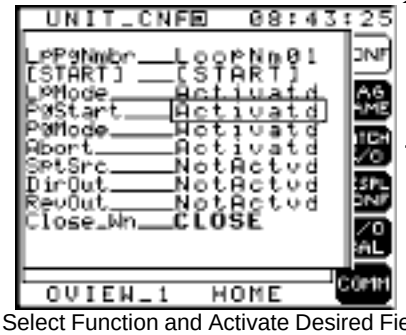
Select Macro Key 1 or 2

Fig. 3–34b



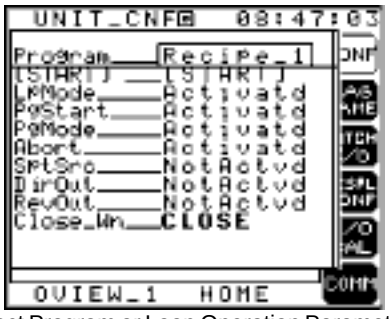
Select Loop/Programmer Number

Fig. 3–34c



Select Function and Activate Desired Field

Fig. 3–34d



Select Program or Loop Operation Parameters

8. The system will display **Activatd** and **NotActvd** in this field when the knob is turned. Entering **Activatd** will enable you to program the function (Fig. 3–34d). Functions are as follows:

   LpMode – Allows setting of the control loop mode. Choices are **Auto** or **Manual**.

   PgStart – Allows selection of the Recipe to start when the **PgMode** parameter is set to **Start**.

   PgMode – Allows selection of the real-time programmer action. Choices are **Run**, **Hold**, or **Start**.

   Abort – Allows setting the abort function to **Enable** or **Disable**. When enabled, the abort sequence will be activated.

   SptSrc – Set the setpoint source for the loop to **Operator**, **Remote**, or **Programmer**.

   DirOut – Set the Direct output percent to a selected level if the loop is in manual mode.

   RevOut – Set the Reverse output percent to a selected level if the loop is in manual mode.

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9. When you are finished making selections for this loop/programmer combination you may repeat this procedure for another loop/programmer combination.
10. Repeat the above procedure to enter a new label and function for the second macro key.

Setting System Start Mode

Dimension can be set up to handle memory contents in one of two ways when line power is removed from the system:

- **WARM START** – All parameters and data residing in memory will be maintained by battery power (up to several years) after a power-down and the system will resume where it left off when powered up again.
- **COLD START** – All data residing in memory will be erased when line power is removed. The original factory default settings for all parameters and data will be in effect when the unit is powered up again.

Note: Analog input/output calibration and configuration is retained in separate memory and is not affected by a system cold start.

Set the system start mode as follows:

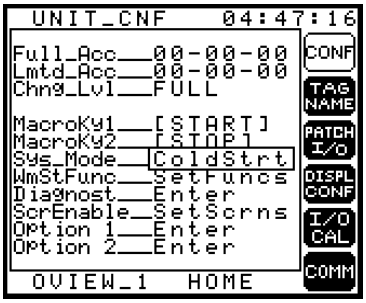


Figure 3–35. Selecting WarmStart or ColdStart

1. Use the diamond key to move to the Unit Configuration icon in the configuration group. The system will display the Unit Configuration screen shown in Fig. 3–35.
2. Use the knob to select the `Sys_mode` field.
3. Select `WarmStrt` or `ColdStrt`. The mode you selected is now active, and will remain active until you change it again.

Warm Start Functions

Selecting `WmStFunc` opens a window to allow the user to execute a series of commands when Dimension is powered up in WarmStart. As shown in Fig. 3–36, the parameters shown in this window are as follows:

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Figure 3–36. Selecting WarmStart or ColdStart

LpPgNmbr - Selects the loop number.

LpMode – Allows setting of the control loop mode. Choices are **Auto** or **Manual**.

PgStart – Allows selection of the Recipe to start when the PgMode parameter is set to **Start**.

PgMode – Allows selection of the real-time programmer action. Choices are **Run**, **Hold**, or **Start**.

Abort – Allows setting the abort function to Enable or Disable. When enabled, the abort sequence will be activated.

SptSrc – Set the setpoint source for the loop to **Operator**, **Remote**, or **Programmer**.

DirOut – Set the Direct output percent to a selected level if the loop is in manual mode.

RevOut – Set the Reverse output percent to a selected level if the loop is in manual mode.

Screen Enable

The **ScrEnable** parameter (see Fig. 3–37) allow the user to turn on or off all the screens at a selected Icon level. When selected, a window opens as shown in Fig. 3–38.



Figure 3–37. (L) Selecting **ScrEnable**



Figure 3–38. (R) **SetScrns** window

For each parameter in the window, select either On to enable the row of screens or Off to disable them. When a row of screens is disabled (Off), the associated icon will also be turned off and there is no access to that icon level. The parameters in the window refer to the icon levels as follows:

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Overview – Overview screens 

Programmer – Programmer screens 

Loops – Loop screens 

Logic – Logic screens 

Alarms – Alarm screens 

Glossary – Glossary (tagname) screens 

Configure – Configuration (patch I/O) screens 

Dsp Config – Display configuration screens 

Inpt_Outpt – Input/output calibration screens 

Communicat – Communication screens 

Diagnostic and Troubleshooting

Refer to Appendix D, *Diagnostics and Troubleshooting*.

Option 1 and 2 Information

Use the following procedure to display the features, functions, and capabilities of the Dimension model you purchased.

1. Use the diamond key to move to the Unit Configuration screen from the configuration group. The system will display the Unit Configuration screen shown in Fig. 3–39a.
2. Use the knob to select the **Option1** field. The Option 1 window will display as shown in Fig. 3–39b.

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Figure 3–39.
Option Information

Fig. 3–39a

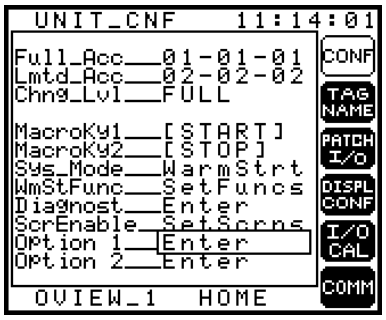


Fig. 3–39b

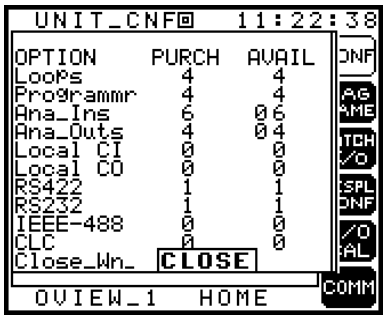


Fig. 3–39c

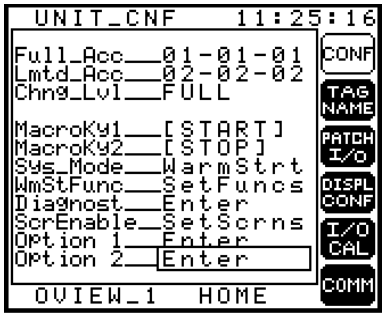
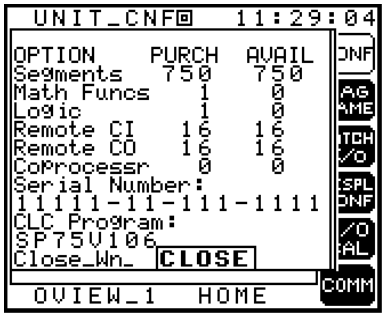


Fig. 3–39d



The following information is displayed in this window:

- **Loops** – The number of control loops
- **Programmr** – The number of real-time programmers
- **Ana_Ins** – The number of analog inputs
- **Ana_Outs** – The number of analog outputs
- **Local CI** – The number of local contact inputs
- **Local CO** – The number of local contact outputs
- **422** – EIA-422 communications
- **232** – EIA-232 communications
- **488** – IEEE-488 communications
- **CLC** – Custom Logic and Control

The number of options purchased with your Dimension is shown in the **PURCH** column. The number of options available is shown in the **AVAIL** column. The number in the **AVAIL** column may be altered by the user up to the **PURCH** value or down to zero. For example, if you purchased a unit

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with four control loops and are currently using only two of the loops, selecting 2 in AVAIL will temporarily remove loops 3 and 4 from the unit until re-selected.

3. Close this window when done.
4. Repeat step 2 to select the **Option2** field (Fig. 3–39c). The following information is provided in this window (Fig. 3–39d):
   - **Segments** – The number of profile segments
   - **Math Funcs** – Math functions
   - **Logic** – Logic
   - **Remote CI** – The number of remote contact inputs
   - **Remote CO** – The number of remote contact outputs
   - **CoProcessor** – The number of co-processors (only available on Model 8725)

Additionally, the Dimension serial number and any special CLC programs (custom features) furnished by Eurotherm Controls Inc are displayed.

If you require additional items, contact your local sales representative or Eurotherm Controls Inc.

Tag Name Configuration

Dimension uses a wide range of terminology to describe screen types, recipe parameters, loop parameters, and inputs/outputs. For example, each Operation screen in the system is labeled with a unique tag name on the top row of the screen. Also, tag names for specific inputs and outputs are used on many screens throughout the system. These tag names and labels are stored in system "glossaries."



Tag Name Configuration screens are used to modify 8-character parameter tag names and screen titles. Whenever a tag name or screen title is changed, the change is reflected anywhere the tag name or title is used on the operation screens. On Tag Name Configuration screens, both the original (default) names and new names are displayed.



Note: *All default terminology used in the Dimension system is listed and defined in Appendix A,* Graphic Operator Interface Terminology.

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Tag Name Configuration Screen

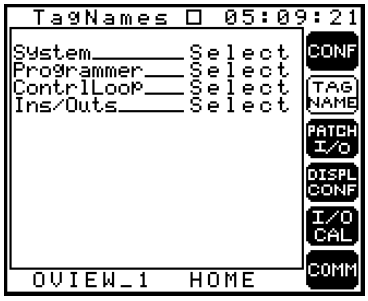


Figure 3–40. TagName Selection Display

To access the tag name configuration screen, use the diamond key to select the tag name TAG NAME icon from the configuration group. The first screen in Tag Name configuration is shown in Fig. 3–40. Use the knob to select a tag name group type to configure. When an item is selected, the Tagname definition screen for that type displays.

System Tag Name Configuration

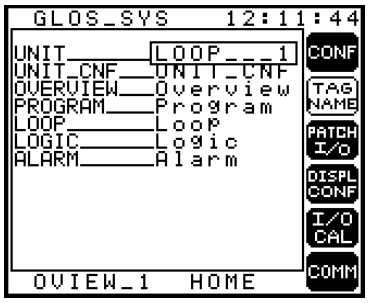


Figure 3–41. Unit Tag Name Configuration Display

Use the knob to access the System Tag Name parameters, and the screen shown in Fig. 3–41 displays. The Unit TagNames Configuration screen is used to change the screen titles of all Operation screens and the Unit Configuration screen. (Most Dimension Configuration screen titles are not changeable.) A screen title is displayed on the top line of each Operation display, and the title for each screen is unique.

For **UNIT, UNIT_CNF, OVERVIEW, PROGRAM, LOOP, LOGIC** and **ALARM** screen titles, a one-line entry or window is displayed which you can scroll through and modify the title of each screen.

When Unit Glossary setup has been completed, press the "HOME" macro key to return to the Base Tag Name display shown in Fig. 3–40.

Programmer Tag Name Configuration Screen

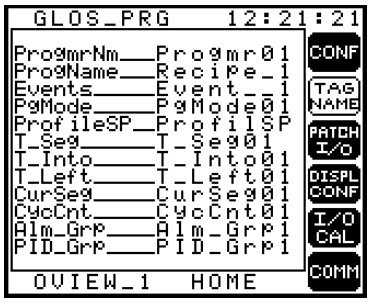


Figure 3–42. Programmer Tag Name Configuration Display

To customize Programmer-related tagnames, scroll to and select the Programmer parameter from the display shown in Fig. 3–40. This displays the Programmer Tag Name Configuration screen (see Fig. 3–42), which is used to change the tag names used in Dimension system programmers.

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When a programmer number (1–8) is selected in the first field, tag names for programmer mode (PgMode), time left in segment (T_Seg), time into segment (T_Into), time left in recipe (T_Left), current segment number (CurSeg), cycle count (CycCnt), alarm group (Alm_Grp) and PID group (PID_Grp) can be modified.

When ProgName is selected, a one-line window is displayed and the tag names for up to 15 recipe names can be modified. When finished modifying in this window, select CLOSE to end.

When the Events field is selected, a one-line window displays and the tag names for up to 12 events can be modified. Select CLOSE to end when finished modifying in this window.

When ProfileSP is selected, a one-line window displays. From this window, profile setpoint names can be selected and modified. When done modifying in this window, select CLOSE to end.

The tag names can be modified for each programmer selected. When Programmer Glossary setup has been completed, press the "HOME" macro key to return to the Base Tag Name display shown in Fig. 3–40.

Control Loop Tag Name Configuration Screen

To customize Control Loop related tagnames, scroll to and select the CntrlLoop parameter from the display shown in Fig. 3–40. This displays the Control Loop Tag Name Configuration screen (see Fig. 3–43), which is used to change the tag names used in Dimension control loops.

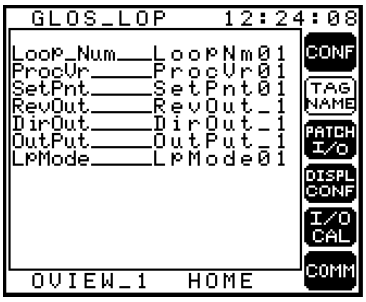


Figure 3–43.
Control Loop Tag Name Configuration Display

When a loop number is selected on this screen, the parameters shown in Fig. 3–43 are displayed for the selected loop. The tag names for process variable (ProcVr), setpoint (SetPnt), reverse output (RevOut), direct output (DirOut), output (OutPut), and loop mode (LpMode) can be modified to match your process parameters.

When Control Loop Glossary setup has been completed, press the "HOME" macro key to return to the Base Tag Name display shown in Fig. 3–40.

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Input/Output Tag Name Configuration Screen

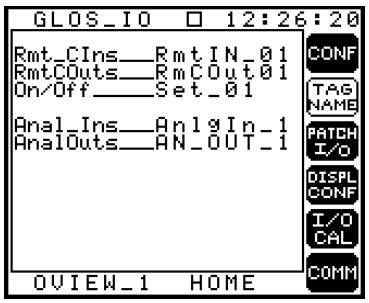


Figure 3–44.
Input/Output Tag Name Configuration Display

To customize Input/Output related tagnames, scroll to and select the **Ins/Outs** parameter from the display shown in Fig. 3–40. This displays the Input/Output Tag Name Configuration screen shown in Fig. 3–44.

The Input/Output Tag Name Configuration screen is used to change the tag names used for I/O. Tag names can be modified for 16 contact inputs (**Rmt_CIns**) and outputs (**RmtCOuts**), contact I/O on/off states (**On/Off**), and analog inputs (**Anal_Ins**)and outputs (**AnalOuts**).

One of four sets of on/off state terminology (on/off, open/closed, true/false, run/stop) can be assigned to each contact I/O point on the Logic Display Configuration screen.

When Input/Output Glossary setup has been completed, press the "HOME" macro key to return to the Base Tag Name display shown in Fig. 3–40.

Process Configuration



The Process Configuration (Patch I/O) display and associated screens areas shown in Fig. 3–45 through Fig. 3–49. The Patch I/O is used to modify the factory default input/output/function setup of the Dimension to match your process or application. A brief description of each parameter and how it can be modified is contained in this section.

Note: *See Section 4 through Section 7 of the Dimension User's Manual for specific information on configuring Control Loops, Programmer, Alarms, and Logic functions.*

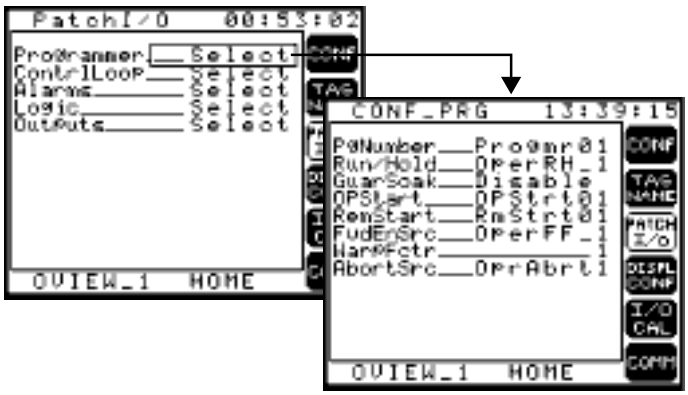


Figure 3–45.
Process Configuration (Patch I/O) Screen. Select **Programmer** to Display CONF_PRG Screen

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The **CONF_PRG** screen is used to set up any **Real-Time Programmers** in the system. Refer to Section 5, *Real-Time Programmer*, for detailed programmer setup. In extended configuration mode, the following parameters may be set up:

- **Run/Hold** - Defines the action that will cause the active recipe to switch between run and hold modes.
- **GuarSoak** - Enables or Disables the guaranteed soak function of the programmer.
- **OpStart** - Defines an action that will cause the programmer to begin executing a recipe.
- **RemStart** - Defines an alternate action that will cause the programer to begin executing a recipe at a selected segment number.
- **FwdEnSrc** - Define an action that will cause the programmer to execute in a fast time base rate.
- **WarpFctr**- Define the actual time base rate for fast forward operation. (1 is normal, 2 is twice rate, 10 is 10 times)
- **AbortSrc** - Define an action that will cause the programmer to execute the abort segment sequence.

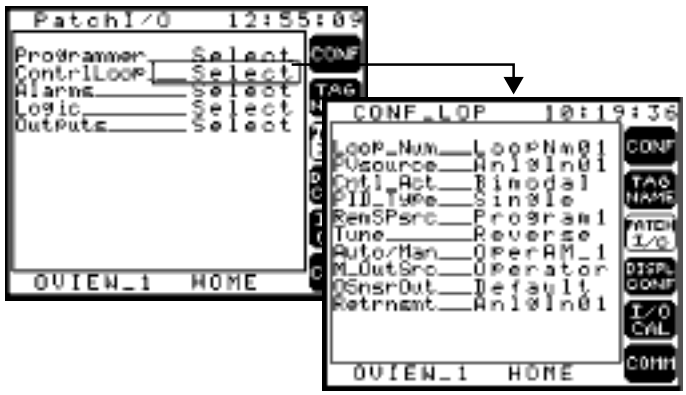


Figure 3–46.
Process Configuration (Patch I/O) Screen. Select **ContrLoop** to Display CONF_LOP Screen

The **CONF_LOP** screen is used to set up any **Control Loops** in the system. Refer to Section 4, *Process Control Loops and Monitor Inputs*, for detailed loop configuration description. The following parameters may be set up:

- **PVSource** - Defines which input will provide the process variable for the selected loop.
- **Cntl_Act** - Defines the control action (Reverse, Direct, Bimodal) for the loop.
- **PID_Type** - Defines the PID type (Single, Dual, Programmed, Select Adaptive) for the loop.
- **RemSPsrc** - Defines the source for a remote setpoint (programmer, analog input, another loop).
- **Tune** - Defines parameters for the Autotune function.

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- **Auto/Man** -Defines an action that will cause the control mode to switch between Auto and Manual modes.
- **M_OutSrc** - Defines the source for a manual output value (typically an Operator but may be another loop).
- **OSnsrOut** - Defines the control output value to set when a process variable OpenSensor is detected.
- **Retrnsmt** - Defines the loop related parameter to an analog output.

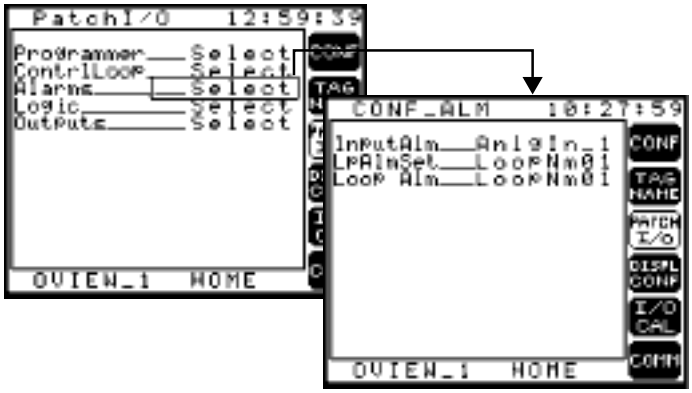


Figure 3–47. Process Configuration (Patch I/O) Screen. Select **Alarms** to Display CONF_ALM Screen

The **CONF_ALM** screen is used to configure alarm characteristics and set alarm limits for monitor and control loops. Refer to Section 6, *Process Alarms*, for detailed alarm setup descriptions. The following items may be set up:

- **InputAlm** - Allows setup of the input alarm High and Low limits, hysteresis value and latch/unlatch state.
- **LpAlmSet** - Allows the setup of alarm limits for HighHigh, High, Low and LowLow loop process variable and deviation alarms for alarm groups 1 through 5
- **Loop Alm** - Allows the setup of the Hysteresis and latch/unlatch states for the loop process variable limit and deviation alarms.

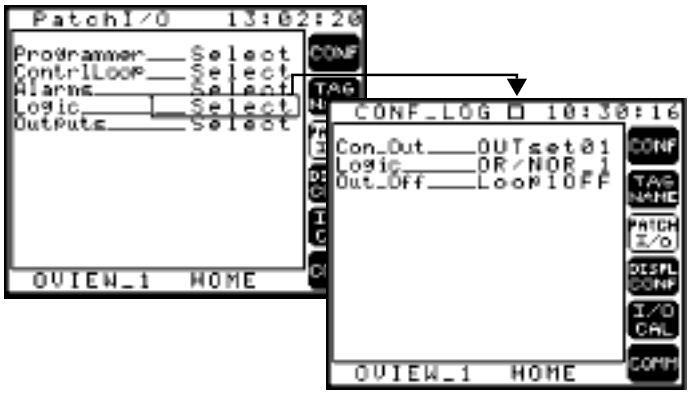


Figure 3–48. Process Configuration (Patch I/O) Screen. Select **Logic** to Display CONF_LOG Screen

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The CONF_LOG screen is used to define logic set inputs for **Outsets, OR/NOR/AND/NAND** sets and **Output Off** sets. Refer to Section 7, *Logic Functions*, for detailed Logic setup descriptions. The following items may be setup:

- Con_Out - Defines the inputs for four available Output Assignments logic sets. The output (result) of this logic operation may be tied to a physical digital output.
- Logic - Defines the inputs for the four **OR/NOR** and four **AND/NAND** logic sets. The output of the logic set may be used for internal logic functions.
- Out_Off - Defines the inputs for a Output Off logic set. A set is provided for each Loop in the system and, when TRUE, forces the loops outputs off.

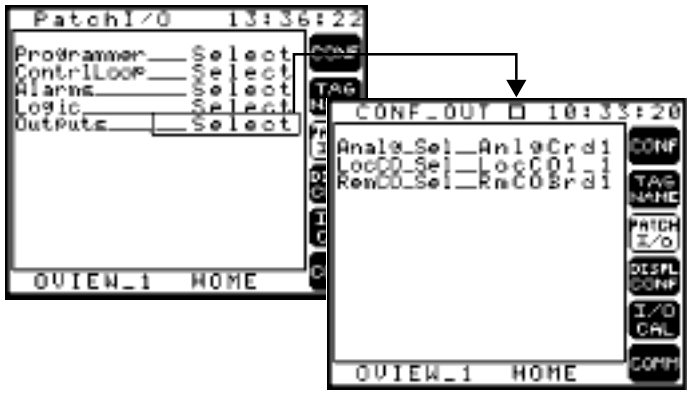


Figure 3–49.
Process Configuration (Patch I/O) Screen. Select Outputs to Display CONF_OUT Screen

The CONF_OUT screen is used to define assignments for analog and digital outputs. Refer to Sections 2, 4, 6, and 7 of this manual for detailed output assignment setup descriptions. The following items may be set up:

- Analg_Sel - Selects an analog card and allows assigning of the outputs to a function such as loop control output (reverse, direct), retransmit, alarms, and programmer events.
- LocCO_Sel - Selects a local digital output (8725 only) and allows assignment of output functions such as reverse or direct control, programmer events or alarms.
- RemCO_Sel - Selects a remote digital output board and allows the assignment of an output function such as reverse or direct control, loop or programer status (auto/manual, run/hold), alarm or programmer events.

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Operation Display Configuration Screens

In addition to terminology (Tag Name) changes, Dimension Operation displays can be "custom-built" to present process information in the best format possible to suit specific application requirements. The Display Configuration screens described in the following paragraphs are used to select the number, format, and contents of these Operation display types:

- OVERVIEW DISPLAYS
- PROGRAMMER DISPLAYS
- LOOP DISPLAYS
- LOGIC DISPLAYS
- ALARM STATUS DISPLAYS

Overview Display Configuration

The Overview Display Configuration screen and several support windows are used to select display formats and configure display characteristics to Dimension Overview displays. Up to 16 Overview displays and optionally, two additional CLC displays, may be selected and configured.

The available display formats are shown in Fig. 3–52.

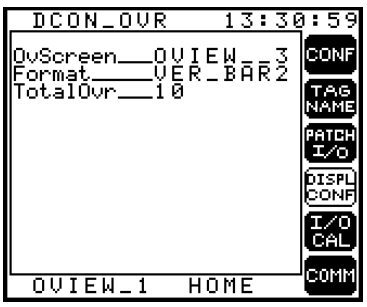
Build Dimension Overview displays as follows:

1. Use the diamond key to select the Display Configuration icon from the configuration group as shown in Fig. 3–50. Use the knob to select the `OverView` field. The Overview Display Configuration screen displays (see Fig. 3–51).

Figure 3–50.(L) Displays Configuration Screen.



Figure 3–51. (R) Overview Display Configuration Screen



2. Use the knob to select the `Ovscreen` field.
3. Select the desired overview display title number (1–16) to configure.
4. Use the knob to select the `Format` field.
5. Select the screen format from the available choices: Horizontal Bar, X-Y Chart, X-Y Display, Vertical Bar (2-, 3-, or 4-bar), Text (1X, 2X, 3X, 3X_Text_4).

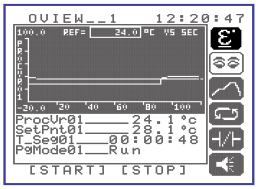
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6. When the format is selected, the system will display a configuration window for the selected format.
7. In the window, select the parameters from Table 3–1 to be displayed on the Overview display as prompted. Parameters include variables to be displayed, high and low PV limits, time base, sample rate, and up to four line definitions (displayed text from Table 3–1).
8. Repeat steps 2–8 for each overview screen.
9. You may also alter the number of Overview screens available by accessing the `TotalOvr` parameter and selecting the desired number of screens (1-16).

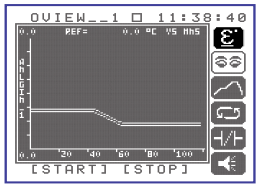
The new configuration for the overview screens is now loaded in memory, and should be saved onto a memory card.

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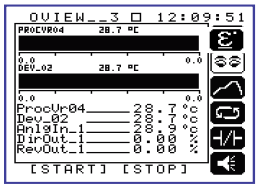
Figure 3–52.
Display Formats for Overview Display Configuration Screens



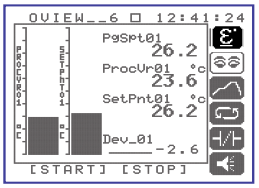
XY Chart Display
Two parameters may be charted versus time and four parameters may be displayed as text.



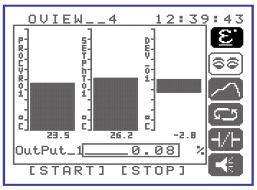
XY Display
Identical to XY Chart Display, but no text is shown.



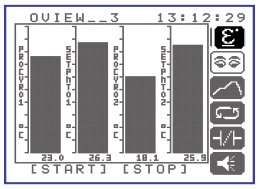
HOR_BAR
Two parameters are displayed in a horizontal bar format and five parameters may be displayed as text.



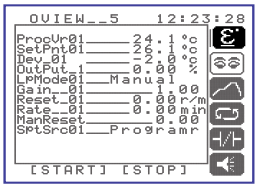
VER_BAR2
Two parameters may be displayed as vertical bar graphs, and four parameters may be displayed as text.



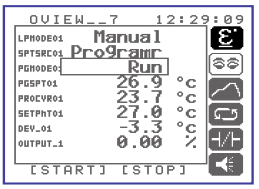
VER_BAR3
Three parameters may be displayed in bar graph format. One parameter may be displayed as text.



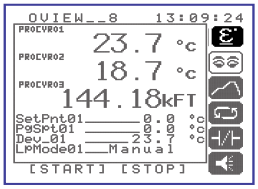
VER_BAR4
Four parameters may be displayed in bar graph format.



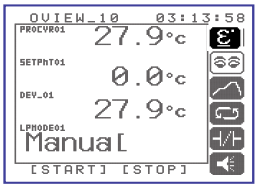
TEXT
Twelve parameters may be displayed in text format.



TEXT_2X
Eight parameters may be displayed in 2X text format.



TEXT_3X
Three parameters may be displayed in 3X text format and four parameters may be displayed as text.



TEXT_3X_4
Four parameters may be displayed in 3X text format.

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Table 3–1, "*Selectable Parameters for Format Displays*" lists all parameters that may be selected and displayed in the formats shown in Fig. 3–52. The ProcVr, SetPnt, Pg#Spt, Dev, DirOut, RevOut and Output can be selected for trending and graphing.

Table 3–1. Selectable Parameters for Format Displays

R/W Parameter*	Description
AnlgIn_#	Analog Input _#
ProcVr##	Process Variable of loop ##
SetPnt##	Setpoint from setpoint of loop ##
Dev_##	Deviation of loop ##
DirOut_#	Direct Acting Control Output of loop #
RevOut_#	Reverse Acting Control Output of loop #
Output_#	Control Output of loop #
LpMode##	Loop Mode of loop ##
PgMode##	Programmer Mode of programmer ##
CycCnt##	Recycle Count of programmer ##
CurSeg##	Current Segment of programmer ##
RmStSeg##	Remote Start Segment of programmer ##
T_Seg##	Time Left in Segment of programmer ##
T_Into##	Time Into program for programmer ##
T_Left##	Time Left in program for programmer ##
Ratio_##	Cascade Ratio factor for loop ##
Blend_##	Cascade Blend factor for loop ##
Scale_##	Cascade Scale factor for loop ##
SpBias##	Setpoint Bias for loop ##
Gain_##	PID Gain for loop ##
Reset_##	PID Reset for loop ##
Rate__##	PID Rate for loop ##
SptSrc##	Setpoint Source for loop ##
ManReset	Manual Reset
Events_#	Programmer Event 1-12
Pg#Spt##	Programmed Setpoint from programmer ##
BasVar_#	*CLC (optional) Basic Variable #
BasSta##	*CLC (optional) Basic Variable Status #
RmStrt#	Remote Start for Programmer#
TODStrt#	Time of Day Start for programmer#
StrtDat#	Start Date for programmer#
TODSen#	Time of Day Start Enable for pg#
TODSeg#	Time of Day Start Segment for pg#
PgMdSt#	Progmode with start for pg#

*These names may be altered depending on the use of this variable

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Note: *The number of each parameter type that is available will depend on the model and options of Dimension ordered.*

Programmer Display Configuration

The Programmer Display Configuration screen is used to select display characteristics for programmer profile graphic displays. These settings are the defaults that scale the profile graphic displays. The settings can be modified on the profile graphic display when it is selected.

Set graphic display characteristics as follows:

1. Use the diamond key to select the Display Configuration icon in the configuration group shown in Fig. 3–50. Use the knob to select the **Programmer** field. The Programmer Display configuration screen displays (see Fig. 3–53).

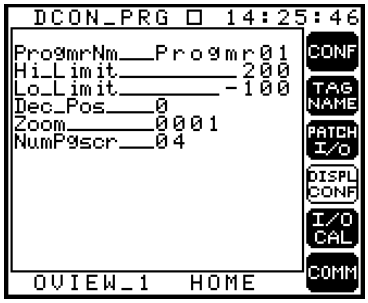


Figure 3–53. Programmer Configuration Display

2. Use the knob to select the **ProgmrNm** field.
3. Select the number of the Programmer display you wish to configure.
4. Use the knob to select the **Hi_Limit** (graph limits) field.
5. Select the desired upper limit for programmer profile displays.

Note: *On the vertical scale, the limits selected are the real values of the setpoint.*

6. Using the same method, select the **Lo_Limit** (lower graph limit) and **Dec_Pos** (decimal position) for programmer profile displays.
7. Use the knob to select the **Zoom** field. The **Zoom** field selects the number of sample rates between displays, i.e., want to display every 10th sample if set to 10. Select the desired horizontal time axis (zoom factor).

Note: *For the zoom factor, the information needed is the amount of time, in seconds/pixel, that the horizontal axis represents (range = 1–3600). The length should be chosen such that the longest segment can be displayed in at least 100 pixels.*

8. **NumPgscr** defines the number of Programmer screens available for display

The new configuration is now loaded in memory and should be saved onto a memory card.

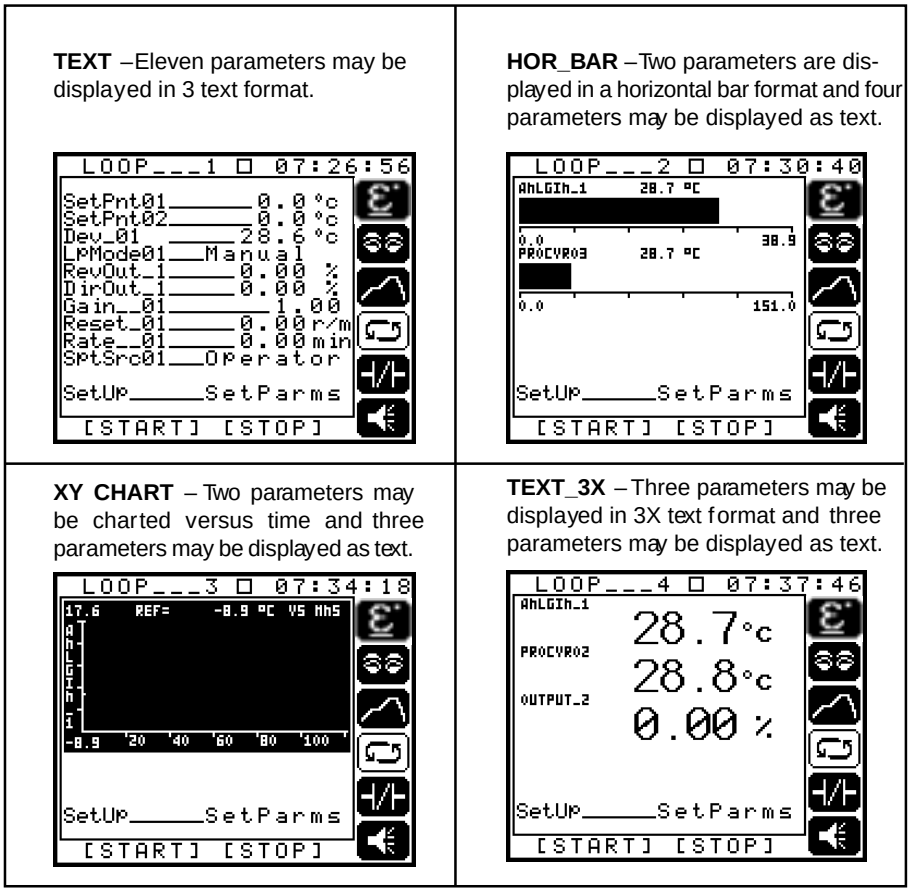
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Control and Monitor Loop Display Configuration

The Control and Monitor Loop Display Configuration screen and several support windows are used to assign display characteristics to Dimension Loop displays.

As shown in Fig. 3–54, there are four display formats available for control loop displays. In any of the display formats shown in Fig. 3–52, the parameters listed in Table 3–1 may be selected.

Figure 3–54.
Available Display Formats for Control Loop Screens



Note: *The last line,* **Setup**, *cannot be altered on the Loop screens.*

Build Dimension Loop displays as follows:

1. Use the diamond key to move to the Display Configuration icon in the configuration group shown in Fig. 3–50. Use the knob to select the **ControlLoop** filed. The Control Loop Display Configuration screen displays (see Fig. 3–55).

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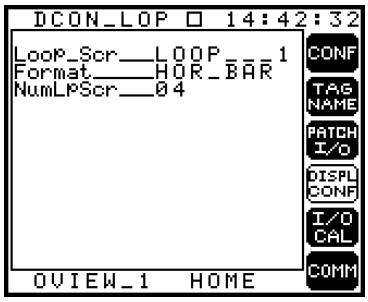


Figure 3–55.
Control Loop Display Configuration Screen

2. Use the knob to select the **Loop_Scr** field.
3. Select the desired loop display title/number.
4. If you wish to change the display configuration, use the knob to select the **Format** field.
5. Select your format choice from the list of available formats: Horizontal Bar, X-Y Chart, Text, Text 3X. The system will display a configuration window for the selected format.
6. In the window, select parameters that will be displayed on the new Loop display as prompted. Parameters (refer to Table 3–1) include graphic representations of specific values and displayed text.
7. The number of Loop screens available may also be set by adjusting the **NumLpScr** parameter.

The new configuration is now loaded in memory, and should be saved onto a memory card.

Logic Display Configuration

The Logic Display Configuration screen and several support windows are used to select events and logic points that will be displayed on Dimension Logic displays. Five screens are provided with the factory default configuration. Up to three screens may be selected and configured. The first screen contains programmer event status (if programmer option purchased), and the next four contain Remote Digital I/O point on/off status.

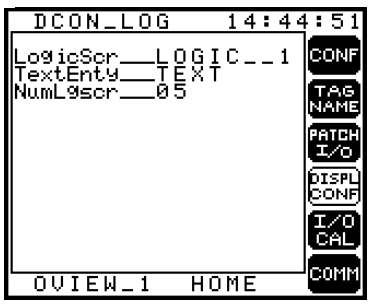


Figure 3–56.
Logic Display Configuration Screen

Build Dimension Logic displays as follows:

1. Use the diamond key to move to the Display Configuration Icon in the configuration group shown in Fig. 3–50. Use the knob to select the **Logic** field. The Logic Display Configuration screen displays (see Fig. 3–56).
2. Use the knob to select the **LogicScr** field.
3. Select the desired logic display title/number.
4. Use the knob to select the **TextEnty** field.

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5. Press **ENTER** twice. The system will display a window from which you can select up to 12 lines of text that will display selected events and/or logic points.
6. Select the event or logic point that will be displayed on each text line.
7. After each selection, select the set of terms (Set_01–Set_04) that best describes the on/off state of the event or point, e.g. ON/OFF, START/STOP, ENABLE/DISABLE. These terms are listed, and can be redefined, on the GLOS_IO screen (see *"Input/Output Tag Name Configuration Screen"* on page 3-39). See Table 3–2, below.

Table 3–2. Default Set Text

SET_01	ON	OFF
SET_02	Open	Close
SET_03	True	False
SET_04	RUN	STOP

8. Use the `NumLgscr` to select the number (1-5) of Logic screens for display.

The new configuration is now loaded in memory and should be saved onto a memory card.

Alarm Status Screen Help Message Configuration

The Alarm Help Message Entry screen is used to enter help messages that will be displayed for specific alarms when the Help key is pressed at the Alarm Status screen. This may be used to provide operators with alarm specific instructions.

Enter Alarm Status screen help messages as follows:

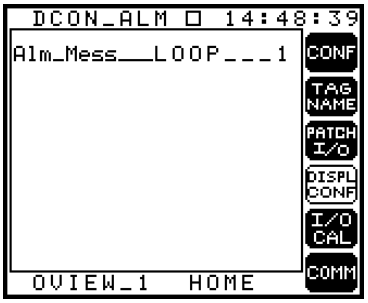


Figure 3–57. Alarm Help Message Screen

1. Use the diamond key to move to the Display Configuration Icon in the configuration group shown in Fig. 3–50. Use the knob to select the `Alarms` field. The Alarm Display Configuration screen displays (see Fig. 3–57).
2. Use the knob to select the `Alm_Mess` field.

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3. Select the loop name/number for which you wish to enter a help message.
4. The system will display a window in which you can enter a help message up to 95 characters in length.
5. When you are finished entering your message, move the cursor to the last field ("C") and press **ENTER**.

The message is now entered into memory, and will be displayed when the help key is pressed with an alarm for this loop displayed on the Alarm Status screen. Repeat this procedure to enter help messages for other loops, and note that your new configuration should be saved onto a memory card.

Input/Output Configuration and Calibration

The Input/Output Configuration (**I/O Cal**) icon and associated screens are shown in Fig. 3–58 through Fig. 3–60. I/O setup screens are used to configure and calibrate Dimension Analog and Digital I/O Card inputs and outputs. Functions performed on these screens include input type selection, zero/span range adjustment, engineering units selection, decimal position and mnemonic selection, time proportioned cycle time and high/low limit setup. Refer to Sections 4, 5, 6, and 7 of the this manual for specific information on configuring Control Loops, Programmer, Alarms, and Logic functions. A brief description of each parameter and how it can be modified is contained in this section.

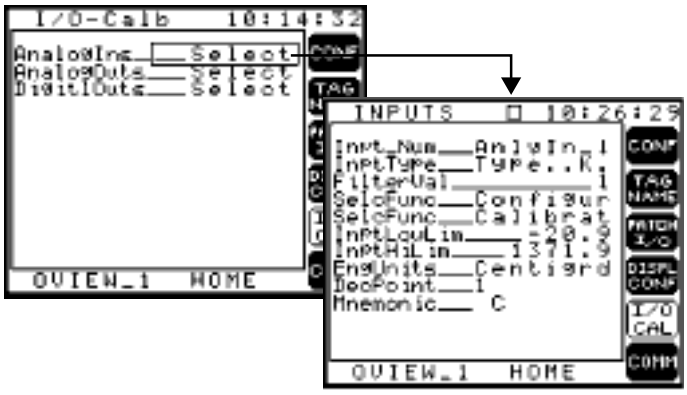


Figure 3–58. Process Configuration (I/O Calb) Screen. Select AnalogIns to Display INPUTS Screen

The **AnalogIns** selection is used to select, define and setup analog inputs to match your process hardware requirements. The following parameters may be configured:

- **Inpt_Num** - Used to select which analog input to configure.
- **InptType** - Used to define the input type. Choices are J, K, T, R, S, E, N, B, G, C, D, Platinell II, NiNiMoly thermocouples, RTD, millivolt, volt, current, pressure, or altitude.

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- **FilterVal** - Defines the amount of software filtering to apply to the selected input.
- **SelcFunc – Configur** - Used to access the linear input span/zero setup window.
- **SelcFunc – Calibrat** - Used to access the input calibration window.
- **InptLowLim** - Used to set the low limit for user entry for this input.
- **InptHiLim** - Used to set the high limit for user entry for this input.
- **EngUnits** - Used to select Centigrade, Fahrenheit or Linear engineering units.
- **DecPoint** - Displays the number of decimal points set up for the input
- **Mnemonic** - Displays the engineering unit mnemonic setup for the input. (C, F, %, RPM, f/m...)

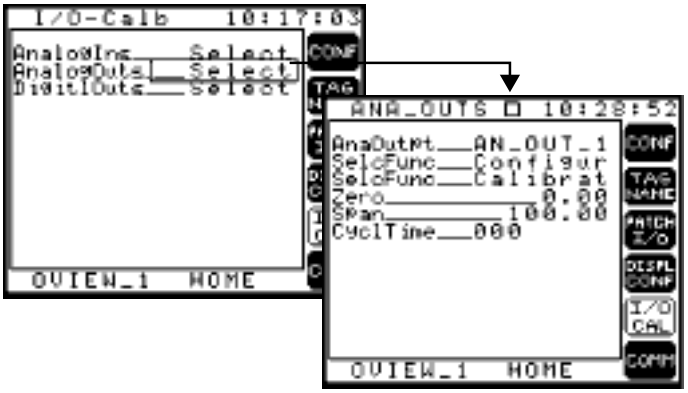


Figure 3–59.
Process Configuration (I/O Calb) Screen. Select AnalogOuts to Display ANA_OUTS Screen

The **AnalogOuts** selection is used to select and set up analog outputs to match your configuration requirements. The following parameters may be configured:

- **AnaOutpt** - Used to select which analog output to configure.
- **SelcFunc_Configur** -Used to configure the ***output*** **Zero** and **Span** values.
- **SelcFunc_Calibrat** - Used to set the ***calibration*** **Zero** and **Span** values.
- **Zero** - Displays the configured output zero value.
- **Span** - Displays the configured output span value.
- **Cyc_Time** - Used to set the ***time-proportioned*** cycle time (defined in seconds).

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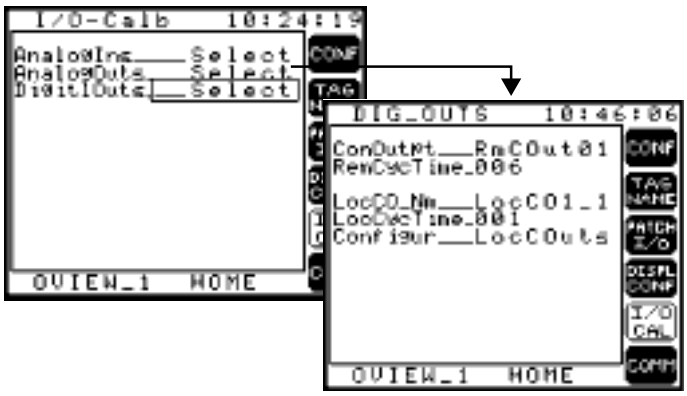


Figure 3–60.
Process Configuration (I/O Calb) Screen. Select DigitlOuts to Display DIG_OUTS Screen

The **DigitlOuts** selection is used to select and setup digital outputs to match your configuration requirements. The following parameters may be configured:

- **ConOutpt** - Used to select which remote contact output to configure.
- **RemCycTime** - Used to set the ***time-proportioned*** cycle time (defined in seconds).
- **LocCO_Nm** - Used to select which local contact output to configure (8725 only).
- **LocCycTime** - Used to set the ***time-proportioned*** cycle time (defined in seconds).
- **Configur_LocCOuts** - Used to set the ***output*** **zero** and **span** values.

Saving Unit Configuration Data

When you are finished configuring or modifying Dimension configuration parameters, your new configuration data should be saved in a file on a memory card.

Important: If the system is set up for a "warm start," all parameters and data residing in memory will be maintained by battery power (up to several years) after a power-down and the system will resume where it left off when powered up again. If the system is set up for a "cold start," however, all data residing in memory will be erased when line power is removed. Configuration parameters must be reconfigured or reloaded from memory cards.

See Section 3 *"Using Memory Cards"* on page 3-54.

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Using Memory Cards

A slot is provided on the operator interface front panel for insertion of credit card-sized memory cards. Configuration, control parameters and data can be retrieved from or stored on these cards.

Note: *The memory card's battery life is approximately five years under normal operating condition. Batteries can be replaced; call Eurotherm Controls Inc customer service department for ordering information.*

Information that can be stored on Dimension memory cards includes:

- Setpoint profile programs (`Recipes`)
- Total memory image of Dimension configuration and operational parameters (`Mem-Img`)
- Display configuration (`DSP Conf`)
- Macro key configuration (`Macroky_`)
- Custom features (`CLCstart`)

Whenever you make changes to Dimension parameters or data, the new information should be saved on a memory card.

Memory Card Operation

The following procedure explains how you can save your new configuration data onto removable memory cards. With your information saved on one or more memory cards, you can load the data into Dimension system memory at any time.

Save your data onto memory cards as follows:

1. Use the diamond key to access the Unit Operation icon. The system will display the Unit Operation screen.
2. Insert a memory card into the card slot on the operator interface front panel.

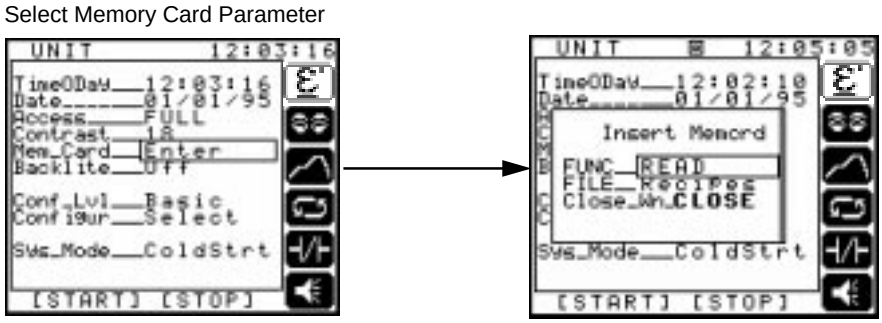
Important: If you wish to write data to a memory card, be sure that the write-protect switch on the card is set to the "NO" position.

3. Use the knob to select the `MEM_CARD` field. The system will display the Memory Card Operation Window shown in Fig. 3–61. The following information and functions are provided in this window:

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- The first line describes the current status of the memory card slot: **INSERT MEMORY CARD** or **UNFORMATTED MEMORY CARD**. If a card is not installed, "**Insert Memcrd**" is displayed. If an installed card has not been initialized and is unreadable, "**Unformat Memcard**" will be displayed.
- The function (**FUNC**) selection field permits you to scroll through and select from a list of functions including **READ**, **WRITE**, **DIRECT**(ory), **FORMAT**, and **DELETE**.
- When you select the **DIRECT**(ory) function, a window permits you to scroll through the directory of files on the card. The name, date, and size (Kbytes) of each file are displayed.
- If **READ** or **WRITE** is selected and a Memory card is installed, the selector box moves to the FILE field where the file to be written or read can be specified.
- A status line displays card status parameters including write-protect on/off, battery low/good, read/write fail, and file too large.

Figure 3–61.
Memory Card
Operation Window



4. If necessary, format the installed memory card. This will delete all data on the card.
5. To write a file to a card, select the **FUNC** field. Select the **WRITE** function. The selector box will move to the **FILE** field. Select or enter the name of the file that is to be written to the card.

If additional information is required, a window will open with prompts for more information. Enter the additional information as required.

At this point, the data will be written to the memory card under the file name you specified. Repeat this for other files as necessary.

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To read a memory card file into system memory, follow the above procedure but specify **READ** rather than **WRITE** functions as required.

Memory Card Information

The memory card files contain the following Dimension information:

1. **Recipes** (Recipes):
   - The programmer build (PgBuild) segment table of 256 segments.
   - Recipe Tag Names (ProgName) of the programmer glossary.
   - Starting Segment numbers (Start_Seg) associated with the eight program recipe tag names (default names Recipe_1 to Recipe_8).
2. **Mem_Img** (Memory Image):
   - Unit configuration: Full and limited access passwords, system mode, Macro key tag names.
   - Glossary configuration: System glossary (GLOS_SYS), programmer glossary (GLOS_PRG) *excluding Recipe Tag Names* (ProgName), Loop glossary (GLOS_LOP), I/O glossary (GLOS_IO).
   - Process configuration: Programmer configuration (CONF_PRG), Loop configuration (CONF_LOP) *including Auto Tune parameters*, Alarm configuration (CONF_ALM), Output configuration (CONF_OUT).
   - Analog Input configuration: (not calibration).
   - Analog Output configuration: (not calibration).
   - Remote Output configuration.
   - Time Proportioning Output configuration.
   - Contact Output configuration.
   - Communication configuration.
   - The following Process Settings: Programmer Option settings (PgOption), Analog Input Alarm settings (InputAlm), Manual Reset (ManRst), Setpoint Source (SptSrc), Loop Mode (LpMode).
   - Loop PID parameters for PID groups 1–5: (Gain, Reset, Rate).
   - Loop Alarm settings for Alarm Groups 1–5: (Loop_Alm): (HiHiPV, LoLoPV, HiPV, LoPV, HiHiDV, LoLoDV, HiDev, LoDev)
3. **DspConf_** (Dimension Display Configuration):
   - Overview display screens (DCON_OVR).
   - Programmer display screens (DCON_PRG).
   - Loop display screens (DCON_LOP).
   - Logic display screens (DCON_LOG).
   - Alarm Messages (DCON_ALM)

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4. `MacroKy_` (Macro Key Configuration):
   - Macro key number 1 function configuration (MacroKy1) *excluding* tag name.
   - Macro key number 2 function configuration (MacroKy2) *excluding* tag name.
5. `CLCStart` (custom features):
   - To be determined by Eurotherm Controls Inc engineering (optional)

Items Not Stored on Card:

- Time of Day
- Date
- Contrast
- Backlight
- UNIT_CNF glossary name parameter
- Mnemonic (linear range characters for process variable units)
- EngUnits (Centigrade, Fahrenheit, Linear): The engineering units are not changed by memory card functions unless the "Input type" parameter selected in the Dimension is different than stored on the memory card. When the memory card restores the Input type to a Thermocouple or RTD, the EngUnits are set to Centigrade. When the memory card restores the input type to Current or Voltage ranges, the EngUnits are set to Linear.

Communications Configuration

The Dimension can be configured for EIA-232 (standard), EIA-422 (option), or IEEE-488 (option) communication (see Fig. 3–62).

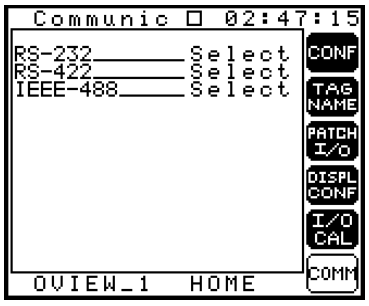


Figure 3–62. Communications Configuration Display

See Appendix B, *Serial Communications*, for information on how to configure your unit for EIA-232 or EIA-422 serial communications. For information on configuring Dimension to IEEE-488 communications, See Appendix B *"IEEE-488 Option Installation and Configuration"* on page B-87.

Note: *If changes are made to the communication configurations, the following must be completed for changes to be active:*

1. *The Dimension must be in warmstart.*
2. *AC power must be cycled off and on.*

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Section 4

Process Control Loops and Monitor Inputs

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Process Control Loops and Monitor Inputs

Section Objectives

Section 4 provides the following information:

- Definition of a PID process control loop.
- Terminology related to the Configuration and Operation of PID process control loops.
- How to Configure a control loop on the Dimension Industrial Process Manager. Configuring refers to setting up the instrument to meet the needs of the process to be controlled.
- How to Configure monitor or data acquisition analog inputs on Dimension.
- The Operation of a control loop using Dimension. "Operation" can be defined as putting Dimension to work in your process.
- StartUp, Checkout and Troubleshooting of a control loop using Dimension.

Control Loop Definition and Terminology

This topic is intended to provide a common base of terminology and control loop theory to help you configure and operate a control loop using the Dimension Industrial Process Manager. A brief discussion of the theory of process control is provided here, using the control of a home furnace as an example.

Process Control - Home Furnace

The fundamentals of process control affect your daily life in many ways.

For example, the furnace that heats your home operates under the principles of process control. You control the temperature of the air in your home by choosing a setting on the thermostat, which in turn controls the furnace. In process control, a setting is referred to as a "setpoint." A setpoint is defined as "the desired value of a process variable." In this example, the process variable is the air temperature.

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By establishing a desired air temperature setting for your home (setpoint), you expect that gas or oil will be supplied to the furnace to heat the air. The furnace is turned on when the temperature falls below the setpoint, and turned off when the temperature rises above the setpoint. This type of control action is often referred to as "on/off" control.

In more sophisticated thermostats, the amount of fuel delivered to the furnace is regulated according to the number of degrees the actual air temperature differs from the desired temperature. This difference is the "error" or "deviation." The deviation is detected by the thermostat, which controls the amount of heat delivered by the furnace by controlling the fuel valve feeding the burner. The valve in turn opens proportionately. If the setpoint is reached, the valve receives a small signal or no signal at all. It closes and very little heat, if any, is generated.

The device that senses the air temperature in your home (sensor) sends a signal (feedback signal) to the temperature controller (thermostat). The signal portrays the actual air temperature (Process Variable, or PV). The thermostat compares the signal received with the setpoint (SP). A corresponding action (valve opens or closes) occurs depending on the magnitude of the deviation (SP–PV). This process is called a "closed loop" process because there is a feedback signal and the controller adjusts the output automatically (see Fig. 4–1).

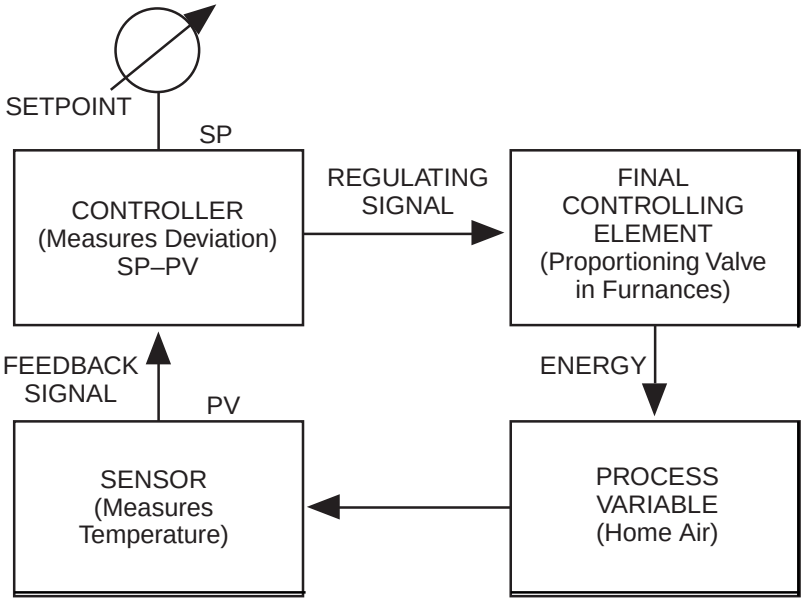


Figure 4-1.
Closed Loop Control

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Terminology

Following are terms used in this Manual and by Dimension when Configuring or Operating a control loop.

- **Alarm** - A function that provides an indication (display or signal) if a specified limit is exceeded. Dimension provides 2 levels of High/Low process variable and deviation alarms, high/low analog input alarms, and Open sensor alarms for thermocouples. Dimension also has a "watchdog timer" alarm that is used to monitor/detect instrument failures.
- **Analog Input (AI)** - Refers to a sensor such as a thermocouple, RTD or pressure sensor that is connected to the Dimension. This input is used by Dimension for monitoring, control and display functions. This parameter is referred to as `AnlgIn` on the Dimension.
- **Configuration** - This is the process of selecting Inputs, Outputs, Limits, Constants, Enabling/Disabling features.
- **Control Action** - The control action of a loop defines what type of **control output** the loop provides. Choices are REVERSE, DIRECT, and BIMODAL and can be defined as follows:
  - **Reverse** output is selected when the process requires an increasing output signal when the *setpoint* is **greater** than the *process variable*. A typical example would be a heating output control signal.
  - **Direct** output is selected when a process requires an increasing output signal when the *setpoint* is **less** than the *process variable*. A typical example would be a cooling output control signal.
  - **Bimodal** output is selected when a process requires both a *reverse* and a *direct* output. An example of this would be an environmental test chamber that has both heating and cooling capabilities.
- **Control Output** - The Control Output is the output signal from the controller that is used to control an element (valve, heater) that affects the process. The source of this output can be either the operator or the calculated PID (see next page) output.
- **Deviation** -The deviation is the difference between the desired process variable (setpoint) and the actual process variable. This value is used with alarms and in the PID output calculation.
- **Linear Output** - A control output that provides a linear output signal, such as 0-5VDC, 0-20maDC, 4-20maDC. The amplitude of the output signal is in proportion to the control output percent. For example, a 0-5VDC output signal would be equal to 1.25 Volts at 25% output, 2.50 Volts at 50% output and 5.00 Volts at 100% output.
- **Loop Mode** - The Loop Mode may be either ***Automatic*** or ***Manual***. In ***Automatic*** (closed loop) mode the control loop calculates a control output based on the current PID constants and the current deviation from setpoint. In ***Manual*** (open loop) mode, the Operator is responsible for adjusting the control output signal.

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- **Monitor Analog Input** - This is an analog input that Dimension uses to measure some aspect of your process. This input is NOT used for PID process control. A monitor input may have alarms and its value may be displayed on user screens.
- **Operator** - Refers to the user of the Dimension making a change to cause something within the instrument to happen. Examples are changing Loop Mode from Auto to Manual, Setpoint Source from Operator to Programmer.
- **PID** - **P**roportional, **I**ntegral and **D**erivative control. The term PID control is used to describe the calculation that is done using the proportional term (gain), the Integral term (reset), the Derivative term (rate), the Setpoint, the Process Variable and the Span of the control loop. The result of the calculation is the **control output**. It is the user's responsibility to select the proper PID constants (gain, reset, and rate) based upon the application that is being controlled. Selecting these constants is referred to as TUNING the control loop (see *"PID Loop Tuning"* on page 4-31).
  - **Gain** - Gain is a multiplication term expressing how the control loop output varies with respect to the control loop deviation (process variable - setpoint). The effect of gain on the control loop output can be calculated from the following equation:

    Output% = Deviation/Input Span x Gain.
  - **Reset** -The reset factor is used to correct for process losses. Reset adds or subtracts from the control loop output. The effect of Reset can be calculated by the following equation:

    Output% = ∑Reset x Elapsed Time in minutes x Deviation/Inputs span X 100.
  - **Rate** - The rate factor is used to anticipate and correct for the process lag and adjust the output to avoid overshoot. The effect of Rate on the control loop output can be calculated by the following formula:

$$\text{OutPut\%} = \frac{\text{Rate} \times \text{Current} - \text{PV \% Last}}{\text{Minutes between PV Current and PV last}}$$

- **PID Type** - PID Type defines which group of PID settings is used in a process. There are up to 5 different PID groups that may contain different values for gain, reset, and rate. **Single, Dual, Programmed, or Select Adaptive** types are available.

  Single PID is used when one set of PID constants is to be used at all times. Group 1 is always used if single is selected.

  Dual PID is used when one set of PID constants is to be used for Reverse output (group #1) and another set is to be used for **Direct** output (group #2).

  Programmed PID is used when the real-time programmer (see Section 5, *Real-Time Programmer*) is used to select which PID group is to be used on each segment.

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Select Adaptive PID is used when you wish to alter PID constants based upon the value of the process variable.

- **Process Variable (PV)** - The element being controlled by the process, such as air temperature, humidity, flow, speed or level. By default, this variable is referred to on the Dimension as the ***ProcVr##***. When configuring a control loop, the Process Variable source (Pvsource) must be defined. This source defines what **analog input** is connected to the sensor that measures the PV.
- **Real-Time Programmer** - A function within Dimension to generate a Setpoint or event that can vary with time. The programmer can be used to ramp a setpoint from one value to another or turn an event on or off over a user-specified time segment. Multiple time segments/setpoints/events are used to make up a real-time program.
- **Retransmit** - An analog signal from Dimension that represents a process characteristic such as Process Variable, Setpoint or Deviation. Typically used to retransmit to a device such as a chart recorder.
- **Setpoint (SP)** - Setpoint is defined as the ***desired valu***e for the PV. This is the value the Dimension tries to achieve when in automatic control.
- **Setpoint Source** - Defines what provides the setpoint to a control loop. In a Dimension this may be the *Operator*, a *Real-Time Programmer* or a *Remote Source*. A remote source may be an external device (such as another controller) or another control loop within the Dimension.
- **Source** - Defines what element of the controller provides the selected function. An example of this is the process variable source defined as analog input #1. What this means is the process variable (temperature, flow, pressure) is provided to the control loop from analog input #1.
- **Span** - The difference between the upper and lower range values of the process variable.
- **Tagname** - A descriptive abbreviation used to label a function or variable in the Dimension. It is typically a single word that is made up from one or more words to describe something. An example is **ProcVr** for **Proc**ess **Var**iable. In the Dimension most tagnames may be altered by the user to fit the process to be controlled or monitored. An example of this would be to modify ProcVar to be **FurnTemp** to describe Furnace Temperature.
- **Thermocouple** - A temperature sensor that produces a millivolt output signal that is proportional to the temperature. This input voltage is then linearized by Dimension to provide a temperature reading (process variable) in degrees.
- **Time Proportioned Output** - A control output that provides periodic on/off pulses. The proportion of *on time* to *off time* is determined by the control output percent.
- **Tuning Parameters** - Refers to the PID constants of Gain, Reset and Rate that are used to calculate the process control output signal.

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Configuration

The configuration process for a control loop is the process of making selections and setting parameters that are required to control your process. The first step in this process is to take a logical look at your process and gather the information that defines the inputs and outputs of the Dimension. Some items you will need for the basic configuration process are as follows:

- Number of Control Loops
- Control Output requirements (heating, cooling, both)
- Real-time Programming requirements
- Types and Ranges of input sensors (Thermocouples, RTDs, Transducers)
- Types and Ranges of output control signals (voltage, current, time proportioned)

There is a worksheet available in Appendix C, *Worksheets* that can be used to document the configuration of control and monitor loops.

Once these basic requirements are known, the actual configuration process may begin. The Dimension has two levels of configuration available, **Basic** and **Extended**. The basic level provides access to the configuration parameters that are needed for most processes. The extended level provides access to additional parameters that may be needed for a more complex process. As a first step in the configuration process the **Basic** level should be used, completed, and checked out before attempting to use the **Extended** level functions.

The Loop Configuration process will be broken into four steps as follows:

1. Loop Setup - Defines the following items:
   - Source of the Loop Process Variable (Analog Input#)
   - Type of Control Action required (Reverse, Direct, Bimodal)
   - Type of PID needed (Single, Dual, Programmed, Adaptive)
   - Setpoint Source (Programmer, Analog Input, another loop)
2. Physical Output Patching - Defines the following items:
   - Function of Analog Outputs (Control Output, Retransmit)
   - Function of Remote Digital Outputs (Control Output, Alarm, Event)
3. Analog Input Setup - Defines the following items:
   - Sensor type and range (Thermocouple type, Linear type)
   - Engineering units (Fahrenheit, Celsius, %, f/m, PSI)
   - Filtering
   - Calibration

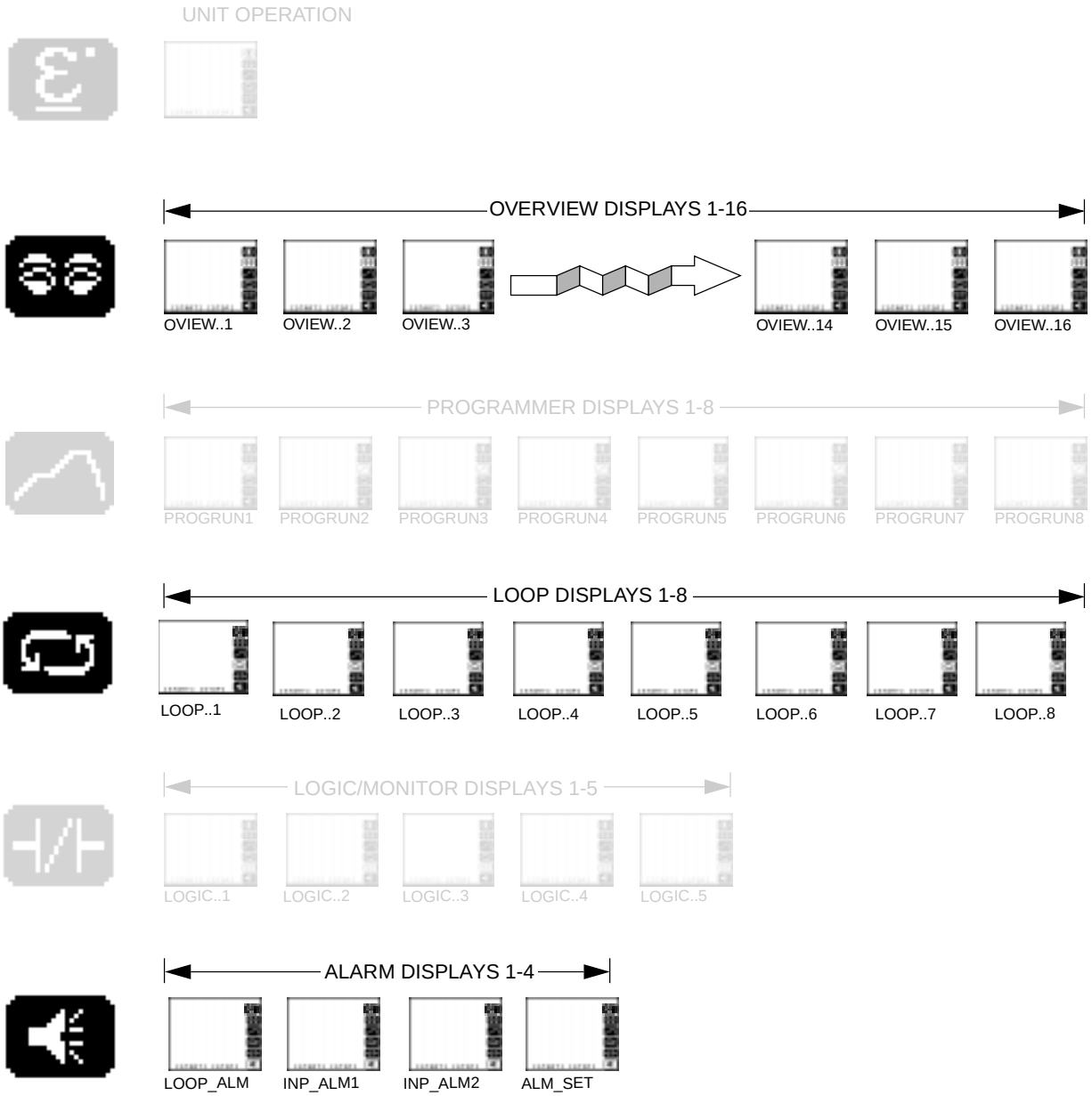
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4. Physical Outputs Configuration - Defines the following items:
   - Output range (0-100%, retransmit range)
   - Calibration
   - Time proportioned cycle time

The above steps are implemented through the Graphic Operator Interface of the Dimension and are explained on the following pages. Fig. 4–2 and Fig. 4–3 show which Operation and Configuration screens are used for configuration and operation of Loop functions.

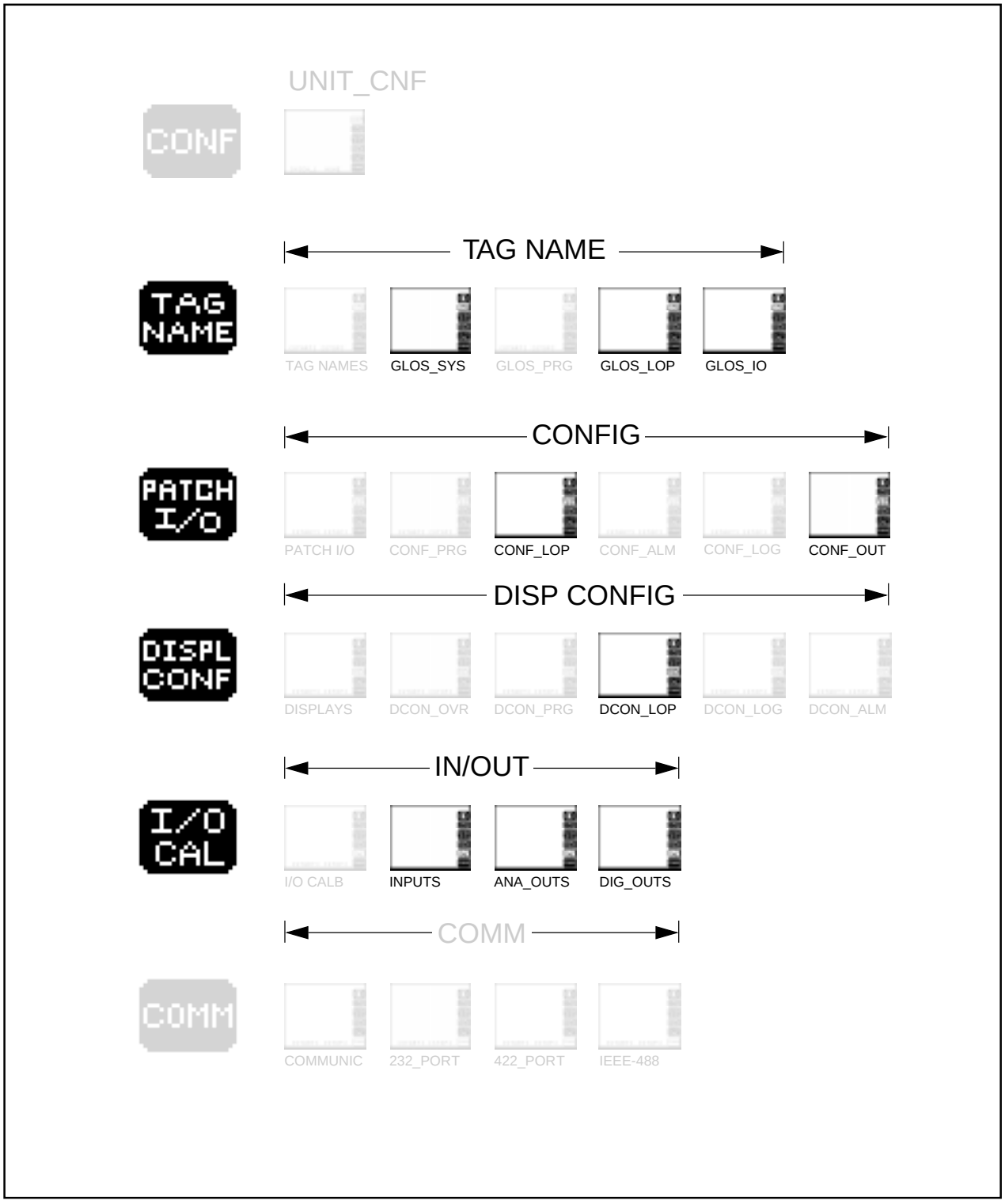
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Figure 4–2.
Map of Dimension Operations Screens Showing Associated Loop Screens



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Figure 4–3.
Map of Dimension Configuration Screens Showing Associated Loop Screens



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Note: *You should already be familiar with the operation of the Graphic Operator Interface before you begin this process. If not refer to* Appendix A3, *Graphic Operator Interface, for conventions.*

The first step is to access Dimension's ***Configuration*** displays:

1. Select the UNIT display.
2. Move the cursor down to the **Conf_Lvl** parameter and select **Basic**.
3. Select the **Configur** parameter as shown in Fig. 4–4.

Once this parameter is selected, Dimension will switch to the configuration displays, **UNIT_CNF**, as shown in Fig. 4–5.

Figure 4–4. (L)
Unit Display

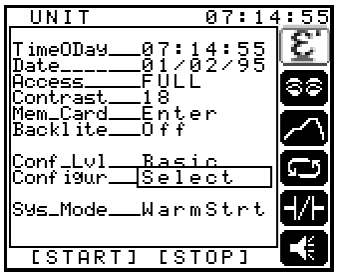
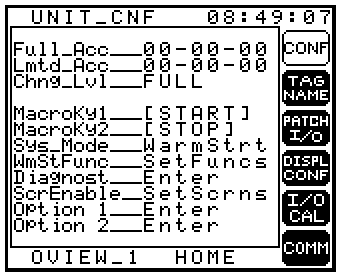


Figure 4–5. (R)
Configuration Displays (Unit_CNF)



Loop Setup

From the **UNIT_CNF** display, access the **PATCH I/O** icon and move to the **ControlLoop** parameter as shown in Fig. 4–6. Selecting this parameter will display the screen shown in Fig. 4–7, and the actual loop setup can be started.

Figure 4–6. (L)
Patch I/O Display

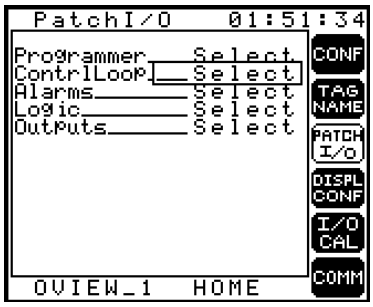
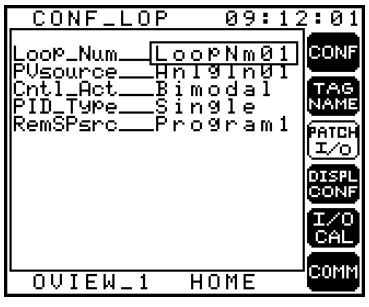


Figure 4–7. (R)
CONF_LOP Display



Note*: The tagnames for most Dimension parameters can be altered to describe the process you are controlling, such as changing the name for* Loop 1 *from* LoopNm01 *to* FurnTemp. *This manual uses the default tagnames in all examples. If the tagnames in your instrument have been changed, you must relate your unique tagname to the default while configuring!! See* Appendix A3, *Graphic Operator Interface, for conventions , for information on how to set up/alter Glossary Tagnames.*

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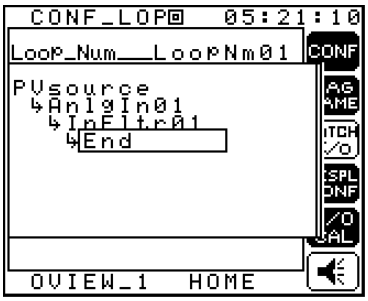
The first parameter on this display is used to select which control loop is to be Configured. The number of available loops depends on the Dimension model that you have, but can range from 1 to 8. The most logical approach is to begin with the first loop and complete its configuration, then repeat this process for each additional loop. Assuming the loop to be setup has been selected, the next step is to assign a **Process Variable Source** or **PVsource**. This parameter selection defines where the **PV** for this loop will come from. To assign the PVSource for the loop, select the **PVsource** line on the display.

Note: *Wherever a ## is appended to a selection choice in the manual, the ## is used to represent a number. The range of this number will vary depending upon the configuration of your Dimension.*

Once selected, the window shown in Fig. 4–8 displays and the selection for the PVSource may be made. The following choices will be available:

- **AnlgIn##** - The process variable will come from the selected analog input #.

Figure 4–8.
PVsource Display



Note: *Whenever an Analog Input # is selected for a PV Source type, you may also set a filter value,* **InFltr##**, *for the selected analog input. The filter value is the time constant in seconds of a low pass filter. As the time increases the amount of filtering increases. Typical settings range from 1 to 5 but may range from 0 to 100. The default value is 1.*

- **AnaIn#_#** - The process variable will come from the analog input # and # specified. If this input detects an Open Sensor, the controller will automatically switch to the second analog input #. (Thermocouple switchover).

Note: *Whenever an AnaIn#_# is selected for a PV Source type you may also set a filter value,* **DigFiltr#**, *for both analog input numbers. The filter value is the time constant in seconds of a low pass filter. As the time increases the amount of filtering increases. Typical settings range from 1 to 5 but may range from 0 to 100. The default value is 1.*

- **Calc___#** - (# = 1 through 4) The process variable will be calculated using the following equation:

$$PV = \frac{(Anlgin\#\# \times Mltpler1) + (Anlgin\#\# \times Mltpler2) + (Anlgin\#\# \times Mltpler3) + (Anlgin\#\# \times Mltpler4)}{Scale}$$

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Where:

AnlgIn## is analog input 1 thru 4 for **Calc1**, **Calc2**, or is input 5 thru 8 for **Calc3**, **Calc4**

Mltpler# is a user defined/entered constant that may be used to weight an input

Scale is a user defined/entered constant that may be used to adjust or scale the result

An example of this input type would be to average inputs 1, 2, and 4 into a single PV value. To do this, set **Mltpler1**, **2**, and **4** to a 1; **Mltpler3** to 0 (this will disable input 3) and **Scale** to 3.

The choices under the Calc selection are as follows:

- **DigFiltr** - Set a filter value for the 4 analog inputs in the equation.
- **Equation** - Select this to set the multiplier values for the Calc equation.

- **RH#** - The process variable will be the result of a Wet Bulb/Dry Bulb relative humidity calculation based on a psychometric table. When this selection is made you will be prompted for several selections to make:

  1. **AtmosPrs** – Select Atmospheric Pressure setting (sea level is 1.0)
  2. **AnglIn##** – Source for the **Wet Bulb** temperature, which may be an analog input #. A filter value may also be entered for the selected analog input.
  3. **AnlgIn##** or **SetPntL#** – Source for the **Dry Bulb** temperature which may be an analog input # or a Control Loop Setpoint #. A filter value may also be entered for the selected analog input. (Selecting a Loop setpoint for the Dry Bulb temperature will provide for more table temperature/RH control in some applications.)

After you have completed making your selection for PVSource, select **End** on the window to complete this configuration step.

The next step is to define the **Control Action** of the loop. Do this by selecting the **Cntl_Act** line on the display. This will open a window as shown in Fig. 4–9. From this display select one of the following control action types:

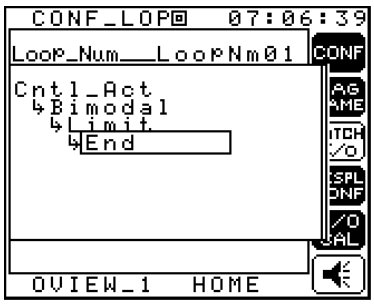


Figure 4–9.
Control Action

- **Reverse** output is selected when the process requires an increasing output signal when the *setpoint* is **greater** than the *process variable*. A typical example is a heating output control signal.
- **Direct** output is selected when a process requires an increasing output signal when the *setpoint* is **less** than the *process variable*. A typical example is a cooling output control signal.

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- **Bimodal** output is selected when a process requires both a *reverse* and a direct output. An example is an environmental test chamber that has both heating and cooling capabilities.
- **None** is selected if this control loop is not used.

Each of these control action types allows entering a **High** and **Low Output Limit** value. These limits can be set by selecting the **Limit** field in the **Cntl_Act** window and are defined as follows:

- **RvHiLmt#** - Reverse High Limit places a maximum limit on the reverse output percent.
- **RvLoLmt#** - Reverse Low Limit places a minimum limit on the reverse output percent.
- **DrHiLmt#** - Direct High Limit places a maximum limit on the direct output percent.
- **DrLoLmt#** - Direct Low Limit places a minimum limit on the direct output percent.
- **DeadBand** - For Bimodal mode only a Deadband/OverLap Band may be entered. DeadBand is the amount of output percent that neither output is on; Overlap band is the amount of output percent BOTH outputs are on. *DeadBand* is entered as a ***positive*** value, *Overlap* as a ***negative*** value.

After you have completed making your selection for Control Action, select **End** on the window to complete this configuration step.

The next step in configuring your control loop is to select the PID Type that will be used. This is accomplished by selecting the **PID_Type** parameter from the CONF_LOP display. This will open up a window as shown in Fig. 4–10.

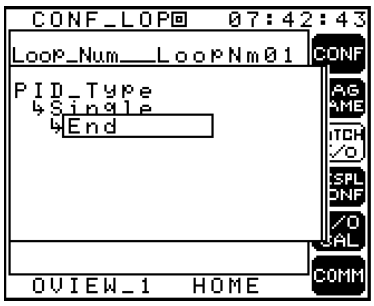


Figure 4–10.
PID Type Display

Refer to Table 4–1 and Fig. 4–11 to make your selection for PID Type based on your control needs. The choices are as follows:

- **Single** - Used when one set of PID constants is to be used at all times. Group 1 is always used if single is selected.
- **Dual** - Used when one set of PID constants is to be used for Reverse output (group #1) and another set is to be used for **Direct** output (group #2).
- **Programmed** - Used when the real-time programmer (Refer to Section 5, *Real-Time Programmer*) is used to select which PID group is to be used on each segment.

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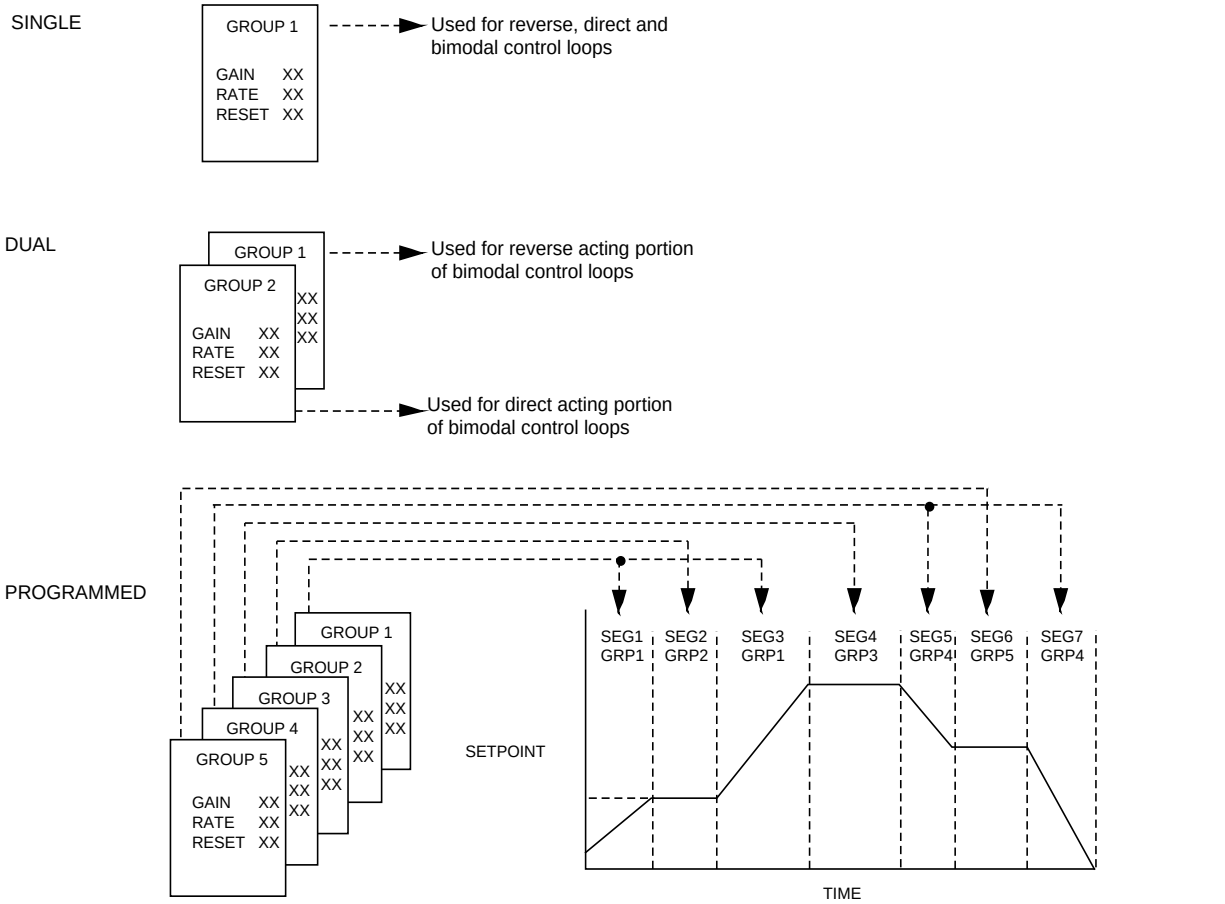
- **Select Adaptive** - Used when you wish to alter PID constants based upon the value of the process variable. When **Select Adaptive** is selected, a window will open that allows the entry of the five group breakpoint values.

Table 4–1. Active PID Groups by Type Selected

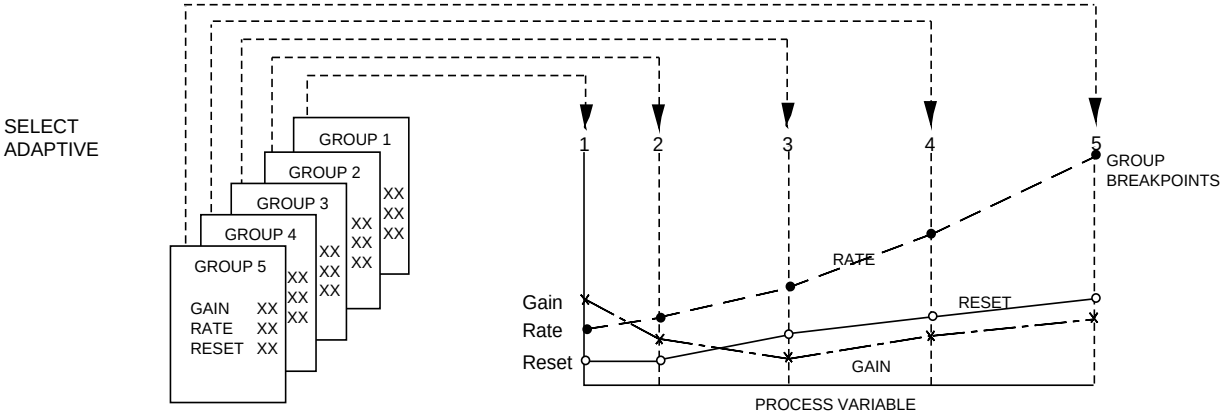
PID Type	PID Groups				
	1	**2**	**3**	**4**	**5**
Single	X	Not Active			
Dual	X	X	Not Active		
Program	X	X	X	X	X
Select Adaptive	X	X	X	X	X
X = Active					

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Figure 4–11.
PID_Type Group Selection



The profile specifies the PID group to be used for each segment. During operation, the programmer sets the gain, rate, and reset to the values defined in the PID group specified for the current segment.



Each PID group specifies the value of gain, rate, and reset at the associated break-point in the range of the process variable. During operation, the gain, rate, and reset are calculated by interpolating between the values at the breakpoints above and below the current values of the process variable.

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After you have completed making your selection for PID_Type, select **End** on the window to complete this configuration step.

The next step is to define a **Remote Setpoint Source** (**RemSPsrc**) for the selected loop. The remote setpoint source is used to provide a setpoint to this control loop that does not originate from the Operator. This selection is made from the screen shown in Fig. 4–12. Choices are as follows:

- **Program#** - Selects which programmer will provide the setpoint.

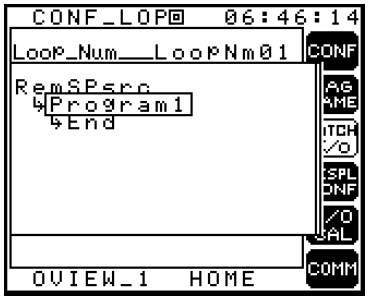


Figure 4–12.
Remote Setpoint Source Display

Note: Dimension provides a separate programmer for each loop in the system. Each programmer also contains a profile (setpoint) for each loop in the system. For example, if you select Programmer #3 for Loop #1, loop #1 will use profile #1 from programmer #3. Refer to Section 5, Real-Time Programmer, for more detail/examples on this subject.

- **AnlgIn#** - Selects one of the analog inputs to provide the setpoint. This would be used to provide a remote setpoint from some other instrument. A filter value may be entered for the analog input selected.
- **OutputL#** - Selects another control loop's output to provide the setpoint. This is most commonly used to implement cascade/blended cascade control. Refer to the Cascade Control Example in Appendix E, *Examples*, for more information. The setpoint will be calculated based on the following formula:

  SP = [(LOutput% * Ratio)+(BlendSetpoint * Blend)]/Scale

  When OutputL# is selected, the following additional parameters are presented:

  Program# - Allows you to select a programmer to provide a blend setpoint for blended cascade control.

  CascParm - Allows you to enter the values for the **Ratio, Blend** and **Scale** constants.
- **SetPntL#** - Selects the setpoint of one of the other control loops in the system to provide the setpoint for this loop. This is useful to set multiple control loops to a single setpoint with one entry.

After you have completed making your selection for Remote Setpoint Source select **End** on the window to complete this configuration step.

This is the last step necessary for the BASIC level of Loop Setup. Press the HOME macro key to return to main Patch I/O icon.

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Physical Outputs Patching

The next step is to make the **Physical Outputs** assignments. From the display shown in Fig. 4–13, select the **Outputs** parameter. When **Outputs** is selected the screen shown in Fig. 4–14 displays. This allows selection of specific output type and board number.

Figure 4–13.
Patch I/O Display

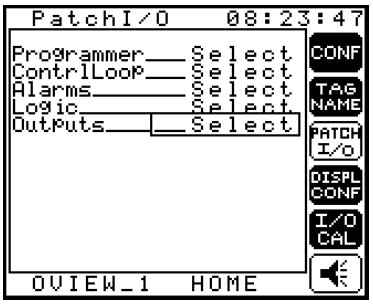


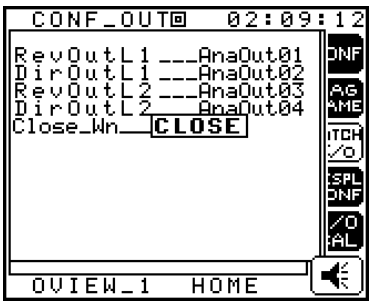
Figure 4–14.
CONF_OUT Display



The **Analg_Sel** line allows the selection of a specific analog output board to configure the analog outputs. This may range from **Analog Card 1** through **Analog Card 3** depending on your model of Dimension. The **LocCO_Sel** line allows selection of the analog card and output for local outputs (model 8725 with two or three analog cards only). The **RemCO_Sel** line allows the selection of Remote Contact Output Board 1 or Remote Contact Output Board 2.

If you select an *analog card*, a screen as shown in Fig. 4–15 displays and allows you to make an assignment for each of the analog outputs available. The assignment can be one of the following types:

Figure 4–15.
Analog Output Display



- **DevOutL#** - To patch the DEVIATION between process variable and setpoint to the selected analog output. This may be used to retransmit the deviation value to a chart recorder.
- **RevOutL#** - To patch the REVERSE (heating) control output to the analog output. Control outputs may need a time proportion cycle time defined. See *"Physical Outputs Configuration"* on page 4-26.
- **DirOutL#** - To patch the DIRECT (cooling) control output to the analog output. Control outputs may need a time proportion cycle time defined. See *"Physical Outputs Configuration"* on page 4-26.
- **SPxmitL#** - To retransmit the selected loop's Setpoint value to the analog output. This may be used to retransmit the setpoint to another Dimension or other control device.

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Note: *You may also need to setup the analog output range values (zero, span) cycle time to match your selection. See "Physical Outputs Configuration" on page 4-26.*

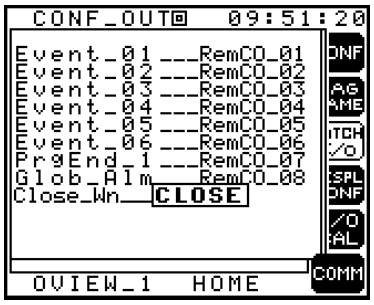
- **Retrans#** - To patch a selected loop's Retransmit parameter to the analog output. See *"Control Loop Extended Configuration"* on page 4-36 for a description of this choice.
- **Event_1-12 #** - To patch a select real-time Programmer Event to the analog output. Refer to Section 5, *Real-Time Programmer*, for more information on programmer events.
- **OUTSet01-04** - To patch a selected logic OUTSet to the analog output. An OutSet can be used to "logically OR" multiple digital outputs to a single physical output. Refer to Fig. 4–35, *Logic Functions*, for more information on OUTSets.

After you have completed making a selection for the analog card, select the **Close_Wn** parameter to close the selection window and return to the board selection display. If you have more than one analog card, complete the configuration for any additional analog cards before proceeding.

Your output may be connected to an 8781-00 Digital Input/Output Expansion Card using the high speed expansion bus from your Dimension. The I/O on this card is referred to as Remote Contact Input/Outputs. The Remote contact output functions are set up in the section below. Note local digital outputs on model 8725 with two or three analog card would be set up in the same manner by selecting the **LocCO_Sel** line shown in Fig. 4–14.

From the **RemCO_Sel** line shown in Fig. 4–14, select the remote contact board to configure and the screen shown in Fig. 4–16 displays. From this screen you may make assignments for each digital output on the selected card. Your choice will be one of the following:

Figure 4–16.
Remote Contact Output Display



- **RevOutL#** - To patch the REVERSE (heating) control output to the remote contact output. Control outputs will typically need a time proportion cycle time defined. See *"Physical Outputs Configuration"* on page 4-26 for information on setting the cycle time for a remote contact output.

- **DirOutL#** - To patch the DIRECT (cooling) control output to the remote contact output. Control outputs will typically need a time proportion cycle time defined. *"Physical Outputs Configuration"* on page 4-26 for information on setting the cycle time for a remote contact output.

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- ***Alarms*** - Various alarm types may be patched to a remote contact output. Refer to Section 6, *Process Alarms*, for detailed information on alarms. The type of alarm indication may be one of the following:

  Glob_Alam - This is set when ***any*** alarm condition is true.

  IN_Alarm - This is set or true when ***any*** analog input limit alarm condition is exceeded.

  PV_Alarm - This is set or true when ***any*** loop Process Variable limit alarm condition is exceeded.

  DV_Alarm - This is set or true when ***any*** loop Deviation (PV-SP) limit alarm condition is exceeded.

  LP#Alarm - This is set or true when ***any*** alarm condition for the selected loop is exceeded.
- **OUTSet01-04** - To patch a selected logic OUTSet to the remote contact output. An OUTSet can be used to "logically OR" multiple digital outputs to a single physical output. Refer to Section 7, *Logic Functions*, for more information on OUTSets.
- **Event_1-12#** - To patch a select Real-Time Programmer Event to the remote contact output. Refer to Section 5 for more information on real-time programmer events.
- **OperAM_#** - To patch the control mode (Auto/Manual) of the selected loop to a remote contact output. This may be used to synchronize multiple instruments or to drive an indicator lamp.
- **OperRH_#** - To patch the Real-Time Programmer status (Run/Hold) to a remote contact output. This may be used to synchronize multiple instruments or to drive an indicator lamp.
- **PrgEnd_#** - To patch the real-time programmer's Program End indicator to a remote contact output. This may be used to synchronize multiple instruments or to provide an operator status light that a program has completed.
- **RemCI__#** - To patch a selected remote contact input back out to another output. This may be used to bring in a low level input signal and switch a higher voltage level output to control an external piece of equipment.

After you have completed making selection for the remote contact board select the **Close_Wn** parameter to close the selection window and return to the board selection display. If have a second remote contact board, complete the configuration at this time. When all of your physical outputs have been configured, press the **HOME** key to return to the main **PatchI/O** display.

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Analog Input Setup

The next step in setting up your control loops or monitor analog input points is to define the actual input types. This is accomplished by accessing the **I/O CAL** display as shown in Fig. 4–17.

From this display select the **AnalogIns** parameter to access the display shown in Fig. 4–18.

Figure 4–17. (L)
I/O Calibrate Display

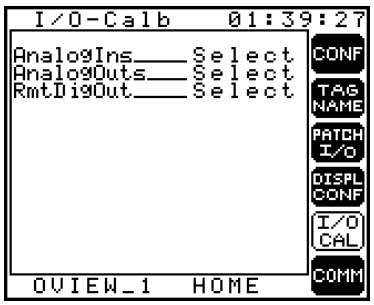
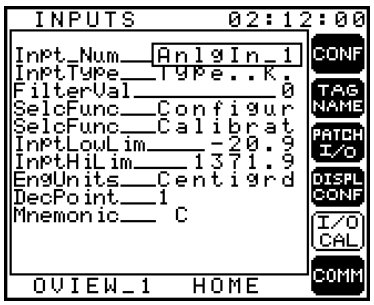


Figure 4–18. (R)
Input Configuration Display



Dimension analog input processing provides high accuracy for thermocouple, millivolt, voltage, milliamp, and RTD sensor types. Each Analog I/O Card provides six universal analog inputs, and up to three cards can be installed in an 8725 Industrial Process Manager (one maximum in an 8705). The **Inpt_Num** parameter is used to select the specific input to configure. When you have selected the input number or tagname (if you altered the default names) the system will display the currently active parameters and characteristics for the input you selected. The following parameters may be modified:

- **InptType** - Selects an analog input type from a list of selections. The following standard types are available:

  Thermocouple type T, J, K, R, S, E, N, Platinel II, B, G, C, D, Nickel Nickel Molly

  Linear DC ranges of 0-100mv, 0-10 volt, 0-5 volt, 4-20ma, 0-20ma, 0-50mv, 0-10mv, 0-1 volt

  Altitude Range from 0 - 200Kft (from a 4-20mA input sensor)

  RTD (American and European curves)

  Pressure range from 0-250 PSI (from a 0-100mv pressure sensor)

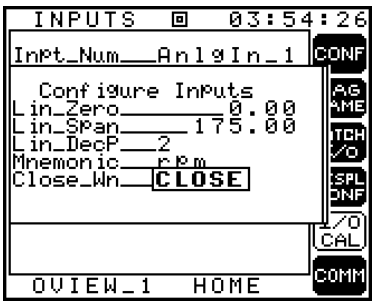
  (See Table 4–4, "Input Types/Ranges," on page 4-46 for descriptions of all selectable analog input types.)

- **FilterVal** - The filter value is the time constant in seconds of a low pass filter. As the time increases the amount of filtering increases. Typical settings range from 1 to 5 but may range from 0 to 100. The default value is 1.

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- **SelcFunc_Configur** - Selecting this function allows the configuration of a linear input range. This selection opens a configuration window as shown in Fig. 4–19 and allows access to the following parameters:

Figure 4–19.
Configure Inputs Display



- **Lin_Zero** sets the zero (low) point in engineering units for the selected linear input. See Table 4–2 for range of settings. See Fig. 4–20 for examples of possible settings. The default setting is 0.
- **Lin_Span** sets the span (high) point in engineering units for the selected linear input. See Table 4–2 for range of settings. See Fig. 4–20 for examples of possible settings. The default setting is 100.
- **Lin_Decp** sets the placement of the decimal point 9 (the number of positions to the right) for the selected linear input. See Table 4–2 for the range of settings. See Fig. 4–20 for examples of possible settings.
- **Mnemonic** selects 3 character engineering mnemonic tag for the selected linear input.

Table 4–2. Maximum Range of Numbers that can be used for Linear Input Zero/Span and Decimal Point Placement

Dec Point	Zero	Span
0	-32767.	32767.
1	-3276.7	3276.7
2	-327.67	327.67
3	-32.767	32.767
4	-3.2767	3.2767
5	-0.32767	0.32767

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Figure 4–20.
Lin_Zero, Lin_Span, Lin_Decp, InptLowLim, and InptHiLim Examples

Example 1:
0 to 10 volts input to represent 0.00 to 100.00%
Lin_Zero = 0.00
Lin_Span = 100.00
Lin_DecP = 2
InptLowLim = 0.00
InptHiLim = 100.00
Setpoint entries limited to 0.00 to 100.00.

To limit setpoints to 10% (1 volt) to 90% (9 volts):
Lin_Zero = 0.00
Lin_Span = 100.00
Lin_DecP = 2
InptLowLim = 10.00
InptHiLim = 90.00
Setpoint entries limited to 10.00 to 90.00.

Example 2:
0 to 10 volts to represent –100.0 to 900.0°C:
Lin_Zero = –100.0
Lin_Span = 900.0
Lin_DecP = 1
InptLowLim = –100.0 (will automatically default when Span / Zero / Dp are changed)
InptHiLim = 900.0
Setpoint entries limited to –100.0 to 900.0.

To limit setpoints to 0 degrees (1 volt in) and 400 degrees (5 volts in):
Lin_Zero = –100.0
Lin_Span = 900.0
Lin_DecP = 1
InptLowLim = 0.0
InptHiLim = 400.0
Setpoint entries limited to 0.0 to 400.0.

Example 3:
Negative slopes ARE allowed: 0 to 10 volts represents 1000 to 0 rpm respectively:
Lin_Zero = 1000
Lin_Span = 0
Lin_DecP = 0
InptLowLim = 0 (Will automatically default when Span / Zero / Dp are changed)
InptHiLim = 1000

To limit setpoints to 100 rpm (9 volts in) and 900 rpm (1 volt in):
Lin_Zero = 1000
Lin_Span = 0
Lin_DecP = 0
InptLowLim = 100
InptHiLim = 900
Setpoint entries limited to 100 to 900 rpm.

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Selecting **CLOSE** will close the window and return you to the Input configuration window shown in Fig. 4–18.

- **SelcFunc_Calibrat** - The Calibrate window (see Fig. 4–21) allows adjustment of calibration parameters to match Dimension input readings to a known reference standard. It changes the offset (Zero) and gain (Span) of the hardware front end via software. All Analog Inputs are factory calibrated and should not require recalibration. If you need to calibrate the inputs on your Dimension, refer to Appendix F, *Verification/Calibration Procedure*, for the recommended procedure.

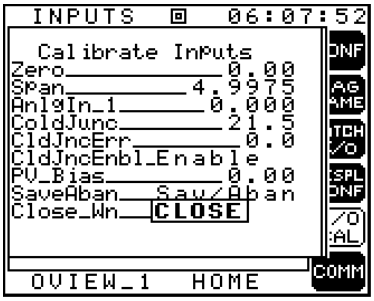


Figure 4–21.
Calibrate Inputs Display

The Calibrate window contains the following parameters:

- **Zero** - This parameter sets the calibration for the low end of the input range. Note that this value is stored as a whole number without decimal precision.
- **Span** - This parameter sets the calibration for the high end of the input range.

Note: *Zero and Span parameters in the Calibrate window are NOT the same as the* **Lin_Span** *and* **Lin_Zero** *parameters in the* **Configur** *window. Zero sets the calibration for the low end of the input range. Span sets the calibration for the high end of the input range*

- **AnlgIn##** - Displays the actual input value of the selected input.
- **ColdJunc** - The cold junction temperature in °C. This parameter always reads in °C even if the thermocouple is set up to read in Fahrenheit. It measures the temperature at the connector where the thermocouple wires and connector pins make contact. This junction then is compensated for in the temperature calculation.
- **CldJncErr** - The Cold Junction Error parameter in °C. This is added to the ColdJunc temperature in order to compensate for error in the cold junction sensor. This parameter is adjusted (plus or minus) until the ColdJunc temperature reading is equal to the reading given by an external temperature measuring device that is attached to the appropriate input connector.
- **CldJncEnbl** - Used to enable or disable the Cold Junction function. This parameter is active only when a thermocouple is the selected input type. When it is set to Enable, the temperature reading from the thermocouple (ProcVr0X) is compensated by the cold junction temperature. When it is set to Disable the ProcVr0X is not compensated by the cold junction temperature. The Disable mode is used to check the accuracy of linearization tables.

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- **PV_Bias** - Sets the process variable bias. This value biases the entire input range. If a bias value of 1.0 is entered, the process variable is increased by 1.0.
- **Save/Aban** - Allows saving or abandoning the calibration parameter values. This allows a user to change the calibration and observe the result without permanently changing the parameters. Newly entered values that are not saved will be lost when the unit is powered down.

Selecting **CLOSE** will close the window and return you to the Input configuration window shown in Fig. 4–18.

- **InptLowLim** - This parameter defaults to the lower limit of the input type selected. For thermocouples and RTDs this is the full usable range of the sensor. Changing this parameter limits the low (zero) value that can be entered as a setpoint. This parameter is used by the PID control algorithm together with the **InptHiLim** parameter to establish the range of the input to be controlled.
- **InptHiLim** - This parameter defaults to the higher limit of the input type selected. For thermocouples and RTDs this is the full usable range of the sensor. Changing this parameter limits the high (span) value that can be entered as a setpoint. This parameter is used by the PID control algorithm together with the **InptLowLim** parameter to establish the range of the input to be controlled.
- **EngUnits** - When an RTD or thermocouple is selected under the **InptType** field, this parameter allows a selection between °F and °C. If a linear input type has been selected this will always show Linear and cannot be changed.
- **DecPoint** - Displays the number of positions to the right of the decimal point. When a linear range is selected (i.e. 0-10, 0-5, 0-20, 4-20) the decimal point defaults to 2, and can be changed under the **Configur** window. When a thermocouple or RTD range is selected, the decimal point normally defaults to 1 (except for thermocouples B, G, and D; these default to 0). The decimal position can NOT be changed for RTDs or T/Cs.
- **Mnemonic** - Displays either 'F' or 'C' for all thermocouples and RTDs depending on the status of the **EngUnits** field. If a linear input type is selected, the three character user-configured mnemonic is displayed.

Once all the Analog Input parameters have been selected press the HOME key to return to the main **I/O CAL** display. The next step is to configure the physical outputs as described next.

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Physical Outputs Configuration

The next step in the configuration process is to define the Analog and Digital Outputs required for the process. This is accomplished by selecting the **AnalogOuts** parameter from the **I/O-Calb** display shown in Fig. 4–22. Selecting the AnalogOuts parameter will bring up a display as shown in Fig. 4–23. The system will display the currently active parameters and characteristics for the analog output you selected. Modify analog output parameters and characteristics as follows:

Figure 4–22. (L)
I/O Calibrate Display

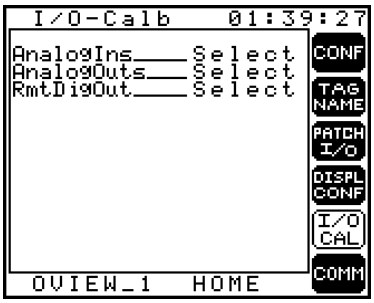
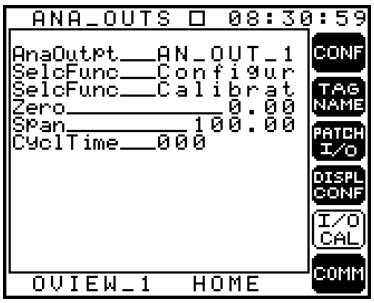


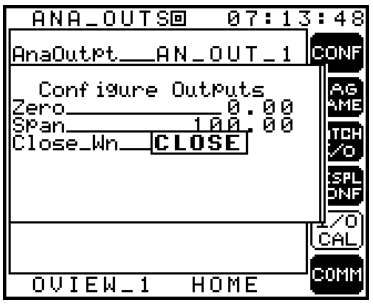
Figure 4–23. (R)
Analog Outputs Display



- **AnaOupt** – Selects which analog output to configure. The number is dependent on the model purchased.

- **SelcFunc_Configur** – Selects the analog output configuration function. This function opens a window as shown in Fig. 4–24 to allow setting the output zero and span values. Each 0-5V or 0-20 mA analog output configuration defaults to:

Figure 4–24.
Configure Analog Outputs



Zero = 0.00
Span = 100.00

For 4-20 mA output the configuration defaults to:

Zero =-25.00
Span = 100.00

Note: Slopes CAN be negative (inverted) by configuring the output as shown:

Zero =100.00
Span =0.00

An output of 0.00 gives 20mA out
An output of 100.00 gives 4mA out

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To calculate zero and span values for a 4-20mA output:

Span = Upper Limit of Range of variable that is patched to the output

$$\text{Zero} = \text{LowLim} - \frac{\text{Range}}{4}$$

Where: LowLim = Low Limit for the variable patched to the output.

Range = The absolute value of the difference between the High Limit and Low Limit [ABS (Hi–Lo)].

Example 1:

Retransmit Analog Input to Analog Output

Input Range is 0°–1000° F

$$\text{Span} = 1000$$

$$\text{Zero} = 0 - \frac{1000}{4}$$

$$= -250$$

Example 2:

Retransmit Setpoint for a Loop to an Analog Output
Setpoint Range is
–80° C to 500° C.

$$\text{Span} = 500$$

$$\text{Zero} = -80 - \frac{580}{4}$$

$$= -225$$

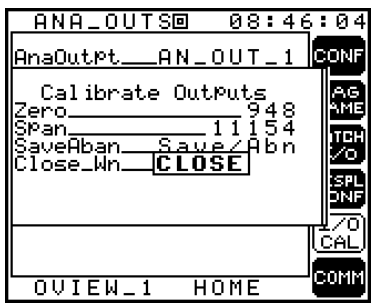


Figure 4–25.
Calibrate Analog Outputs

- **SelcFunc_Calibrat** – Opens a window to allow setting the zero and span calibration points (see Fig. 4–25). These points are different from the zero and span in the **Configur** window. The calibration zero and span values calibrate the output to provide the correct voltage or current out. To calibrate, connect a volt meter to the appropriate terminals and adjust the span and zero values. When complete, save your calibration settings by selecting **Save**. If you wish to revert to the original settings select **Abandon**. Select **CLOSE** to close the window and return to the main analog outputs screen.

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- **Zero** – Displays the zero value setup in the configuration window.
- **Span** – Displays the span value setup in the configuration window.
- **CyclTime** – Selects the cycle time in seconds. If the cycle time is set to 0 this output will function as an analog proportional output. If the cycle time is set to any value greater than 0, this output will function as a time proportioning output. See Section 2, *Hardware Installation and Field Wiring*, for information on setting jumpers for time proportioning relay drive.

Once you have completed setting up the Analog outputs, press the **HOME** key and return to the main **I/O-CAL** display.

CAUTION!

The input types and retransmit configuration should be set up BEFORE the output configuration span and zero are set to match the input high and low limits. The decimal position of the analog outputs does not change until the Retransmit parameter is set under the CONF_LOP screen and the parameter to be retransmitted is set under the CONF_OUT screen.

The next step in Output Configuration is to configure any Digital Outputs that may exist in the system. This is accomplished by selecting the **DigitlOut** parameter from the I/O - Calb display. Once selected the display shown in Fig. 4–26 is displayed.

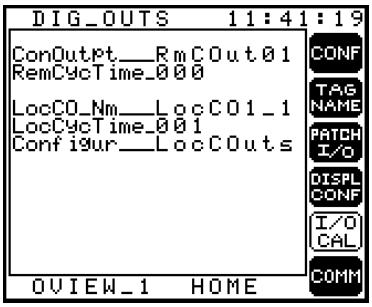


Figure 4–26.
DIG_OUTS Display

The user may select which specific remote contact output to configure from the **ConOutpt** line. The number of contact outputs available is dependent upon your configuration. Once the output number has been selected, the time proportioned cycle time (**RemCycTime**) may be set. Setting the time to a zero value will disable time proportioning and enable On/Off control.

- **LocCo_Nm** – Selects which local contact output to configure. (Available on 8725 models with two or three analog cards.)
- **LocCycTime** – Sets time proportioning cycle for the selected output. A cycle time of 0 will disable time proportioning and enable on/off control.
- **Configur** – Opens a window to set the zero and span for the selected local contact output. This is used to stage two outputs.

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Operation

This section describes how to operate and view the performance of the control loops that are configured into your Dimension. It is assumed that you have completed the configuration process described in the previous sections and have made the physical input/output wiring connections as described in Section 2, *Hardware Installation and Field Wiring*.



Note: *You should now access the* ***Operation*** *display area of your Dimension. Verify that the top icon along the right side of the display is the unit icon. If the top icon is* ***CONF*** *you are in the* ***Configuration*** *area. Press the* ***OVIEW_1*** *macro key to switch to the operation display area. Refer to* Section 3, *Graphic Operator Interface, for Dimension display conventions.*

The first step in the operation of the control loop is to access the **LOOP** display icon level. At this icon level you may move right or left using the diamond key to access a specific loop display for each control loop in the system. The default loop status screen shown in Fig. 4–27 will display and the following parameters will be available:

Figure 4–27.
LOOP_ _ _1 Display



- **ProcVr##** - This parameter displays the actual process variable (PV) of the selected control loop. This value is calculated and may not be accessed by the operator. This is the value of the parameter you selected as the PVSource when configuring the loop.
- **SetPnt##** - This parameter displays the desired value for the process variable (SP). This is the value at which you want your process to control. This value may be set by the Operator, from a Real-time Programmer or from a Remote source. By default it is set by the operator and may be altered from this display.
- **Dev_##** - This parameter displays the *deviation from setpoint* for the selected control loop. It is the difference between the actual PV and the desired SP. (PV - SP = Dev). This is a calculated value and may not be accessed by the operator.
- **LpMode##** - This parameter displays the current Loop Mode of the loop. It will be *Manual* mode by default and may be altered by the operator between *Auto* (closed loop) and *Manual* (open loop).
- **RevOut_#** - This parameter displays the current Reverse Output (heating) value for the control loop. This is an operator entered value if the loop mode is *Manual*, or a calculated value if the loop mode is *Auto*.

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- `DirOut_#` - This parameter displays the current Direct Output (cooling) value for the control loop. This is an operator entered value if the loop mode is *Manual*, or a calculated value if the loop mode is *Auto*.
- `Gain_##` - This parameter is the currently active Gain value. This parameter may be entered/altered by the operator and is used in the control output calculation when the loop mode is Automatic. See *"PID Loop Tuning"* on page 4-31.
- `Reset_##` - This parameter is the currently active Reset value. This parameter may be entered/altered by the operator and is used in the control output calculation when the loop mode is Automatic. See *"PID Loop Tuning"* on page 4-31.
- `Rate_##` - This parameter is the currently active Rate value. This parameter may be entered/altered by the operator and is used in the control output calculation when the loop mode is Automatic. See *"PID Loop Tuning"* on page 4-31.

Note: *The above values for Gain, Reset and Rate will switch automatically based upon the configured* ***PID Type****. For example, if dual PID is selected,* ***group 1*** *values will be displayed/altered if the control output is* ***reverse, group 2*** *values will be displayed/altered if the control output is* ***direct****.*

- `SptSrc##` - This parameter is the currently selected **setpoint source** for the control loop. This parameter may be altered to select either **Operator, Programmer,** or **Remote** as the setpoint (SP) source. The actual source for programmer or remote is set during the configuration process when the `RemSpsrc` is defined.
- `SetUp` - This parameter will open a window that contains the following parameters, as shown in Fig. 4–28:

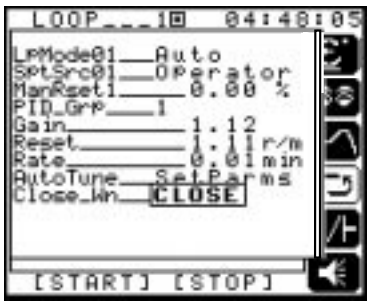


Figure 4–28.
Loop Setup Display

- `LpMode##` - This parameter displays the current Loop Mode of the loop. It will be *Manual* mode by default and may be altered by the operator between *Auto* (closed loop) and *Manual* (open loop).
- `SptSrc##` - This parameter is the currently selected **setpoint source** for the control loop. This parameter may be altered to selected either **Operator, Programmer** or **Remote** as the setpoint (SP) source. The actual source for programmer or remote is set during the configuration process when the `RemSpsrc` is defined.
- `ManRset#` - This parameter allows the entry of a Manual Reset or bias value that will add or subtract to the control loop output value.

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- **PID_Grp** - This parameter allows the selection of the PID group that is currently being displayed in the Gain, Reset and Rate parameters below it. Refer to page 4-14 for a detailed description of how PID groups are used.
- **Gain** - This is the current GAIN value for the selected PID group. This value may be altered from this display. See Section 4 *"PID Loop Tuning"* on page 4-31.
- **Reset** - This is the current RESET value for the selected PID group. This value may be altered from this display. See Section 4 *"PID Loop Tuning"* on page 4-31.
- **Rate** - This is the current RATE value for the selected PID group. This value may be altered from this display. See Section 4 *"PID Loop Tuning"* on page 4-31.
- **AutoTune** - When selected, opens a window that allows access to the Autotune function. Refer to Appendix E, *Examples*, page E-16 for a description of the Autotune function and this window.
- **Close_Wn** - Select this parameter to close this window and return to the main loop display.

PID Loop Tuning

The Dimension uses PID control. PID is an acronym meaning proportional, integral, and derivative. The calculations provided by the three functions are mathematically summed together to provide an output signal to control your process.

Before tuning your process, keep the following points in mind:

- The GAIN parameter adjusts the *proportional* PID term. Increasing the GAIN value will increase the output response to the process deviation.
- The RESET parameter adjusts the *integral* PID term. Increasing the RESET value will increase the output response to the process deviation.
- The RATE parameter adjusts the *derivative* PID term. Increasing the RATE parameter will increase the output response to a process variable change.
- Setting the GAIN, RESET, or RATE values to 0 will disable the proportional, integral, or derivative functions respectively.
- The derivative function is usually not used in applications where there is an immediate response to the process variable from the control output signal. The derivative function by nature will cause the output signal to appear unstable, as it responds to the changing process variable signal. Input filtering (**FilterVal** set greater than 0) is always required when using derivative. Using derivative may not be desirable in a application where the output controls a mechanical valve.

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- The Dimension uses the difference (input span) between the input high limit (**InptHiLim**) and input low limit (**InptLowLim**) for the PID calculations. If setpoint limiting is desired, change the input high and low limit values before starting your loop tuning.

  Should you have tuned your loop already, and are required to change the input high or low limit values, change your PID parameters as follows:

  $$\frac{\text{New input high limit} - \text{New input low limit}}{\text{Old input high limit} - \text{Old input low limit}} \times \text{Old PID values} = \text{New PID values}$$

- Be sure the control action (**Cntl_Act**) is set properly:
  Set to **Reverse** if an increasing process variable should decrease the output (heating). Set to **Direct** if an increasing process variable should increase the output (cooling). Set to **Bimodal** if there will be 2 physical outputs for both reverse and direct control actions.
- When the PID type (**PID_Type**) is set to **Single**, only PID group 1 is used. If PID type is set to **Dual**, PID group 1 is used for reverse control action and PID group 2 is used for direct control action.
- We do not advise to perform loop tuning while a real-time programmer is changing the setpoint. If the process is not controlling to a steady state condition, controlling to a changing setpoint will likely not occur.

Tuning the Loop

Proportional Adjustments (GAIN):

Gain $\left(\text{Gain} = \frac{1}{\text{PB}}\right)$ adjusts the proportional control action by modifying the control loop's output in response to the amount of deviation from the setpoint. A low gain value changes the output gradually over a wide deviation band. A high gain value changes the output rapidly over a narrower deviation band. Gain is the inverse of proportional band, so control action with a low gain setting is like control action with a large proportional band.

When loop tuning from scratch, adjust the gain value first (reset and rate values to 0). Increase the gain until a small amount of oscillation of the process variable occurs. Lower the gain until the oscillation stops. Note that the oscillation may occur at a level lower than the setpoint (heating application).

Typical gain settings are from 15 - 60 in a temperature control application. Typical gain settings are 0.3 - 1.5 in applications such as pressure or mass flow control.

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Integral Adjustments (RESET):

Reset adjusts the integral action by integrating the output in a positive or negative direction based on deviation. For example, in a heating application the output is increased over time if the temperature is low and the output is decreased over time if the temperature is high. The output is not changed if there is no deviation. In most control applications, proportional control alone cannot achieve zero deviation. For example, in a typical heating application, the process temperature stabilizes below the setpoint at a deviation value where the control loop provides just enough heat output to balance the heat losses from the process. This is called proportional droop. Reset action is used to eliminate this offset between the process variable and the setpoint.

Reset values are expressed in terms of repeats per minute. One repeat per minute is a measurement of integration speed of 100 percent output over 1 minute of time, *when the deviation is at maximum* (input high limit - input low limit). A higher value repeats per minute, the faster the output will integrate.

After the gain has been adjusted, adjust the reset. Increase the reset to eliminate the proportional droop achieving 0 deviation. Make small setpoint changes watching the response of the process. A small overshoot may be normal as long as oscillation of the process variable does not occur. Too small of reset value will cause the process to have a sluggish response. Too high of reset value will cause the process variable to oscillate.

Typical reset settings are from 3 - 10 in a temperature control application. Typical reset settings are 5 - 15 in applications such as pressure or mass flow control.

Derivative Adjustments (RATE):

Rate adjusts the derivative action by changing the output in a positive or negative direction based on process variable change. Derivative opposes change of the process variable even if the process variable is under or over setpoint. For example, in a heating application the output is increased if the temperature is falling and the output is decreased if the temperature is rising. The output is not changed if the temperature is steady. Derivative action is used primarily in control applications where the process changes very slowly (where there are large time lags in response to changes in the controller output). Also a small amount of derivative may be used to eliminate overshooting of the process variable while still maintaining a good response time to setpoint changes.

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Rate values are expressed in terms of minutes of duration. A rate of 1 describes a future process variable value in one minutes time based on the current process variable change. The future process variable value is used with proportional action to offset the output based on where the process variable will be one minute from now. The higher rate value, the higher the output will be offset.

After the reset has been adjusted, adjust the rate. Increase the rate to eliminate process overshooting. Make small setpoint changes watching the response of the process. Too high of rate value will cause the process variable to oscillate.

Typical rate settings are from .5 - 5 in a temperature control application.

Fine Tuning the Process

Here are some hints for fine tuning your process:

- Small adjustments may be made to any one parameter at a time giving enough time to allow for the process to stabilize after the change.
- Keep in mind the effect of the PID parameter values. For example, doubling the response of proportional action is done by doubling the gain from 1 to 2 or doubling the gain from 100 to 200.
- Watch the output percent simultaneously with watching the process variable. Observe the nominal output values required to maintain various process variable values (this may be done in manual mode also). The reset value may be adjusted higher or lower so the output percent is close to where it should be when the corresponding process variable is achieved.

An approximate gain value for temperature control loops may be determined by this formula:

GAIN = .02 * ((output at temperature 1 - output at temperature 2)/((temperature 1 - temperature 2)/(Input high limit - Input low limit)))

Startup and Checkout

Once the loop configuration process has been completed, the next step is to verify the basic loop operation. This is accomplished by validating the following functions for each loop:

1. Process Variable reads correctly
2. Control Output(s) operate correctly (Manual Mode)
3. Operator Setpoint, Automatic mode response

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Note: *This section assumes the you have completed the configuration steps described in previous sections of this manual and that you have made your physical input/output wiring connections as described in Section 2, Hardware Installation and Field Wiring. If you have not completed these steps please do so before continuing!*

The first step in the checkout of the control loop is to access the Loop displays on the operator interface. The Loop displays are found at the Loop Icon on the operation side of the Dimension.

Note: *Refer to the Dimension display conventions in Section 3, Graphic Operator Interface for instructions on accessing the loop icon displays.*

1. Process Variable verification

From the **Loop_1** display (see Fig. 4–29), examine the first item, **ProcVr01**. This is the process parameter that the Dimension is being set up to control or monitor, such as temperature, humidity or pressure. The display shown in Fig. 4–29 has a connected thermocouple that is currently reading 107.3 degrees F. At this point you should verify that this parameter is reading as reasonable a value as can be expected based on the conditions of the process you are connecting to. If an unreasonable value is displayed, refer to *"Troubleshooting Process Control and Monitor Loops"* on page 4-43 for trouble-shooting steps that will help determine the cause of the problem. If the value is reasonable, go to step 2.



Figure 4–29.
LOOP_ _ _1 Display

2. Control Output Verification

From the loop display shown in Fig. 4–29, set the **LpMode** parameter to **Manual**. Next, based upon your **Control Action** selection, access the following parameters and verify the operation as described:

- **RevOut_#** - If **Bimodal** or **Reverse** action are selected, enter an output percent value and verify the process response. For example, if the reverse output is set to control an electric heater, as you increase the output percent the temperature should increase as monitored by the Process Variable parameter. If you set the output percent back to 0.0%, the process should stop increasing. If the expected result of the output is not observed, refer to *"Troubleshooting Process Control and Monitor Loops"* on page 4-43.
- **DirOut_#** - If **Bimodal** or **Direct** action are selected, enter an output percent value and verify the process response. For example, if the direct output is set to control a cooling water valve, as you increase the output

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percent the temperature should **decrease** as monitored by the Process Variable parameter. If you set the output percent back to 0.0% the process should stop decreasing. If the expected result of the output is not observed, refer to *"Troubleshooting Process Control and Monitor Loops"* on page 4-43.

3. Operator Setpoint, Automatic Mode response

Verify Operator setpoint and closed loop control response, as follows:

- Select the `LpMode` parameter and set it to `Automatic` mode.
- Set the `SptSrc` parameter to `Operator`.
- Set the `Gain` value to 1.00, `Reset` and `Rate` to values 0.00.

Next select an SP (setpoint) value for the control loop above, below and equal to the PV (process variable). Refer to the Table 4–3 and verify the proper control output response.

Table 4–3. Control Output Responses

Deviation value (PV - SP)	Control Action Reverse Only	Control Action Direct Only	Control Action Bimodal
PV > SP (pos value)	Reverse Output % = NO	Direct Output % = YES	Direct Output % = YES
PV < SP (neg value)	Reverse Output % = YES	Direct Output % = NO	Reverse Output % = YES
PV = SP	Reverse Output % = NO	Direct Output % = NO	Direct Output % = NO Reverse Output % = NO

Control Loop Extended Configuration

The extended configuration for the control loop provides access to advanced loop-related configuration functions. These functions should be altered only after you have configured and verified the operation of the Basic setup.

The **Extended** configuration is accessed by selecting `Extended` at the `Conf_Lvl` parameter as shown in Fig. 4–30.

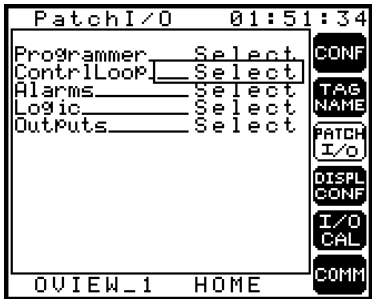
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Figure 4–30.
Unit Operation Display



After selecting **Extended**, select **ConFigur** to switch to the configuration side of the Dimension. Next access the **Patch I/O** icon and select the **ContrlLoop** parameter as shown in Fig. 4–31. 

Figure 4–31.
Patch I/O Display



Once **ContrlLoop** has been selected, the screen shown in Fig. 4–32 displays and the extended configuration process may be started. The following items may be set up during extended configuration:

Figure 4–32.
CONF_LOP Extended Configuration Display



- **Tune** – Provides set up of the Autotune parameters.
- **Auto/Man** – Allows the selection of an alternate source to control the switching of the control loop Auto/Manual mode.
- **M_OutSrc** – Allows the selection of an alternate source for the control loop manual output. This is normally sourced from the Operator.
- **OSnsrOut**– Allows the setting of a default control output value that is set whenever the control loop's process variable is detected as Open.
- **Retransmit** - Allows selection of a loop-related variable to be retransmitted to an output.

The first item that is added when Extended configuration is selected is **Tune**. This parameter allows the setup of parameters required for the Autotune function of the Dimension. See Appendix E *"Setting Up Autotune"* on page E-16 , for a detailed description of the autotune function. When selected, the window shown in Fig. 4–33 displays. This window provides access to the following parameters:

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Figure 4–33.
Tune Configuration



- **Reverse/Direct** – This parameter is used to select which type of control action is to be tuned. Choices are Reverse or Direct.
- **RespTime** – Sets the estimated response time of the process when a change in the control output occurs. Set in Minutes.
- **Bump** – Sets the amount the output will be "bumped" or changed during the tune process.
- **PIDGrp** - Sets which PID group the calculated parameters will be saved to, if accepted, after the tune process.
- **Fast/Medium/Slow** - Sets the type of response desired from the autotune process. Choices are **Fast**, **Medium**, or **Slow**.

Select **End** to close the **Tune** window and return to the extended **Conf_Loop** display.

The next extended parameter is the Loop Auto/Manual mode control parameter. This may be modified to allow a condition other than operator to switch the loop mode from Auto to Manual. Select the **Auto/Man** parameter shown in Fig. 4–34 to open the window shown in Fig. 4–35.

Figure 4–34.
CONF_LOP Extended Configuration Display



The following choices are available for switching the control loop auto/manual mode:

- **OperAM_#** – Allows the Operator to change the mode. The # indicates which Operator Auto/Manual parameter will be selected. Each control loop in the unit has its own OperAm parameter. Multiple loops could be set up to change modes based upon a single OperAM selection.
- **OR/NOR_set0#** – Allows selection of a logic "OR" or "NOR" set to control the mode. Refer to Section 7 for details on logic functions.
- **AND/NAND_set0#** – Allows selection of a logic "AND" or "NAND" set to control the mode. Refer to Section 7 for details on logic functions.
- **RemCI_##** – Allows selection of a Remote Contact input to control the loop mode. This input would come from a connected 8781 Remote Digital I/O card.
- **LocCI#_#** – Allows selection of a Local Contact input to control the loop mode (model 8725 with two or three analog cards only).

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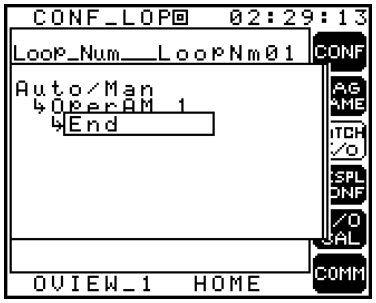


Figure 4–35.
Auto/Manual Source Configuration

When the desired selection has been made, select **End** to close the window and complete the configuration step.

The next parameter available in the extended configuration process is the selection of a Manual Output source. This allows the selection of a source other than the Operator to provide the control output value when the control loop is in manual mode.

This is done by selecting the **M_OutSrc** parameter shown in Fig. 4–36. Once selected, the window shown in Fig. 4–37 displays. See Appendix E *"Example 1: Thermocouple/Pyrometer Switchover"* on page E-2, for an example using this function.



Figure 4–36.
CONF_LOP Extended Configuration Display

The following choices for Manual Output Source are available:

- **Operator** – This selects the Operator as the source for the Manual Output value. This is the default and most common selection.
- **Remote** – This selects a Remote source for the manual output value. When selected, an addition configuration parameter will be made available to allow the selection of the remote source. Choices for the remote source are as follows:
  - **AnlgIn#** – To select an analog input to provide the manual value. This may be used to bring in a value from another controller or instrument. This selection also allows the entry of a digital filter value for the selected analog input.
  - **OutputL#** – Allows the selection of another control loop's output value to be the manual output source. When this is selected, the cascade parameters will need to be set. The following choices are available:

    Program X – selects which programmer the profile will come from.

    CaseParm – Allows the user to enter the value for Ratio, Blend, and Scale.

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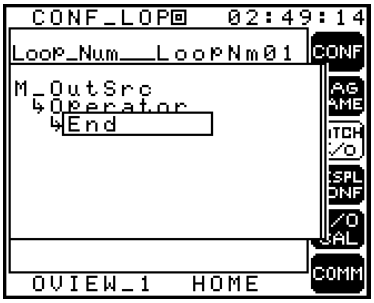


Figure 4–37. Manual Output Source Display

Select **End** to complete the configuration of the Manual Output source and return to the main extended configuration display.

The next parameter that can be selected is the **OSnsrOut** as shown in Fig. 4–38. This parameter allows the setting of a default control loop manual output percent value that will be set whenever the loop's process variable (PV) is detected to be Open (open sensor). This parameter will affect only control loops that have thermocouples as their input type. When selected, the window shown in Fig. 4–39 displays.

When the **DefltVal** parameter is selected, you will be prompted for the desired output percent value (the default is 0%). This value should be **negative** for a **reverse** output and **positive** for a **direct** output. When the value has been entered, select **CLOSE** followed by **End** to complete the setup process and return to the extended configuration display.

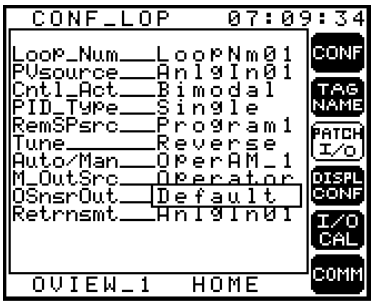


Figure 4–38. (L) CONF_LOP Extended Display

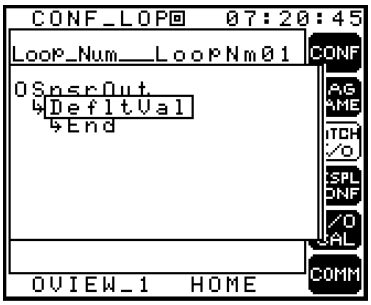


Figure 4–39. (R) Open Sensor Output Display

The last configurable extended parameter allows the selection of a parameter that may be patched to a physical analog output. This allows the selected loop parameters to be retransmitted to an external device such as a chart recorder or another Dimension Industrial Process Manager. This parameter may be set by selecting the **Retrnsmt** parameter as shown in Fig. 4–40.

When selected, a window will open and allow selection of the desired retransmit parameter. This window is shown in Fig. 4–41.

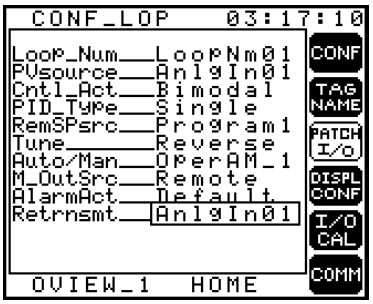


Figure 4–40. (L) CONF_LOP Extended Configuration Display

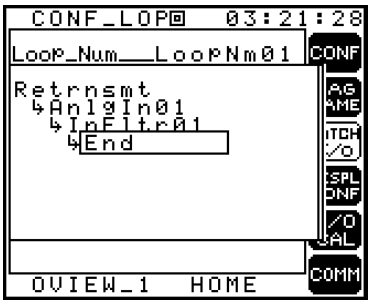


Figure 4–41. (R) Retransmit Configuration

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This window allows the selection of one of the following parameters:

- **AnlgIn##** - The process variable will come from the selected analog input #.

Note: Whenever an Analog Input # is selected for a PV Source type, you may also set a filter value, **InFltr##**, *for the selected analog input. The filter value is the time constant in seconds of a low pass filter. As the time increases the amount of filtering increases. Typical settings range from 1 to 5 but may range from 0 to 100. The default value is 1.*

- **AnaIn#_#** - The process variable will come from the analog input # and # specified. If this input detects an Open Sensor, the controller will automatically switch to the second analog input #. (Thermocouple switchover).

Note: Whenever an AnaIn#_# is selected for a PV Source type you may also set a filter value, **DigFiltr#**, *for both analog input numbers. The filter value is the time constant in seconds of a low pass filter. As the time increases the amount of filtering increases. Typical settings range from 1 to 5 but may range from 0 to 100. The default value is 1.*

- **Calc___#** - (# = 1 through 4) The process variable will be calculated using the following equation:

$$PV = \frac{(Anlgin\#\# \times Mltpler1) + (Anlgin\#\# \times Mltpler2) + (Anlgin\#\# \times Mltpler3) + (Anlgin\#\# \times Mltpler4)}{Scale}$$

Where:

AnlgIn## is analog input 1 thru 4 for **Calc1**, **Calc2**, or is input 5 thru 8 for **Calc3**, **Calc4**

Mltpler# is a user defined/entered constant that may be used to weight an input

Scale is a user defined/entered constant that may be used to adjust or scale the result

An example of this input type would be to average inputs 1, 2, and 4 into a single PV value. To do this, set **Mltpler1**, **2**, and **4** to a 1; **Mltpler3** to 0 (this will disable input 3) and **Scale** to 3.

The choices under the Calc selection are as follows:

- **DigFiltr** - Set a filter value for the 4 analog inputs in the equation.
- **Equation** - Select this to set the multiplier values for the Calc equation.
- **RH#** - The process variable will be the result of a Wet Bulb/Dry Bulb relative humidity calculation based on a psychometric table. When this selection is made you will be prompted for several selections to make:
- **SetPntL#** – To select a loop setpoint as the retransmit variable.
- **Lp#_Prof** – To select a loop's Real-time Programmer's profile variable to be retransmitted.

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When the selection has been made, select **End** to complete the retransmit configuration process and close the window. This completes the Extended configuration process. The next step is to complete the Physical Output assignments and Analog Input or Output setup that may be required by the extended choices that were made. Refer to previous topics in this section for details on how to do this.

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Troubleshooting Process Control and Monitor Loops

Symptom	Action
Process Variable Unreasonable.	Verify that the correct PV Source is selected. Refer to *"Configuration"* on page 4-7. If a thermocouple is selected for an input type, verify that Cold-Junction is ENABLED. Refer to *"Analog Input Setup"* on page 4-21. Verify that PV Bias is set to zero. Refer to *"Analog Input Setup"* on page 4-21. Check input calibration. Refer to *"Analog Input Setup"* on page 4-21. Verify that input type is configured and the ranges are set correctly. Refer to *"Configuration"* on page 4-7, and *"Analog Input Setup"* on page 4-21. Verify that the input is wired properly. See Section 2 *"Analog and Digital I/O Field Wiring Procedure"* on page 2-21. Verify that the input sensor functions properly using a Volt/Ohm/Milliamp meter. Simulate an input to the Dimension using a voltage or current source.
An Operator setpoint cannot be entered.	Verify that the Setpoint source is set to Operator. Refer to *"Operation"* on page 4-29. Verify that the Input High or Low Limit is not being exceeded. Refer to *"Analog Input Setup"* on page 4-21.
Programmer/Remote setpoint is not being accepted.	If using cascade control, verify that the Ratio, Blend, and Scaled settings are set properly. Refer to *"Configuration"* on page 4-7. Verify that the Setpoint source is set to Programmer or Remote and not to Operator. Refer to *"Operation"* on page 4-29. Verify that the proper Remote setpoint source is assigned to the loop. Refer to *"Configuration"* on page 4-7. Verify that the selected programmer is active and has a valid profile (setpoint) value. Refer to Section 5, *Real-Time Programmer.*

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Symptom	Action
Not able to set a Manual Output percent value.	Verify that the loop is in manual mode. Refer to *"Operation"* on page 4-29. Verify that the LoopOFFX(X = loop number) does not have an active alarm or parameter that is true in manual mode. Refer to *"Configuration"* on page 4-7. Verify that the Manual Output source is set to Operator. Refer to *"Control Loop Extended Configuration"* on page 4-36.
Analog output percent has no effect on physical output.	Verify that the control output is patched to the proper physical (hardware) output. Verify output patching as described in *"Physical Outputs Patching"* on page 4-18. Verify that the physical device has a matching input to the Dimension output. See Section 2 *"Analog Output Wiring"* on page 2-17 (Fig. 2–10). Verify that a thermocouple input is not reading Opensensor. Verify that Loop OFFX(X = loop number) does not have an active alarm or parameter that is true in manual mode. Refer to *"Configuration"* on page 4-7. Check that output is wired properly. See Section 2 *"Analog and Digital I/O Field Wiring Procedure"* on page 2-21 , and See Section 2 *"Digital I/O Expansion Cards"* on page 2-45 . Verify the output type selected on the analog board using jumpers. See Section 2 *"Analog and Digital I/O Field Wiring Procedure"* on page 2-21. Verify that the Time Proportioned cycle time is not set. Refer to *"Physical Outputs Configuration"* on page 4-26. Verify that the External I/O card (8781) is powered up before or at the same time as the Dimension.

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Symptom	Action
Dimension will not communicate with 8781 I/O card.	Verify that the connection to the I/O card is on the first Analog Output card. Verify that the External I/O card (8781) is powered up before or at the same time as the Dimension. Verify wiring between Dimension and the 8781 card. See Section 2 *"Connector – Digital I/O (Expansion Bus Communications)"* on page 2-19 . Verify the address switch settings of the 8781 card. The first 8781 must be address 2. See Section 2 *"Selecting the Digital I/O Address"* on page 2-44 .
The alarm icon is flashing but no alarm is present.	Any unused analog inputs should be shorted. The unused input (+) and (–) terminals should be connected. See Section 2 *"Analog and Digital I/O Field Wiring Procedure"* on page 2-21.
Reading from the Memory card causes configuration problems.	Verify that the same firmware version is installed in the unit being loaded as was used to write the Memory card.
The process variable overshoots or undershoots when approaching the setpoint.	The PID parameters (Gain, Reset, Rate) may need to be changed. Refer to *"Operation"* on page 4-29.
Changing PID values has no response on the output percent.	Verify that the PID Type is set properly. Refer to *"Configuration"* on page 4-7.

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Table 4–4. Input Types/Ranges

Standard Sensor Inputs	**Celsius** Min	Max	**Fahrenheit** Min	Max
J thermocouple	-22	760	-7	1400
K thermocouple	-20	1372	-5	2500
T thermocouple	-232	400	-380	750
N thermocouple	-23	1300	-11	2370
C thermocouple - W5$Re/W26%Re (Hoskins)	-18	2319	0	4200
R thermocouple	-20	1768	-5	3200
S thermocouple	-20	1768	-4	3200
B thermocouple	47	182-	117	330
Platinel II thermocouple	-28	1450	-19	2640
RTD/PT 100 DIN 43760 European (.00385) or American (.00392)	-200	630	-345	1130
E thermocouple	-270	1000	-450	1830
Ni/Ni 18% Mo thermocouple	0	1350	32	2460
D thermocouple - W3%Re/W25%Re	23	2300	-9	4200
G thermocouple - W/W26%Re	-20	2315	0	4200
Linear Inputs	-999	9999		
Linear Range Millivolt Voltage Current	0mV to + 100mV 0V to + 10V 0mA to + 20 mA			

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Section 5

Real-Time Programmer

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Real-Time Programmer

Section Objectives

Section 5 provides the following information:

- A description of Real-Time Programmer functions and capabilities
- Definition of Programmer Terminology
- How to configure the Programmer
- Operation of the Programmer – How To Enter a Recipe, Start, Run and Hold.
- How to graphically display the recipe
- Troubleshooting the Programmer operation

Description

A Real-Time Programmer is a sequence of steps (Segments) that can be programmed to control a setpoint(s) and/or event(s) over a period of time. This allows the setpoint to be adjusted or event to be turned on or off without the need for operator intervention. The generated setpoint may be used as the control loop setpoint or retransmitted as an analog output, for example, to a chart recorder. Events that can turn on digital outputs may be programmed into each segment. These outputs may be used to turn on an external device such as a circulating fan. Each segment may select one of five different alarm groups to allow the use of different alarm limits at various times in the profile. One of five different PID groups may also be used on a per segment basis to achieve better control of the process as it runs through its cycle. The Hi and Lo deviation alarms may be used to "Hold" or "Soak" the programmer and allow the process to "catch-up" with the programmed setpoint.

Terminology

- **Abort** - A function that when enabled will cause the programmer to suspend execution of the currently active program and begin executing a separate routine beginning at segment 0. When the abort is disabled, the program will resume executing the current program it stopped.
- **Alarm Group** - Select 1 of 5 different sets of alarm limits that will be active during the current segment. The alarm limits may be set on the ALM_SET screen.
- **Current Segment** - Displays the current segment being executed by the active recipe.

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- **Cycle Count** - Displays the number of recycles remaining.
- **Events (Evnts)** - Up to 12 events (1-9, a-c) may be turned on during the current segment. Typically, events are patched to digital outputs and are used to control on/off functions.
- **Fast Forward** - The ability to run a programmer at an accelerated rate. The rate is determined by the Warp Factor setting.
- **Guaranteed Soak** - The condition where Hi and Lo Deviation alarms will put the programmer into "Hold," allowing the process to "catch-up" with a change in the setpoint. The use of Guaranteed Soak will speed-up the test cycle and still maintain correct times for the soak period. The limits are entered on the `ALM_SET` screen. See Section 6, *Process Alarms*, for information on alarm configuration.
- **Next Segment** - The next segment for the programmer to execute after completing the current segment. In a program recipe setting, the next segment parameter equal to the current segment will cause the recipe to end after the segment completes.
- **PID_Group** - Select 1 of 5 sets of PID parameters (Gain, Reset, Rate) that will be active during the current segment. The PID parameters are set up on the CONF_LOP display. Programmed PID groups must be selected for PID_Type to enable this function. See Section 4, *Process Control and Monitor Loops*.
- **Program Mode** - Displays the current status of the programmer, `Run`, `Hold`, `Start`, `PG_END`. The selected status may also be entered to change the state of the programmer. The mode will be one of the following values:

  `Run` - The state of the programmer when it is currently executing its sequence of segments.

  `Hold` - The state of the programmer when its execution has been stopped. May be due to operator intervention or due to a guaranteed soak condition.

  `Start` - Begin programmer execution at the selected starting segment.

  `PG_END` - Displayed when the program completes execution of a segment where the next segment number is equal to the current segment number.
- **Ramp** - The action of increasing or decreasing the setpoint over a period of time. An example of a Ramp is to heat a furnace from 100 ºF to 200 ºF over a 30 minute time period.
- **Recipe** - A name associated with a sequence of steps (ramp/soak) that begins at a corresponding starting segment. 15 recipes are available in Dimension. The recipe name may be altered by the user to be descriptive of the sequence of steps to be run.
- **Recycles** - The number of repeats for a group of segments. After the number of recycles is completed, the programmer will index to the next sequential segment.

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- **Segment** - A step in the recipe sequence. Each step will have its own unique assigned parameters. Dimension has a "pool" of 750 available segments.
- **Segment Time** - The amount of time for the current segment to run. From 0.1 seconds to 99 hours.
- **Soak** - The action of maintaining the setpoint at a constant value over a period of time. An example of a soak is to maintain a furnace at 200 ºF for 30 minutes.
- **Start Date/Time** - The Date and Time on which you would like the programmer to start. This is used with the Time of Day Start function to start a program at the set date/time.
- **Time Left in Segment** - Displays the time remaining in the current segment of the programmer.
- **Time Left in Program** - Displays the time remaining in the current program.
- **Time of Day Start** - The time of day that you would like to start a programmer running. This allows you to start a process without requiring an operator being present.
- **Time of Day Start Segment** - The segment number from which to start when the Time of Day start is executed.
- **Time of Day Start Enable** - Enables the Time of Day start function.
- **TimeBase** - The time base for the program to run. HH:MM:SS for hours, minutes, seconds, or MM:SS.TT for minutes, seconds, tenths.
- **Warp Factor** - A multiplier value applied to the programmer time base that causes the programmer to run at an accelerated rate. A warp factor of 10 will cause the programmer to run ten times the normal speed.

Configuration

The configuration process for a real-time programmer is the process of making selections and setting parameters that are required to control the operation of the programmer. The first step in configuration is to examine your process and determine what is to be controlled by your real-time program. Some items you will need to consider for the basic configuration process are:

- The Number of Real-Time Programmers
- Do you want to temporarily stop and start the programmer and what will control this action.
- Do you require a soak time of a specific length.

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Table 5–1 on the following page is a worksheet that can be used to define programmer setup requirements. This worksheet is also available in See Appendix C*"Worksheets"* .

There are two levels of configuration, **Basic** and **Extended**. The Basic level includes the parameters needed to provide programming for most applications. The Extended configuration level includes all of the Basic parameters along with some advanced parameters that may be needed for specific application requirements.

The configuration/setup of Programmer functions in your Dimension is accomplished by accessing the Configuration side of Dimension. Fig. 5-1 and Fig. 5-2 show which Operation and Configuration screens are used for configuration of Programmer functions.

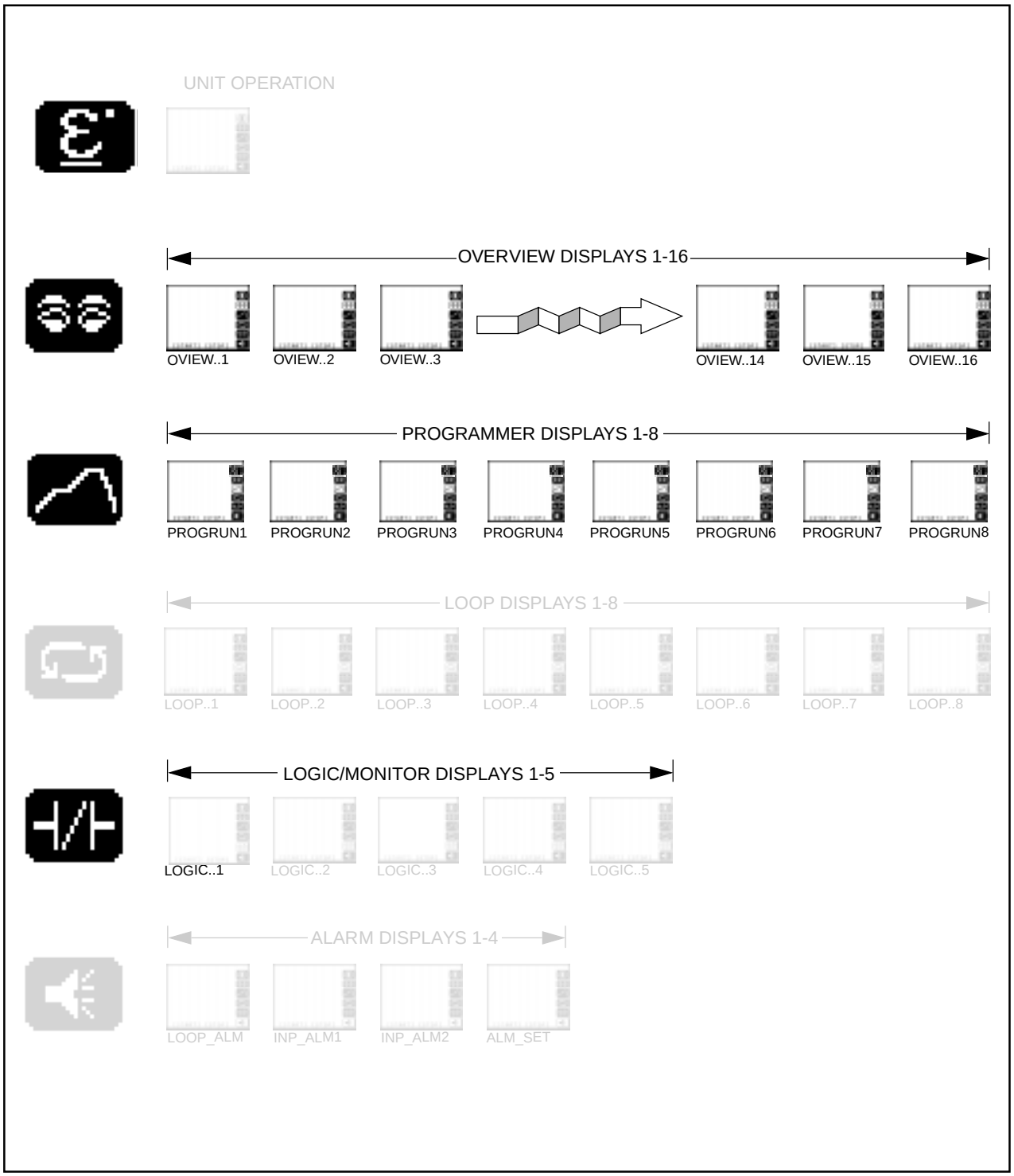
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Table 5–1. Real-Time Program Worksheet

Program # Recipe 1-15											
Start Segment											
Segment # 0-749											
Profile/Setpoint	1										
	2										
	3										
	4										
	5										
	6										
	7										
	8										
Segment Time 00:00:00 to 99:59:59											
Events On											
	1										
	2										
	3										
	4										
	5										
	6										
	7										
	8										
	9										
	A										
	B										
	C										
(0-255) Recycles											
Next Segment											
Alarm Group (1-5)											
PID Group (1-5)											

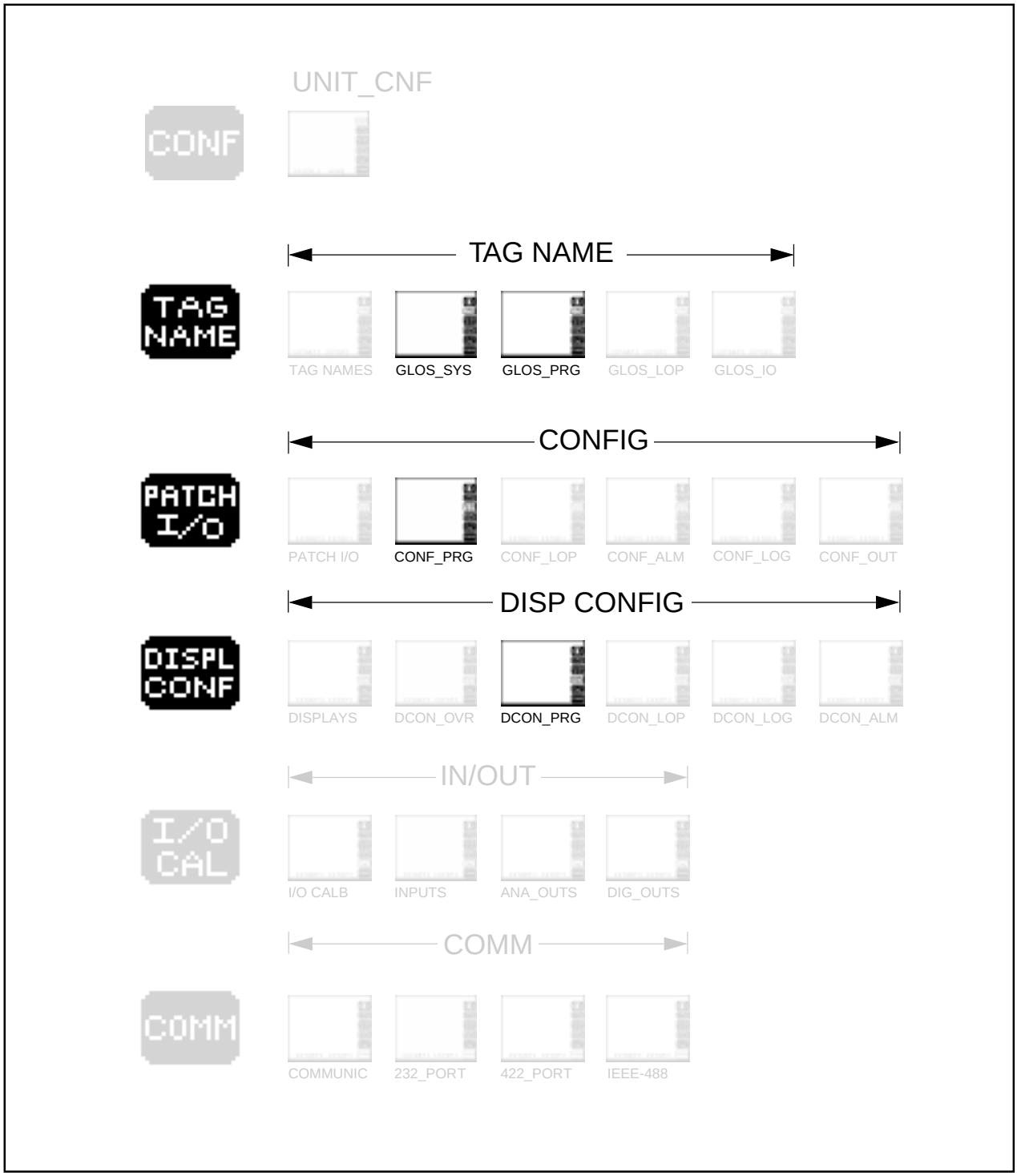
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Figure 5-1.
Map of Dimension Operations Screens Showing Associated Programmer Screens



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Figure 5-2.
Map of Dimension Configuration Screens Showing Associated Programmer Screens



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To access the ***Configuration*** side of Dimension displays:

1. Start from the UNIT display shown in Fig. 5–3.
2. Scroll to the **Conf_Lvl** parameter and select **Basic**.
3. Select the **Configur** parameter and the UNIT_CNF screen will display as shown in Fig. 5–4.

Figure 5–3.(L) Unit Display

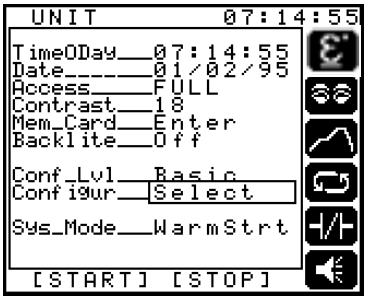
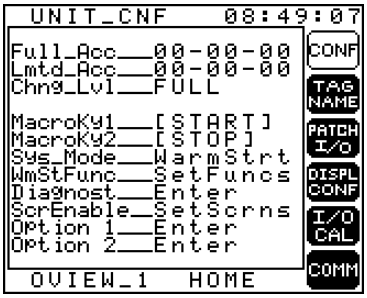


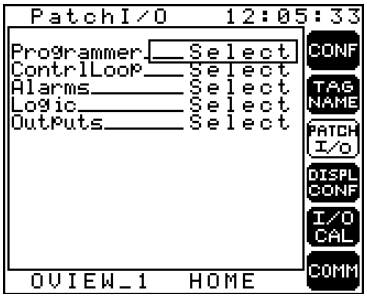
Figure 5–4. (R) UNIT_CNF Display





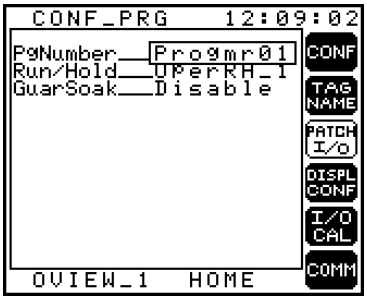
Next access the **Patch I/O** icon and select the **Programmer** parameter from the Patch I/O display as shown in Fig. 5–5.

Figure 5–5. Programmer Setup Selection



When the **Programmer** parameter has been selected, the screen shown in Fig. 5–6 displays and the actual programmer configuration may be started.

Figure 5–6. CNF_PRG Display



The **PGNumber** line is used to choose which programmer to configure. The standard number of programmers in Dimension is one, but you may have as many programmers as you do control loops. If you have more than one programmer, it is suggested that you start with **Progmr01** configuration and then proceed to the others.

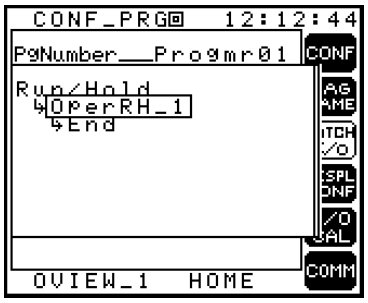
In BASIC configuration mode the programmer parameters are as follows:

Note: *The ## notation is used as an abbreviation of a numerical entry. The range of the number will vary depending on the model of your Dimension.*

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Run/Hold - Select the action that will switch the programmer mode between Run and Hold. Do this by selecting the Run/Hold line on the display. This will open a window as shown in Fig. 5–7 to choose one of the following selections:

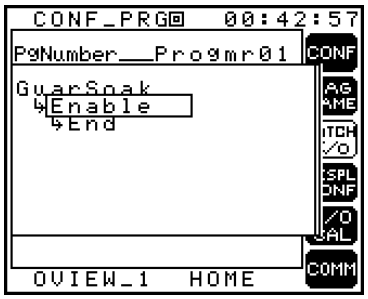
Figure 5–7.
Run/Hold Selection Display



- **OperRH_#** - Allows the operator to change the programmer mode from the display.
- **RemCI_##** - Allows the selection of a Remote Contact input to change the programmer mode. This input would come from a connected 8781 remote Digital I/O expansion card.
- **LocCI#_#** - Allows the selection of a local contact input to change the programmer mode (model 8725 with two or three analog cards only).
- **OR_set##,NORset##,ANDset##,NANDset#** - Allows the state of the logic sets to change the programmer mode. The state of each logic set is determined by its 4 inputs. Refer to the Section 7, *Logic Functions*.

After you have selected your Run/Hold source parameter, select **End** to complete this configuration step.

Figure 5–8.
Guaranteed Soak Enable/Disable Display



The next step is to determine if Guaranteed Soak is required in your process. For a more detailed description of guaranteed soak, See Section 5 *"Guaranteed Soak"*. If guaranteed soak is required select the **GuarSoak** parameter and a window will open as shown in Fig. 5–8. From this display select **Enable**.

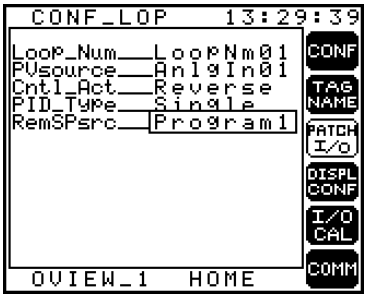
After you have selected **Enable**, select **End** to complete this configuration step. Then, press the HOME macro key to return to the Patch I/O Display.

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Setpointing a Loop

The next configuration step is to patch the profile being generated from the real-time programmer to the Setpoint of a particular control loop. In this manner the control loop setpoint will be controlled exclusively by the programmer without the need for operator intervention. Dimension is defaulted to have 1 programmer, but an option is available to have an individual programmer available with each loop. Each programmer has the same number of profiles as there are loops in the system. Each loop, when using the programmer as the setpoint source, will use the corresponding profile value from the programmer. To patch a profile setpoint from a programmer to a Loop setpoint, you must first access the CONF_LOP screen. To do this, from the Patch I/O display select the **ContrlLoop** parameter. This will display the screen shown in Fig. 5–9.

Figure 5–9.
CONF_LOP Display



To patch the profile from a programmer to the setpoint of a loop, complete the following steps:

1. At the **Loop_Num** parameter, select the loop number you want the profile setpoint patched to.
2. Move the cursor down to the Remote setpoint source (**RemSPsrc**) line and select the Programmer number that you want the profile value to come from (the default is Program1).
3. Select **End** to close the window.
4. Press the OVIEW_1 macro key to access the Operation side of Dimension, and Overview Display #1.



The next step is to access the desired loop display. From the Overview display, move down to the Loop icon as shown in Fig. 5–10.

Figure 5–10.
Loop Display, Setpoint Source Selection



Move right or left to access the desired loop display, move the cursor to the **SptSrc** parameter and scroll to the **Programr** option. This Loop setpoint will now come from the selected programmer.



Note: *When building a program, each profile is tied to a corresponding loop. When entering a profile,* Pg1Spt01 *is the profile value for Loop 1,* Pg1Spt02 *is the*

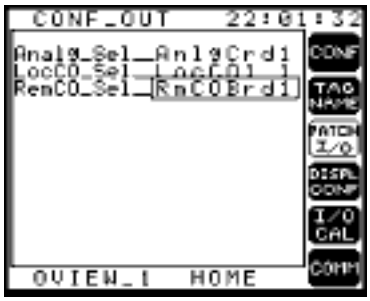
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profile value for Loop 2, etc. See Section 5"Building a Real-Time Program" on page 5-16.

Configuring Outputs as Events

When you are building your real-time program, you may want to turn on external devices during particular segments of the profile. This can be done by entering Events into the profile and then patching them to digital outputs. See "Building a Real-Time Program" on page 5-16 for information on entering events. To patch the events to digital outputs, first access the CONF_OUT screen, as shown in Fig. 5–11.

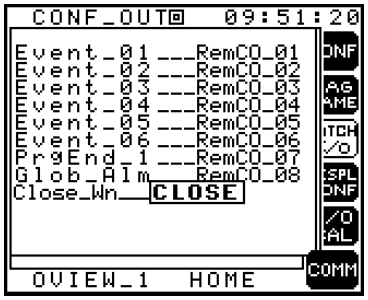
Figure 5–11.
CONF_OUT Display



This is done by starting at the UNIT screen and selecting **Configur** to move to the configuration side. Move down to the Patch I/O icon and select the **Outputs** parameter. Move the cursor down to **RemCO_Sel** and select the remote output card number, either 1 or 2. Number 1 has outputs 1 - 8; number 2 has outputs 9 -16, if available.

After **RmCOBrd#** is selected, a window displaying the 8 outputs will open, as shown in Fig. 5–12.

Figure 5–12.
CONF_OUT Output Events Display



Move the cursor down to the output that you would like to turn on, select, and scroll to the Event that will energize this output. The output will remain on as long as the event is on. Do the same for all outputs that will be energized by events. When finished, select **CLOSE** to close the window.

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Guaranteed Soak

Guaranteed Soak is a configuration in which a High or Low deviation alarm changes the programmer execution to a hold condition. The most common use of this function is to ensure proper process operation during a programmer "soak" segment. A soak segment is a segment during which the setpoint remains at the same value for a specific period of time. An example of using guaranteed soak: A particular part in a furnace needs to be heated to 500 °F and "Soak" there for four hours. If during the heating up (ramping) of the furnace the programmer has completed its ramp segment and is ready to begin the four hour soak segment, but the furnace is only at 450 °F, the part will not be at 500 °F for four hours. This is because the process variable (actual temperature of the furnace) is lagging behind the setpoint (desired temperature). By using guaranteed soak and setting the High and Low deviation alarms, the programmer will be put into Hold until the furnace heats up to 500 °F; then the programmer will be returned to the Run mode for the four hour soak segment, ensuring that the parts in the furnace soaked at 500 °F for the four hour period.

Configuring Guaranteed Soak

First access the CONF_ALM screen. This is done by starting at the UNIT screen and selecting **Configur** to move to the configuration side. Move down to the Patch I/O icon and select the Alarms parameter. This will display the CONF_ALM screen shown in Fig. 5–13.

Figure 5–13. (L)
CONF_ALM Display

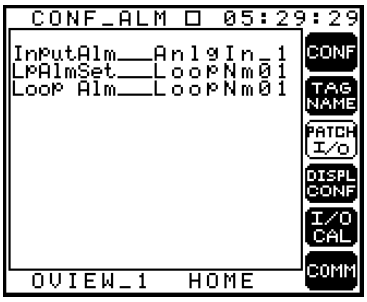
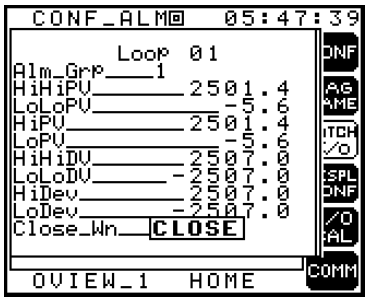


Figure 5–14. (R)
Loop Alarm Limit Window



Move down to the Loop Alarm set parameter (**LpAlmSet**). Select the Loop number to be used under the guaranteed soak condition. **ENTER** to open the alarm limits window shown in Fig. 5–14. At the **Alm_Grp** parameter, select 2 for the alarm group. This is done so you can select different alarm limits on a per segment basis. Next, move the cursor down to the **HiDev** parameter and enter the deviation value between the process variable and the profile setpoint that you want the programmer to hold if this value is exceeded. At the **LoDev** parameter, enter in a deviation value between the process variable and the profile setpoint that you want the programmer to hold if this value is exceeded. The other parameters on this screen may be set for different alarming purposes. Refer to Section 6, *Process Alarms*, for more details. Select **CLOSE** to close the window, and return to the display shown in Fig. 5–13.

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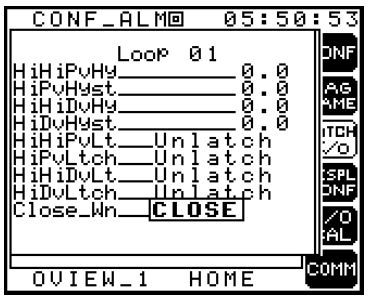


Figure 5–15.
Alarm Hysteresis and Latch Conditions Window

Next scroll down to the **Loop Alm** parameter and select the Loop number to be used under the guaranteed soak condition. Select this parameter and a window will open (Fig. 5–15) showing the hysteresis and latch conditions of the alarms. Scroll down to the **HiDvLtch** parameter and change the variable to Unlatch. This is required because an alarm condition will occur if the set deviation limits are exceeded and a latched requires operator intervention to acknowledge it. Unlatching the alarm will allow it to clear when the deviation alarm condition is no longer true, thus allowing the program to resume running without operator action. The other parameters on this screen do not need to be set for guaranteed soak, but for a description of them, refer to the Section 6, *Process Alarms*. Select **CLOSE** to close the window.



Figure 5–16.
CONF_PRG Display (Extended Level)

Next access the CONF_PRG screen by pressing the HOME macro key to get back to the Patch I/O display; then select **Programmr** to display the CONF_PRG screen, Fig. 5–16.

Note: *You should be in the extended configuration level before accessing the CONF_PRG screen. The extended configuration level is selected from the Conf_Lvl parameter on the UNIT operation screen.*

Move down to the **GuarSoak** parameter and set it to **Enable**. Select **END** to close the window and press the HOME macro key to return to the Patch I/O Display.

Note: *When building a profile, if you want the alarm limits and guaranteed soak to be active, select Alm_Group 2 when building the segment. Whenever the process variable and the profile setpoint differ by more than the deviation limits, the programmer will be put into a hold condition until the process variable can "catch up" to the profile setpoint.*

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Operation/StartUp

Figure 5–17.
PROGRUN # Display



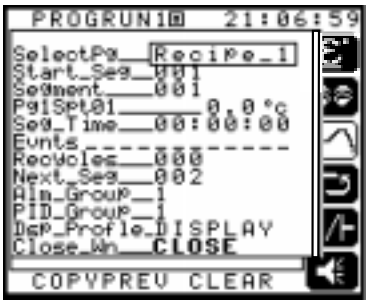
We will use only Programmer 1 in this section, but each programmer may be configured in a similar manner. It's time to Build a recipe and Start the programmer. First, access the Programmer icon on the operation side and continue with "Building a Real-Time Program," below. If you are on the configuration side of Dimension, press the OVIEW_1 macro key to get to Overview 1 screen and then select the Programmer icon to display the PROGRUN # screen (Fig. 5–17).

Building a Real-Time Program

Recipe Build Screen

When `PGBUILD` is selected at the Program Run screen, the Recipe Build window shown in Fig. 5–18 displays.

Figure 5–18.
Recipe Build Window



Note: *When in the Recipe Build window, the macro keys perform new functions. Macro Key1, labeled* ***"COPYPREV,"*** *will copy all data from the previous segment (except the next segment parameter) into the current segment when pressed.*

Macro Key 2, labeled ***"CLEAR,"*** *will clear all data in the current segment, setting all parameters (except the next segment parameter) to the default values when pressed.*

Move the cursor to the SELECT PROGRAM (`SelectPg`) field, and select the recipe (1-15) that you wish to build or modify. The currently active parameters for the recipe you selected will display. The following parameters are in the Build window:

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- **Start_Seg** - Displays the "start" segment number for the selected
recipe.
- **Segment** - Select segment number 001 through 749. (Note: Segment 000 is dedicated to serve as a recipe "abort" function.)
- **Pg1Spt01** - When selected, a window will open to allow the entry of the programmer setpoint values for each loop in the controller.
- **Seg_Time** - Enter segment time up to 99 hours. This is the time to ramp to the entered setpoint, soak at the entered setpoint, or have an event on.
- **Evnts** - Select the desired events (1-9, a-c) to turn on at the start of the segment and to be on for the segment duration time. The events are entered by moving the cursor to the **Evnts** parameter and pressing the multi-function knob. This puts the cursor at the Event 1 position. To select this event, press the knob again and turn it once to display the number "1" in the first position. Press the knob again to select this event and the cursor will move to the second position. Repeat this process for any events desired to be turned on during this segment. When no other events are required, turn the knob until the cursor moves "past" the twelfth event (Event C). The selected events will now display.
- **Recycles** - Enter the number of times you want to "recycle through" a group of segments.
- **Next_Seg** - Specify 000 to 749 for the number of the next segment to execute. Used to sequence the segments of the recipe, end a Recipe, or Recycle back to the desired segment.



Note: *When the next segment number is the same as the current segment number, a recipe end is indicated.*

- **Alm_Group** - Select alarm group 1-5 to activate specific alarms groups at specific times in the program.
- **PID_Group** - Select PID Group 1-5 to activate different PID values depending on the active segment number.
- **Dsp_Profile** - Call up graphic recipe profile "build" window.
- **Close_Win** - Closes the Recipe Build Window and returns to the PROGRUN# Display.

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Example Recipe

The following example is a profile of both temperature and humidity showing ramping and soaking of both parameters and entering events to turn on an external fan and the humidity system. A graphical representation of the recipe is shown in Fig. 5–19. This recipe example is also loaded into Recipe 2 of your Dimension as a factory default.

Graphing a Recipe

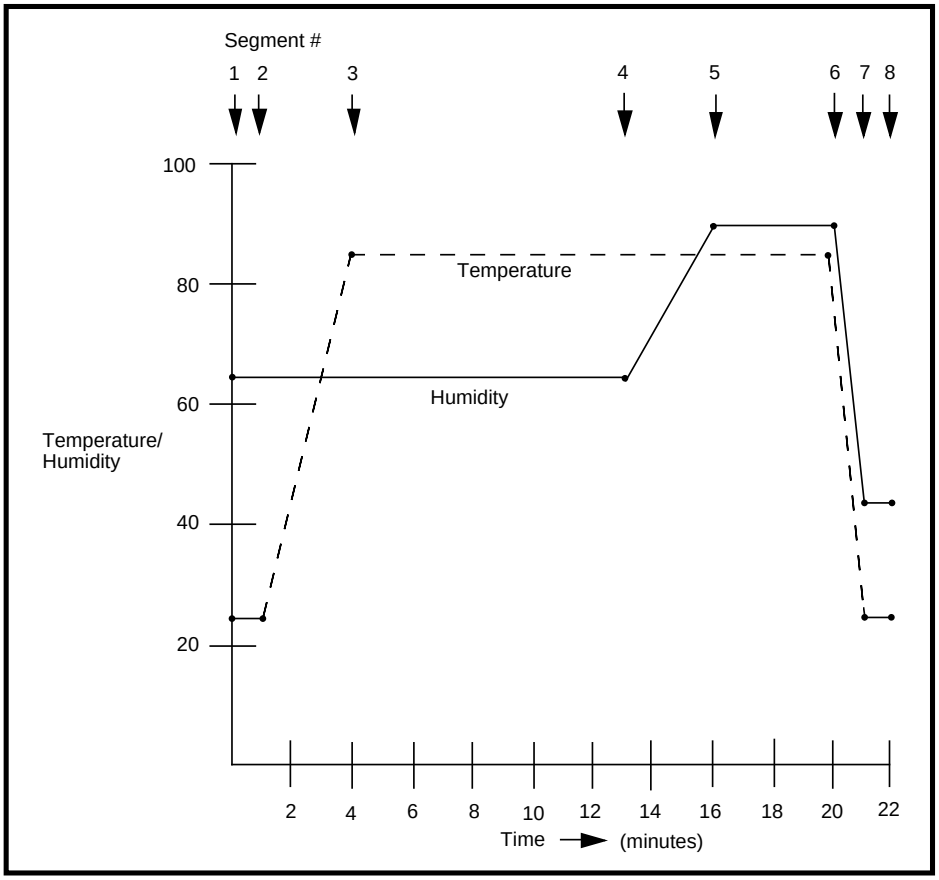


Figure 5–19. Graph of Test to be Performed

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Convert Graph to Table

Figure 5–20.
Converting Graph to Table Entries

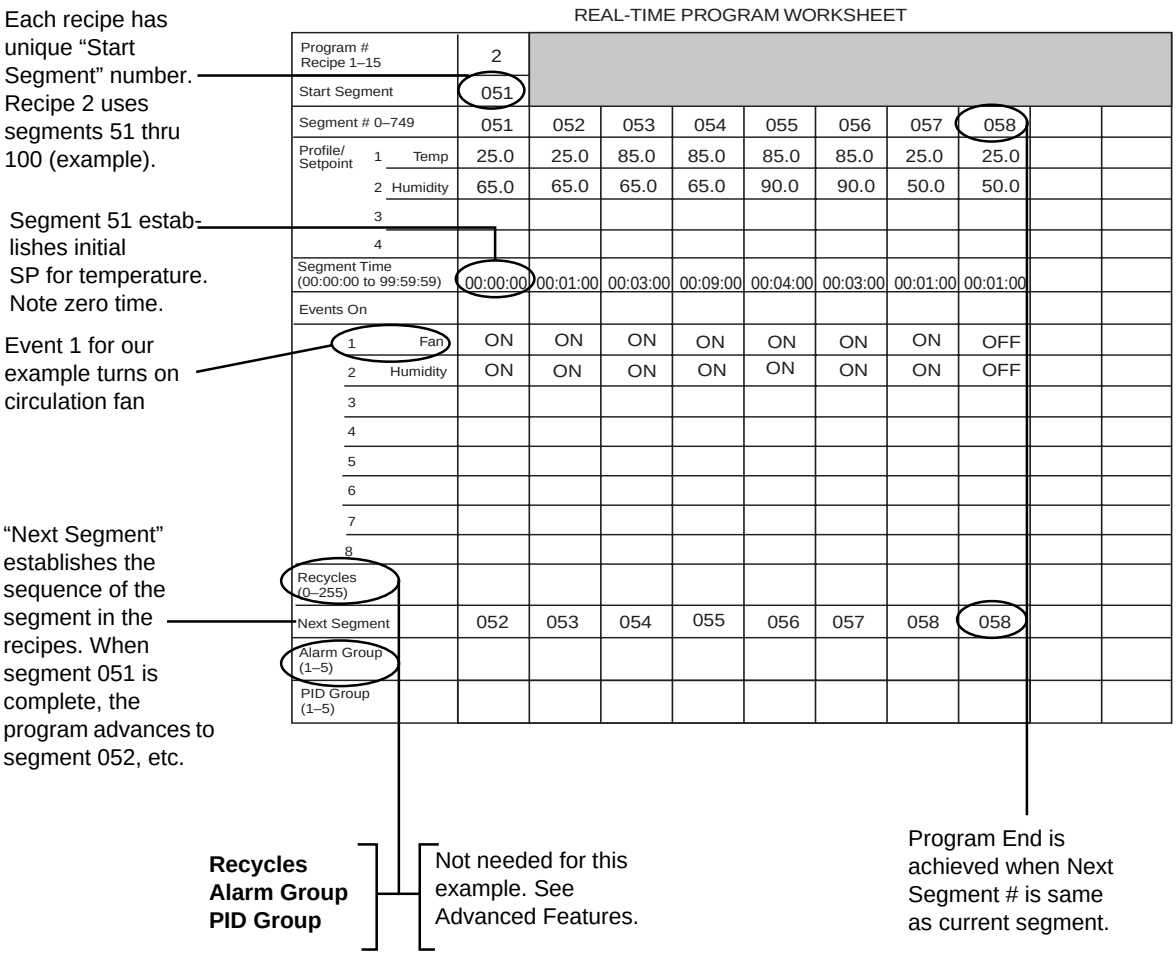
REAL-TIME PROGRAM WORKSHEET

Program # Recipe 1–15		2									
Start Segment		051									
Segment # 0–749		051	052	053	054	055	056	057	058		
Profile/ Setpoint	1 Temp	25.0	25.0	85.0	85.0	85.0	85.0	25.0	25.0		
	2 Humidity	65.0	65.0	65.0	65.0	90.0	90.0	50.0	50.0		
	3										
	4										
Segment Time (00:00:00 to 99:59:59)		00:00:00	00:01:00	00:03:00	00:09:00	00:04:00	00:03:00	00:01:00	00:01:00		
Events On											
	1 Fan	ON	ON	ON	ON	ON	ON	ON	OFF		
	2 Humidity	ON	ON	ON	ON	ON	ON	ON	OFF		
	3										
	4										
	5										
	6										
	7										
	8										
Recycles (0–255)											
Next Segment		052	053	054	055	056	057	058	058		
Alarm Group (1–5)											
PID Group (1–5)											

The worksheet shown in Fig. 5–20 is an effective way to document your profile before entering the parameters into the Dimension. Fig. 5–21 gives an explanation of entries for this table. See Appendix C, *Worksheets*, for a blank worksheet to copy and use for each of your Recipes.

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Figure 5–21.
Table Explanation



Entering Data From Table into Dimension Program

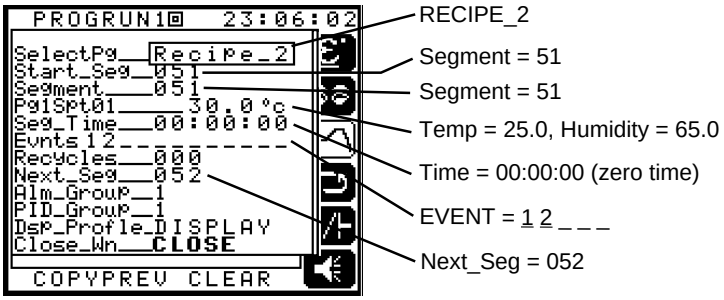
Recipe 2 in Fig. 5–21 has been entered into your Dimension and can be reviewed as an example. The following steps were taken to complete the entry process. When entering data for your recipe(s), similar steps can be taken. To enter data into a field, select the field and make appropriate entry using the knob. Also, see note regarding macro keys on 5-16.

1. Select `PGBuild` from the PROGRUN# display.
2. Select Recipe 2 from the `SelectPG` parameter. Follow steps 3-10 in Fig. 5–22.

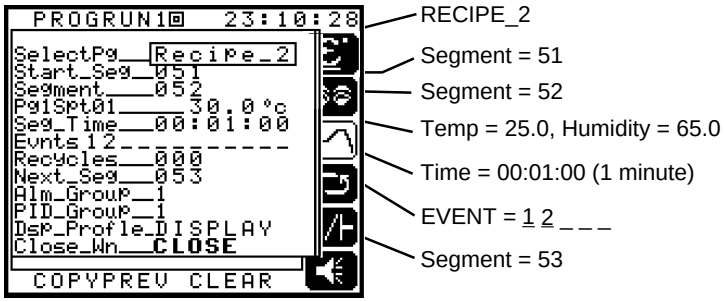
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Figure 5–22.
Entering Table Data into Dimension Program

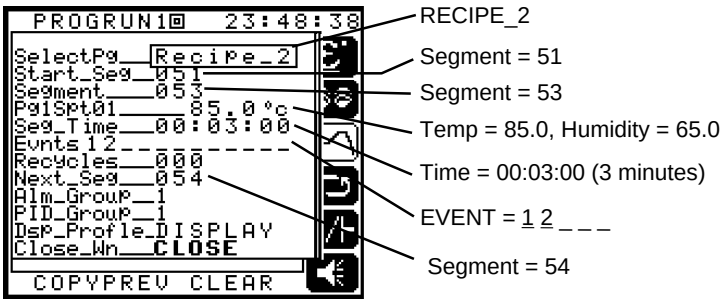
3. Enter 051 segment of recipe from data in first column of table.



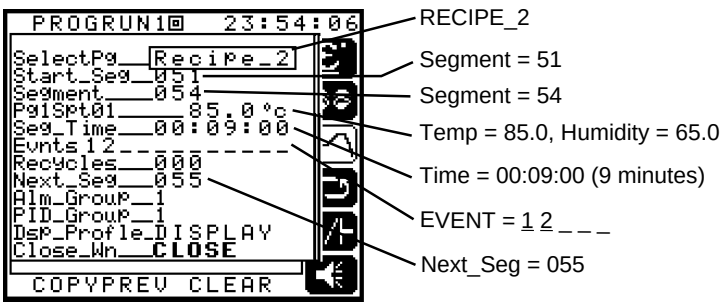
4. Enter 052 segment of recipe from data in second column of table.



5. Enter 053 segment of recipe from data in third column of table.



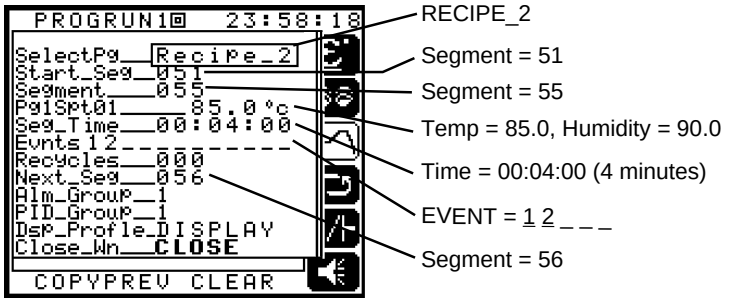
6. Enter 054 segment of recipe from data in fourth column of table.



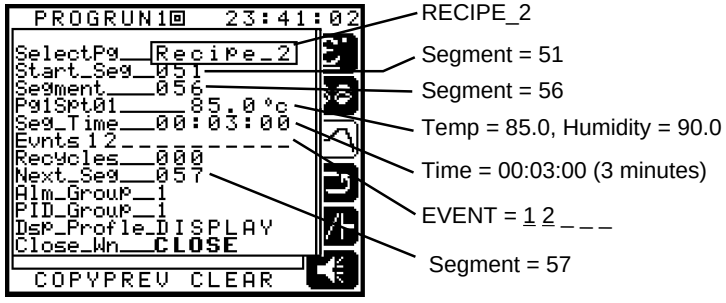
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Figure 5-22, Cont'd
Entering Table Data into Dimension Program

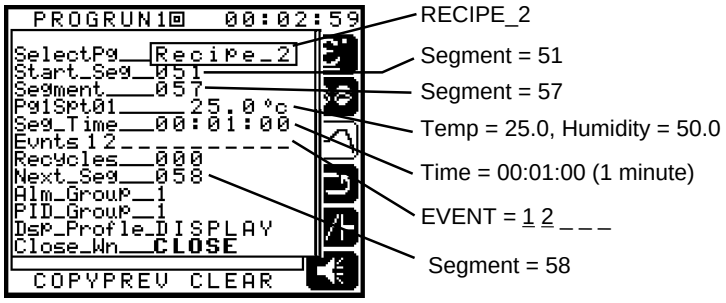
7. Enter 055 segment of recipe from data in fifth column of table.



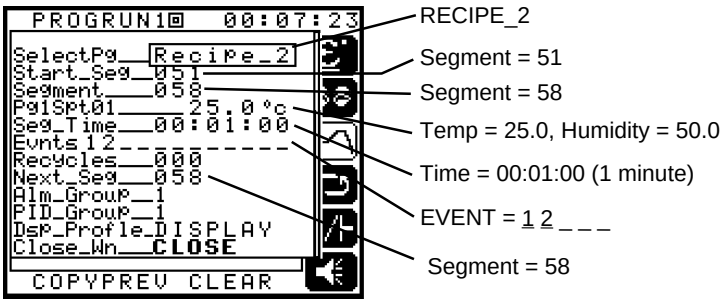
8. Enter 056 segment of recipe from data in sixth column of table.



9. Enter 057 segment of recipe from data in seventh column of table.



10. Enter 058 segment of recipe from data in eighth column of table.



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Starting a Recipe

The Programmer may be configured to begin executing in the four ways described below:

1. Operator start from an Overview or Programmer display.
2. The Macro Keys may be configured to start a program.
3. A Remote start using a contact input, an alarm condition, or a remote start signal from another programmer.
4. Time of Day start.

Possible methods of starting a recipe are described below:

Operator Start

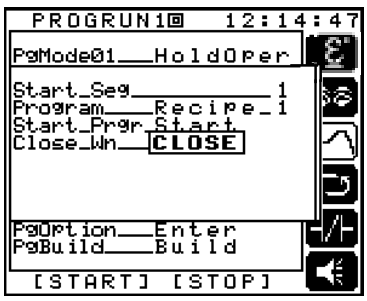
From the operation group, select the Program icon. The system will display a PROGRUN# screen (see Fig. 5–23). From the PROGRUN# screen, select `Start_Pgr1` and a window will open (see Fig. 5–24). The operator can select any segment or a particular Recipe to tell the programmer where to start. Moving the cursor to the `Start` parameter and pressing enter will start the programmer. `Close` the start window to view the current programmer status.

Note: *If a particular recipe is selected, the starting segment will automatically change to the first segment in that recipe.*

Figure 5–23.(L) PROGRUN# Display



Figure 5–24. (R) Operator Program Start Window



Alternate Recipe Starts

1. Macro Keys. The macro key may be configured to start the programmer. (See Section 3*"Defining Macro Keys"* on page 3-30, for more information.)
2. Remote Start. When configured, a remote switch will start the Programmer at the selected segment. (See remote start parameter in *"Programmer Extended Configuration Parameters"* on page 5-33.)
3. Time of Day. When configured, the Programmer will start at the time, date and segment number specified. See Section 5*"Program Options"* on page 5-32.

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Once a Recipe is started, the program mode (**PgMode##**) changes to **Run**, indicating the clock or time-base is counting. The **PgMode##** will continue to display **Run** and count down time until the Recipe ends. The **PgMode##** parameter will change to **Pg_End** when the recipe ends.

Stopping a Recipe

The user may need to stop or end the current Recipe while the programmer is in the Run mode. The following choices are available:

Restart the Recipe at the End Segment

If, for example, Recipe 1 uses Segments 1–10, with Segment 10 as the ending segment, restart the Recipe (follow the process outlined under *"Operator Start"* on page 5-23) and select "10" as the start segment (Fig. 5–25).

As an alternative, define a unique stop segment (for example, Segment 749) that can be used with all Recipes. You may (not required) assign a Recipe number to this "Stop" segment. Then the operator can select that Recipe number to stop any recipe.

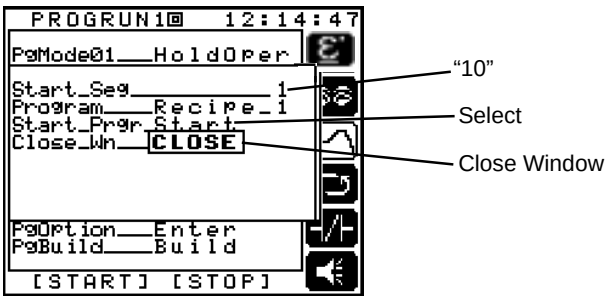


Figure 5–25.
Stop a Recipe

Use "Stop" Macro Key

To use the macro key as an effective "STOP" key, you will need to define an unused recipe to be executed when the STOP key is pressed. For example, use Recipe 15.

Recipe 15 will be defined with safe setpoints (ambient temperature, for example), minimum time (possibly 0 seconds), and perhaps the events turned off. Its start segment is user-defined.

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Configure the Macro Key to start Recipe 15, as follows:

From the UNIT screen move the cursor to the **Configur** parameter and select. The UNIT_CNF screen displays (see Fig. 5–26). Move the cursor down to the **MacroKy2** ([STOP]) parameter and select. A window displays (see Fig. 5–27)allowing you to select the desired functions to be executed when the macro key is pressed.

Figure 5–26.(L)
UNIT_CNF Display

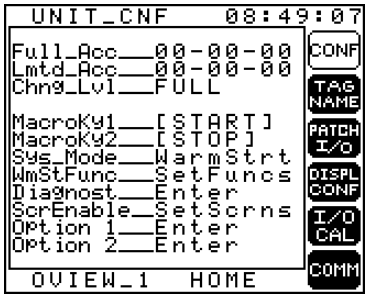


Figure 5–27. (R)
Macro Key Configuration Window



Move the cursor to the **PgStart** parameter and select **Activatd**. A window opens at the top of the display (see Fig. 5–28). Select **Recipe_15** for the recipe to run and close the window. Move the cursor to the **PgMode** parameter and set to **Activatd**. A window will open at the top of the display (see Fig. 5–29). Select **Start** and close the window.

Figure 5–28.(L)
Recipe Selection Window



Figure 5–29. (R)
Program Mode Selection Window



When the "STOP" macro key is pressed, the currently active recipe will be halted and Recipe 15 will be executed.

➥ ***Note:*** *Refer to Section 3,* Graphic Operator Interface*, for Defining Macro Keys instructions.*

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Use a Remote Switch

Configure Remote Start input so the Programmer will jump to the selected segment. The user needs to define the end Recipe or segment to be used. This is done in *"Programmer Extended Configuration Parameters"* on page 5-33) or from the Programmer Option screen (see Fig. 5–39).

Configure the Remote Start input so the Programmer will start executing at the selected remote start segment. To do this, the Dimension must be in the Extended configuration mode. Move to the Patch I/O icon and select **Programmer** (see Fig. 5–30). The CONF_PRG screen displays (see Fig. 5–31).

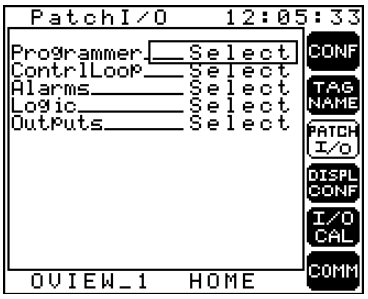


Figure 5–30.(L) Programmer Select Configuration



Figure 5–31. (R) Programmer Extended Configuration



Figure 5–32. Remote Start Segment Selection

Move the cursor down to the **RemStart** parameter and select. A window opens that will allow you to select the source for the Remote start to occur. Next select the **RemSeg01** parameter and a window will open at the top of the screen that will allow you to set which segment the programmer will start at when the remote start signal is detected by the Dimension (see Fig. 5–32).

Hold Function

If desired, the user can stop the Programmer from running by putting the **PgMode##** to Hold. All the current conditions remain active, except the programmer time is halted.

To do this, from the PROGRUN# display in the operation group, select **PgMode##** and change to **HoldOper**. At this point, **Pg#Sp##, Alm_Grp#, PID_Grp#** and **Evnts** parameters can be selected and changed. These changes will become active immediately after the knob is pushed to enter the change (see Fig. 5–33).

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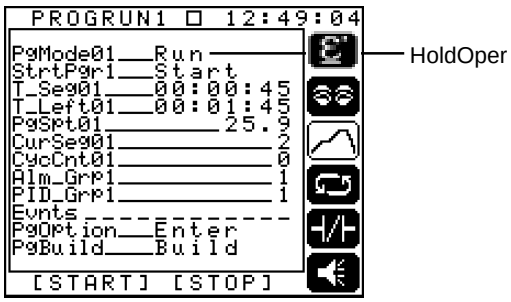


Figure 5–33.
Putting the Programmer in "Hold"

Hold/Run also can be activated by Alarms, as with Guaranteed Soak, or by a remote input configuration choice.

Note:

1. *If the Programmer is returned to* **Run** *from a* **HoldOper** *condition, all changes will remain active.*
2. *If the setpoint value was changed, the setpoint will now Ramp to the programmed setpoint value at the rate determined by the time left in the segment.*
3. *If the events were changed, their condition will remain until the next segment is reached.*

Advanced Features

Recycles

Recycles are used to repeat a segment or group of segments. The entry is available on each segment and must jump to a previous segment.

Range is 0 to 255 cycles.

Note: *Maximum of 25 segments can be configured with recycles. If more than 25 segments with recycles are programmed, the Dimension will go to program end.*

The cycle counter on the **PROGRUN#** display keeps track of remaining cycles during the process.

Recycles is used with **Next_Seg** in the recipe build window (see Fig. 5–18) to direct the sequence of the program.

When the Recycles are complete, the programmer automatically advances to the next higher segment.

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Note:

1. ***Recycles cannot be used to repeat the current segment.*** *Next segment is the director of the program and if set to the current segment the program will end.*
2. *Program automatically advances to the next segment when recycles are complete.*

PID Groups

Entry of values (1–5) into PID group selection can be made on a segment-per-segment basis. The typical use is to achieve better control as the process ramps and soaks through its cycle. Feedback and values can respond differently at different points of the process. PID Groups will become active only if selected in the program segment and values are set for the PID in the desired PID group (see page 4-14 through page 4-16 and page 4-31).

Alarm Groups

Selecting Alarm group (1–5) can be made on a segment-per-segment basis. The typical use is to switch to different limits at various times in the Recipe, usually to activate or deactivate a Guaranteed Soak function.

Alarm Groups will become active only if selected in the program segment and values are set for the alarm in the desired alarm group. See Section 6*"Loop Alarms"* on page 6-9.

Abort Function

The abort function is designed to be used as a way to temporarily halt the execution of the programmer (saving all the current parameters) and execute a different recipe or segment starting at segment 0. Once the abort is enabled by the operator, an alarm or from a remote source, the abort recipe will remain active, even when it reaches Program End, until the abort signal is removed or the selection changed. When the abort signal is removed, the programmer control will then return to the original recipe and continue executing at the point that the abort occurred.

The abort function is not intended to be used as a method to stop the programmer from executing.

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An example of using the abort function would be to use a High Process variable alarm to trigger an abort if the furnace temperature was too high during a ramp/soak profile. This would activate the abort recipe at segment 0, where an ambient setpoint profile would be entered that would allow the furnace to cool down to an appropriate operating temperature. Once the furnace cooled down far enough to clear the process variable alarm, the abort signal would be removed, returning the programmer back to the ramp/soak profile for the furnace.

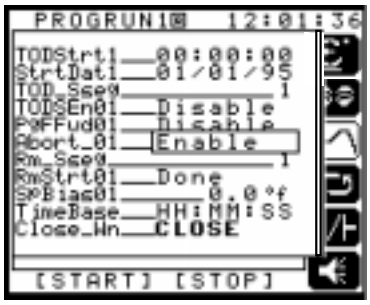
Enabling the Abort

When the abort source is configured to be Operator abort (`OprAbrt1`) shown in Fig. 5–34, it is up to the user to `Enable` & `Disable` the abort from the PgOption screen shown in Fig. 5–35. If the abort source is configured to be a contact input or a logic set, when the input has a valid signal, the abort will be activated and when the signal is removed the abort is de-activated. No further enabling is required.

Figure 5–34.(L) Abort Source



Figure 5–35. (R) PgOption Screen



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Editing a Recipe

Figure 5–36.
Converting Graph to Table Entries

REAL- TIME PROGRAM WORKSHEET

Program # Recipe 1–15		2									
Start Segment		051									
Segment # 0–749		051	052	053	054	055	056	057	058		
Profile/ Setpoint	1 Temp	25.0	25.0	85.0	85.0	85.0	85.0	25.0	25.0		
	2 Humidity	65.0	65.0	65.0	65.0	90.0	90.0	50.0	50.0		
	3										
	4										
Segment Time (00:00:00 to 99:59:59)		00:00:00	00:01:00	00:03:00	00:09:00	00:04:00	00:03:00	00:01:00	00:01:00		
Events On											
	1 Fan	ON	ON	ON	ON	ON	ON	ON	OFF		
	2 Humidity	ON	ON	ON	ON	ON	ON	ON	OFF		
	3										
	4										
	5										
	6										
	7										
	8										
Recycles (0–255)								3			
Next Segment		052	053	054	055	056	057	054	058		
Alarm Group (1–5)			2								
PID Group (1–5)											

Add Guaranteed Soak in Segment 053. Not active in all other segments.

Recycle from Segment 0057 back to Segment 054.

Add Recycles to repeat heat-up and ramp-down cycle 3 times, plus the original cycle. Program automatically ends after repeating the 3 cycles and advancing to segment 058.

To edit a recipe, the process is the same as building a recipe except you will be changing the parameters that have been set previously. This is done by starting from the PROGRUN# display and opening the `PgBuild` window. In the example shown in Fig. 5–36, move down to the segment parameter and change to segment 052 and select. The current parameters for segment 052 will display. Move the cursor down to the `Alm_Grp` parameter and select 2 to use the Alarm limits set in Alarm group 2 for guaranteed soak to be active during this segment. Change the recycle parameters in segment 057 in the same manner.

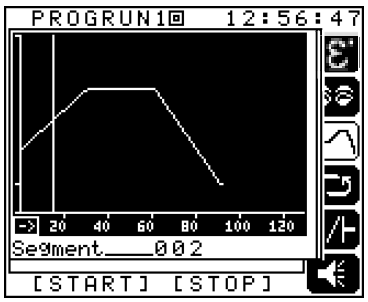
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Viewing a Recipe

Display Profile

When first called up, the text-based Recipe Build screen displays default segment (001) parameters in tabular form. During the recipe building process, a window displaying an X-Y graph of the current state of the recipe can be called up by using the `Dsp_Profile_` from the program build window (see Fig. 5–18) display. As shown in Fig. 5–37, this window dynamically displays the recipe. As the recipe develops, the graphic profile scrolls horizontally. When entries are made or edited, successive recipe segments are displayed according to the new values.

Figure 5–37.
X-Y Display Graph



Note: *The horizontal time scale is set on the Programmer Display Configuration screen (DCON_PRG). Reference "Programmer Display Configuration" on page 3-47.*

At the bottom of the X-Y graph is a line of text that scrolls through the selections on the Recipe Build Window. Using the knob, the items scroll as if they were displayed on a full screen. These values can be modified by using the multi-function knob editing functions. As values are entered for profile segments, the profile is graphically displayed. If, for example, the process setpoint is chosen for editing, the text process variable displayed will change when the knob is turned. On the X-Y graph, a line moves up and down on the display representing the relative value of the process variable. When the segment time is changed, the X-Y graph displays that segment, expanding or contracting along the horizontal axis.

When the recipe grows larger than the display screen, the profile will scroll horizontally. The horizontal time scale can be changed to condense or expand the display. A value of 2 will condense the display by a factor of 2. If a segment that has following segments is edited, anything that follows that segment will be graphically erased. When the edited segment is entered, all segments will then display.

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When you move the cursor to the small arrow field on the bottom left-hand corner of the display and press **ENTER**, a vertical reference line displays. This line can be moved horizontally by turning the knob. This will cause the text at the bottom of the display to increment or decrement the segment numbers as the line travels across the display. In addition, the macro key labels will be replaced with the time and temperature readings for the segment referenced. Pressing enter on the small arrow field again will enable you to move the cursor to the text line.

From the text line, segments can be selected and modified. Moving the cursor to the **CLOSE** field on the text line closes the graphic window and returns you to the Recipe Build window.

Program Options

There are several options provided with the real-time programmer that can be accessed from the `PgOption` window on the PROGRUN# screen (Fig. 5–38). To open the window, move down to the `PgOption` parameter and **ENTER** to display the window shown in Fig. 5–39.



Figure 5–38.(L) PROG_RUN1 Display



Figure 5–39. (R) Programmer Option Window

`TODStrt#` - Set the time of day to start the programmer. Does not require the user to be present to activate the start.

`StrtDat#` - Set the date on which the programmer is to be started.

`TOD_Sseg` - Set the start segment for the programmer when it is started by the Time of Day start sequence.

`TODSEn##` - Enables or Disables the Time of Day start. Must be Enabled for the programmer to start at the selected time and date.

`PgFFwd##` - Select enable or disable to run the programmer at an accelerated rate.

`Abort_##` - Select Enable or Disable to activate the abort sequence for the programmer, See Section 5*"Abort Function"* .

`Rm_Sseg` - Select the segment for the programmer to start when a remote start is activated.

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RmStrt## - Start the programmer from the operator interface at the remote start segment.

SpBias## - A bias value that will add to or subtract from the current profile value.

TimeBase - Select the time base for the program to run. HH:MM:SS for hours, minutes, seconds, or MM:SS.TT for minutes, seconds, and tenths.

Programmer Extended Configuration Parameters

The extended configuration for the programmer provide access to advanced programmer configuration functions. These functions should be altered only after you have configured and verified the operation of the Basic setup. The following items may be set up during extended configuration:

- **OpStart** - Allows the selection of an alternate source to start the programmer.
- **RemStart** - Allows the selection of an alternate source to start the programmer at the chosen segment.
- **FwdEnScr** - Allows the selection of a source to enable the programmer fast forward option.
- **WarpFctr** - The multiplier factor applied to the normal programmer time when the fast forward option is enabled.
- **Abort Source** - Allows the selection of a source to cause an abort of the currently active program.



Figure 5–40. Selecting Configuration Level

Extended configuration is accessed by selecting **extended** at the **Conf_Lvl** parameter as shown in Fig. 5–40.

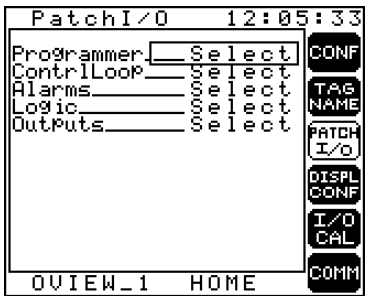


Figure 5–41. Programmer Select Configuration

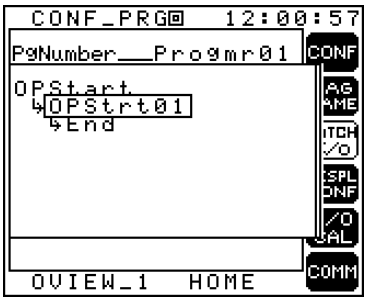
After selecting **Extended**, select **Configur** to switch to the configuration side of Dimension. Next access the Patch I/O icon and select the **Programmer** parameter as shown in Fig. 5–41. Once Programmer has been selected, the screen shown in Fig. 5–42 displays and the extended configuration process may be started.

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Figure 5–42.
Programmer Extended Configuration



Figure 5–43.
Operator Start Source Selection Window



The first item that is added when the Extended configuration is selected is Operator Start (**OPStart**). This parameter allows for the selection of the source for the operator start parameter to start the programmer. The programmer will start at the segment identified as the Start Segment. When **OPStrt** is selected, the window shown in Fig. 5–43 displays. Selections include:

OPStrt## - Allows the operator to start the programmer from the PROGRUN# display.

RemCl_## - Allows the selection of a Remote Contact input to start the programmer. This input would come from a connected 8781 remote Digital I/O expansion card.

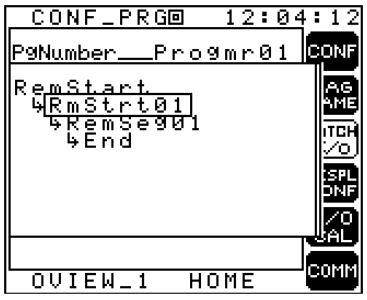
LocCl#_# - Allows the selection of a local input to start the programmer (model 8725 with two or three analog cards only).

OR_set##,NORset##,ANDset##,NANDset# - Allows the state of the logic sets to start the programmer. The state of each logic set is determined by its four inputs. Refer to Section 7, *Logic Functions*, for details.

After you have completed your selection of an Operator Start source, select **End** to complete this configuration step and return to the extended CONF_PRG display.

The next extended parameter is the Remote start parameter. This may be modified to allow a remote source to start the programmer at the chosen segment. Select the **RemStart** parameter to open the window shown in Fig. 5–44.

Figure 5–44.
Remote Start Segment



The following choices are available for starting the programmer from a remote source:

RmStrt## - Allows the operator to start the programmer from the display using the remote start segment.

RemCl_## - Allows the selection of a Remote Contact input to start the programmer. This input would come from a connected 8781 remote Digital I/O expansion card.

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LocCI#_# - Allows the selection of a local input to start the programmer (model 8725 with two or three analog cards only).

OR_set##,NORset##,ANDset##,NANDset# - Allows the state of the logic sets to start the programmer. The state of each logic set is determined by its four inputs. Refer to Section 7, *Logic Functions*, for details.

RemSeg## - Allows the selection of the recipe segment the programmer will begin at when remote start is activated.

After you have completed your selection of a Remote Start source, select **End** to complete this configuration step and close the window.

The next parameter available in the extended configuration process is the selection of a Fast Forward Enable source. This allows the selection of a source to enable the fast forward function of the programmer. When this is enabled from a remote contact input, local contact input (8725 only) or a logic set, the programmer runs through the program at an accelerated rate. The rate is adjusted by the **WarpFctr**. This selection is made by selecting the **FwdEnSrc** parameter. Once selected, the window shown in Fig. 5–45 displays.

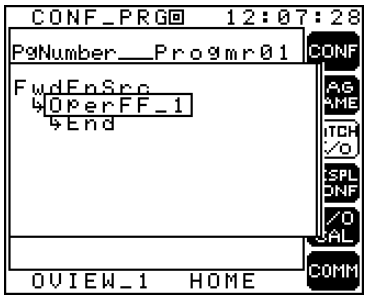


Figure 5–45. Fast Forward Configuration

The following choices for Fast Forward Enable source are available:

OperFF_# - Allows the operator to enable the FF function from the display.

> ***Note:*** *If fast forward enable source (***FwdEnSrc***) is set to* **OperFF_#***, the only way to start the fast forward option is to enable* **PgFFwd##** *on the programmer option window* *(See page 5-32).*

RemCI_## - Allows the selection of a Remote Contact input to enable the FF function. This input would come from a connected 8781 remote Digital I/O expansion card.

LocCI#_# - Allows the selection of a local input to enable the FF function (model 8725 with two or three analog cards only).

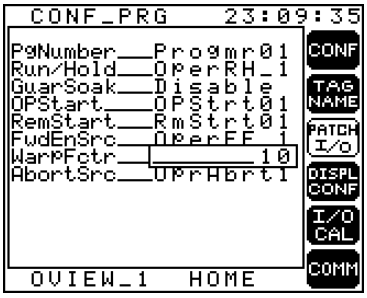
OR_set##,NORset##,ANDset##,NANDset# - Allows the state of the logic sets to enable the FF function. The state of each logic set is determined by its four inputs. Refer to Section 7, *Logic Functions*, for details.

After you have completed your selection of a Fast Forward Enable Source, select **End** to complete this configuration step and close the window.

The next parameter available in the extended configuration process is the selection of a Warp Factor value (see Fig. 5–46).

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Figure 5–46.
Warp Factor



WarpFctr sets the multiplier value applied to the normal programmer time base if the **FwdEnSrc** is enabled. A warp factor of 10 will cause the programmer to run ten times the normal speed.

Figure 5–47.
Abort Source



The last parameter in the extended configuration process is the selection of an abort source. See Section 5*"Abort Function"* . This allows the selection of a source to activate the abort sequence of the programmer. This selection is made by selecting the **AbortSrc** parameter. Once selected, the window shown in Fig. 5–47 displays.

The following choices for the Abort source are available:

OprAbrt# - Allows the operator to enable the abort sequence from the display.

RemCI_## - Allows the selection of a Remote Contact input to activate the abort sequence. This input would come from a connected 8781 remote Digital I/O expansion card.

LocCI#_# - Allows the selection of a local input to enable the FF function (model 8725 with two or three analog cards only).

OR_set##,NORset##,ANDset##,NANDset# - Allows the state of the logic sets to cause an abort to occur. The state of each logic set is determined by its four inputs.See Section 7*"Logic Functions"* , for details.

After you have completed your selection of an Abort source, select **End** to complete this configuration step.

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Troubleshooting Real-Time Programmer

Symptom	Action
The programmer is running but the loop setpoint does not change.	Verify that the Setpoint source (**SptSrc0#**) for the selected loop is set to Programr. See Section 4*"Operation"* on page 4-29. Verify that the Remote setpoint source (**RemSPsrc**) is set to the correct programmer. See Section 4*"Configuration"* on page 4-7.
The time left in the program reads XX:XX:XX.	Check for an endless loop in the active recipe segments. *"Building a Real-Time Program"* on page 5-16.
The program does not end when it should.	Check the last executing segment in the currently running recipe and verify that the **NextSeg** parameter is the same as the current segment number. Refer to *"Building a Real-Time Program"* on page 5-16.
The Program mode is always in "Hold".	Check to see if Guaranteed Soak is enabled. *"Configuration"* on page 5-5. If guaranteed soak is to be used, verify that the correct **Alm_Group** is selected for the current segment number. Refer to "*"Guaranteed Soak"* on pages 5-14 and 5-28, and Fig. 5–37. Verify that a digital input is not in a TRUE condition with a digital input patched to the Run/Hold source for the Programmer. Refer to*"Configuration"* on page 5-5.
The Program is running faster than it should.	Check to see if Fast Forward is enabled. Refer to *"Program Options"* on page 5-32.
An event remains on when the program runs even if it is not turned on in the segment.	This may occur with multiple programmers, where the event may be turned on in a different programmer.
Programmer does not run.	Check to see if **Abort_##** (## is programmer number) is enabled. Refer to *"Program Options"* on page 5-32.
Programmer will not start from the PROGRUN screen.	Verify that the Operator start (**OPStart**) parameter is set to **OPStrt##** (where ## is the Programmer number). Refer to *"Programmer Extended Configuration Parameters"* on page 5-33.

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Section 6

Process Alarms

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Process Alarms

Section Objectives

Section 6 provides the following information

- Description of Alarm Capabilities
- Terminology related to Dimension's Alarm capabilities
- How to configure Alarms. Configuration refers to setting up Dimension to meet your alarm requirements
- How to monitor the status of any Alarms
- Troubleshooting of Alarm configuration

Dimension Alarm Capabilities

The Dimension Industrial Process Manager has the ability to detect and act upon the following types of process alarms:

- Input High/Low Limit
- Control Loop Process Variable Limits (4 levels)
- Control Loop Deviation from Setpoint Limits (4 levels)
- Open Sensor

When one or more of these alarms is detected, Dimension may be set up to respond with one or more of the following actions:

- Alter process control loop control mode (i.e. switch from Auto/Manual)
- Alter Real-Time Programmer status (i.e. Start a new program, Hold an active program)
- Turn on a physical digital output that could turn on an alarm horn or light

Dimension also provides the ability to create a custom alarm message that may be displayed (at operator request) whenever selected alarms are detected. This feature may be used to provide the operator with instructions that should be followed when the alarm is detected.

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Terminology

This section describes Dimension terms used in this manual when configuring or monitoring process alarms.

- **Alarm Group** - Dimension has up to five Alarm Groups that may be defined for each control loop in the unit. Each group consists of HighHigh (HiHi), High (Hi), Low (Lo), and LowLow (LoLo) limits for both process variable and deviation alarms. The alarm groups are used in conjunction with the real-time programmer function to vary alarm limits based upon the segment of the programmer.
- **Alarm Message** - A unique alarm message may be defined for each control loop that will be displayed when the **Help** key is pressed from the alarm status display. This message consists of 6 lines of 16 characters each.
- **Alarm Levels** - Dimension has four different alarm levels for both the process variable and deviation alarms. They are HiHi, Hi, Lo, and LoLo. The multiple levels for high and low alarms give the user flexibility when controlling the process. For example, a Hi process variable alarm may be set at 500 °F to sound an audible alarm as a warning for the operator to check the system. A HiHi process variable alarm may also be set at 525 °F to shut the furnace down to avoid critical damage to the furnace or the parts contained in the furnace. The same logic may be used for Lo and LoLo alarms.
- **Control Input** - An analog input sensor connected to Dimension that is also patched to a PID process control loop.
- **Deviation (DV) Alarm** - Refers to a HiHi, Hi, Lo, or LoLo alarm on the deviation or difference between the control loop Process Variable (PV) and the desired or setpoint value (PV -SP). A Hi deviation alarm is detected if the PV-SP result is greater than a Hi limit value. A Lo deviation alarm is detected if the PV-SP result is less than a Lo limit value.
- **Hysteresis** - A band around an alarm limit that is used to prevent repeated alarms from occurring/clearing when the process is at or near an alarm limit. For example, if a high PV alarm limit is set at 80 °F the alarm will be detected as soon as the PV exceeds 80 °F. If a Hysteresis value of 0.0 is used, the alarm will clear whenever the PV drops below the limit. If a Hysteresis value of 2.0 is used, the alarm will not clear until the PV drops below 78 °F.
- **Input Alarm** - Refers to a Hi or Lo limit alarm on a monitored input point. A Hi Limit alarm is detected if the input exceeds an upper limit value. A Lo Limit alarm is detected if the input is less than the low limit value.
- **Latch/Unlatch** - An Latched alarm requires operator acknowledgment before it is cleared even if the condition that caused the alarm has cleared. An Unlatched alarm will clear without any user interaction as soon as the condition that caused the alarm clears.

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- **Monitor Input** - An analog input sensor connected to Dimension that is NOT being used as the process variable of a control loop.
- **Process Variable (PV) Alarm** - Refers to a HiHi, Hi, Lo, or LoLo limit alarm on a selected process control loop. Each control loop has two Hi limit values (HiHi, Hi) and two Lo limit (LoLo, Lo) values that may be independently set. A Hi limit type alarm is detected if the loop process variable (PV) exceeds a high limit value. A Low limit type alarm is detected if the loop process variable is less than the low limit value.

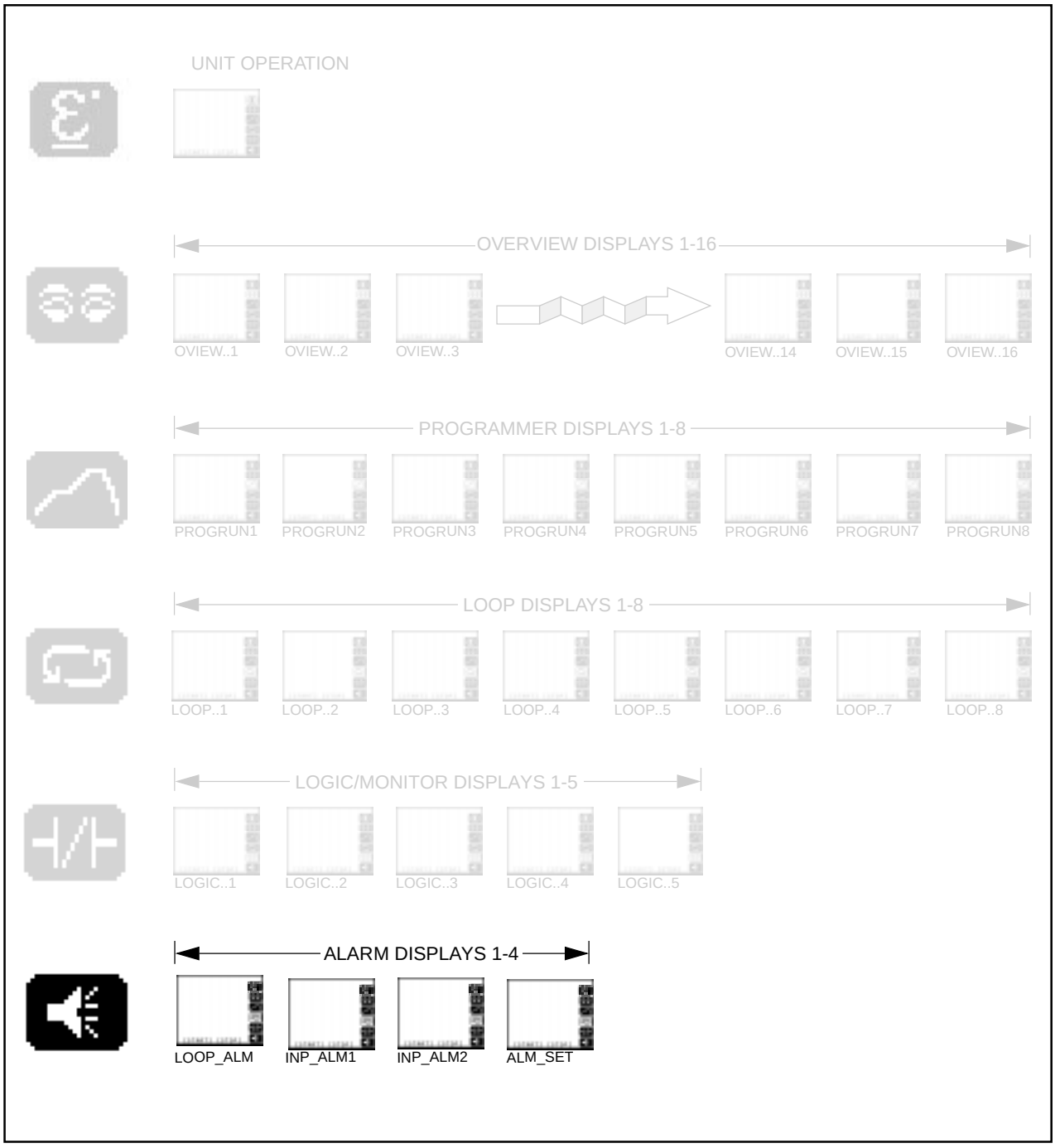
Alarm Configuration

This section describes the steps that should be followed to configure input alarm limits, loop process variable limits, and loop deviation limits. Alarms may be used along with the Dimension Logic functions to alter a digital output (e.g., an Alarm Horn) or to alter the mode of a control loop or real-time programmer. This section does NOT deal with configuring the result of alarms to provide this function. Refer to the *Section 7*, *Logic Functions*, for details on these functions.

The configuration/setup of Alarm functions in your Dimension is accomplished by accessing the Configuration side of Dimension. Fig. 6-1 and Fig. 6–2 show which Operation and Configuration screens are used for configuration of Alarm functions.

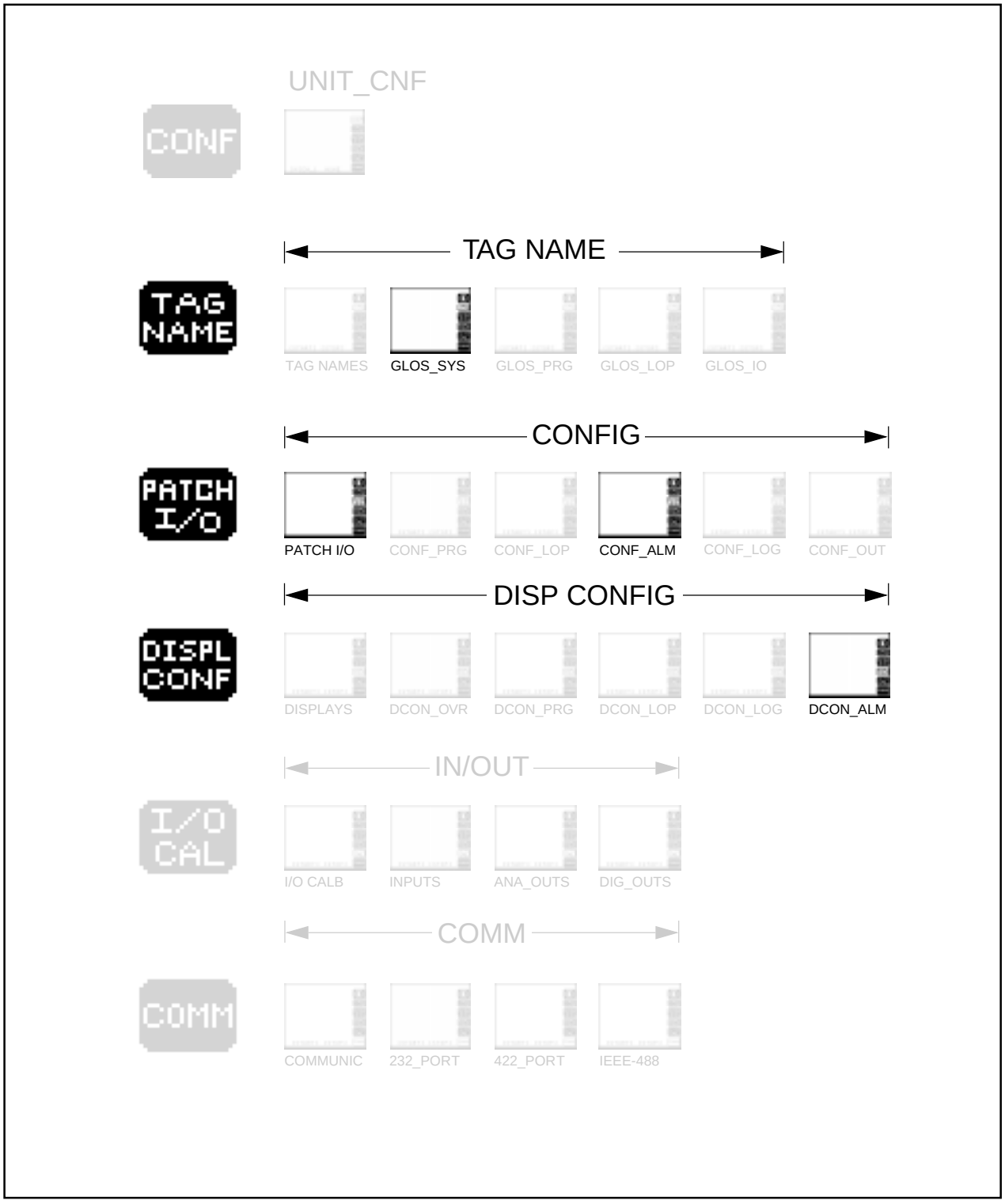
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Figure 6-1.
Map of Dimension Operations Screens Showing Associated Alarm Screens



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Figure 6–2.
Map of Dimension Configuration Screens Showing Associated Alarm Screens



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To access the ***Configuration*** side of Dimension Displays:

1. Start from the UNIT display shown in Fig. 6–3.
2. Scroll to the `Conf_Lvl` parameter and select `Basic`.
3. Select the `Configur` parameter to display the UNIT_CNF screen shown in Fig. 6–4.

Figure 6–3.(L)
Unit Display

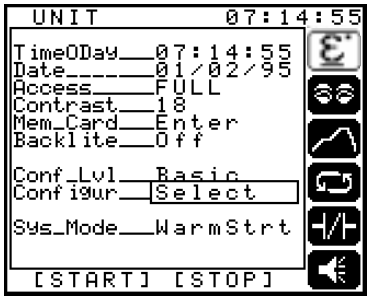


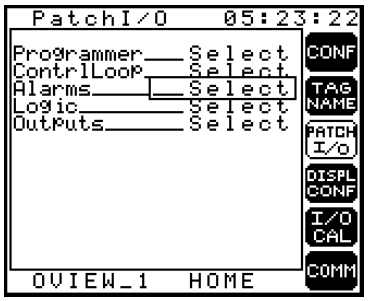
Figure 6–4. (R)
Unit Configuration Display (UNIT_CNF)





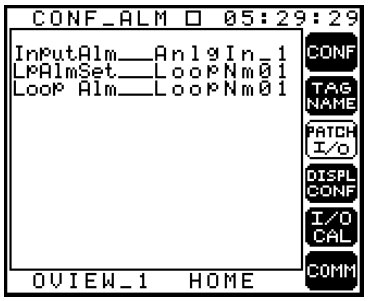
Next access the **Patch I/O** icon and select the `Alarms` parameter as shown in Fig. 6–5.

Figure 6–5.
Alarm Setup Selection



When the `Alarms` parameter has been selected, the screen shown in Fig. 6–6 displays and the actual alarm configuration may be started.

Figure 6–6.
Alarm Configuration Display (CONF_ALM)



From the CONF_ALM display shown in Fig. 6–6, choices are available for the following items:

- `InputAlm` - This parameter allows you to select the specific analog input on which to set up the alarms. When the input is selected, a window opens that allows the setting of input alarm limits, latch/unlatch status, and alarm hysteresis values.
- `LpAlmSet`- This parameter allows you to select the specific Control Loop on which to set up alarms. When the specific loop is selected a window opens that provides access to the alarm limits values for the selected loop: HiHi,Hi,Lo,LoLo process variable and deviation alarms. Each loop has up to five different alarm groups.

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- **Loop_Alm** - This parameter allows you to select the specific control loop on which to set up alarms. When the Loop is selected, a window opens that allows the setting of the Loop hysteresis and alarm latch/unlatch status.

➥ ***Note:*** *The maximum/minimum values for the alarm settings are dependent on the type of input selected and the high and low limits configured for the input. Refer to Section 4, Process Control Loops and Monitor Inputs, for additional information on these settings.*

Input Alarms

The display shown in Fig. 6–7 is opened when an analog input has been selected for configuration from the main **CONF_ALM** display. It contains the following parameters:

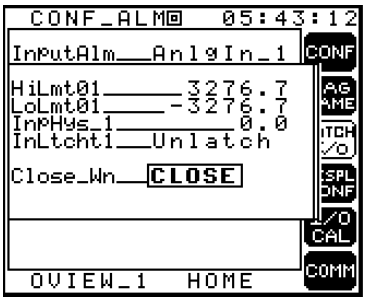


Figure 6–7. Input Alarm Configuration

- **HiLmt#** - Defines the Hi alarm limit value for the selected input. When the input **exceeds** this value an alarm will be set.
- **LoLmt#** - Defines the Lo alarm limit value for the selected input. When the input is **less** than this value an alarm will be set.
- **InpHys_#** - Defines the hysteresis band for the selected input.
- **InLtcht#** - Defines the **Latch/Unlatch** status for the selected input.

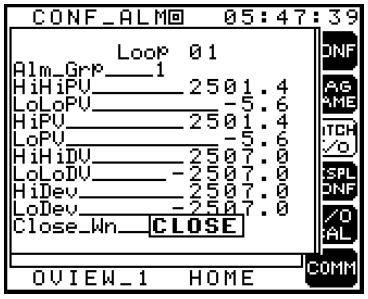
When all of the entries have been made, select **CLOSE** to return to the main **CONF_ALM** display. Select and configure any additional Input Alarms using the above steps.

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Loop Alarms

There are two setup windows for each Dimension control loop. The first window, shown in Fig. 6–8, is opened by selecting a loop from the **LpAlmSet** parameter on the **CONF_ALM** display (see Fig. 6–6). This window contains the following parameters:

Figure 6–8.
Loop Alarm Limit Configuration



- **Alm_Grp** - This parameter selects the alarm group in which to set up the limits. There are 5 groups available for each control loop.
- **HiHiPV** - This parameter is used to set the HiHi process variable limit for the selected loop/alarm group.
- **LoLoPV** - This parameter is used to set the LoLo process variable limit for the selected loop/alarm group.
- **HiPV** - This parameter is used to set the Hi process variable limit for the selected loop/alarm group.
- **LoPV** - This parameter is used to set the Lo process variable limit for the selected loop/alarm group.
- **HiHiDV** - This parameter is used to set the HiHi deviation limit for the selected loop/alarm group.
- **LoLoDV** - This parameter is used to set the LoLo deviation limit for the selected loop/alarm group.
- **HiDev** - This parameter is used to set the Hi deviation limit for the selected loop/alarm group.
- **LoDev** - This parameter is used to set the Lo deviation limit for the selected loop/alarm group.

When all of the entries have been made, select **CLOSE** to return to the main **CONF_ALM** display.

Figure 6–9.
Loop Alarm Setup



The second window available for control loop alarms is opened by selecting a loop at the **Loop Alm** parameter on the **CONF_ALM** display (see Fig. 6–6). This window, shown in Fig. 6–9, contains the following parameters:

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- `HiHiPvHy` - This parameter is used to set the HiHi and the LoLo process variable hysteresis limit for the selected loop.
- `HiPvHyst` - This parameter is used to set the Hi and the Lo Process variable hysteresis limit for the selected loop.

Note: The HiHi and Hi hysteresis and latch values are also used for the LoLo and Lo alarms.

- `HiHiDvHy` - This parameter is used to set the HiHi and the LoLo deviation hysteresis limit for the selected loop.
- `HiDvHyst` - This parameter is used to set the Hi and the Lo deviation hysteresis limit for the selected loop.
- `HiHiPvLt` - This parameter is used to set the HiHi and the LoLo process variable latch/unlatch alarm status for the selected loop.
- `HiPvLtch` - This parameter is used to set the Hi and the Lo process variable latch/unlatch alarm status for the selected loop.
- `HiHiDvLt` - This parameter is used to set the HiHi and the LoLo deviation latch/unlatch alarm status for the selected loop.
- `HiDvLtch` - This parameter is used to set the Hi and the Lo deviation latch/unlatch alarm status for the selected loop.

When all of the entries have been made, select `CLOSE` to return to the main CONF_ALM display.

Alarm Status Screen Help Message Configuration

The Alarm Help Message Entry screen is used to enter help messages that will be displayed for specific alarms when the **Help** key is pressed at the Alarm Status screen.

Enter Alarm Status screen help messages as follows:

1. Use the diamond key to move to the Display/Configure icon on the Configuration displays.
2. Select the `Alarms` parameter, (see Fig. 6–10).
3. The alarm help message window (see Fig. 6–11) will display.



Figure 6–10. (L) Displays Configuration Display



Figure 6–11. (R) Alarm Help Message Access Window (DCON_ALM)

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4. Select the loop name/number for which you wish to enter a help message.
5. The system will display a window in which you can enter a help message up to 95 characters in length (see Fig. 6–12). To do this, position the cursor where the message should begin and use the knob to select and enter message characters.



Figure 6–12..
Alarm Message Entry Window

6. When you are finished entering your message, move the cursor to the last field ("C") and press **ENTER**.

The message is now entered into memory, and will be displayed when the **Help** key is pressed when an alarm for this loop is displayed on the Alarm Status screen. Repeat this procedure to enter help messages for other loops, and note that your new configuration should be saved onto a memory card.

Alarm Status Monitoring



Dimension will alert the user to any alarm condition detected by blinking the alarm icon on the Operator Interface (the alarm icon is in the operation group of icons). Dimension may also be configured to turn on an output that may be connected to an alarm light or horn. It also provides status displays for control loop and monitor input alarm detail. These displays will show the specific alarm(s) that may be active. An example of the Loop Alarm screen is shown in Fig. 6–13. This display is accessed by moving down to the bottom (alarm) icon on the operation side of Dimension. In this example Loop #1 does not have any alarm condition present, Loop #2 has an open thermocouple sensor alarm detected, Loop #3 has a HiHi process variable alarm detected, and Loop #4 has a Lo deviation alarm detected.



Figure 6–13.
Loop Alarm Status Display

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The following list defines the alarms that may show up on this display:

- **Opensens** - If an input is defined as a thermocouple and an open sensor condition is detected.
- **Hi_Hi_PV** - If the HiHi process variable limit has been exceeded.
- **Lo_Lo_PV** - If the LoLo Process variable limit has been exceeded.
- **High__PV** - If the High process variable limit has been exceeded.
- **Low___PV** - If the Lo process variable limit has been exceeded.
- **Hi_Hi_DV** - If the HiHi deviation from setpoint limit has been exceeded.
- **Lo_Lo_DV** - If the LoLo deviation from setpoint limit has been exceeded.
- **High__DV** - If the Hi deviation from setpoint limit has been exceeded.
- **Low___DV** - If the Lo deviation from setpoint limit has been exceeded.

Note: *If multiple alarms for a single loop/input are detected, the first alarm in the list will be displayed. If the displayed condition clears, the next alarm in the list that is still active will display.*

This display is also used to acknowledge alarms. If the alarm is configured as **Latched**, it must be acknowledged by the operator and the condition corrected before the alarm will be cleared. An **Unlatched** alarm can be cleared by an operator acknowledgment or by the condition being corrected. To acknowledge an alarm, simply select the alarm using the multi-function knob and press to acknowledge.

Note: *The Alarm Limits for each group/alarm type as described in* "See *"Input Alarms" on page 6-8 and " "Loop Alarms" on page 6-9 may also be accessed from the* ***ALM_SET*** *display. This display is found by moving LEFT from the LOOP_ALM display described above.*



Figure 6–14. INP__ALM (Input Alarm) Display

The **INP_ALM** display shown in Fig. 6–14 is used to view and acknowledge input Hi and Lo limit alarms. This display is accessed by moving right from the main Loop Alarm (LOOP_ALM) display. The number of inputs listed and screens will vary depending upon the configuration of your Dimension. The display shown in Fig. 6–14 contains the status of inputs one through six. Inputs 1, 3, 5, and 6 contain no alarm condition while input 2 has a Hi input alarm and input 4 a Lo input alarm. This display is also used to acknowledge alarms as described above for loop alarms.

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Troubleshooting/Verifying Alarm Configuration

After the setup of the alarm parameters has been completed, it is important to verify the result of the configuration. The following sections describe how to check out your alarm configurations.

Input and PV Limit Alarms

Input and PV alarms are detected whenever the selected input exceeds a specified high or low limit. The best way to verify the alarm is configured properly is to simulate or vary the input until it exceeds the set alarm limit value. To do this, connect a calibration or variable input source (voltage, current, thermocouple) to the individual analog inputs and adjust the output of the source so that the input (PV) exceeds the set limit. The LOOP display, shown in Fig. 6–15, may be used to monitor the actual value (ProcVr#) of a loop input as it is adjusted using the variable source. An Overview display may also be created that can display selected Analog Inputs or Loop Process Variables as shown in Fig. 6–16.

Figure 6–15. (L) Loop Status Display



Figure 6–16. (R) User-Configured Overview Display



By adjusting your variable input source you can cause an alarm to occur. When the alarm limit has been exceeded, the *Alarm Icon* will begin to blink, indicating that an alarm has been detected. Next, view the appropriate LOOP_ALM or INP_ALM display screen to verify the alarm detected was as expected.

Note: *Refer to Section 3, Graphic Operator Interface, for more information on configuring Overview displays.*

The next step is to alter the input source to a level that should clear the alarm condition. Then verify that the alarm clears. Remember that a **Latched** alarm requires the operator to acknowledge the alarm, while **Unlatched** will clear without any operator action.

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If you set a value for hysteresis, verify the proper hysteresis action by adjusting the input below the alarm limit. The alarm should not clear until the input is below the alarm limit by the hysteresis value. (This is assuming a high limit alarm; a low limit alarm would need to be above the limit by the hysteresis value.)

Loop Deviation Alarms

Deviation alarms are detected whenever the actual process variable (PV) differs from the desired variable (setpoint, SP) by more than the set limit value. Deviation alarms are only applicable to control loops. The best way to verify the alarm is configured properly is to simulate or vary the input or the setpoint until it exceeds the set alarm limit value. This can be done from the LOOP display, shown in Fig. 6–17. From this display verify that the Setpoint Source for the selected loop is in **Operator** mode. To do this, select **Operator** from the **SptSrc##** line in Fig. 6–17. Next select the **SetPnt##** parameter and alter the setpoint until it differs from the **ProvVr##** value by more than the deviation alarm limit value set in alarm configuration. This should cause the *Alarm Icon* to blink, indicating an alarm. Next, access the LOOP_ALM display shown in Fig. 6–18. Verify that the expected Deviation alarm is displayed.

Figure 6–17. (L)
Loop Status Display



Figure 6–18. (R)
Loop Alarm Status Display



The next step is to alter the setpoint to a level that should clear the alarm condition. Then verify that the alarm clears. Remember that a **Latched** alarm requires the operator to acknowledge the alarm, while **Unlatched** will clear without any operator action.

If you set a value for hysteresis, verify that the proper hysteresis action by adjusting the deviation value below the alarm limit. The alarm should not clear until the deviation is below the alarm limit by the hysteresis value. (This is assuming a high deviation alarm, a low deviation alarm would need to be above the limit by the hysteresis value.)

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Section 7

Logic Functions

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Logic Functions

Section Objectives

Section 7 provides the following information:

- Description of Dimension logic capabilities
- Terminology related to the configuration and use of the logic capabilities
- How to configure/set up logic functions
- Checkout and Troubleshooting of the logic functions.

Definition of Logic Capabilities

The Dimension Industrial Process Manager has the capability to combine external (remote contact) and internal (Alarms, Programmer Events, Loop Status, Programmer Status) inputs to produce a logical output. This output may then be used to turn on digital outputs, change control loop or programmer functions and force control outputs off. The logic capabilities are built using basic "OR" and "AND" logic boxes.

An example of this capability is combining a digital input from an operator pushbutton switch with the control mode (Auto/Manual) of a control loop to force a digital output ON, starting a new setpoint program recipe based on an Input Alarm condition or a digital input.

The following internal operations may be performed using a combination of OR/NOR, AND/NAND functions:

- Control Loop Auto/Manual state: Auto mode is selected with a TRUE state and Manual with a FALSE state.
- Real-Time Programmer Program Start: Start is selected by a TRUE state.
- Real-Time Programmer Run/Hold state: Run is selected with a TRUE state, Hold with a FALSE state.
- Real-Time Programmer Fast Forward: Enabled by a TRUE state, Disabled by a FALSE state.
- Real-Time Programmer Abort function: Enabled by a TRUE state, Disabled by a FALSE state.

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Terminology

This section describes Dimension terms used in this manual when configuring and using Logic functions.

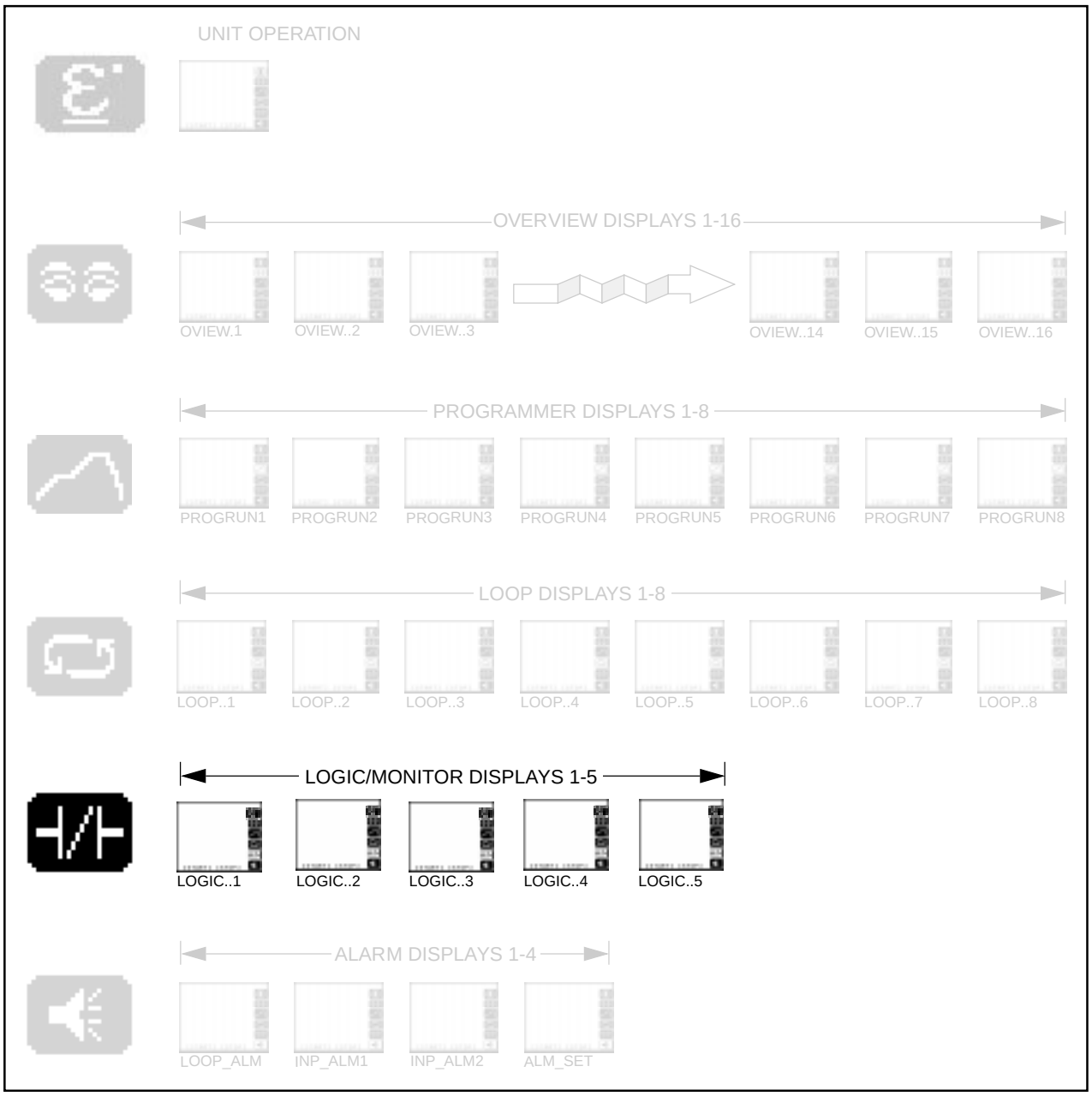
- **TRUE** - A Positive, ON or 1 logic condition.
- **FALSE** - A Negative, OFF or 0 logic condition.
- **OR logic** - A logic type that has a TRUE output whenever any of its inputs are TRUE.
- **AND logic** - A logic type that has a TRUE output only when ALL of its inputs are TRUE.
- **OR/NOR set** - A logic type that is used to combine up to 4 inputs to generate 2 outputs. In an OR/NOR set, if any of the four inputs are TRUE the OR output is TRUE. The NOR output is always the inverse (opposite) of the OR output. Dimension has four OR/NOR logic sets available.
- **AND/NAND set** - Logic type that is used to combine up to 4 inputs to generate 2 outputs. In an AND/NAND set, ALL four inputs must be TRUE to cause the AND output to be TRUE. The NAND output is always the inverse (opposite) of the AND output. Dimension has four AND/NAND logic sets available.
- **Loop#OFF** - A logic set type that uses OR logic to combine four inputs into a single output. The output of the set is tied to a specific control loop. If the output is TRUE, the control loop's control output will be forced OFF.
- **OUTset#** - A function block that uses OR logic that can be used to tie 4 inputs together. If any of the inputs are TRUE the output of the OUTset will be TRUE. The output of the OUTset may be tied to a physical output (Analog or Digital).
- **Remote Contact Input** - An On/Off signal obtained from an 8781 Digital Input/Output Expansion Card connected to the Dimension. Up to 16 inputs may be read from a connected 8781 and used within logic functions.
- **Remote Contact Output** - An On/Off signal sent to an 8781 Digital Input/Output Expansion Card connected to the Dimension. Sixteen outputs may be written to connected 8781 cards and may output from logic functions.
- **Invert** - An action that causes a TRUE (1) input to be FALSE (0) and a FALSE (0) input to be TRUE (1).
- **Internal Logic Point** - The result of a Dimension logic operation that is used to alter the status or function of the instrument but is not necessarily tied to an external output point.

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Logic Configuration and Use

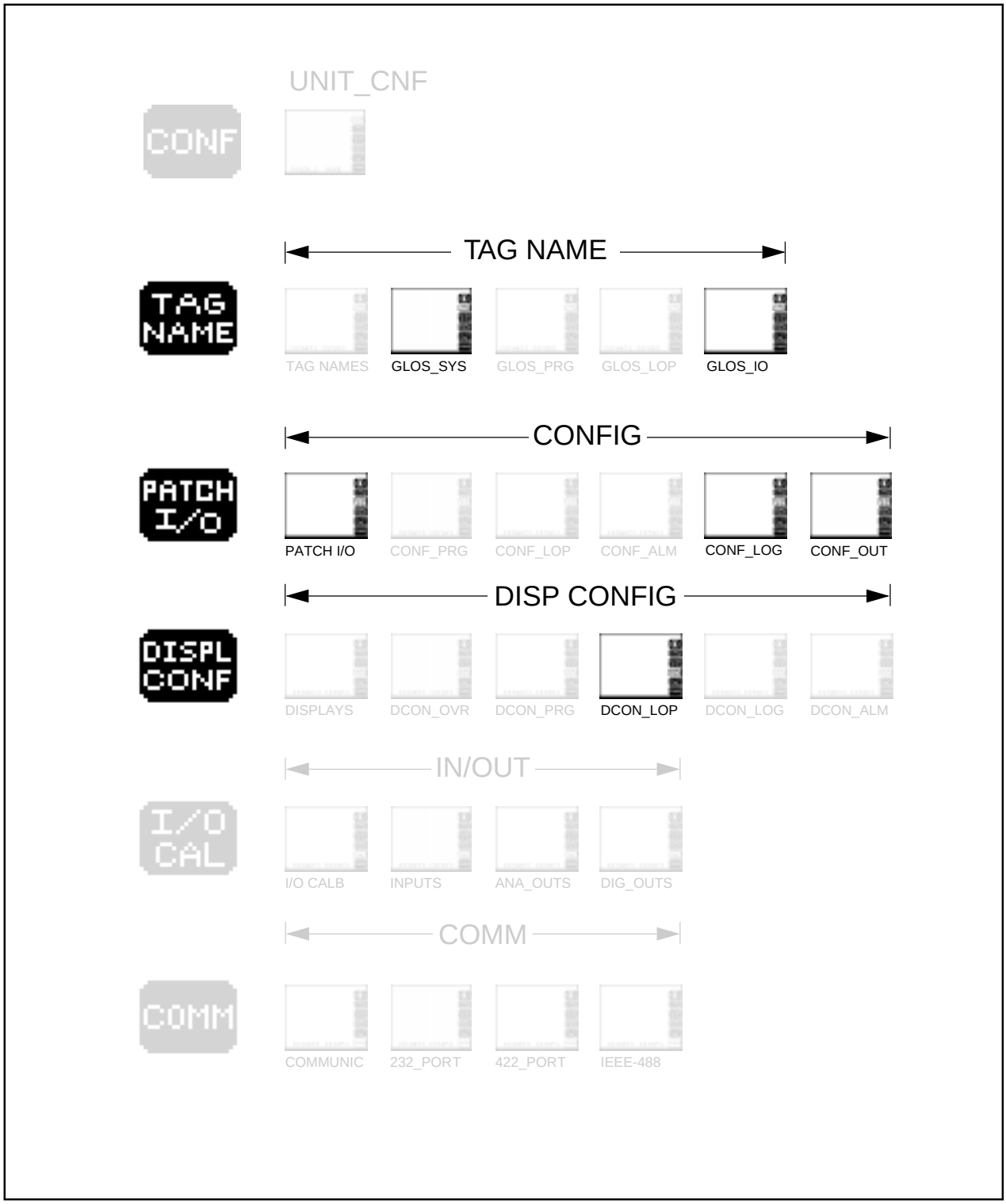
The configuration/set up of logic functions in your Dimension is accomplished by accessing the Configuration side of Dimension. Fig. 7-1 and Fig. 7–2 show which Operation and Configuration screens are used for configuration of Logic functions.

Figure 7-1.
Map of Dimension Operations Screens Showing Associated Logic Screens



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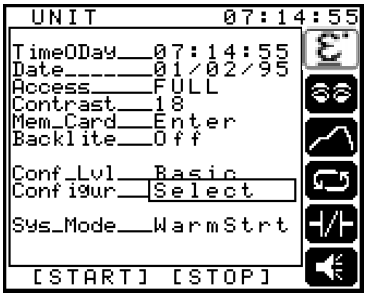
Figure 7–2.
Map of Dimension Configuration Screens Showing Associated Logic Screens



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To access the ***Configuration*** side of Dimension displays:

Figure 7–3.
Unit Display



1. Select the UNIT display.
2. Move the cursor down to the **Conf_Lvl** parameter and select **Basic**.
3. Select the **Configur** parameter as shown in Fig. 7–3.

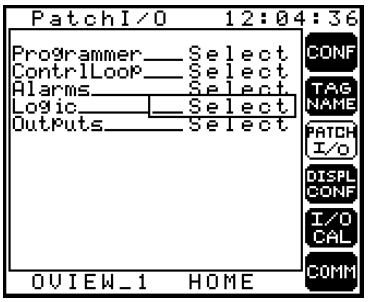
Figure 7–4.
Configuration Displays (Unit_CNF)



This will enable the configuration functions of Dimension as shown in Fig. 7–4. Use the diamond key to access the PATCH I/O icon to access the display shown in Fig. 7–5.



Figure 7–5.
Patch I/O Display– Select Logic Parameter



Select the **Logic** function as shown. Once **Logic** has been selected, the screen shown in Fig. 7–6 displays and the actual logic configuration of Dimension may be started.

Figure 7–6.
Logic Configuration (CONF_LOG) Display



The display shown in Fig. 7–6 is used to select the desired logic type to set up for your application. The types available are as follows:

- **Con_Out** - Contact Output assignment sets that will allow up to four inputs to be OR'd together. The result of this logic function may then be patched to a physical analog or digital output. This provides a mechanism to control a single output based on multiple inputs. There are four contact output sets available for use: **OUTset01-04**.

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- **Logic** - Logic assignment sets that will allow up to four alarms, digital inputs, programmer events or status points to be combined together to create an internal logic point. This internal point may then be tied to another logic set type or used to control an internal function such as control loop mode, or programmer status. There are four OR type logic sets available, **OR/NOR01-04**; and four AND type sets, **AND/NAND01-04**.
- **Out_Off** - Control Loop Output Off assignment sets that will allow up to four inputs to be OR'd together to force the control outputs for a selected control loop to be OFF. The number of output off sets available is dependent upon the number of control loops in your Dimension.

The assignment of the inputs to the specific logic sets is accomplished by selecting the desired set (Con_Out, Logic, Out_Off) to be configured. This will open a window as shown in Fig. 7–7 that contains selection lines for each input of the selected set, **FirstAlm** through **ForthAlm**. The default state for unassigned inputs is a ***False*** input as shown in Fig. 7–7.



Figure 7–7.
Logic Set Configuration Display

Use the knob to select an input to assign and the selection input list will be provided. Turn the knob to scroll through the list of choices. Choices are available as follows:

- **False** - This is the default selection for all logic set inputs and provides a "0" type input state. This selection should be made for all unused inputs of an "OR" type set to avoid the logic output always being *true*.
- **True** - This selection should be made whenever a selected input is to be forced to an ON or '1' state at all times. This selection should be made for all unused inputs of an "AND" type set to avoid the logic output always being *false*.
- **Glob_Alm** - This should be selected if the desired input is to be TRUE whenever ***any alarm*** in the Dimension is detected.
- **In_Alarm** - This should be selected if the desired input is to be TRUE whenever ***any input alarm*** in the Dimension is detected.
- **PV_Alarm** - This should be selected if the desired input is to be TRUE whenever ***any Process Variable limit alarm*** in the Dimension is detected.
- **DV_Alarm** - This should be selected if the desired input is to be TRUE whenever ***any Process Variable Deviation alarm*** in the Dimension is detected.
- **Opensens** - This should be selected if the desired input is to be TRUE whenever ***any Open Sensor (thermocouple) alarm*** in the Dimension is detected.

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- **LP#Alarm** - This should be selected if the desired input is to be TRUE whenever any l***oop alarm*** is detected on the selected loop #.
- **In#_High,Low** - This should be selected if the desired input is to be TRUE whenever a ***High or Low Input limit alarm*** is exceeded for the selected input #.
- **PV#_HiHi,High,Low,LoLo** - This should be selected if the desired input is to be TRUE whenever a specific ***Loop Process Variable limit alarm*** is detected for the selected loop #.
- **DV#_HiHi,High,Low,LoLo** - This should be selected if the desired input is to be TRUE whenever a specific ***Loop Deviation from Setpoint limit alarm*** is detected for the selected loop #.
- **OSAlm_#** - This should be selected if the desired input is to be TRUE whenever an opens sensor alarm is detected on the selected input #.
- **RemCI_#** - This should be selected if the desired input is to be TRUE whenever the selected Remote Contact Input # is in the "ON" or active state.
- **OperAM_#** - This should be selected if the desired input is to be TRUE whenever the selected control loop is in ***Automatic*** mode. The input will be FALSE whenever the selected loop is in ***Manual*** mode.
- **OperRH_#** - This should be selected if the desired input is to be TRUE whenever the selected Real-Time Programmer is in ***Run*** mode or is at **PG_END** mode. The input will be FALSE if the programmer is in Hold mode.
- **OPStrt_#** This should be selected if the desired input is to be TRUE whenever the selected real-time programmer is ***Started***. *Note that this input is held TRUE only* ***momentarily*** *(1 second) while the programmer is being started*!
- **NORset#** - This should be selected if the desired input is to be TRUE whenever the selected OR/NORset # **NOR** output is true. *Note that the OR/NORset# selected has two outputs, a OR output and a NOR (inverse of OR) output that is controlled by its four inputs*.
- **OR_set#** - This should be selected if the desired input is to be TRUE whenever the selected OR/NORset # **OR** output is true. *Note that the OR/NORset# selected has two outputs, a OR output and a NOR (inverse of OR) output that is controlled by its four inputs*.
- **NANDset#** - This should be selected if the desired input is to be TRUE whenever the selected ANDNANDset # **NAND** output is true. *Note that the ANDNANDset# selected has two outputs, an AND output and a NAND (inverse of AND) output that is controlled by its four inputs*.
- **ANDset#** - This should be selected if the desired input is to be TRUE whenever the selected ANDNANDset # AND output is true. *Note that the ANDNANDset# selected has two outputs, a AND output and a NAND (inverse of AND) output that is controlled by its four inputs*.

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- **CLCLogic** - This should be selected if the desired input is to be TRUE whenever a special condition is detected by a customer special request program (custom feature) that is contained in Dimension. For most applications, this will not be used.
- **Event_#** - This should be selected if the desired input is to be TRUE whenever the selected programmer event # is turned on.

When the appropriate entry has been made for each alarm, select **CLOSE** to return to the CONF_LOG display.

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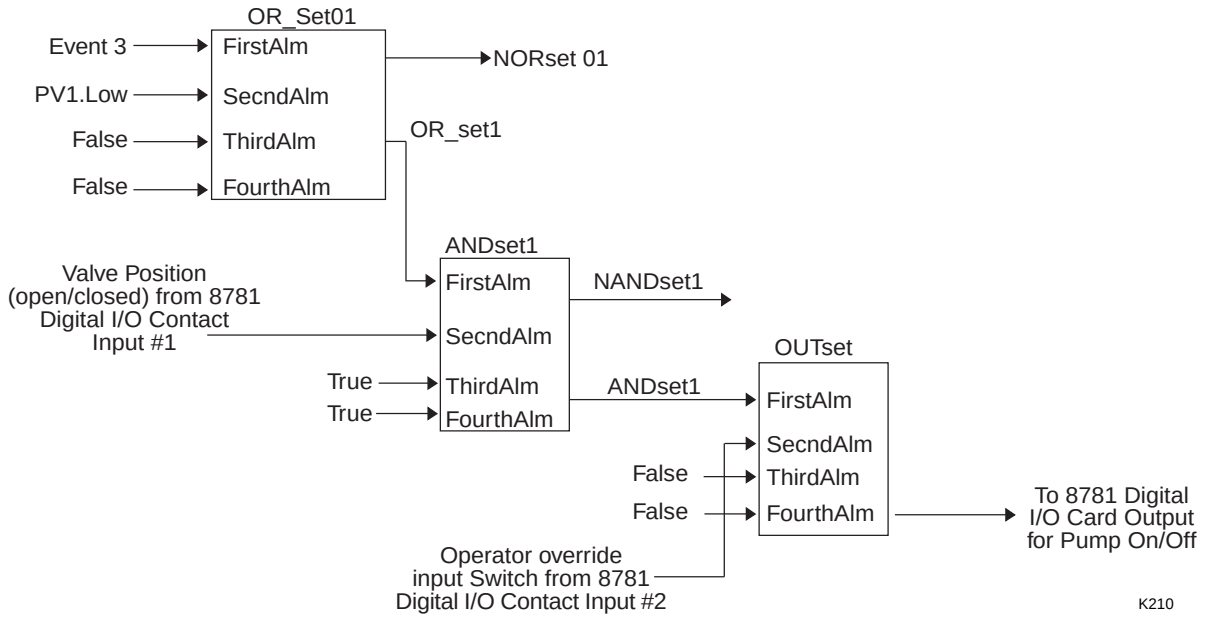
Practical Examples of Dimension Logic Functions

This section describes some common applications of the Logic capabilities that are available in Dimension. Included in this section will be examples of the setup, display, checkout, and troubleshooting of the example's function.

Example #1 - Pump Control

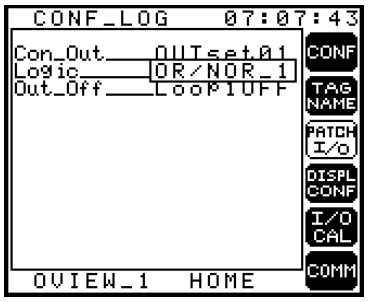
This example will show how the Dimension can be set up to turn a pump on or off based upon the position of a valve, a temperature sensor, a programmer event and an override switch. We will assume that during normal operation the pump should be allowed to turn on only if the valve is in the open position and either the programmer event is on or a low temperature limit is exceeded. For maintenance functions, an operator override switch may be used turn the pump on/off at any time. This is accomplished in Dimension using an OR_Set, an ANDSet, and an OUTSet, and can be graphically described as shown in Fig. 7–8.

Figure 7–8.
Pump Control Logic



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Figure 7–9.
Logic Configuration Selection Display



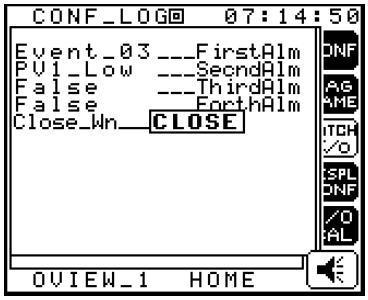
The first step in setting up the pump control is to define the inputs to the OR_Set. To do this, position the cursor on the **Logic** parameter on the CONF_LOG display (see Fig. 7–9) and press **ENTER**.

Figure 7–10.
Logic Set Configuration Display



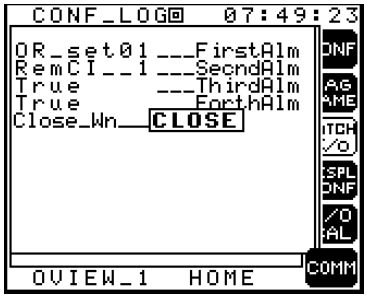
Select the **OR/NOR_1** logic set and press **ENTER** to open the configuration window shown in Fig. 7–10.

Figure 7–11.
OR/NOR_1 Set Configuration Display for Pump Control Example



Referring to the drawing in Fig. 7–8, we will define the inputs to the **OR_Set**. Assign **Event_03** to the **FirstAlm** parameter, select **PV1_Low** as the **SecndAlm** parameter, and **False** for the **Third** and **ForthAlm's** (see Fig. 7–11). Then select **CLOSE** to finish this **Or_Set** configuration and return to the CONF_LOG display. Next select the **ANDNAND1** logic set from the **Logic** parameter to open the window as shown in Fig. 7–10.

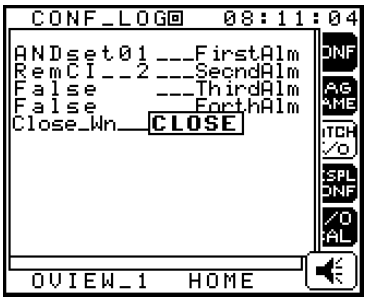
Figure 7–12.
ANDNAND1 Set Configuration Display for Pump Control Example



Select **OR_set01** for the **FirstAlm** parameter, **RemCl__2** for the **SecndAlm** parameter and **True** for the **Third** and **ForthAlm** parameters. Remember that all input parameters for an AND set must be TRUE for the output of the set to be true; thus the need to default the third and fourth alarms to True (see Fig. 7–12). Next select **CLOSE** to complete the ANDset portion of the configuration and return to the display shown in Fig. 7–9.

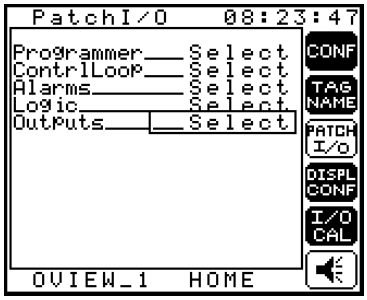
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Figure 7–13.
OutSet01 Configuration Display for Pump Control Example



Select the **OUTSet01** parameter from the **Con_Out** line to open the window shown in Fig. 7–10. Assign **ANDset01** to the **FirstAlm** and **RemCI__2** to the **SecndAlm** and **False** to the **Third** and **ForthAlm** parameters (see Fig. 7–13). Select **CLOSE** to complete the Outset portion of the configuration.

Figure 7–14.
Patch I/O Display



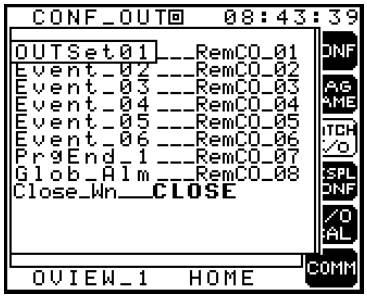
Next press the **Home** key to return to the main **PatchI/O** display as shown in Fig. 7–14. From this display select the **Outputs** parameter to begin the physical Output patching process. Once **Outputs** is selected, the screen shown in Fig. 7–15 displays and the patching of the **OutSet** to a remote digital output may be completed.

Figure 7–15.
Remote Digital Output Configuration Display



Selecting the desired Remote Contact Output Board will highlight the selection, and clicking the knob a second time will cause a window as shown in Fig. 7–16 to display.

Figure 7–16.
Remote Digital Output Configuration Display for Pump Control Example



From this window select the desired output number to which to assign the pump control output. For this example select **OUTSet01** as the source for **RemCO_01** to patch the outset to the physical output. Next select **CLOSE** to complete the configuration process.

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The next step is to verify the actual operation of the logic sequence configured. This may be done by monitoring the status of the **Events**, the **Remote Digital Inputs**, and the **Remote Digital Outputs**. The status of these items may be displayed on a **LOGIC** display as shown in Fig. 7–17. Logic displays are accessible from the operation group of icons by highlighting the Logic icon. This display was set up to show the status of remote contact output #1, named `PumpStat`, remote contact input #1, named `ValvePos`, remote contact input #2, named `ManPCtrl`, and programmer `Event__3`.

Note: Refer to Section 3 Graphic Operator Interface, for instructions on configuring displays and setting up custom tagnames for inputs/outputs as shown in this example

This display can now be monitored as the inputs, events, and alarm limits are altered. The `PumpStat` should display ON whenever the `ManPCtrl` input is ON or if the `ValvePos` is Open and either `Event__3` is ON or **Loop 1 Low PV** alarm is active. The `LOOP_ALM` display, shown in Fig. 7–18, may be viewed to monitor the status of the Loop Low limit alarm input.



Figure 7–17. (L) Logic Status Display for Pump Control Example



Figure 7–18. (R) Loop Alarm Status Display for Pump Control Example

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Example #2 - Programmer Run/Hold Status

This example will show how the Run/Hold state of the real-time programmer in Dimension may be altered using an Operator Interface function as well as a remote contact input. This is accomplished using a NORset, an ANDset, and a programmer configuration selection and is graphically shown in Fig. 7–19.

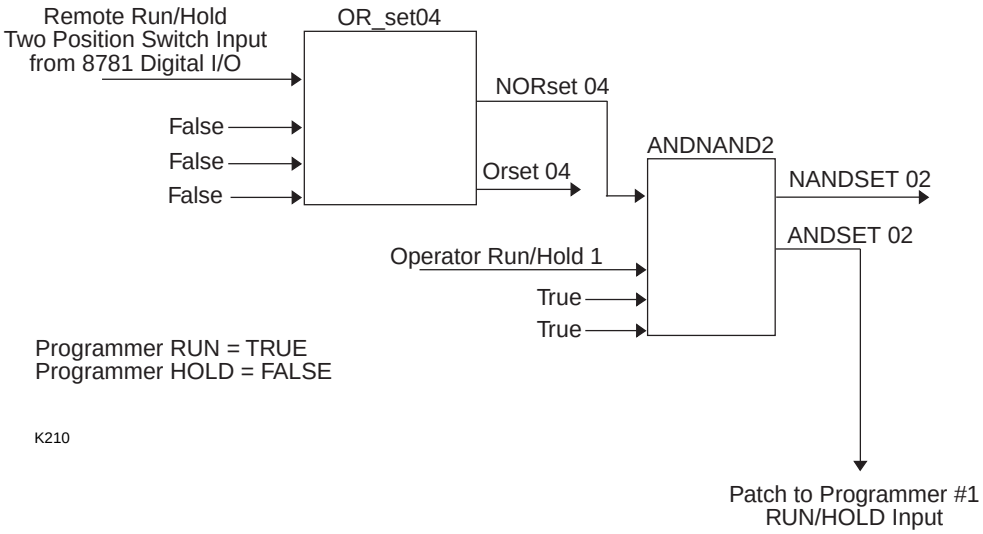


Figure 7–19.
Programmer Status Logic

The first step in the **configuration** process is to access the configuration displays and the **PATCH I/O** icon as described earlier in this section. From the **PATCH I/O** icon, select the **Programmer** configuration parameter to access the display shown in Fig. 7–20.

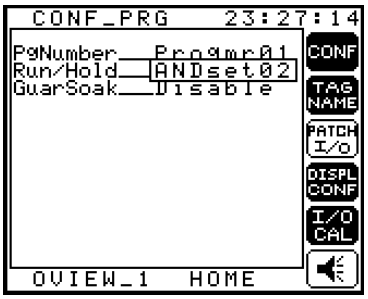


Figure 7–20.
Configure Programmer Display

From this display access the **Run/Hold** parameter and patch **ANDset02** as the source for this function. Next press the **HOME** key to return to the main Patch I/O display and select the **Logic** configuration parameter to access the display shown in Fig. 7–21.

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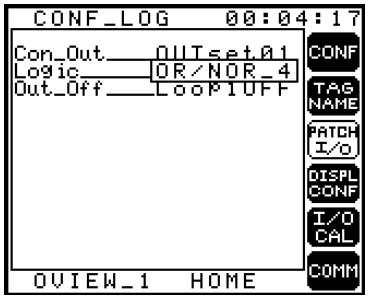


Figure 7–21.
Logic Configuration Display

From this display select the **OR/NOR** set to be configured from the **Logic** parameter. This will open a window as shown in Fig. 7–22 that will allow you to assign **RemCl__2** to the **FirstAlm** and **False** to the rest of the inputs. Select **CLOSE** to complete the configuration of the OR/NOR set. Next select the **ANDNAND2** from the **Logic** parameter for configuration.

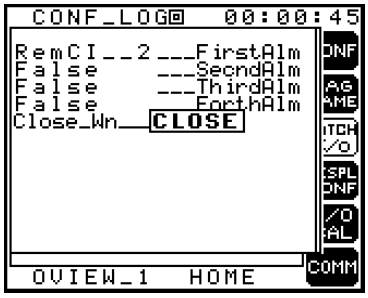


Figure 7–22.
OR_Set04 Configuration Display for the Programmer Example

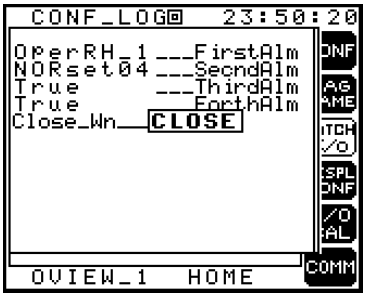


Figure 7–23.
ANDNAND2 Set Configuration Display for Programmer Example

After selecting **ANDNAND2**, the window shown in Fig. 7–23 opens. Select **OperRH_1** for the **FirstAlm**, **NORSet04** for the **SecondAlm**, and **True** for the **Third** and **ForthAlms**. Select **CLOSE** to complete the configuration.

__Note:__ The __NOR__ output was selected to invert the Remote Run/Hold input switch.

The next step is to verify the operation of the configuration just completed. This can be done by starting a program (refer to the Section 5, Section 5 *Real-Time Programmer*, for details on programmer operation/configuration), monitoring the **PgMode** parameter and switching the Status from Run to HoldOper and back using the Operator Interface. Next toggle the switch input and view the programmer status. The On/Off status of the remote Run/Hold switch may also be viewed from a Logic display.

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Troubleshooting Logic Functions

When using Dimension logic functions to control internal functions or to control digital outputs, the following tips may assist in the checkout and troubleshooting of the configured functions:

- Configure a diagnostic LOGIC display to show the state of any related digital inputs, outputs and programmer events that are part of the logic configuration.
- Isolate and verify individual OR/NOR#, AND/NAND# outputs by temporarily patching them to a Remote Digital Output using an Outset. This will allow you to view the TRUE/FALSE output state of each part of your logic configuration before they are all combined. If each part works as expected, the combined result should also function properly.

Table 7–1. Troubleshooting Logic Functions

Symptom	Action
ORset/NORset output does not activate function.	If any input to an OR function is TRUE the output will be TRUE. Verify that unused inputs to an OR function are set to FALSE. Verify that the correct output, either ORset or NORset is patched to the function.
ANDSet/NANDset output does activate function	All inputs to an AND function must be TRUE for the output to be TRUE. Verify that unused input to an AND function are set to TRUE. Verify that the correct output, either ANDset or NANDset is patched to the function.

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Appendix A

Graphic Operator Interface Terminology

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Graphic Operator Interface Terminology

Abort – Programmer Abort 

Use: One of the possible actions that can be selected when defining a macro key or warm start functions.

Selections: Macroky# or WmStFunc; NotActvd or Activatd

Remarks: Selecting Activatd will cause the programmer identified by `LpPgNmbr` to Abort when the macro key is pressed or warm start occurs. Selecting NotActvd disables this action.

Abort_## – Programmer Abort Enable 

Use: This field will either place the associated programmer (##) in the abort mode or remove it from the abort mode when AbortSrc is set to OprAbrtSrc.

Selections: PROGRUN# screen; PgOption; Enable/Disable

Remarks: Placing the programmer in abort mode causes the programmer to save the current state of the programmer and start a new program run at Segment 0. The Programmer will remain in the Abort Mode until the Abort is disabled. When the Abort is disabled, the programmer will restore the previous state it was in and continue running as if nothing happened.

AbortSrc – Programmer Abort Source 

Use: This field is used to select the source for the program abort initiation.

Selections: CONF_PRG screen; OprAbrtSrc1–OprAbrtSrc8, LocIn__1–LocIn__2, RemCI 1–16, NANDSet 1–4, ANDSet 1–4, OR_Set 1–4, NORSet 1–4, CLC_IN 1–2

Remarks: The OprAbrt1 - OprAbrt8 selections correspond with the initiation of an Abort through the Operator Interface. The selection of OprAbrt1 would place the programmer in the Abort Mode when the Abort_01 field was selected to Enable. NAND/AND/OR/NOR selections correspond with the initiation of an abort through a logic function. Thus an abort could be started when an alarm condition occurred or an Opensensor. A latched alarm would cause the programmer to remain in the Abort Mode until that alarm was acknowledged. An unlatched alarm would remove the programmer from abort as soon as the alarm condition cleared. RemCI1 -

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RemCI16 selections correspond with the initiation of an abort through a contact input. This would allow an abort to start from a remote location. If all four programmers abort sources were selected to be the same, then all four programmers would go into the abort mode when the appropriate Abort source became true.

ACC – Security Access Level

Use: To display current access level.

Selection: None

Remarks: This entry will display the current access level. If the correct access code is entered for FULL or LIMITED access the status message 'Access Granted' will be displayed at the bottom of the window with this entry being updated to reflect the new level (see Access).

Accept – Accept Auto-tuning PID Parameters

Use: To accept the calculated PID parameters and transfer them into use for the control loop.

Selections: LOOP_# screen; SetUp; AutoTune; Yes or No

Remarks: True will transfer the calculated PID parameters. The appropriate PID Group needs to be selected.

Access – Security Access Level

Use: To display the current access level and to enter a passcode to change the current access level.

Selection: UNIT screen; opens a window

Remarks: FULL allows complete access to all parameters. LIMITED allows access to all operating parameters and does not allow access to configuration parameters. NONE allows access to view all operating parameters but does allow access to change them or allow access to configuration parameters.

ALARM – Alarm Display Screen Titles

Use: To select the Alarm screen titles for change.

Selections: GLOS_SYS screen; LOOP_ALM, INP_ALM1, INP_ALM2, ALM_SET; 8 characters

Remarks: Select up to eight characters to form a new name.

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Alarms – Alarms  

Use: At Patch I/O screen, to open a window in which alarm parameters can be configured. At Displays screen, to open a window in which loop alarm messages can be configured for loops 1-8.

Selections: None

Remarks: None

Alarms## – Alarm Status 

Use: To display alarm status.

Selections: LOOP_ALM screen; Alarm acknowledged by selecting "Alarms##" and pressing knob.

Remarks: An operator message may be displayed by pressing the "?" key when an alarm field is selected. (See Alm_Mess)

Alm_Group – Alarm Group  

Use: At PROGRUN# screen, to select the alarm group that will be active in the currently accessed segment. At GLOS_PRG screen, to change alarm group tag name.

Selections: PROGRUN# screen; PgBuild. GLOS_PRG screen; 8 characters

Remarks: At PROGRUN# screen, each alarm group may contain a different set of loop alarm settings (see Loop_Alm). At GLOS_PRG screen, select up to eight characters to form a new name.

Alm_Grp# – Alarm Group 

Use: To display the currently active alarm group.

Selections: PROGRUN# screen

Remarks: One of the five alarm settings groups is active at all times. The programmer selects which group is active.

Alm_Mess – Alarm Message 

Use: To display and/or enter a user entered alarm help message.

Selections: DCON_ALM screen; LOOP__1 to LOOP__8 (opens a window)

Remarks: Enter an alarm help message using the knob. Press the knob and move the cursor block to the large 'C' to close this window. The help message can be displayed on the LOOP_ALM status screen when the given alarm is selected and the **Help** key is pressed.

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Anal_Ins – Analog Input Tag Names 

Use: To select analog input tag names for change.

Selection: GLOS_IO screen; AnlgIn01 through AnlgIn16; 8 characters

Remarks: Select up to eight characters to form a new name.

Analg_Sel – Analog Card# Select 

Use: Select the analog card to configure control outputs.

Selections: CONF_OUT screen; AnlgCrd1 through AnlgCrd3

Remarks: Opens a window to select the control output to drive a specific I/O port. Choices are RevOutL#, DirOutL#, SPxmitL#, Retrans#, Event_##, OUTSet##, DevOutL#

AnalOuts – Analog Output Tag Names 

Use: To select analog output tag names for change.

Selection: GLOS_I/O screen; AN_OUT_1 through AN_OUT_12; 8 characters

Remarks: Select up to eight characters to form a new name.

AnalogIns – Analog Inputs 

Use: To access analog inputs for configuration.

Selection: I/O - Calb screen; AnalogIns; Select

Remarks: Opens a window to configure analog inputs.

AnalogOuts – Analog Outputs 

Use: To access analog outputs for configuration.

Selection: I/O - Calb screen; AnalogOuts; Select

Remarks: Opens a window to configure analog outputs.

AnaOutpt – Analog Output 

Use: Selects an analog output for configuration or calibration.

Selections: ANA_OUTS screen; AN_OUT_1 to AN_OUT_12

Remarks: Analog outputs 1–4 are found on the first analog I/O card. Analog outputs 5–8 are found on the second analog I/O card and analog outputs 9–12 are found on the third analog I/O card. See Section 4.

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AnlgIn## – Analog Input 

Use: Displays analog input.

Selection: INPUTS screen; SelcFunc_Calibrat

Remarks: Displays current analog input value.

AT_ErrNo – Auto Tune Error Number 

Use: To display the error number when an auto tuning error occurs.

Selection: None

Remarks:
Error 600: Loop is not in manual.
Error 604: PV not responding to output change.
Error 605: Process not moving fast enough, increase sample rate.
Error 606: Manual output changed during tuning process.
Error 607: System error.
Error 608: Buffer full
Error 609: User Abort

Auto/Man – Control Loop Automatic/Manual 

Use: This field is to select how the loop will be switched from Auto to Manual mode.

Selections: CONF_LOOP screen; OperAM_#, RemCI_##, LocCI#_#, OR_Set##, NORSet##, ANDSet##, NANDSet#, CLC_IN_#

Remarks: The OperAM_1–OperAM_8 selections correspond with the switching from Auto to Manual (or vise versa) through the Operator Interface. The selection of OperAM_1 would place the loop in Auto when LpMode01 was selected to Auto and the loop would go into Manual when the LpMode01 was selected to Manual. LpMode01 can be found under the LOOP__1 screen in the LpMode01 window. AND/OR/NOR/NAND selections correspond with the switching from auto to manual (or vise versa) through a logic function. Thus the loop mode could be switched when an alarm condition occurred or an Open Sensor. A latched alarm would cause the loop to remain in Manual until that alarm was acknowledged. An unlatched alarm would revert to the auto mode as soon as the alarm condition went away. RemCI 01–16 selections correspond with the switching from auto to manual (or vise versa) through a contact input. This would allow the loop status to be switched from a remote location. If it is desired to have the contact input logic inverted, use the contact inputs through the logic sets. If all four loops have their LpModes selected to be the same source, then all four loops would switch form Auto to Manual at the same time by one action.

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AutoTune – Auto Tuning 

Use: To initiate Auto Tuning of control loop PID parameters.

Selections: Loop_# screen; LpMode_#; SetParms; Start, Abort

Remarks: Set the Start to initiate auto tuning. The control loop must be in Manual and the process should be stable. Change to Abort to stop.

Backlite – Display Back Lighting 

Use: To set the state of the backlight.

Selection: UNIT screen; opens a window

Remarks: The present state, on or off, of the backlight is shown. The window opens to allow the backlight to be turned on, off or cycled on and off. If Cycle is selected at the Set parameter the backlighting is turned on and off at the time entered for On and Off. Time is entered in 24 hour Hours:Minutes:Seconds (HH:MM:SS) format.

BasSta_# – Basic String Variable 

Use: For use with special control and monitoring programs.

Selection: OVIEW_# screen; Character entry

Remarks: None

BasVar_# – Basic Numeric Variable 

Use: For use with special control and monitoring programs.

Selection: OVIEW_# screen; Numeric entry

Remarks: None

BaudRate – Communications Baud Rate 

Use: To select the communications baud rate for this unit.

Selections: 232_PORT and 422_PORT screens; 300, 1200, 2400, 4800, 9600 or 19200

Remarks: Select the communications baud rate to match your computer. The two most common selections are 9600 or 19200.

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BitsChar – Bits per Character 

Use: To select the number of data bits in a character.

Selections: 232_PORT and 422_PORT screens; 7 or 8

Remarks: Select to match your computer. The most common selection is 8 bits per character.

Blend_## – Cascade Blend 

Use: To apply a blending factor to the cascaded setpoint.

Selection: OVIEW_# screen; Numeric entry

Remarks: This parameter is only used if cascade control is selected (see RemSPsrc) and cascade blending is desired. The formula used is [(Primary control loop output * Ratio##) + (Primary control loop setpoint * Blend_##)] / Scale_## = Secondary control loop setpoint.

Bump – AutoTune Output Bump 

Use: Sets the amount the output will be "bumped" or changed during the tuning process.

Selections: Loop_# screen; SetUp; AutoTune; Numeric

Remarks: None

CalcGain – Calculated Gain 

Use: To display the PID Gain calculated by auto tuning.

Selection: None

Remarks: These values are only displayed after auto-tune is complete. If the operator wishes to accept these values, YES is entered in the Accept field of the auto-tune screen.

CalcRate – Calculated Rate 

Use: To display the PID Rate calculated by auto tuning.

Selection: None

Remarks: These values are only displayed after auto-tune is complete. If the operator wishes to accept these values, YES is entered in the Accept field of the auto-tune screen.

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CalcRST – Calculated Reset

Use: To display the PID Reset calculated by auto tuning.

Selection: None

Remarks: These values are only displayed after auto-tune is complete. If the operator wishes to accept these values, YES is entered in the Accept field of the auto-tune screen.

CC_Diag – Control Cage Diagnostics

Use: To check the status of the control cage boards.

Selection: Diagnost; Opens a window.

Remarks: This window is informational only, it displays the current software level for the CPU and Analog boards in the analop I/O. If the boards are not found, 'NotFound' will be displayed. If the boards have a failure, the error number will be displayed.

Chng_Lvl – Change Access Level

Use: To change the access level from a higher level to a lower level.

Selections: If current Access = FULL, the FULL, LIMITED or NONE is selectable.
If current Access = LIMITED, then LIMITED or NONE is selectable.
If current Access = NONE, then this entry is not selectable.

Remarks: If LIMITED is selected, then the passcode for FULL access is blanked from the display. If NONE is selected, then both the FULL and LIMITED access passcodes are blanked from the display. In order to restore a higher access level it is necessary to enter the correct passcode by selecting 'Access' on the UNIT screen. All parameters on the UNIT_CNF side require an access level of FULL to modify. All parameters on the operating UNIT side require a level of LIMITED to modify. Only the Macro Keys and 'Access' selection are selectable with an access level of NONE. An access level of FULL allows any parameter to be modified.

CLCstart – Memory Card CLC Custom Features File Type

Use: To read, write or delete a CLC file type.

Selection: UNIT screen; Mem_Card; FILE

Remarks: See FILE

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CldJncEnbl – Cold Junction Enable 

Use: Enables or disables cold junction compensation.

Selection: INPUTS screen; SelcFunc_Calibrat

Remarks: Usually set to enable for thermocouple inputs.

CldJncErr – Cold Junction Error 

Use: Sets the cold junction error for the input.

Selection: INPUTS screen; SelcFunc_Calibrat

Remarks: None

Cntl_Act – Control Loop Control Action 

Use: To select the type of control action for the control loop.

Selections: CONF_LOP screen; None, Reverse, Direct or Bimodal.

Remarks: This field will open a window to allow selection of control action. None. Selects no control action. Control loop is not used. **Reverse**. Selects reverse acting control. Reverse acting control is used for processes where when the process variable increases the output signal needs to decrease to maintain control. Most heating processes use reverse acting control. **Direct**. Selects direct acting control. Direct acting control is used for processes where when the process variable increases the output signal needs to increase to maintain control. Most cooling processes use direct acting control. **Bimodal**. Bimodal control is used two control outputs are utilized to provide both a reverse and a direct acting output. When making these selections a Limit setting is presented. The Limit setting allows entry of output limit values.

ColdJunc – Cold Junction 

Use: Displays cold junction of input.

Selection: INPUTS screen; SelcFunc_Calibrat

Remarks: None

ColdStrt – Cold Start Power Up Mod 

Use: To select cold start power up mode.

Selection: UNIT_CNF screen; Sys_Mode

Remarks: See Sys_Mode.

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Con_Out – Contact Output Logic Assignment 

Use: To make internal logic assignments that can be used to operate contact outputs.

Selections: CONF_LOG; Con_Out OTASet01–OTASet04

Remarks: Opens a window that allows selecting up to four alarm conditions and contact input states that will operate contact outputs.

Conf_Lvl – Configuration Level 

Use: To select Basic and Extended configuration level.

Selections: UNIT screen; Basic or Extended

Remarks: Sets configuration level to Basic or Extended for configuration of process control and monitor loops and real-time programmer.

Configur – Configuration  

Use: From UNIT screen, to move to configuration group of icons. From I/O_Calb screen, to configure inputs and outputs.

Selections: UNIT screen; ENTER on select. ANA_OUTS, INPUTS or DIG_OUTS screen; SelcFunc; opens window

Remarks: When selected from UNIT screen, switches from operation to configuration group of icons. From I/O_Calb screen, allows selection of linear zero and span values. See Section 4.

ConOutpt – Contact Output 

Use: To select a contact output to be configured for time proportioning action.

Selections: DIG_OUTS screen; RmCOut01 through RmCOut16

Remarks: The contact outputs are on the digital I/O card. See Section 4.

Contrast – Display Contrast Level 

Use: Set contrast level

Selection: Contrast; 8 to 25

Remarks: Contrast will vary according to vertical viewing level. Selected contrast setting is saved if 'Warmstrt' is selected as Sys_Mode.

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ContrlLoop – Control Loop   

Use: To open a window in which control loop tag names, parameters or displays can be modified or configured.

Selections: TagNames screen; Select. Patch I/O screen; Select. Displays screen; Select.

Remarks: None

CPU_Brd 1 – CPU Software Revision Level 

Use: To display the software revision level.

Selections: UNIT_CNF screen, Diagnost; CC-Diag

Remarks: None

CurSeg – Current Segment Tag Name 

Use: Allows current segment tag name to be changed.

Selection: GLOS_PRG screen; 8 characters

Remarks: Select up to 8 characters to form a new name.

CurSeg## – Current Segment Number  

Use: To display the currently active segment of the setpoint programmer.

Selection: None

Remarks: None

CycCnt – Cycle Counter Tag Name 

Use: Allows cycle counter tag name to be changed.

Selection: GLOS_PRG screen; 8 characters

Remarks: Select up to 8 characters to form a new name.

CycCnt## – Cycle Counter  

Use: To display the number programmer recycles that are remaining.

Selection: PROGRUN# screen; 0–255

Remarks: Maximum of 25 segments may be configured with recycles. If more than 25 segments with recycles are entered, unit will go to program end.

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CyclTime – Time Proportioning Cycle Time 

Use: To select the time proportioning cycle time for an output.

Selections: ANA_OUTS screen; 0 to 255 seconds

Remarks: A setting of 0 disables time proportioning. When analog outputs are selected for time proportioning action, jumpers on the analog I/O card must be changed. See analog I/O card output type configuration/calibration instructions for more information.

Date – Calendar Date 

Use: To display and set Date.

Selections: UNIT screen; Month/Day/Year (MM/DD/YY)

Remarks: Enter current calendar date.

Dec_Pos – Decimal Point Position 

Use: To select a decimal position for hi and lo limits of the profile display on PROGRUN# screens.

Selection: DCON_PRG screen; 1 to 5

Remarks: The decimal position will change the profile setpoint and the high and low limits of the profile display (Dsp_Profle) which is selected on the PgBuild window of the PROGRUN# screens.

DecPoint – Decimal Point Position 

Use: To display the current number of decimal point positions for linear inputs.

Selection: INPUTS screen; Configure, 0–5

Remarks: The parameter will display 0 or 1 for all thermocouple and RTD inputs. If a linear input type is selected, the number of decimal point positions can be user configured (see SelcFunc).

DELETE – Memory Card Delete Function 

Use: To delete a file from a memory card.

Selection: UNIT screen; Mem_Card, FUNC

Remarks: See FUNC; Note**:** *Memory Card must be inserted for this to appear.*

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Dev_## – Control Loop Deviation  

Use: To display the control loop deviation from setpoint for control loop ##.

Selection: None

Remarks: The deviation is calculated by subtracting the setpoint from the process variable. (PV–SP=DEV)

Diagnost – Diagnostics 

Use: To run basic diagnostics of Dimension.

Selection: UNIT_CNF screen, Diagnost

Remarks: Opens a window to run diagnostics on the operator interface and the analop I/O.

DigitlOuts – Digital Outputs 

Use: To access digital outputs for configuration.

Selection: I/O - Calb screen; DigitlOuts; Select

Remarks: Opens a window to configure digital outputs.

DIRECT – Memory Card Directory Function 

Use: To list a directory of memory card files.

Selection: UNIT screen; Mem_Card; FUNC

Remarks: See FUNC. **Note:** *Memory Card must be inserted for this to appear*.

DirOut – Direct Output Level  

Use: From UNIT_CNF screen, to configure macro key or warm start functions to set direct output percent to desired level. At GLOS_LOP screen, allows direct output level tag name to be changed.

Selections: UNIT_CNF screen; MacroKy# or WarmStFunc, Activatd or NotActvd. GLOS_LOP screen; 8 characters.

Remarks: At GLOS_LOP screen, select up to eight characters to form a new name.

DirOut_# – Control Loop Direct Output  

Use: To access the control loop direct output value for loop #.

Selections: LOOP__# screens; LpMode##; 0.0% to 100.0%

Remarks: This field is only changeable when the control loop is in manual mode (see LpMode##). A direct output is usually used for cooling.

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DspConf – Memory Card Display Configuration File Type 

Use: To read, write or delete a display configuration file type.

Selection: UNIT screen; Mem_Card; FILE

Remarks: See FILE

Dsp_Profle – Display Profile 

Use: Opens a window to graphically display the setpoint program profile.

Selections: PROGRUN# screen; PgBuild, Dsp_Profle

Remarks: None

Echo – Communication Echo 

Use: To select echo.

Selections: 232_PORT and 422_PORT screens; ON or OFF

Remarks: Echo should be set to ON when communications to the Dimension is interactive using a dumb terminal.

EIA-232 – EIA-232 Communications 

Use: Selects EIA-232 communications for set up.

Selections: Communic screen; EIA-232; Select

Remarks: Opens a window to set up communications parameters.

EIA-422 – EIA-422 Communications 

Use: Selects EIA-422 communications for set up.

Selections: Communic screen; EIA-422; Select

Remarks: Opens a window to set up communications parameters.

EngUnits – Engineering Units 

Use: To select engineering units for an input type.

Selections: INPUTS screen; Centigrd, Fahrenht, Linear

Remarks: When an RTD or thermocouple is selected under the InptType field, this parameter allows a selection between degrees centigrade and degrees fahrenheit. If a linear input type has been selected this will always show Linear and cannot be changed.

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Enter – Enter  

Use: At UNIT screen, to enter a access level passcode. At UNIT_CNF screen, to open a window of diagnostic selections.

Selection: UNIT screen; Access; 6 digit passcode.
UNIT_CNF screen; Diagnost; Enter

Remarks: If any invalid passcode is entered, access is denied and the access level does not change. Access passcodes are defined on the UNIT_CNF screen (see Access). The default code of 04-01-57 will always gain FULL access.

EOM_Char – End of Message Character 

Use: To select the end of message character for IEEE-488 communications.

Selections: IEEE-488 screen; LF-CR, CR-LF, LF, CR or none (8725 only)

Remarks: Default EOM character is LF-CR.

Event_## – Programmed Events 

Use: Tag Names to display programmed event states.

Selection: LOGIC_# screen; None

Remarks: Displays the status of all events.

Events – Event Tag Names  

Use: To select event tag names for change.

Selection: GLOS_PRG screen; EVENT_#; 8 characters

Remarks: Select up to eight characters to form a new name.

Evnts – Events 

Use: To select the events that will be "ON" during the currently accessed segment.

Selections: PROGRUN# screen; PgBuild; 123456789abc

Remarks: Selecting 1 through c indicates the event(s) that will be activated. When the programmer is in hold event states may be turned on or off by the operator.

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FILE – Memory Card File Type

Use: To select a file type for a memory cartridge function.

Selections: Mem_Card; Recipes, Mem_Img, DspConf_, MacroKy_, CLC start

Remarks: File names can be changed but the default file names determine what is stored for each file type. The default file types are: Recipes – this file type stores all program segment information for all 750 segments. Mem_Img – this file stores all system configuration settings, calibration settings, and tag names. DspConf_ – this file stores all changes to display configuration for the OVERVIEW, LOOP, and LOGIC screens. MacroKy_ – this file stores the Macro Keys programs.

FilterVal – Filter Value

Use: To set the filter value for the selected analog input.

Selection: INPUTS screen; 0 - 100

Remarks: The filter value is the time constant in seconds of a low pass filter. As the value increases, the amount of filtering increases.

FORMAT – Memory Card Format Function

Use: To format a memory card.

Selection: UNIT screen; Mem_Card; FUNC

Remarks: See FUNC

Format – Display Format

Use: To select a format for display configuration.

Selections: DCON_OVR screen; HOR_BAR, XYCHART, XYDISPLY, VER_BAR2, VER_BAR3, VER_BAR4, TEXT_3X, TEXT_2X, TEXT, 3X_TEXT_4

Remarks: Display configuration changes can be stored on the memory card in the DspConf_ file type. HOR_BAR – displays 2 horizontal bar graphs at the top of the screen, with 5 lines of text below. XYCHART – displays 2 parameters in a strip chart like display at the top of the screen with 4 lines of text below. Only 4 XYCHART or XYDISPLY are allowed. Trending of data starts when the screen is displayed for the first time and continues until power down. XYDISPLY - same as XYCHART except without the text. VER_BAR2 – displays 2 vertical bar graphs to the left of the screen with the

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2 selected bar graph parameters also displayed in 2X text to right of the bargraphs. There is also two additional selections – one 2X text on top, and 1X text on the bottom. VER_BAR3 – displays 3 vertical bar graphs, with one line of text at the bottom. VER_BAR4 – displays 4 vertical bar graphs. TEXT_3X – displays 3 parameters in 3X text at the top, with 4 lines of text at the bottom. TEXT_2X – displays 8 parameters in 2X text. TEXT – displays 12 parameters in 1X text. 3X_TXT_4 - displays 4 parameters in 3X text.

Full_Acc – Full Access Passcode 

Use: To enter a passcode for FULL Access.

Selections: UNIT screen; Full_Acc, 00-00-00, three 2 digit numbers.

Remarks: This is the passcode that will need to be entered to bring the unit to FULL access if the present access is LIMITED or NONE. The current access must be FULL to select this entry.

FUNC – Memory Card Function 

Use: To select a memory card function.

Selections: UNIT screen; Mem_Card; Func; READ, WRITE, DIRECT, FORMAT, DELETE

Remarks: READ reads the selected FILE from the memory card into unit memory.
WRITE writes the selected FILE from unit memory to the memory card.
DIRECT lists the directory of FILEs on the memory card.
FORMAT formats a memory card. Memory card must be formatted before a read, or write can be made to the card.
DELETE deletes a selected FILE from the memory card.
The default file name determines what is stored in the file. The status message 'Writing…' appears when a file is being written, the Mem_Img file is long and takes about a minute and a half to write. Recipes – this file type stores all program segment information for all 750 segments. SysConf_ – this file stores communication parameters set on the COMM screen. Mem_Img – this file stores all system configuration settings, calibration settings, and tag names. DspConf_ – this file stores all changes to display configuration for the OVERVIEW, LOOP, and LOGIC screens. Macroky_ – this file stores the Macro Keys programs.

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FwdEnSrc – Programmer Fast Forward Enable Source 

Use: This is used to select the action to enable program fast forward.

Selections: CONF_PRG; OperFF##, RemCI_##, LocCI#_#, OR_Set##, NORSet##, ANDSet##, NANDSet#, CLC_IN_# (optional)

Remarks: The OperFF_1 - OperFF_8 selections correspond with the initiation of fast forwarding through a program via the Operator Interface. The selection of OperFF_1 would place the programmer in fast forward when the PgFFwd01 field (in the progrun screen in the PGOption window) is selected to Enable. RemCI selections correspond with the initiation of the fast forward through a contact input. This would allow fast forwarding through a program form a remote location. OR/NOR/AND/NAND selections correspond to internal logic assignments. This could allow fast forward to be initiated from one of several points. If all four programmers fast forward sources were selected to be the same, then all four programmers would be placed in fast forward when the appropriate fast forward source became true. The rate at which the programmers execute is determined by the warp factor. If the warp factor is set to 10 and the programmer fast forward was enabled, then the programmer would run the recipe in a tenth of the time it would normally take to complete that recipe.

Gain__## – Control Loop PID Gain  

Use: To set PID gain for control loop ##.

Selections: LOOP screens; LpMode##; 0.01 to 327.67

Remarks: Gain is a multiplication term expressing how the control loop output varies with respect to the control loop deviation (process variable – setpoint). The effect of gain on the control loop output can be calculated from the following equation: Output % = Deviation/Input Span * Gain.

GuarSoak – Guaranteed Soak 

Use: Opens a window to allow enabling the program guaranteed soak function.

Selections: CONF_PRG screen; GuarSoak; ENABLE, DISABLE

Remarks: Guaranteed soak causes the programmer to HOLD when either Hi or Lo deviation limits are exceeded. The deviations limits are set at the ALM_SET screen using the Loop_Alm parameter for the loop associated with this programmer.

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Handshke – Handshake 

Use: To select hardware handshaking.

Selections: 422_PORT or 232_PORT screen; Enable or Disable

Remarks: Set to match your computer.

Hi_Limit – High Limit 

Use: To set default high limit for Profile display (Dsp_Profle).

Selection: DCON_PRG screen; Numeric

Remarks: Limit depends on input range

IEEE-488 – IEEE 488 Communications 

Use: Selects IEEE-488 communications for set up.

Selections: Communic screen; IEEE-488; Select

Remarks: Opens a window to set up communications parameters.

InFltr## – Filter Constant 

Use: To enter filtering value.

Selections: CONF_LOP screen, PV Source; AnlgInxx; 0–100

Remarks: The input filter is the time constant in seconds of a low pass filter. As the value increases, the amount of filtering increases.

InpAlm## – Input Alarm 

Use: Status of input alarms.

Selection: INP_ALM1 screen; Alarm acknowledged by selecting "Alarms##" and pressing knob.

Remarks: An operator message may be displayed by pressing the "?" key when an alarm field is selected (see Alm_Mess).

Inpt_Num – Input Number 

Use: Selects which input is to be set up.

Selections: INPUTS screen; AnlgIn_1 to AnlgIn_18

Remarks: Number of Analog inputs depends on Dimension unit purchased, i.e., 1 to 6 for 8705 or 1 to 18 for 8725.

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InptHiLim – Input High Limit

Use: To select the upper limit for the input type selected.

Selection: INPUTS screen; Numeric

Remarks: This parameter is used when Thermocouple or RTD inputs are selected. These limits are used by the PID control algorithm as the range of the input to be controlled. They are also used by the operator interface to limit operator setpoint entries. The limits are stored in the EEPROM of the I/O card.

InptLowLim – Input Low Limit

Use: To select the lower limit for the input type selected.

Selection: INPUTS screen; Numeric

Remarks: This parameter is used when Thermocouple or RTD inputs are selected. These limits are used by the PID control algorithm as the range of the input to be controlled. They are also used by the operator interface to limit operator setpoint entries. The limits are stored in the EEPROM of the I/O card.

InptType – Input Type

Use: Selects the desired input type.

Selections: INPUTS screen; Type..J., Type..K., Type..T., Type..R., Type..S., Type..E., Type..N., Pltnl.II, Type..B., Type..G., Type..C., Type..D., RTD.am.1, RTD.eu.1, 0–10 mv, 0–50mv, 0–100mv, 0–10volt, 0–5volt., 4–20ma.., 0–20ma.., PG_CH_01, PG_CH_02, PG_CH_03, PG_CH_04, Altitude, NiNi Mo.

Remarks: In addition to the thermocouple types, RTD's and linear inputs, there are four channels labeled PG_CH_01, PG_CH_02, PG_CH_03, and PG_CH_04. These are used by the factory to calibrate the four independent programmable gain channels for the analog inputs. See Section 4.

InputAlm – Input Alarm

Use: In CONF_ALM opens a window to select input alarm limits, hysteresis value and latching action. In ALM_SET opens a window to select alarm limits.

Selections: ALM_SET or CONF_ALM screen; ANLGIN_1 to ANLGIN_18; HiLmt##, LoLmt##, InpHys_#, InLtch#

Remarks: Hysteresis value and the latching action are valid for both Hi and Lo alarms.

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Ins/Outs – Inputs and Outputs Tag Names 

Use: To open a window in which inputs and outputs tag names can be modified.

Selections: TagNames screen; Select

Remarks: None

Keypd – Keypad Test 

Use: To test the correct action of the front panel keypad.

Selections: UNIT_CNF screen; Diagnost; OI_Diag; ENTR_KEY, MACRO1_KY, MACRO2_KY, UP_KEY, DOWN_KEY, LEFT_KEY, RGHT_KEY or HELP_KEY.

Remarks: Press the knob to enter and exit the keypad test.

Knob – Rotary Knob Test 

Use: To test the correct action of the rotary knob.

Selections: UNIT_CNF screen; Diagnost; OI_Diag; RIGHT or LEFT

Remarks: Press the knob to enter and exit test.

Lin_DecP – Linear Decimal Place 

Use: Sets the linear decimal place for the selected input.

Selections: INPUTS screen; SelcFunc_Configure

Remarks: See Section 4.

Lin_Span – Linear Span 

Use: Sets the linear span for the selected input.

Selections: INPUTS screen; SelcFunc_Configure

Remarks: See Section 4.

Lin_Zero – Linear Zero 

Use: Sets the linear zero for the selected input.

Selections: INPUTS screen; SelcFunc_Configure

Remarks: See Section 4.

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Lmtd_Acc – Limited Access Passcode 

Use: To enter a passcode for LIMITED Access.

Selections: UNIT_CNF screen; 00-00-00, three 2 digit numbers.

Remarks: This is the passcode that will be entered to bring the unit to LIMITED access. The present access must be LIMITED or FULL to select this entry.

Loc_CIns – Local Contact Inputs Tag Names 

Use: To select local contact input tag names for change.

Selection: GLOS_IO screen; LocCI1_1 or LocCI2_1; 8 characters

Remarks: Select up to eight characters to form a new name.

Loc_COuts – Local Contact Outputs Tag Names 

Use: To select local contact output tag names for change.

Selection: GLOS_IO screen; LocCO1_1 or LocCO2_1; 8 characters

Remarks: Select up to eight characters to form a new name.

LocCo_Nm – Local Contact Output Number 

Use: To select the time proportioned output to configure.

Selections: DIG_OUTS screen; LocCo#_#

Remarks: None

LocCo_Sel – Local Contact Output Select 

Use: Select the hardware card to configure control outputs.

Selections: CONF_OUT screen; LocCo#_#

Remarks: Opens a window to select the control output to drive a specific I/O point. Choices are RevOut#, DirOut#, SPxmit#; Retrans#, Alarms, Outset##, Event_##, OperAm##, OperRH##, PgEnd#, REMCI_#, DevOutL#, or CLC_Out# (optional).

LocCycTime – Local Contact Output Cycle Time 

Use: To set the cycle time for the selected local contact output.

Selections: DIG_OUTS screen; Numeric

Remarks: Setting the time to a zero value will disable time proportioning and enable On/Off control.

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Lo_Limit – Low Limit 

Use: To set default low limit for Profile display (Dsp_Profle).

Selection: DCON_PRG screen; Numeric.

Remarks: Limit depends on input range.

LOGIC – Logic Display Screen Titles 

Use: To select logic screen titles for change.

Selections: GLOS_SYS screen; LOGIC_#; 8 characters

Remarks: Select up to eight characters to form a new name.

Logic – Logic 



Use: At CONF_LOG screen, to make internal logic assignments that can used by control and monitor loops and real-time programmers. At Displays screen, to access logic displays for configuration.

Selections: Patch I/O Screen; Logic; Select; CONF_LOG screen; OR/NOR_1–4 or AND/NAND_1–4. Displays screen; Select.

Remarks: At CONF_LOG screen, allows selection of up to four alarm conditions and contact input states that will operate an internal logic point. At Displays screen, opens a window in which logic displays 1-5 can be configured.

LogicScr – Logic Display Screen 

Use: To select a Logic screen for configuration.

Selection: DCON_LOG screen; LOGIC__1 to LOGIC__5

Remarks: This entry selects which Logic screen will be configured for display. Selection may be limited by the number of logic screens set (see NumLgscr). Display configuration information can be stored on the memory card in the file type DspConf_.

LOOP – Loop Display Screen Titles 

Use: To select loop screen titles for change.

Selections: GLOS_SYS screen; Loop___1 to Loop___8; 8 characters

Remarks: Select up to eight characters to form a new name.

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Loop_Alm – Loop Alarm 

Use: To select a loop to enter alarm hysteresis and latch state.

Selection: CONF_ALM screen; LoopNm01 to LoopNm08

Remarks: The hysteresis and latch state are entered for the selected loop. Hysteresis and latching selections are valid for both Hi and Lo alarms.

Loop_Num – Loop Number 



Use: To select a loop number.

Selections: GLOS_LOP or CONF_LOP screen; LoopNm01 to LoopNm08

Remarks: On the CONF_LOP screen this entry selects the loop for configuration. On the GLOS_LOP screen this entry selects which loop's tag names will be edited.

Loop_Scr – Loop Display Screen 

Use: To select a loop screen for display configuration.

Selections: DCON_LOP screen; Loop screen tag names, LOOP___1 to LOOP___8

Remarks: Selects Loop screen for display configuration. The entry 'Format' will be updated to show the present display configuration (XYCHART, TEXT, etc.) of the selected Loop screen.

LpAlmSet – Loop Alarm Set 


Use: To select a loop to enter alarm limits.

Selections: ALM_SET or CONF_ALM screen; LoopNm01 to LoopNm08

Remarks: The alarm group is selected first and then the PV and DEVIATION alarm limits can be set for the selected loop and group.

LpMode – Loop Mode 



Use: At UNIT_CNF screen, to configure macro key and warm start functions to select control loop mode. At GLOS_LOP screen, allows loop mode tag name to be changed.

Selections: UNIT_CNF screen, Macroky# or WmStFunc; Activatd, NotActvd. GLOS_LOP screen; 8 characters.

Remarks: Choices are Auto and Manual when Activtd from UNIT_CNF screen. From GLOS_LOP screen, select up to eight characters to form a new name.

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LpMode## – Loop Mode  

Use: To access control loop mode.

Selections: LOOP_# screen; Auto or Manual

Remarks: Select Auto for closed loop control.

LpPgNmbr – Loop/Programmer Number 

Use: To select the control loop and setpoint programmer number to which macro key definitions will be made and warm start functions will be assigned.

Selections: UNIT_CNF screen; Macroky1, Macroky2, and WmStFunc, LoopNm01–LoopNm08

Remarks: See Macroky and WmStFunc

M_OutSrc – Manual Output Source 

Use: This field is used to select the source for the manual output.

Selections: CONF_LOP screen; Operator and Remote

Remarks: If operator is selected as the manual output source, then the manual output is determined by the value entered by the user in the LOOP_# screen under the reverse output or the direct output entries. If remote is selected, then the manual output is determined by an analog input or a loop output. One use of setting the manual output source to another loops output would be to use two different sensors for one control loop. A high PV alarm could be set to transfer loop one from auto to manual and a low PV alarm to transfer loop two from manual to auto. When loop one is in manual, the control output comes from loop two and when loop one is in auto, the control output comes from loop one. Note that if Output L# is selected for the remote source, the cascade parameters should be set to allow the proper ranging of the output. Refer to RemSpsrc in loop configuration section for accessing the cascade parameters.

Macroky – Memory Card Macro Keys File Type 

Use: To read, write or delete a macro key file type on memory card.

Selection: UNIT screen; Mem_Card; FILE

Remarks: See FILE

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Macroky# – Macro Key Definitions 

Use: To program the Macro Keys.

Selection: UNIT_CNF screen; opens a window.

Remarks: The functions that are activated on the Macroky window will be executed in the order that they are listed on the window. For example, if LpMode and Abort are activated then when the associated Macroky is executed the LpMode command will be executed then the Abort command.

ManRset# – Manual Reset  

Use: To set the control loop manual reset value.

Selections: LOOP_# screen, LpMode##; –100.00 to 100.00

Remarks: Manual reset is summed to the control loop output. When used, the manual reset value is usually the same as the control loop output % in a steady state condition.

Mem_Card – Memory Card Functions 

Use: To execute a memory card function.

Selection: UNIT screen; opens a window

Remarks: See FUNC and FILE glossary descriptions.

Mem_Img – Memory Card Memory Image File Type 

Use: To read, write or delete a memory image file type.

Selections: UNIT screen; Mem_Card; FILE

Remarks: See FILE

Mnemonic – Engineering Unit's Mnemonic 

Use: To display the current engineering unit's mnemonic.

Selection: INPUTS screen and INPUTS screen SelcFunc_Configur

Remarks: This parameter will read either 'F' or 'C' for all thermocouples and RTD's depending on the status of the Eng Units field. If a linear input type is selected, the three character field mnemonic can be user configured (see SelcFunc).

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Net_Addr – Network Address 

Use: To select the network address of serial communications.

Selection: 232_PORT or 422_PORT screen; 1–99

Remarks: The selection identifies the address of this unit on a communications network. Each unit on the same network must have a unique address.

Next_Seg – Next Segment 

Use: To select the segment to be executed after the currently accessed segment.

Selections: PROGRUN# screen; PgBuild; 1–749

Remarks: Any segment, including the currently accessed segment, may be selected. If the currently accessed segment is selected, a program end will be indicated and programmer operation will be halted at this point.

NumLgscr – Number of Logic Display Screens 

Use: To select the number of Logic screens.

Selection: DCON_LOG screen; 1 to 5

Remarks: The number of logic screens that will be displayed is entered here. A minimum of 1 to a maximum of 5 screens are allowed. This information is stored on the memory card in the file type DspConf_.

NumLpScr – Number of Control Loop Display Screens 

Use: To select the number of control loop display screens.

Selection: DCON_LOP screen; 1 to 8

Remarks: The number of control loop screens that will be displayed are entered here.

NumPgScr – Number of Programmer Display Screens 

Use: To select the number of programmer display screens.

Selection: DCON_PRG screen; 1 to 8

Remarks: The number of programmer screens that will be displayed are entered here.

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OI_Diag – Operator Interface Diagnostics

Use: To select Operator Interface diagnostics.

Selections: UNIT_CNF screen, Diagnost; Opens a window.

Remarks: The diagnostics displays the software revision level. The keypad and knob can also be tested. (See Keypd and Knob.)

OI_Version – Operation Interface Version

Use: To display installed software version.

Selections: None

Remarks: None

On/Off – On/Off Tag Names

Use: To open a window in which on/off state tag names can be changed.

Selection: GLOS_IO screen; Set_01 to Set_04; On or Off; 8 characters

Remarks: Select up to eight characters to form a new name.

OPStart – Operator Program Start

Use: This field is used to select the source for starting a programmer via the operator start.

Selections: CONF_PRG screen; OpStrt##, RemCI_##, LocCI#_#, OR_Set##, NORSet##, ANDSet##, NANDSet#, CLC_IN_# (optional)

Remarks: The OPStrt01–OPStrt04 selections correspond with starting a programmer through the Operator Interface. When OPStart is set to OPStrt01, the programmer can be started when the Start_Prgr parameter set to start. This parameter can be found on the PROGRUN# screen in the StrtPgr1 window. OR/NOR/AND/NAND selections correspond with Starting a programmer through a logic function. RemCI 1–16 selections correspond with starting a programmer through a contact input. If all four programmers' Operator start sources were selected to be the same, then all four programmers would start when the appropriate source became true. There are three different ways to start a programmer. One is through an operator start, another is through a remote start, and the third is via a time of day start. Each of these has a user defined starting segment. Both the operator start and remote start can be initiated through the operator interface, or a contact input, or through a logic function. The only difference between these starts is where on the operator interface the start sequence is initiated. The operator start is found on the PROGRUN# screen under the StrtPgr1 window. The remote start is found on the PROGRUN# screen under the PgOption window.

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Option# – Options 

Use: Opens a window to display Dimension option data. Lists purchased options and allows quantities available for use to be changed.

Selections: UNIT_CNF screen; Option 1 or Option 2; quantity to be made available for each option.

Remarks: Option 2 also displays Dimension serial number and identification number of any installed custom features.

OSnsrOut – Open Sensor Output Action 

Use: Configures the control loop's output action when an open sensor fault occurs.

Selections: CONF_LOP screen; DefltVal

Remarks: Default Value is 0.00.

Out_Off – Control Outputs Off 

Use: To make internal logic assignments that will cause all control loop outputs to turn off.

Selections: CONF_LOG screen; Loop1OFF - Loop8OFF

Remarks: Opens a window that allows selecting up to four alarm conditions and contact inputs that will cause all control outputs to turn off.

OutPut – Control Loop Output Tag Name 

Use: Allows control loop output tag name to be changed.

Selection: GLOS_LOP screen; 8 characters

Remarks: Select up to eight characters to form a new name.

Output_# – Control Loop Output 

Use: To display the control loop output value.

Selection: None

Remarks: Displays both the reverse and direct output levels. Direct is displayed as 0 to +100% and reverse is displayed as 0 to –100%. This field is only changable when the control loop is in manual mode (see LpMode##).

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Outputs – Outputs Patch I/O 

Use: To open a window in which outputs can be configured.

Selections: Patch I/O screen; Outputs; Select; CONF_OUT screen

Remarks: None

OVERVIEW – Overview Displays Screen Title 

Use: To select overview screen titles for change.

Selection: GLOS_SYS, OVIEW__1 to OVIEW__16; 8 characters.

Remarks: Select up up to eight characters to form a new name.

OverView – Overview Displays 

Use: To access overview displays for configuration.

Selections: Displays screen; Select

Remarks: Opens a window in which overview displays 1-16 can be configured.

OvScreen – Overview Display Screen 

Use: To select an overview screen for display configuration.

Selections: DCON_OVR screen; OVScreen; OVIEW__1 to OVIEW__16

Remarks: The number of overview screens selectable will be limited by the entry TotalOvr which is the number of Overview screens that will be displayed. The present display configuration of the selected screen will be displayed in the entry 'Format'.

PgBuild – Programmer Build 

Use: Opens window to define program parameters.

Selection: PROGRUN# screen, PgBuild

Remarks: Provides access to build real-time programs.

PgFFwd## – Program Fast Forward 

Use: To enable program fast forward.

Selections: PROGRUN#; PgOption; Enable, Disable

Remarks: When enabled the program will execute at the speed set by WarpFctr. If the warp factor is set to 10 then the programmer would run the recipe in a tenth of the time it would normally take.

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PgMdSt## – Programmer Mode with Start 

Use: To select Programmer Mode - Run, Hold or Start.

Selections: OVIEW_# screen; Run, Hold or Start.

Remarks: Run places the programmer in run at the current point in the program. This is usually used after a program hold. Hold places the programmer in hold at the current point in the program. This field will display PG_END when the program runs to completion. Start opens window allowing choice of starting segment recipe number and starting the programmer.

PgMode – Programmer Mode  

Use: At UNIT_CNF screen, to configure macro key or warm start functions to control programmer action. At GLOS_PRG screen, to change programmer mode tag name.

Selections: UNIT_CNF screen; Macroky# or WmStFunc; Activatd, NotActvd. GLOS_PRG screen; 8 characters.

Remarks: Choices are Start, Run or Hold when Activatd from UNIT_CNF screen. From GLOS_PRG screen, select up to eight characters to form a new name.

PgMode## – Programmer Mode  

Use: To select Programmer Mode - Run or Hold

Selections: PROGRUN# screens; Run or Hold

Remarks: Run places the programmer in run at the current point in the program. This is usually used after a program hold. Hold places the programmer in hold at the current point in the program. This field will display PG_END when the program runs to completion.

PgNumber – Programmer Number 

Use: To select a Programmer for configuration.

Selections: CONF_PRG screen; Progmr01 to Progmr08

Remarks: This entry selects the Programmer for configuration.

PgOption – Programmer Options 

Use: Opens a window.

Selection: PROGRUN# screen; None

Remarks: Provides access to Time of Day start, Fast Forward, Abort and Remote Start.

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PgStart – Programmer Start 

Use: To configure a macro key or warm start function to start a specific program.

Selections: UNIT_CNF screen; Macroky# and WmStFunc; Activatd, NotActvd

Remarks: When Activatd, selects program to start when PgMode = Start.

Pg#Spt## – Programmed Setpoint  

Use: To display the programmed setpoint generated by the setpoint programmer.

Selections: PROGRUN# screen; PgBuild

Remarks: This setpoint is used by the control loop when the setpoint source is set to Programr (See SptSrc##).

PID_Group – PID Group 

Use: To select the group of PID parameters that will be active in the currently accessed segment.

Selection: PROGRUN# screen; PgBuild; 1–5

Remarks: This entry is only valid if programmed PID groups has been selected (see PID_Type).

PID_Grp# – PID Group  

Use: To display the currently active PID group for control loop #.

Selections: PROGRUN# or LOOP__# screens; 1-5

Remarks: One of the five PID groups is active at all times (see PID_Type).

PID_Grp – PID Group  

Use: At LOOP_# screen, to select the PID group to which the calculated PID parameters will be transferred. At GLOS_PRG screen, to change PID group tag name.

Selections: LOOP_# screen; SetUp 1–5. GLOS_PRG screen; 8 characters.

Remarks: At GLOS_PRG screen, select up to eight characters to form a new name.

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PID_Type – PID Type 

Use: To open a window to change the type of PID desired.

Selections: CONF_LOP screen; Single, Dual, Progmmed, SelAdapt.

Remarks: Single uses one set of PID values, group 1. Dual uses two sets of PID values, group 1 and group 2. Group 1 is active for a reverse acting output value and group 2 is active for a direct acting output value. This is normally used with bimodal control (see Cntl_Act). Progmmed uses up to five sets of PID values in conjunction with the setpoint programmer. When a setpoint program is developed PID groups can be selected on a per segment basis. SelAdapt uses up to five sets of PID values in conjunction with the process variable input value. Each PID group specifies the value of gain, rate and reset at the associated breakpoint in the range of the process variable. During operation, the gain, rate and reset are calculated by interpolating between the values at the breakpoint above and below the current values of the process variable.

Power_DN – Power Down Time and Date 

Use: To display time and date of the last time the unit was powered down.

Selection: UNIT_CNF screen; Diagnost; TimeDiag

Remarks: None

Power_UP – Power Up Time and Date 

Use: To display time and date of the last time the unit was powered up.

Selection: UNIT_CNF screen; Diagnost; TimeDiag

Remarks: None

PrimAddr – Primary IEEE-488 Address 

Use: To select the primary address of the Dimension for IEEE-488 communication.

Selections: IEEE-488 screen; 0-31

Remarks: Default address is 4.

Protocol – Communications Protocol 

Use: Selects the type of communications protocol.

Selections: 232_PORT or 422_PORT screens; Terminal or Network.

Remarks: Terminal protocol is used with EIA-232. Network protocol is used with EIA-422 and provides complete error detection and correction.

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ProcVr – Process Variable Tag Name 

Use: Allows process variable tag name to be changed.

Selection: GLOS_LOP screen; 8 characters

Remarks: Select up to eight characters to form a new name.

ProcVr## – Process Variable  

Use: To display Process Variable of control loop ##.

Selections: LOOP_# screens; None

Remarks: Displays the current process variable value for a control loop.

ProfileSP – Profile Setpoint Tag Name 

Use: To select a profile setpoint tag name for change.

Selection: GLOS_PRG screen; Pg1Spt01 to Pg1Spt08; 8 characters

Remarks: Select up to eight characters to form a new name.

ProgmrNm – Programmer Number  

Use: To select a programmer number.

Selections: DCON_PRG or GLOS_PRG screen; Progmr01 to Progmr08

Remarks: The entries on the DCON_PRG screen are used to configure the profile displays of the PROGRUN# screens. The GLOS_PRG screen selects the programmer number for which tag names will be changed.

ProgName – Program Name 

Use: To select a program name tag name for change.

Selection: GLOS_PRG screen; Recipe__1 to Recipe_15; 8 characters

Remarks: Select up to eight characters to form a new name.

PROGRAM – Program Display Screen Titles 

Use: To select program screen titles for change.

Selections: GLOS_SYS screen; PROGRUN01 to PROGRUN08; 8 characters

Remarks: Select up to eight characters to form a new name.

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Programmer – Programmer 

Use: At TagNames screen, to open a window in which programmer tag names can be changed. At Patch I/O screen, to open a window in which programmer parameters can be configured. At Displays screen, to access programmer displays for configuration.

Selections: TagNames, Patch I/O or Displays screen; Select

Remarks: When selected at Displays screen, displays DCON_PRG screen at which programmer displays 1-8 can be configured.

PV_Bias – Process Variable Bias 

Use: Enter a value to add or subtract from the process variable value.

Selection: INPUTS screen; SelcFunc_Calibrat

Remarks: The new PV value will be used throughout the system.

PVsource – Process Variable Source 

Use: To select a source to be used for the process variable.

Selections: CONF_LOP screen;
AnlgIn#
AnaIn#
Calc#
CLCINPT#
RH1
RH2

Remarks: There are four different types of inputs that can be used as the process variable. The first is an analog input, next is an option to use inputs 1 and 2, 3 and 4, or 5 and 6, third is a calculated input, and fourth is a wet bulb/dry bulb calculation of RH. In every case the PV can be digitally filtered. If AnlgIn01 is selected, then the first analog input on analog card one is use as the process variable for that loop. If AnaIn1_2 is selected, then analog input 1 is used for the PV until it burns out. In that condition, analog input 2 takes over. If both inputs are burned out, then an open sensor condition is in effect. If Calc__1 is selected, then the process variable is derived from the following equation: PV =(IN1*Mtlpler1 + IN2*Mltpler2 + IN3*Mltpler3 + IN4*Mltpler4)/Scale where; IN1 – IN4 = analog input 1 – 4, Mltpler1 Mltpler4 = constant 1 – 4, Scale = a constant. Be sure to note decimal alignments and not to exceed the maximum values of 32767 to –32767 (no decimal points). If RH is selected, then the process variable is a calculation of the relative humidity based on a dry bulb/wet bulb criteria. The Dry bulb can be any of the four analog inputs or any of the four setpoints. The Wet bulb can be any of the four analog inputs. The default selections are

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Dry bulb = analog input 1 and Wet bulb = analog input 2. The RH calculation also used atmospheric pressure. The atmospheric pressure can be set from 0.7 to 1.2 with 1.0 = sea level.

Rate__## – Control Loop PID Rate

Use: To set PID rate for control loop ##.

Selection: LOOP_# screen; 0.00 (off) to 200.00

Remarks: The rate factor is used to anticipate and correct for the process lag and adjust the output to avoid over shoot. The effect of Rate on the control loop output can be calculated by the following formula:

$$\text{Output \%} = \text{Rate} \times \frac{\text{PV \%} - \text{PV \\% Last}}{\text{Minutes between PV current and PV Last}}$$

Ratio## – Cascade Ratio Factor

Use: To apply a multiplier to the cascade setpoint.

Selection: CONF_LOP screen; RemSPrc; Numeric

Remarks: This parameter is only used if cascade control is selected (see RemSPsrc). The Cascade multiplier applies a multiplication factor to the output of the primary control loop before it is used as a setpoint by the secondary control loop. The formula used is [(Primary control loop output * Ratio##) + (Primary control loop setpoint * Blend_##)] / Scale_## = Secondary control loop setpoint. See Blend_## and Scale_##.

READ – Read from Memory Card Function

Use: To initiate reading a file from a memory card

Selections: UNIT screen; Mem_Card; FUNC

Remarks: See FUNC

Recipes – Memory Card Recipe File Type

Use: To read, write or delete recipe file types.

Selections: UNIT screen; Mem_Card; FILE

Remarks: See FILE

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Recycles – Recycles 

Use: To set the number of times a portion of the program will be repeated.

Selections: PROGRUN# screen; PgBuild; 0–255

Remarks: An entry of 0 indicates no recycling. Any other entry will cause the program to continue executing a looping series of segments for the numbers set for recycle. After the number of recycles is completed the programmer will increment to the next sequential segment.

REF= – Reference Marker 

Use: To move Reference marker on XYCHARTs.

Selection: OVIEW_XX; Numeric

Remarks: The Reference marker on the right side of the vertical axis is a means to get a more accurate reading of the XYCHART trends.

RemCO_Sel – Remote Contact Output Select 

Use: Select the hardware card to configure control outputs.

Selections: CONF_OUT screen; RmCOBrd1, RmCOBrd2

Remarks: Opens a window to select the control output to drive a specific I/O point. Choices are Event#_#, OperAM_#, OperRH_#, PrgEnd_#, RemCI_##, RevOutL#, DirOutL#, Glob_Alm, In_Alarm, PV_Alarm, DV_Alarm, LP#Alarm, OUTSet##

RemCycTime – Remote Contact Output Cycle Time 

Use: To set the cycle time for the selected remote contact output.

Selections: DIG_OUT screen; Numeric

Remarks: Setting the time to a zero value will disable time proportioning and enable on/off control.

RemSeg## – Remote Start Segment 

Use: To access the starting segment to be used when a remote start is initiated.

Selections: CONF_PRG screen; RemStart; Run Start; 1 to 749.

Remarks: None

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RemSPsrc – Remote Setpoint Source 

Use: To select a source to be used for the setpoint when the setpoint source (SptSrc##) is set to the remote mode.

Selections: CONF_LOP screen; Program#, AnlgIn##, OutputL#, SetPntL#, CLC Input#

Remarks: There are three different types of inputs that can be used as the remote setpoint source; analog inputs, programmer profile outputs, or control loop outputs. One reason for using analog inputs for the remote setpoint source could be to use an external potentiometer to manual setpoint the Dimension. Programmer profile outputs can be used to synchronize loops that are running the same profile. Control loop outputs are used for a cascade configuration. When using cascade in the Dimension, the Primary control loop output needs to be multiplied by a ratio to conform to the Secondary loop setpoint input limits. For example if the secondary loop setpoint runs from 0 to 1300°C then the ratio should be –13. (full scale reverse output) * (ratio) = Remote Setpoint, (–100%) * (–13) = 1300. When using Blended cascade, the setpoint of the first loop is multiplied by a blend factor and this is added to the output * the ratio. (BlndFctr) * (SP Primary loop) + (Primary loop RevOutput) * (ratio) = Remote Setpoint. In this case if the BlndFctr is set to 0.2 and the Maximum setpoint for Primary loop is 1000°C then the Ratio should be set to –11. (0.2) (1000°C max) + (–100%) (–11) = 1300.

RemStart – Remote Start 

Use: This field is used to select the source for starting a programmer from a remote source.

Selections: CONF_PRG screen; RmStrt##, RemCI_##, LocCI#_#, OR_Set##, NORSet##, ANDSet##, NANDSet#, CLC_IN_# (optional)

Remarks: None

Reset_## – Control Loop PID Reset  

Use: To set PID Reset for control loop ##.

Selection: LOOP_# screen; 0.00 (off) to 300.00

Remarks: The reset factor is used to correct for process losses. Reset adds or subtracts from the control loop output. The effect of Reset can be calculated by the following equation:

Remarks: Output % = SReset x Elapsed Time in minutes x Deviation/Input span X 100.

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RespTyp# – Auto Tune Response Type

Use: To select the type of control loop response when Auto Tuning is calculating PID parameters.

Selections: Loop_# screen; SetUp; AutoTune; Slow, Medium, or Fast

Remarks: A Slow setting will have no overshoot and will take the longest to respond to a disturbance. A Medium setting will have little or no overshoot, but will take longer to respond. A Fast setting will respond to a disturbance as quickly as possible with some overshoot.

Retrnsmt – Retransmit

Use: To select a source that will be retransmitted by an analog output.

Selections: CONF_LOP; AnlgIn01–AnlgIn06, AnaIn1_2, AnaIn3_4, AnaIn 5_6, Calc__1, Calc__2, Calc__3, Calc__4, RH, SetPntL1–SetPntL4, Lp1-Prof–Lp8-Prof, CLCInpt

Remarks: The setup on this window refers to the selection of the variable to be retransmitted if Retrans1–Retrans8 are chosen on the output configuration screen (CONF_OUT). When retransmitting a value that has limits other than 0.00 to 100.00 the zero and the span of the analog outputs should be adjusted to match those new limits. For example, selecting SetPntL2 for Retrnsmt on loop 2 and selecting Retrans2 for one of the analog output (CONF_OUT) selections would retransmit loop 2 setpoint to that output.

RevOut – Reverse Output Percent

Use: From UNIT_CNF screen, to configure macro key or warm start functions to set reverse output percent to desired level. At GLOS_LOP screen, allows reverse output level tag name to be changed.

Selections: UNIT_CNF screen; MacroKy# or WarmStFunc, Activatd or NotActvd. GLOS_LOP screen; 8 characters.

Remarks: At GLOS_LOP screen, select up to eight characters to form a new name.

RevOut_# – Control Loop Reverse Output

Use: To access the control loop reverse output value for loop #.

Selections: LOOP__# screens; LpMode##; 0.0% to 100.0%

Remarks: This field is only changable when the control loop is in manual mode (see LpMode##). A reverse output is usually used for heating.

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Rm_Sseg – Remote Start Segment 

Use: Identifies the starting point at which the programmer will run when the Remote Start is executed.

Selections: PROGRUN# screen; PgOption

Remarks: None

RmCOut## – Contact Outputs 

Use: Tag Names to display the state of contact outputs.

Selection: LOGIC_# screen; None

Remarks: Tag Names are configured in the glossary.

RmStrt## – Remote Start  

Use: Allows the operator to start the programmer from the display.

Selections: PROGRUN# screen; PgOption

Remarks: None

RmStSeg## – Remote Start Segment 

Use: To display and access the starting segment to be used when a remote start is initiated.

Selections: OVIEW_# screen, 0 to 749

Remarks: None

RmtCOuts – Remote Contact Outputs Tag Names 

Use: Opens a window to allow changing the tag names of remote contact outputs.

Selections: GLOS_IO screen; 8 characters

Remarks: Select up to eight characters to form a new name.

Rmt_CIns – Remote Contact Inputs Tag Names 

Use: To select contact inputs tag names for change.

Selections: GLOS_IO screen; RmtIN_01 to RmtIN_16; 8 characters

Remarks: Select up to eight characters to form a new name.

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RmtIn_## – Contact Inputs 

Use: Tag Names to display the state of contact inputs.

Selection: LOGIC_# screen; None

Remarks: None

Run/Hold – Programmer Run/Hold Source 

Use: To select how the programmer will be switched from run to hold.

Selections: CONF_PRG screen; OperRH##, RemIn_##, LocCL#_#, OR_Set##, NORSet##, ANDSet##, NANDSet#, CLC_IN_# (optional)

Remarks: The OperRH_1–OperRH_8 selections correspond with the switching from Auto to Manual (or vise versa) through the Operator Interface. The selection of OperRH_1 would place the programmer in HOLD when PgMode01 was selected to HOLD and the programmer would go into RUN when the PgMode01 was selected to RUN. PgMode01 can be found under the PROGRUN1 screen. OR/NOR/AND/NAND selections correspond with the switching from RUN to HOLD (or vise versa) through a logic function. Thus the programmer mode could be switched when an alarm condition occurred, or an opensensor, or a contact input, or even all three. A latched alarm would cause the loop to remain in HOLD until that alarm was acknowledge. An unlatched alarm would revert to the RUN mode as soon as the alarm condition went away. The alarm logic can be switch if a low alarm is used instead of a high alarm. Using a contact input through the logic sets, cause the logic of the contact input to be inverted. One application would be if all four programmer are to be synchronized together, a guaranteed soak could be achieved by using deviation alarms. If the DV_Alarm was used in a ANDset2 and all the programmer had their programmer status source tied to ANDset2, then when any loop had an deviation alarm, all four programmers would be placed in hold until that alarm condition went away. RemCI 1–16 selections correspond with the switching from RUN to HOLD (or vise versa) through a contact input. If all four loops have their Pg Mode selected to be the same source, then all four loops would switch from RUN to HOLD at the same time.

SaveAban – Save/Abandon 

Use: To save or abandon setting for analog outputs.

Selections: ANA_OUTS or INPUTS screen; SelcFunc_Calibrat; Save, Abandon

Remarks: Selecting Save will save calibration settings; Abandon will revert settings to the original settings.

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Scale_## – Cascade Scale Factor

Use: To apply a scaling factor to a cascaded setpoint.

Selection: CONF_LOP screen; RemSPsrc; OutputL1; CascParm; Numeric

Remarks: This parameter is only used if cascade control is selected (see RemSPsrc, page 4-14). The formula used is [(Primary control loop setpoint * Ratio_##)] / Scale_## = Secondary control loop setpoint. (The Blend_## parameter should be set to zero for cascade control.) See Ratio## and Scale##.

ScndAddr – Secondary Addressing

Use: Enables or Disables Secondary Addressing for IEEE-488 communication. The second selection selects the secondary address.

Selection: IEEE-488 screen; 96-126; Enable - Disable

Remarks: Default selection is Disable

ScrEnable – Screen Enable

Use: To activate or deactivate specific screen groups.

Selections: UNIT_CNF screen; SetScrns; On or Off

Remarks: Can be used to limit access to screens.

Segment – Program Segment

Use: To select the program segment to edit or review.

Selections: PROGRUN# screen; PgBuild; 0–749

Remarks: None

Seg_Time – Segment Time

Use: To set the time duration of the currently accessed segment.

Selections: PROGRUN# screen; PgBuild; HH:MM:SS (Hours:Minutes:Seconds)

Remarks: Segment time is selectable from one second to 99 hours.

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SelcFunc – Select Functions 

Use: On the INPUTS screen to calibrate all types of inputs or to configure scaling and engineering units for linear inputs. On the ANA_OUTS screen to calibrate analog outputs or configure the zero and span of analog outputs.

Selections: ANA_OUTS screen or INPUTS screen; Calibrat or Configur

Remarks: Opens window for calibration or configuration. If selecting Calibrat see Section 4 for instructions. On the INPUTS screen, selecting Configur will open a window which allows setting the limits for linear zero (Lin_Zero), linear span (Lin_Span) and linear decimal point position (Lin_Decp). A three character engineering unit's mnemonic may also be selected. These parameters affect linear input ranges ONLY! On the ANA_OUTS screen, selecting Configur will open a window which allows setting the zero and span. See Section 4 for more information.

SelectPg – Select Program Recipe Number 

Use: To select the recipe number for building a real-time program.

Selections: PROGRUN#; PgBuild; 1-15

Remarks: None

Set – Set Backlighting Mode 

Use: To select the backlighting mode.

Selections: Backlite; On, Off or Cycle

Remarks: Cycle causes the backlighting to turn on at the time set for On and Off at the time set for Off.

SetPnt – Control Loop Setpoint Tag Name 

Use: Allows control loop setpoint tag name to be changed.

Selection: GLOS_LOP screen; 8 characters

Remarks: Select up to eight characters to form a new name.

SetPnt## – Control Loop Setpoint  

Use: Display control loop Setpoint for loop ##.

Selections: LOOP_# screens; Numeric

Remarks: Setpoint value to which the control will control. The setpoint is setable by this field when the setpoint source (SptSrc) is set to Operator.

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SetUp – Set Up Control Loop Parameters

Use: To set up loop mode, setpoint source, gain, reset, rate and other parameters for a control loop.

Selections: LOOP_# screens; SetParms

Remarks: Opens a window in which parameters are set up.

SmplRate – Sample Rate

Use: To set the time in minutes that the process takes to stabilize after a step change in output.

Selections: Loop_# screen; SetUp; AutoTune; 1-100

Remarks: Determines the time it takes to autotune the process.

Span – Output Span

Use: Displays the span (maximum) value of an output.

Selections: INPUTS or ANA_OUTS screen; SelecFunc; Calibrate; Numeric

Remarks: See Section 4 for set up information.

SpBias## – Setpoint Bias

Use: To set a bias that will add to or subtract from the current profile setpoint value.

Selections: PROGRUN# screen; PgOption

Remarks: Can be used to modify a program.

SptSrc – Setpoint Source

Use: To configure a macro key or warm start function to select setpoint source.

Selections: UNIT_CNF screen; Macroky# and WmStFunc; Activatd; NotActvd

Remarks: When Activatd, choices are Operator, Remote or Programmer.

SptSrc## – Control Loop Setpoint Source

Use: To select the source of the setpoint for a control loop.

Selections: LOOP__## screen; LpMode##; Operator, Programr, Remote

Remarks: When set to Operator, the setpoint is entered by the operator. When set to Programr, the setpoint is generated by the programmer. When set to Remote, the setpoint comes from a source defined in control loop configuration (see RemSpsrc).

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Start_Seg – Programmer Starting Segment 

Use: To select a starting segment.

Selections: PROGRUN# screen; PgBuild; 0–749

Remarks: Selects the segment number at which the programmer will start running when a program start is performed.

StopBits – Communications Stop Bits 

Use: To select the number of stop bits.

Selections: 232_PORT or 422_PORT; 1 or 2

Remarks: Select to match your computer. The most common selection is 1 stop bit.

StrtDat# – Start Date  

Use: To set the date on which a programmer will start.

Selections: PROGRUN# screen; PgOption; MM/DD/YY

Remarks: TOD_Strt must be set to Enable.

StrtPgr# – Start Programmer 

Use: To start a program running.

Selections: PROGRUN# screen; opens a window – Tag Name

Remarks: Opens a window to select a starting segment and/or a program name. The programmer can be started by selecting Start.

Sys_Mode – System Mode  

Use: To display and set the system power up mode.

Selections: UNIT_CNF screen; WarmStrt or ColdStrt

Remarks: This parameter is changeable only on the UNIT_CNF screen. WarmStrt will warm start the unit on power up restoring all parameters at the time of power down. ColdStrt will cold start the unit on power up clearing memory but saving Analog I/O calibration and configuration.

System – System Tag Names 

Use: To open a window in which system level tag names can be modified.

Selections: TagNames screen; Select

Remarks: Select up to eight characters to form a new name.

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T_Into – Time Into Program Tag Name 

Use: Allows time into program tag name to be changed.

Selection: GLOS_PRG screen; 8 characters

Remarks: Select up to eight characters to form a new name.

T_Into## – Time Into Program 

Use: To display the total elapsed time of the currently running program.

Selection: None

Remarks: None

T_Left – Time Left In Program Tag Name 

Use: Allows time left in program tag name to be changed.

Selection: GLOS_PRG screen; 8 characters

Remarks: Select up to eight characters to form a new name.

T_Left## – Time Left in Program  

Use: To display the time remaining in the currently running program.

Selection: PROGRUN# screen; None

Remarks: None

T_Seg – Time Left In Segment Tag Name 

Use: Allows time left in segment tag name to be changed.

Selection: GLOS_PRG screen; 8 characters

Remarks: Select up to eight characters to form a new name.

T_Seg## – Time Left in Segment  

Use: To display time left in current segment of the programmer.

Selection: None

Remarks: Time left in the current segment. Time is displayed as Hours:Minutes:Seconds.

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TextEnty – Text Entry 

Use: To enter text selections for display configuration.

Selections: DCON_LOG screen; TEXT, opens a window

Remarks: This entry opens a window which allows the user to select an Event for display for each line of a selected Logic screen. Up to 12 items may be selected for each logic screen.

TimeBase – Time Base 

Use: To select the programmer time base.

Selections: PROGRUN#; PgOption; HH:MM:SS for hours, minutes, seconds or MM:SS:TT for minutes, seconds, tenths

Remarks: None

TimeDiag – Time Diagnostics 

Use: To display last time and date of unit power down and power up.

Selections: UNIT_CNF screen; Diagnost

Remarks: None

TimeODay – Time of Day 

Use: To enter Time of Day.

Selections: UNIT screen; Hours:Minutes:Seconds (HH:MM:SS)

Remarks: The time is entered and displayed in a 24 hour format.

TODSEn## – Time of Day Start Enable  

Use: To enable a programmer time of day start.

Selections: PROGRUN# screen; PgOption; Enable, Disable

Remarks: When set to Enable will start program running from the start segment (TOD_Sseg) at the time and day identified by TODStrt and StrtDat#.

TOD_Sseg – Time of Day Starting Segment  

Use: To set the program starting segment when a time of day start occurs.

Selections: PROGRUN# screen; PgOption; 0–749

Remarks: None

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TODStrt# – Time of Day Start  

Use: To set the time of day at which a programmer will start.

Selections: PROGRUN# screen; PgOption; HH:MM:SS (Hours:Minutes:Seconds)

Remarks: Time is set in standard 24 hour format. TODSEn## must be set to Enable.

TotalOvr – Total Number of Overview Display Screens 

Use: To select the total number of Overview screens displayable.

Selections: DCON_OVR screen; 1 to 16

Remarks: This entry along with all display configuration information can be saved on a memory card in the file type DspConf_. Display configuration information is also saved when WarmStrt is selected as Sys_Mode.

Tune – PID Tune 

Use: This field is used to setup auto-tuning parameters.

Selections: CONF_LOP screen; Reverse, Direct, Sample rate, Bump, PID group, Response speed

Remarks: Prior to starting auto-tuning, the following should be set up in the CONF_LOP display.
Output Action: Reverse or Direct. This determines which direction to bump the output.
RESPTIME determines the time it takes the process to stabilize after a step change in the output. This will determine the time auto-tune will take to evaluate the process and calculate PID parameters.
BUMP–1 to 100%: Determines the amount of output change to a process.
PIDGRP–1 to 5: Determines which PID group is to receive the calculated PID parameters.
FAST/MEDIUM/SLOW: Determines the response speed of the closed loop system. A FAST setting will respond to a disturbance in the system as quickly as possible with some overshoot. A MEDIUM setting will have little or no overshoot, but will take longer to respond. A SLOW setting will have no overshoot and will take the longest to respond to the disturbance. If a thermocouple is to be used that has a greater range than the capacity of the process, the Input Low Limit and Input High Limit should be set to reflect the usable range of the oven. For Example if a J thermocouple is selected the low limit is –22.0°C and the High is 760.2°C. If the chamber can only reach a temperature of 200°C with the output full on, then the usable range is 0 to 200°C. Therefore, to provide the best control as possible, set the Input high Limit to 200.0°C and the low limit to 0.0°C. Before starting the Auto-tune function, the process should be stabilize at some non-zero condition. For example, set the reverse output to 5% and let the PV stabilize.

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TuneAct# – Auto Tuning Action 

Use: To select reverse or direct tuning action.

Selections: LOOP_# screen; SetUp; AutoTune; Reverse or Direct

Remarks: Select reverse when tuning a reverse acting process such as a heating process. Select direct when tuning a direct acting process such as a cooling process.

UNIT – Unit Display Screen Title 

Use: Allows unit screen title to be changed.

Selection: GLOS_SYS screen; 8 characters.

Remarks: Select up to eight characters to form a new name.

UNIT_CNF – Unit Configuration Display Screen Title 

Use: Allows unit configuration screen title to be changed.

Selection: GLOS_SYS screen; 8 characters.

Remarks: Select up to eight characters to form a new name.

WarmStrt – Warm Start Power Up Mode 

Use: To select warm start power up mode.

Selection: UNIT_CONF screen; Sys_Mode

Remarks: See Sys_Mode.

WarpFctr – Warp Factor 

Use: Determines the speed at which the programmer will execute when fast forward is enabled.

Selection: CONF_PRG screen; 1–1000

Remarks: If 2 is selected, the program will run at twice its normal rate (see FwdEnSrc).

WmStFunc – Warm Start Function 

Use: To set multiple functions to be executed on a warmstart.

Selections: UNIT_CNF screen; SetFuncs

Remarks: When Selected, opens a window to set functions.

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WRITE – Write to Memory Card Function 

Use: To initiate writing a file to a memory card.

Selections: UNIT screen; Mem_Card; FUNC

Remarks: See FUNC

Xon/Xoff – Xon and Xoff 

Use: To select X-on/X-off software handshaking.

Selections: 232_PORT or 422_PORT screen; Enable or Disable

Remarks: Set to match your computer.

Zoom – Profile Zoom 

Use: Zoom factor on Profile displays.

Selection: DCON_PRG screen; 1 to 3600

Remarks: The zoom factor alters the time base for the profile display. It can be thought of as the number of seconds per pixel on the display. For example if the segment time equals 10 minutes (600 seconds) then with a zoom factor of 60, the segment would have a horizontal length of 10 pixels, or 60 seconds per pixel (zoom factor = 60).

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Communications

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Communications

This appendix explains how to communicate with Dimension 8705 and 8725 Industrial Process Managers, via an EIA-232 or EIA-422 serial link or IEEE-488 General Purpose Interface Bus, from a terminal or host computer. All parameters needed for terminal or network mode communications are described.

Serial Communications Overview

Serial communications capability is available to link Dimension units with a terminal or a host computer. The following topics are discussed in this appendix:

- *Communication types*
- *Data access methods*

Communication types refer to handshaking techniques that permit communication to occur. Data access refers to the methods by which Dimension data can be viewed or changed.

The two communication types available for Dimension are:

- *Terminal mode*
- *Network mode*

In the terminal mode, a simple X-on/off handshaking procedure may, at the user's option, be used for data transfer. If used, this handshaking is enabled and disabled on a dedicated Dimension communications screen. In the network mode (also called Data Link Control, or DLC), data is transferred in blocks, and ASCII control characters are used to regulate data flow.

! **Important:** Network mode may be used only with a host computer. Terminal mode can be used by either a host computer or a terminal.

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When a host computer is used, the user must write a software driver. This appendix provides sufficient information for a computer programmer to do so. It is presumed that the programmer already knows the requirements of the host computer's operating system.

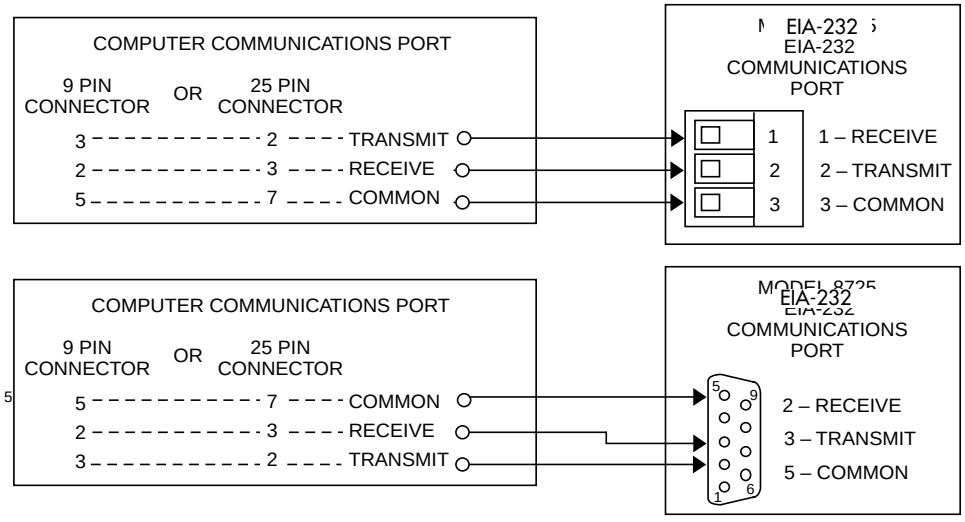
The Dimension may simultaneously use the EIA-232 port and EIA-422 port. EIA-232 only supports one Dimension connected to a computer. EIA-422 will support up to 31 Dimensions connected to a computer.

Electrical Connections

EIA-232 Connections

EIA-232 communication supports only one Dimension to a computer or CRT terminal. For EIA-232 connections(see Fig. B-1). The Model 8725 Dimension uses a 9 pin D shell connector. A "NULL" modem cable may be used between a Model 8725 and computer. The maximum EIA-232 cable length is 100 feet (30 meters).

Figure B-1.
EIA-232 Connections



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EIA-422 Connections

EIA-422 communication is useful in applications which require communicating over up to 4,000 feet (1219 meters) of interconnecting cable or when multiple Dimensions are connected in a distributed communications network. Up to 31 Dimensions may be connected in parallel to one computer. Fig. B-2 shows EIA-422 communications from the computer to the first Dimension. Wire additional Dimensions to the first Dimension pin for pin and in a 'Daisy Chain' manner (see Fig. B-3).

Figure B-2.
EIA-422 Connections

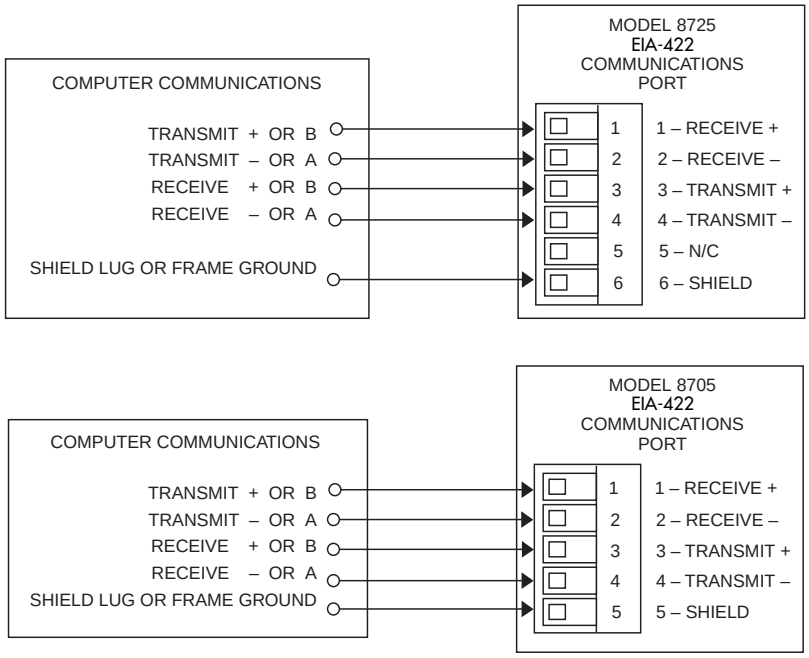
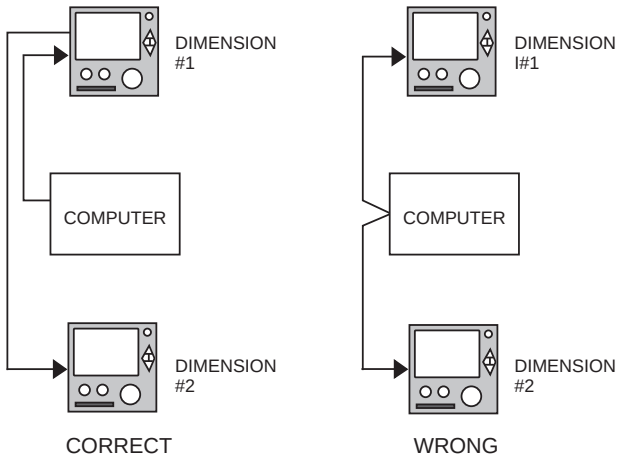


Figure B-3.
Daisy Chain Connections



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Shield Connection

> ***Note:*** *The following shield connection procedure is recommended for typical Dimension applications. However, different connection procedures may be required in order to match a particular operating environment or host computer.*

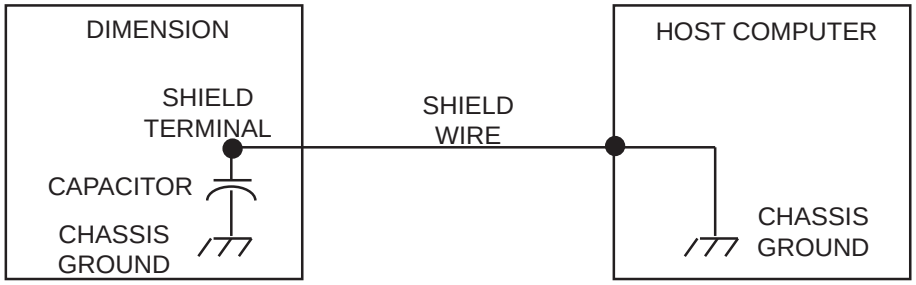
Use of the **SHIELD** connection minimizes pickup of electrical noise by the communications wiring.

The communications cable used for **EIA-422** connections should include a metal sheath. This metal sheath is called the "shield." The shield surrounds the communications wires to keep out electrical interference.

In most cases, the shield functions best if DC current flow in the shield is blocked and AC voltages are effectively drained to ground. This is best achieved as follows:

1. To block DC current in the shield, connect the shield directly to the ground and nowhere else.
2. To drain AC voltages to ground, connect the shield toEarth ground.
3. In a distributed network, connect the cable shield to Earth ground.

Figure B-4.
SHIELD Terminal Wiring Diagram



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Terminal Mode

Terminal mode is a simple handshaking technique that, at the user's option, allows a terminal or a host computer to control the data flow from Dimension by using two ASCII control characters: X-on and X-off. Table B-1 illustrates different methods of documenting these control characters.

Table B-1. Dimension X-on/X-off Control Characters

Type	X-on	X-off
ASCII Name	DC1	DC3
HEX Number	11	13
Decimal Number	17	19

When Dimension receives an X-off character, it stops transmitting characters through the communication port. The Dimension remains in this state until it receives an X-on character, at which time it resumes transmission.

The X-on/off characters are the only special control characters used for terminal mode communication. A station address or checksum is not required.

When a computer terminal is connected to Dimension and is set for terminal mode, the X-on character is usually **Control Q** (press the **Control** key and then, while holding down the **Control** key, also press **Q**). The X-off character is usually **Control S** (press the Control key and, while holding down the **Control** key, also press **S**). Under most circumstances, a terminal does not need a software driver because most terminals have built-in X-on/off communications. **Control S** and **Control Q** are the only two control characters that are needed once the terminal is connected to the controller.

Fig. B-5 illustrates the communication sequence for a message exchanged using X-on/off communications.

Software Drivers

Most host computers have terminal drivers that support X-on/off. If not, the Network Mode topic on page B-9 contains the information needed to write a software driver using the network mode.

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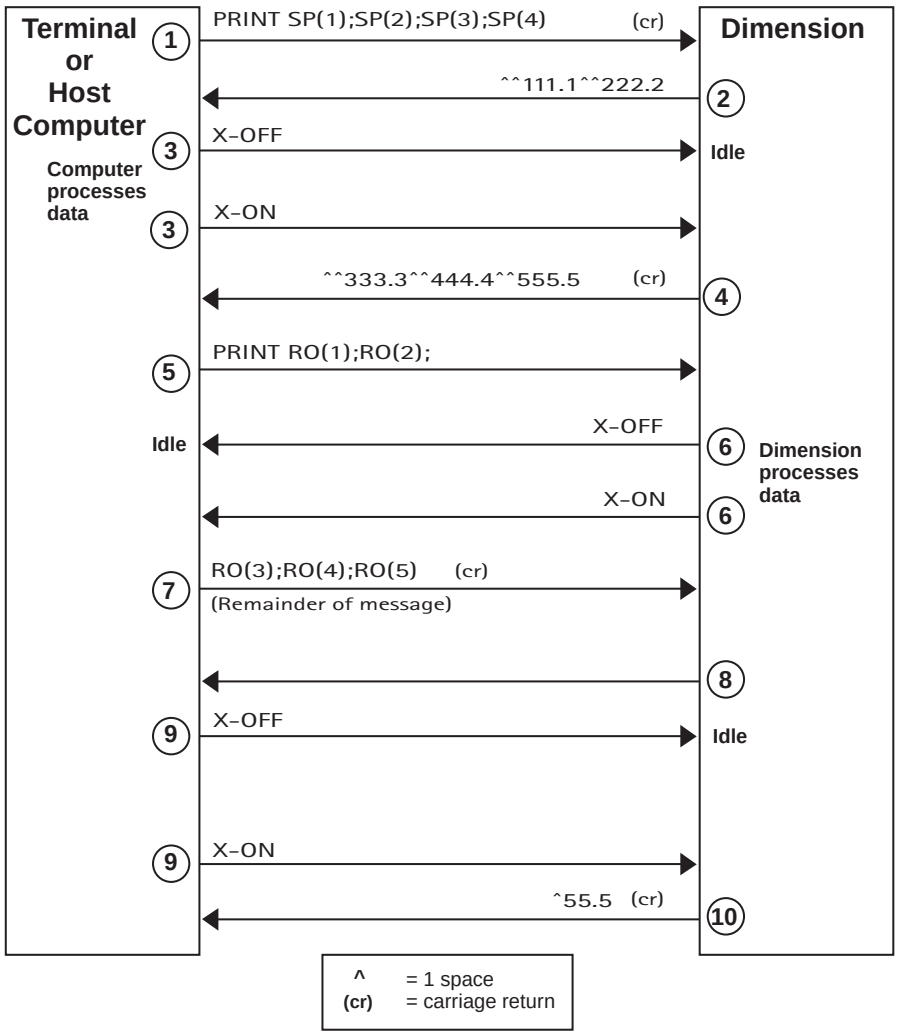


Figure B-5.
Terminal Mode (X-on/off) Communications Sequences

Error Checking

Terminal mode does not use error checking. The terminal or computer assumes that data is valid even if an error occurs during transmission. Error codes, however, are generated by Dimension for items such as syntax errors and number errors. (See "*Error Messages*" on page B-86.)

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Setting Up the Terminal Mode

Set up Dimension terminal mode as follows:

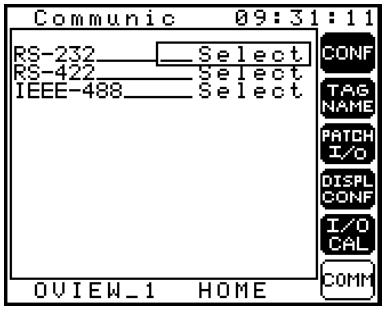


Figure B-6. Communications Type Selection Screen

1. With the unit in the **"FULL"** access mode, use the diamond key to access the Communications Type Selection screen shown in Fig. B-6.

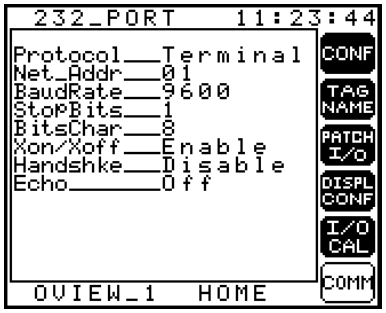


Figure B-7. Communications Configuration Screen

2. Use the diamond key to select the **232_Port** Configuration screen for EIA-232 communications or **422_Port** Configuration screen for EIA-422 communications. The screen shown in Fig. B-7 will display.
3. Use the knob to select the **Protocol** field.
4. Select **Terminal** mode (no error checking).
5. Ignore the network address setting (network mode only), but set all other variables on the Communications Configuration screen to match the configuration of the terminal or host computer.

Important: When the echo mode is enabled, all characters sent to the Dimension except X-on/off are immediately sent back to the terminal or computer. When using terminal mode, select the echo mode for terminals but not for computers.

6. Hardware handshake is not supported with Dimension. Set this parameter to **Disable**.
7. With the Dimension set for **Warmstrt**, remove AC power from Dimension.
8. Check that the host computer or terminal is powered up and electrically connected to the Dimension.

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9. Apply AC power to the Dimension. The Dimension performs its startup routines, after which the terminal or host computer displays:

   ```
   Dimension terminal mode v3.Ø
   (c) 1997 Eurotherm Controls Inc
   ```

   Note: *If there is no response on your terminal or host computer following step 9, it is possible that the settings given do not work with your application. Try other baud rates and settings, making sure that the settings on the Dimension Communications Setup screen are also set on your terminal or computer.*

Test the terminal mode by entering the following message at the terminal or computer keyboard:

`PR TD` (press **ENTER** or **RETURN**)

Response: `13:47:Ø3` (current time)

If an error number appears rather than a number as a response to the command, refer to Table B-5 to identify the error that occurred.

Terminal Mode Data Access

Once the terminal mode is established on Dimension, the system variable data access method can be used as described under "*System Variable Data Access*" on page B-22.

Network Mode

Network mode (DLC) is a more advanced communication protocol intended for use with a host computer. This mode defines the sequence and format for communication with Dimension and consists of request and response messages, which are framed by control characters. These messages are transmitted as an entire block. If equipped with a user-developed software driver that understands the selected protocol, the computer dictates when Dimension transmits blocks of characters. Communication is always initiated by the computer; at no time can Dimension transmit unless the host computer requests data to be transmitted.

Software Driver

When using a host computer in the network mode, a software driver must be running on the host computer. The following topics explain how the protocol operates, and this information can be used to write a software communications driver for a host computer. Host software products are also available from Eurotherm Controls Inc.

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Setting Up the Network Mode

Set up Dimension network mode as follows:

1. With the unit in the "FULL" access mode, use the diamond key to access the Communications Type Selection screen shown in Fig. B-6.
2. Use the diamond key to select the 232_Port Configuration screen for EIA-232 communications or 422_Port Configuration screen for EIA-422 communications. The screen shown in Fig. B-7 will display.
3. Use the knob to select the Protocol field.
4. Select Network mode (error checking used).
5. Use the knob to select the Net_Addr field.
6. Select a network address number (01–99) for the Dimension. (This address is used only with Network selected and must be unique.)
7. Set other variables on the Communications Setup screen to match the configuration of the host computer. (Note that Xon/Xoff, Handshke and Echo have no effect in the network mode.)
8. With the controller set for Warmstrt, remove AC power from Dimension.
9. Check that the host computer is powered up and electrically connected to Dimension.
10. Connect AC power to Dimension. No response is displayed in either the Dimension or the host computer. Dimension simply performs its normal startup routines.
11. To test whether the network mode is set up correctly, start your software driver or run the 'DRIVER' program found on the Dimension Utility diskette:

    A.On your computer, change to the DIMUTIL directory.

    B.Type **'DRIVER' <CR>**.

    C.Select the COM port you are connected to.

    D.Select the station address.

    E.Select 2 seconds for Character Timeout.

    F.Set "caps lock" **ON** on your keyboard.

    G.At the Comnd: prompt, enter PR TD and press return.

    Response: XX:XX:XX the Time of Day

    H.Enter ! to end program or @ to start over.

If an error number appears rather than a number as a response to the command, refer to Table B-5 to identify the error that occurred.

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Note: *If there is no response on your host computer following step 11, the settings given may not work with your application. Try other baud rates and settings, making sure that the settings on the Dimension Communications Setup screen are also set to match your computer. Remember, the Dimension AC power must be cycled off and on with the Dimension in Warm Start for communications changes to take effect.*

Communications Set Up for SpecView Software

SpecView is a supervisory software package that runs on industry standard personal computers and communicates to Dimension. The Dimension needs to be set up as follows, in order to operate with SpecView.

1. With the unit in the configuration mode (see "Configuration Screens" on page 3-25), use the diamond key to access the Communications (Comm) icon.
2. Use the rotary selector key to select EIA-232 communications or EIA-422 communications.
3. Set up each communication parameter as listed below:

Protocol _____ Network
Net_Addr _____ (as required)
Baud Rate _____ 9600
StopBits _____ 1
BitsChar_____ 8
Xon/Xoff _____ Disabled
Echo _____ Off

Network Mode Request and Response Messages

Two types of messages are used with network mode protocol: request messages and response messages. The host computer initiates request messages; the Dimension answers with response messages. The Dimension always generates one message in response to a request message from the host computer. Both message types require **ACK/NAK** handshaking control characters for proper operation.

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Network Mode Control Characters – Special handshaking control characters frame the messages between the computer and Dimension. The five control characters used in Dimension serial communication are:

STX(Start of TeXt: used to begin a request or response message)

ETX(End of TeXt: used to end a request or response message)

ENQ(ENQuiry: to prompt a response message from the Dimension)

ACK(ACKnowledge: to verify proper communication)

NAK(Not-AcKnowledge: to verify improper communication)

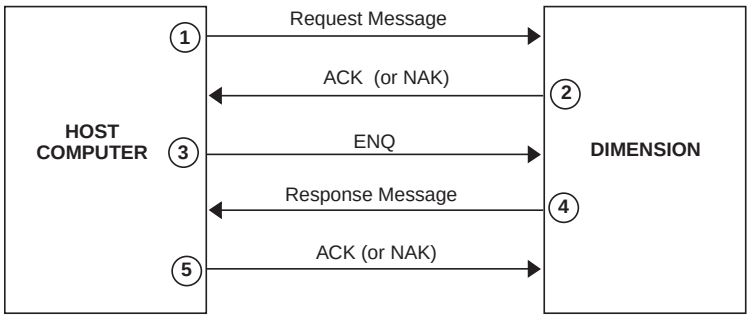
See Table B-3 for the numeric equivalents of these characters.

Note: *Control characters may* NOT *be used in the station address or data field portions of a message.*

Network Mode Communication Sequence – Fig. B-8 illustrates the communication sequence for a message between a host computer and Dimension. Each communication begins with the transmission of a request message from the computer to Dimension, which then transmits either an **ACK** or a **NAK** control character back to the computer. An **ACK** confirms that the request message has been received without error. A **NAK** indicates that an error occurred and the request message should be retransmitted.

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Figure B-8.
Dimension Serial Communications Message Sequence



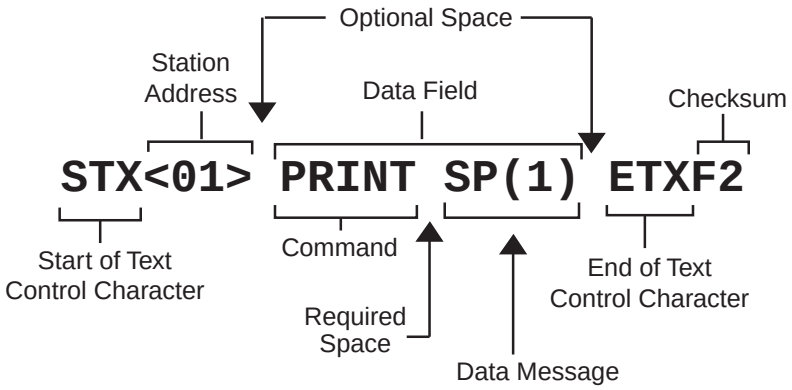
Once the request from the computer has been acknowledged, the Dimension is ready to transmit the response message. To request the response, the computer transmits an **ENQ** control character, upon receipt of which the Dimension transmits the response message and then waits for an **ACK** or **NAK** from the computer. If the Dimension receives a NAK, it automatically retransmits its response message up to four times. After the fourth **NAK**, the Dimension enters an idle state, waiting for another **STX**.

Once a response message is received and acknowledged by the computer, Dimension is ready to receive another request message.

Network Mode Request and Response Message Formats

Both request and response messages follow the same general format, as illustrated in Fig. B-9. The only difference is the structure of the data field. The following paragraphs explain in detail each element of the format.

Figure B-9.
Dimension Serial Communications Request Message Format



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In the example of a message format shown in Fig. B-9, the checksum (F2) is calculated with the two optional spaces. If one optional space were removed from the message, the checksum would be **D2**; if both optional spaces were removed, the checksum would be **B2**.

Start of Text – The **STX** control character begins any request or response message. If communication with the Dimension is interrupted, a new **STX** must be sent by the computer to reestablish communication. An **STX** at any time during communication cancels the communication in progress and begins a new message sequence.

Station Address – A station address must be included in all request and response messages. Station addresses must be enclosed by brackets and be two digits long, e.g. **<Ø1>, <Ø9>, <14>**, etc. Spaces are not allowed between **STX** and the station address.

The station address for each Dimension is set using the Dimension Communications Setup screen **Net_Addr** field. Valid addresses are **ØØ** through **99**, even though only 31 stations may be used by an EIA-422 network at a time.

Request Message Data Field – A request message requires that a ***command*** and a ***data message*** follow the station address. The request message format requires a space between the command characters and the data message (e.g. between **PRINT** and **SP(1)** in Fig. B-9).

Commands – The command is one of the two elements in the request message data field (see Fig. B-8). There are five valid commands: PRINT, LET, LI (LIST), STAG and CTAG. The command determines whether the data message will monitor (PRINT) a system variable, change (LET) a system variable, display (LIST) all permissible parameters, show a display tagname (STAG) for a system variable, or change a display tagname (CTAG) for a system variable. If a command is not specified, LET is assumed. The Dimension will recognize the first two letters of PRINT, LET, and LIST, you can transmit LE for LET, PR for PRINT, or LI for LIST. However, STAG and CTAG cannot be abbreviated and LIST must be abbreviated. Also, a PRINT command may include comment text enclosed in quotes. Comment text will be returned in the response message. For example:

Request message:

PR "The Dimension setpoint is"; SP(1)

Response message:

The Dimension setpoint is 1Ø.Ø

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Data Message – The data message is one of the two elements in the data field and can be up to 120 characters long. The data message always begins with a system variable that identifies the type of information (setpoint, deviation, process variable, etc.) to be changed or monitored. Also, several system variables may be included in the same data message by separating the system variables with semicolons, e.g. **SP(1); PV(2); DV(2)**. The process of linking two or more system variables together in this manner is referred to as concatenation.

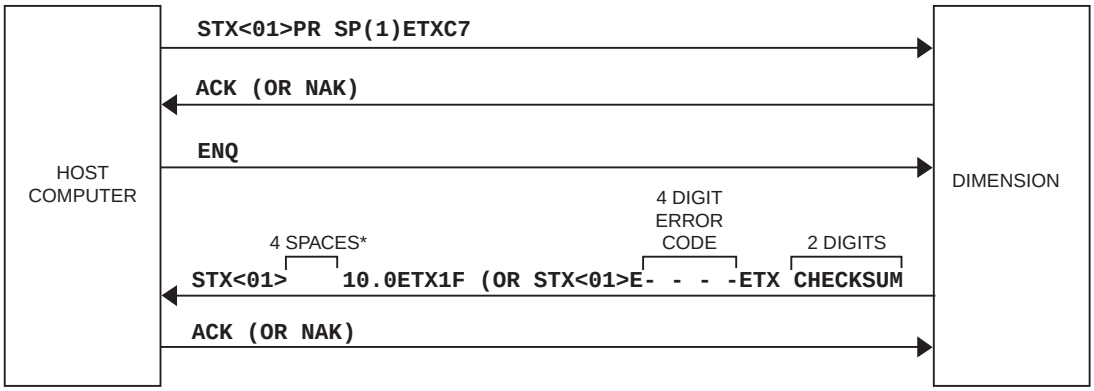
For a PRINT command, the data message consists of just the desired system variable(s) (see Fig. B-10). For example:

- To monitor the channel 2 setpoint: **PR SP(2)**.
- To monitor the channel 2 setpoint and deviation: **PR SP(2); DV(2)**.

The PRINT command can also include comment text enclosed in quotes and placed in front of the system variable(s). For example:

- **PR "The Ch 2 setpoint is:"; SP(2)**
- **PR "Ch 2 is:";SP(2); "deviation 2 is:"; DV(2)**
  (one continuous message)

Figure B-10.
Dimension Serial Communications Message Format for a PRINT Command



* This setpoint field length is eight characters. Since the setpoint data in this example is four digits long, Dimension transmits four spaces, followed by "10.0".

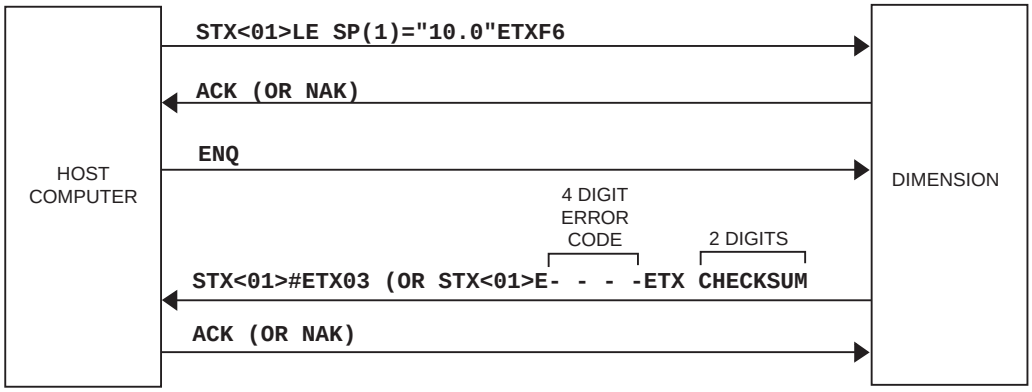
For a LET command, the data message contains the new system variable value, preceded by an equal sign and enclosed in single or double quotation marks (see Fig. B-11). Note that a LET command cannot include comment text. For example, to enter a channel 2 setpoint of 59.6:

```
LE SP(2)="59.6"
```

Note: *The LE is optional; see example below.*

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Figure B-11.
Dimension Serial Communications Message Format for a LET Command



To enter a setpoint of 60.5 for both channels:

```
SP(1)="6Ø.5";SP(2)="6Ø.5"
```

Since no command is specified in this example, LET is assumed.

Response Message Data Field – The format of the response message is determined by the type of request message command. If the response message is replying to a LET or CTAG command, a pound sign (#) or ***error message*** follows the station address. If the response message is replying to a PRINT, LIST, or STAG command, either a data message or an error message follows the station address. There are no spaces in a response message except those required by a system variable field length, error message, or spaces in the comment text included by the user. The pound sign (#), data messages, and error messages are explained under "*System Variable Data Access*" on page B-22.

End of Text Control Character

The **ETX** control character ends all messages. A space between the data field and the **ETX** message is optional. A space may not be used between the **ETX** and the checksum (a space after **ETX** will be interpreted as being part of the checksum).

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Checksum

To verify the accuracy of each transmission, a two-character checksum is included at the end of each request and response message. The checksum is based on the 8-bit binary sum of all characters from the **STX** to and including the **ETX**. The checksum characters are the two least significant hex digits in the sum. Table B-2 illustrates the checksum generation process.

For information on hex-to-decimal and decimal-to-hex conversion, see Table B-3.

Table B-2. Checksum Generation Example

Sample ASCII Message*:

STX<01> LET SP(1)="56.3" ETX97

MESSAGE CHARACTER	HEX EQUIVALENT	HEX RUNNING SUM
STX	02	02
<	3C	3E
0	30	6E
1	31	9F
>	3E	DD
SPACE	20	FD
L	4C	149
E	45	18E
T	54	1E2
SPACE	20	202
S	53	255
P	50	2A5
(	28	2CD
1	31	2FE
)	29	327
=	3D	364
"	22	386
5	35	3BB
6	36	3F1
.	2E	41F
3	33	452
"	22	474
SPACE	20	494
ETX	03	497
		97 (CHECKSUM)

* The first and last spaces and the **T** in **LET** are optional; they are included in this example only for clarity. The only space required is between **LET and SP(1).** This example message could also be written:

STX<01>LE SP(1)="56.3"ETX03

5168

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Table B-3. ASCII Character Codes in Hexadecimal and Decimal

CHR	DEC	HEX	CHR	DEC	HEX	CHR	DEC	HEX
NUL	000	00	+	043	2B	V	086	56
SOH	001	01	,	044	2C	W	087	57
STX	002	02	-	045	2D	X	088	58
ETX	003	03	.	046	2E	Y	089	59
EOT	004	04	/	407	2F	Z	090	5A
ENQ	005	05	0	048	30	[	091	5B
ACK	006	06	1	049	31	\	092	5C
BEL	007	07	2	050	32	]	093	5D
BS	008	08	3	051	33	^	094	5E
HT	009	09	4	052	34	-	095	5F
LF	010	0A	5	053	35	.	096	60
VT	011	0B	6	054	36	a	097	61
FF	012	0C	7	055	37	b	098	62
CR	013	0D	8	056	38	c	099	63
SO	014	0E	9	057	39	d	100	64
SI	015	0F	:	058	3A	e	101	65
DLE	016	10	;	059	3B	f	102	66
DC1	017	11	<	060	3C	g	103	67
DC2	018	12	=	061	3D	h	104	68
DC3	019	13	>	062	3E	i	105	69
DC4	020	14	?	063	3F	j	106	6A
NAK	021	15	@	064	40	k	107	6B
SYN	022	16	A	065	41	l	108	6C
ETB	023	17	B	066	42	m	109	6D
CAN	024	18	C	067	43	n	110	6E
EM	025	19	D	068	44	o	111	6F
SUB	026	1A	E	069	45	p	112	70
ESCAPE	027	1B	F	070	46	q	113	71
FS	028	1C	G	071	47	r	114	72
GS	029	1D	H	072	48	s	115	73
RS	030	1E	I	073	49	t	116	74
US	031	1F	J	074	4A	u	117	75
SPACE	032	20	K	075	4B	v	118	76
!	033	21	L	076	4C	w	119	77
"	034	22	M	077	4D	x	120	78
#	035	23	N	078	4E	y	121	79
$	036	24	O	079	4F	z	122	7A
%	037	25	P	080	50	{	123	7B
&	038	26	Q	081	51	l	124	7C
'	039	27	R	082	52	}	125	7D
(	040	28	S	083	53	~	126	7E
)	041	29	T	084	54	DEL	127	7F
*	042	2A	U	085	55			

DEC= Decimal, HEX= Hexadecimal, CHR=Character, LF= Line Feed, FF= Form Feed, CR= Carriage Return, DEL =Rubout.

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Error Checking

The network mode contains a full set of error codes. Refer to Table B-5 for a listing and explanation of these codes.

Test Program

We have written the test program found in Fig. B-11 to test communications between a host computer and the Dimension using Network mode. This is not a complete communication driver program. This program was written using the Basic language and is compatible with QBASIC and GWBASIC.

Figure B-12.
Test Program

```
1Ø REM ****** FULL PROTOCOL COMMUNICATIONS TEST PROGRAM ******
2Ø OPEN "COM2:96ØØ,N,8,1,RS,CS,DS" FOR RANDOM AS #1
3Ø CLS
4Ø PRINT #1, CHR$(2); "<Ø1>SP(1)='1Ø'"; CHR$(3); "F1";
5Ø GOSUB 1ØØ
6Ø PRINT #1, CHR$(2); "<Ø1>PR SP(1)"; CHR$(3); "C7";
7Ø GOSUB 1ØØ
8Ø CLOSE #1
9Ø END
1ØØ A = TIMER + 2
11Ø IF LOC(1) > Ø GOTO 14Ø
12Ø IF TIMER > A GOTO 3ØØ
13Ø GOTO 11Ø
14Ø B$ = INPUT$(1, #1)
15Ø IF ASC(B$) = 6 THEN PRINT "ACK"
16Ø IF ASC(B$) = 6 THEN PRINT #1, CHR$(5);
17Ø IF ASC(B$) = 21 GOTO 25Ø
18Ø IF ASC(B$) = 2 THEN PRINT "STX"
19Ø IF ASC(B$) = 3 GOTO 22Ø
2ØØ IF ASC(B$) > 6 THEN PRINT B$;
21Ø GOTO 1ØØ
22Ø PRINT "ETX";
23Ø PRINT INPUT$(2, #1)
24Ø RETURN
25Ø PRINT "CONTROLLER SENT CHECKSUM ERROR (NAK)"
26Ø RETURN
3ØØ PRINT "NO RESPONSE FROM CONTROLLER"
31Ø RETURN
```


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The program changes loop 1 setpoint to 10 and then prints the setpoint. Correct output is displayed as follows:

```
ACK
STX
<Ø1>#ETXØ3
ACK
STX
<Ø1>.....1ØETXØ1
```

Test Program output.

PC to Dimension Communications – Optimized for Speed

Variables are typically requested one at a time from Dimension. To cut some of the overhead associated with this method, a macro can be created in the PC and request a string of data with one command. The following is an example of a typical macro to implement this function.

1. Set to use the highest baud rate – 19.2 Kbaud
2. Use **"SET"** command to create macro in the PC. The following creates a macro which allows the user to transmit or receive blocks of information with one command.

   PRINT Example

   – Create Macro

   ```
   SET $Z = "PR AI(1);AI(2);AI(3);AI(4);AI(5);AI(6)"
   SET $Y = "PR AO(1);AO(2);AO(3);AO(4)"
   SET $X = "PR CIN(1);CIN(2);CIN(3)"
   ```

   – View Macro

   ```
   SHOW $Z
   SHOW $Y
   SHOW $X
   ```

   –Execute Macro

   ```
   EX $Z
   EX $Y
   EX $X
   ```


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LET Example
–Create Macro

```
SET $U = "LE PS(1)='H';PS(2)='H';PS(3)='H';PS(4)='H'"
```

–View Macro

```
SHOW $
```

–Execute Macro

```
EX $U
```

LIMITS: 255 characters per macro

$ (U,V,W,X,Y,Z) only character available Macros.

System Variable Data Access

Access to Dimension parameters via terminal or network communications is accomplished using "System Variables". A System Variable is a two or three character abbreviation which corresponds to a certain parameter in the Dimension. In addition, many system variables take a numeric "subscript" surrounded by parentheses which specifies a specific member of a group of parameters. For example, the system variable for a setpoint is 'SP' and it takes a subscript which indicates the channel for which it is used. The full variable name would then be 'SP(x)' where x is a number from 1 to 8. Other system variables take no subscripts, and some take two. The System Variable Descriptions are listed in Table B-4 and described beginning on page B-28.

System Variable Commands

There are five valid commands for accessing system variables:

PRINT – Read a system variable

LET – Write a system variable

LIST – Display possible values for a system variable

STAG – Show the Tagname of a system variable

CTAG – Change the Tagname of a system variable

The PRINT, LET and LIST commands may be shortened to just two letters (PR, LE, LI), but the STAG and CTAG commands may not be truncated. All commands must be in capital letters, and if a command is not specified, LET is assumed. Each command is explained further below.

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PRINT Commands

When using a PRINT command, you may either print only the desired system variable(s) or you may print both text and the desired system variables.

The following two examples use a PRINT command consisting of only the desired system variable(s):

- To monitor the channel 2 setpoint: `PR SP(2)`
- To monitor the channel 2 setpoint and deviation: `PR SP(2);DV(2)`

The following two examples use a PRINT command with both text and the variables:

- `PR "The channel 2 setpoint is:";SP(2)`
- `PR "Setpoint 2 is:";SP(2); "Deviation 2 is:";DV(2)`

Response Message to a PRINT Command – When the response message is replying to a PRINT command, either a data message or an error message follows the station address. There are no spaces in a response message except those required by the system variable field length, error message, or spaces in comment text included by the user.

A response message contains the system variable information requested by a PRINT command. In addition, any comment text included in the request message will be returned in the response message.

Each system variable has a field length. Any unused characters in the field length are transmitted as spaces in the response message.

For example, the field length for the setpoint is eight characters. If the setpoint data requested is 10.0, the data response message would look like this:

```
^^^^10.0
```

where ^ = one space.

If the PRINT command is concatenated, the response data is also linked together. For example, the response data for setpoint (field length = 8), reverse output (field length = 8), loop status (field length = 1), and process variable (field length = 8) might look like this:

```
^^^^10.0^^^25.20A^^^35.63
```


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If the PRINT command included text, the response data includes that text. For example, the response data for the message:

```
PR "The channel 2 setpoint is:";SP(2)
```

might look like this:

```
The channel 2 setpoint is:^^^^1Ø.Ø
```

PRINT Request Error Messages – An error message indicates that the PRINT request message was unsuccessful. The error message is an E followed by a four-digit number. The number identifies what was wrong with the request message, e.g., a syntax error. All error messages are listed in Table B-5.

LET Commands

For a LET command, the data message contains the new system variable value, preceded by an equals sign and enclosed in single or double quotation marks. A LET command cannot include comment text. Two examples are:

To enter a channel 2 setpoint of 59.6:

```
LE SP(2)="59.6"
```

To enter a setpoint of 60.5 into both channels 1 and 2:

```
SP(1)="6Ø.5";SP(2)="6Ø.5"
```

Response Message to a LET Command – If the response message is replying to a LET command, either a pound sign (#) or an error message follows the station address. A # response indicates that Dimension has correctly executed a LET command.

LET Request Error Message – An error message indicates that the LET request message was unsuccessful. The error message is an E, followed by a four digit number. The number identifies what was wrong with the request message, e.g. a syntax error. All error messages are listed in Table B-5.

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LIST Commands

The LIST command provides a useful "help" function that can be used during communications. To display all parameters (entries) on-screen that can be used with a PRINT or LET command (see Table B-4), type LI followed by the 2- or 3-character system variable and the channel number in parentheses. The system will display all possible entries that can be used with the variable, capitalized correctly and separated by commas. For example, to list all parameters that can be used with the Loop Status system variable, type **LI LS(1)** and press **ENTER**. (This function works with system variables which have a finite number of possible settings.)

Table B-4. System Variables

Code	Title	Access	Code	Title	Access
AB	Abort Enable	R,W,P	CJ	Cold Junction Temperature	R,I
ACL	Access Level	R	CJE	Cold Junction Error	R,W,I
ACP	Accept Input	R,W,L	CM	Cascade Multiplier	R,W,L
ACY	Analog Output Time-Pro		CO	Contact Out	R,C
	portioning Cycle Time	R,W,O	CP	Calculated Gain	R,L
AGP	Alarm Group	R,W,*	CPG	Current PID Group	R,L
AHY	Alarm Hysteresis	R,W,L	CRS	Calculated Reset	R,L
AI	Analog Input	R,I	CS	Current Segment Number	R,P
AK	Alarm Acknowledge	W,L,I	CSP	Current Span Reference	R,W,I
AL	Alarm Screen Titles	R,W,T,S	CZE	Current Input Zero	R,W,I
ALL	All Input Range Names	R,*	DF	Digital Filter	R,W,I
ALT	Alarm Latch	R,W,L	DH	Direct Output High Limit	R,W,L
AO	Analog Output	R,O	DL	Direct Output Low Limit	R,W,L
AS	Alarm Status	R,L	DO	Direct Output (in percent)	R,W,L
ATD	Activate Time of Day Start	R,W,P	DOW	Day of Week Start	R,W,P
BC2	EIA-232 Bits/Character	R,W	DT	Date	R,W
BC4	EIA-422 Bits/Character	R,W	DV	Deviation	R,L
BD2	EIA-232 Baud Rate	R,W	EO2	EIA-232 Echo Mode	R,W
BD4	EIA-422 Baud Rate	R,W	EO4	EIA-422 Echo Mode	R,W
BEU	CLC Basic Engineering Units	R,W*	EU	Engineering Units	R,W,I
BF	Blend Factor	R,W,L	EV	Event Outputs	R,*
BHL	CLC Basic High Limit	R,W*	FPC	Full Passcode	R,W
BLL	CLC Basic Low Limit	R,W*	GAS	Global Alarm Status	R
BLV	CLC Basic List Variable	R,W*	GN	Gain	R,W,L
BND	CLC Basic Number of Decimals	R,W*	HH2	EIA-232 Hardware Handshaking	R,W
BNV	CLC Basic Numeric Variable	R,W*	HH4	EIA-422 Hardware Handshaking	R,W
BSV	CLC Basic String Variable	R,W*	IAS	Input Alarm Status	R,I
CAG	Current Alarm Group	R,L	IH	Input High Alarm	R,W,I
CC	ReCycle Counter	R,P	IHL	Input High Limit	R,W,I
CCY	Contact Output Time-Pro		IHY	Input Alarm Hysteresis	R,W,I
	portioning Cycle Time	R,W,C	IL	Input Low Alarm	R,W,I
CD	Calculated Rate	R,L	ILL	Input Low Limit	R,W,I
CEV	Current Events	R,P	ILT	Input Alarm Latch	R,W,I
CI	Configuration Image	R,W,*	LG	Logic Screen Titles	R,W,T,S
CIN	Contact In	R,C			

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Code	Title	Access	Code	Title	Access
LND	Linear Analog Input Decimal Position	R,W,I	PS2	Programmer Start Segment 2 (Unused)	R,W,P
LNS	Linear Analog Input Span	R,W,I	PS3	Programmer Start Segment 3 (TOD Start)	R,W,P
LNZ	Linear Analog Input Zero	R,W,I			
LP	Loop Screen Titles	R,W,T,S	PS4	Programmer Start Segment 4 (Operator Start)	R,W,P
LPC	Limited Passcode	R,W			
LS	Loop Status	R,W,L	PT	PID Type	R,W,L
MC1	Macro Name #1	R,W,T	PUD	Power Up Date	R
MC2	Macro Name #2	R,W,T	PUT	Power Up Time	R
MI	Memory Image	R,W,*	PV	Process Variable	R,L
MR	Manual Reset	R,W,L	QS2	EIA-232 XON/XOFF Mode	R,W
NA2	EIA-232 Network Address	R,W	QS4	EIA-422 XON/XOFF Mode	R,W
NA4	EIA-422 Network Address	R,W	RH	Reverse Output High Limit	R,W,L
NAI	Number of Analog Inputs	R	RI	Recipe Image	R,W,*
NAO	Number of Analog Outputs	R	RL	Reverse Output Low Limit	R,W,L
NCI	Number of Contact Inputs	R	RO	Reverse Output (in percent)	R,W,L
NCO	Number of Contact Outputs	R	RS	Reset	R,W,L
NL	Number of Loops	R	RSD	Response Speed	R,W,L
NM2	EIA-232 Protocol	R,W	RSS	Remote Start Segment	R,W,P
NM4	EIA-422 Protocol	R,W	RT	Rate	R,W,L
NP	Number of Programmers	R	SA	Setpoint Adjust	R,W,*
NS	Number of Segments	R,P	SB2	EIA-232 Stop Bits	R,W
NTP	Number of Time-Proportioning Outputs	R	SB4	EIA-422 Stop Bits	R,W
			SC	Scale	R,W,L
OA	Output Action	R,W,L	SG	Segment Data	R,W,*
OC	Output Change	R,W,L	SMD	System Mode	R,W
OLS	Analog Output Linear Span	R,W,O	SP	Setpoint	R,W,L
OLZ	Analog Output Linear Zero	R,W,O	SPS	Setpoint Source	R,W,L
OT	Output	R,W,L	SR	Sampling Rate	R,W,L
OV	Overview Screen Titles	R,W,T,S	SS	System Status	R,W
P1	Programmer 1 1 value	R,W,L	SY	System Screen Title	R,W,T
P2	Programmer 2 Profile values	R,W,L	TCY	Time-Proportioning Cycle Time	R,W,C
P3	Programmer 3 Profile values	R,W,L	TD	Time-of-Day (TOD)	R,W
P4	Programmer 4 Profile values	R,W,L	TDD	Tuning Complete	R,L
P5	Programmer 5 Profile values	R,W,L	TDS	Time of Day Start	R,W,P
P6	Programmer 6 Profile values	R,W,L	TEN	Tuning Error Number	R,L
P7	Programmer 7 Profile values	R,W,L	TER	Tuning Error	R,L
P8	Programmer 8 Profile values	R,W,L	TL	Time Left in Segment (SEGtime)	R,P
PDD	Power Down Date	R	TLP	Time Left in Program	R,P
PDT	Power Down Time	R	TP	Time into Program	R,P
PG	Programmer Screen Titles	R,W,T,S	TS	Tuning Status	R,W,L
PID	PID Group	R,W,*	TYP	Analog Input Type	R,W,I
PS	Programmer Mode Status	R,W,P	UT	Engineering Units Type	R,W,I
PS1	Programmer Start Segment 1 (Remote Start)	R,W,P			

Access Code Legend:

R – Read
W – Write
T – Tagnames Only
S – Screen Subscript
L – Loop Subscript
I –Input Subscript
P –Programmer Subscript
O –Output Subscript
C –Contact Subscript
* –Miscellaneous Subscript

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STAG Commands

The Tagname of a system variable is the label used on the Dimension graphic operator interface for that variable. For example, the default tagname for the setpoint of loop 1 is **"SetPntØ1"**. So **PR SP(1)** would read the value of the loop 1 setpoint, and **STAG SP(1)** would read the label used for the setpoint of loop 1. The STAG command is used to show the operator interface tagname used for a system variable. The data message contains the system variable abbreviation and a subscript if applicable. Multiple tagnames may be requested in a single command. The following examples show the use of the STAG command:

- To monitor the channel 1 process variable tagname: **STAG PV(1)**
- To monitor the channel 2 setpoint and process variable tagnames: **STAG SP(2);PV(2)**
- To monitor the first macro key title: **STAG MC1**

Response Message to a STAG Command – When the response message is replying to a STAG command, either a data message or an error message follows the station address. There are no spaces in a response message except those included in the system variable tagname, or the error message. Each response message contains the tagnames requested with no separators, and each tagname has a length of 8 characters. The following examples are the responses to the command examples above:

- Command:**STAG PV(1)**
  Response: **ProcVrØ1**
- Command:**STAG SP(2);PV(2)**
  Response: **SetPntØ2ProcVrØ2**
- Command: **STAG MC1**
  Response: **[START]**ˆ

where ˆ = one space.

STAG Request Error Messages – An error message indicates that the STAG request message was unsuccessful. The error message is an **E** followed by a four digit number. The number identifies what was wrong with the request message, e.g., a syntax error. All error messages are listed in Table B-5.

CTAG Commands

For a CTAG command, the data message contains the new system variable tagname, preceded by an equal sign and enclosed in single or double quotation marks. The new tagname MUST have a length of 8 characters. Some examples:

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- To change the channel 1 process variable tagname:
  CTAG PV(1)="Tempratr"
- To change the channel 2 setpoint tagname:
  CTAG SP(2)"Targetˆˆ"
- To change the first macro key title:
  CTAG MC1="RUNˆˆˆˆˆ"

where ˆ = one space. New tagnames will appear on Dimension graphic operator interface screens as soon as a new screen is displayed.

Response Message to a CTAG Command – If the response message is replying to a CTAG command, either a pound sign (#) or an error message follows the station address. A # response indicates that the Dimension has correctly executed the CTAG command.

CTAG Request Error Message – An error message indicates that the CTAG request message was unsuccessful. The error message is an E followed by a four digit number. The number identifies what was wrong with the request message, e.g., a syntax error. All error messages are listed in Table B-5.

System Variable Descriptions

Table B-4 lists all Dimension system variables that can be used for communications. The format and operation of all Dimension system variables are described on the following pages. The variables are organized alphabetically by system variable code, e.g., **AB**, **ACL**, **ACP**, etc. The following information is provided for each system variable:

System variable code: a two- or three-letter abbreviation for each system variable. For example, **SP** is the code for the "setpoint" system variable.

System variable name: For example, "setpoint."

Purpose: A description of the typical use of the variable.

Use: Describes valid commands (**PR**, **LE**,**STAG**, **CTAG**), field length, format.

Remarks: Information for the operation and use of the variable. If the format is complex, additional format information is provided.

Examples: Illustrate commands using the variable in a request message and the subsequent response message. When necessary, additional explanations are provided.

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Note: *The caret symbol (^) indicates the position of spaces in commands and responses. In LET and CTAG commands, spaces must be typed after an alphabetical entry so the total number of characters matches the field length. Spaces are not required for numeric entries.*

AB — Programmer Abort Enable

Purpose: To Enable or Disable programmer abort.

Use: PRINT format: **PR AB(P)**, where **P** is programmer number
LET format:
LE AB(P)="Enable" – enables abort
LE AB(P)="Disable" – disables abort
Field length: 8

Remarks: Programmer number is 1 through 8. If an abort signal is sent to programmer **P** when it is running, it will immediately go to the abort segment (segment 0) if **AB(P)** is "Enable".

Examples: PRINT request: **PR AB(1)**
PRINT response: **"Disable"**
LET request: **LE AB(1)="Enable"**
LET response: **#**

ACL — Access Level

Purpose: To view controller security access (passcode) level.

Use: PRINT format: **PR ACL**
Field length: 8
Value: **FULL,LIMITED,NONE**

Remarks: Full access to all Operation and Configuration functions = **FULL**
Access to all Operation functions = **LIMITED**
View-only access to Operation screens = **NONE**

Examples: PRINT request: **PR ACL**
PRINT response: **^^^^FULL**

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ACP — Accept Input

Purpose: To view or change the status (accept, reject) of calculated PID autotuning parameters.

Use: PRINT format: **PR ACP(L)**, where **L** is loop number.
LET format: **LE ACP(L)="x"**, where **L** is loop number, **x** is accept/reject status.
Field length: 8
Value: Yes, No

Remarks: Accept autotuning parameters = Yes
Reject autotuning parameters = No

Examples: PRINT request: **PR ACP(1)**
PRINT response: **Yes^^^^^**
LET request: **LE ACP(1)="No"**
LET response: **#**

ACY — Analog Output Time-Proportioning Cycle Time

Purpose: To view or change the cycle time of an analog output that has been configured, via jumpers, to function as a time-proportioned output.

Use: PRINT format: **PR ACY(L)**, where **L** is loop number.
LET format: **LE ACY(L)="XXX"**, where **L** is loop number, **XXX** is number of seconds.
Field length: 3
Value: XXX (1–255 seconds)

Remarks: Default (dead start) cycle time is 0 seconds (output functions as non-time-proportioned analog output). Range is 1 to 255 seconds.

Examples: PRINT request: **PR ACY(1)**
PRINT response: **ØØØ**
LET request: **LE ACY(1)="1Ø"**
LET response: **#**

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AGP — Alarm Group

Purpose: To view or change the settings of an entire alarm group.

Use: PRINT format: `PR AGP(L,G)`, where `L` is loop number and `G` is group number.
LET format: `LE AGP(L,G)="A,B,C,D,E,F,G,H"` where `L` is loop, `G` is group, and
`A` is Hi Hi Process Variable alarm limit
`B` is Lo Lo Process Variable alarm limit
`C` is Hi Process Variable alarm limit
`D` is Lo Process Variable alarm limit
`E` is Hi Hi Deviation alarm limit
`F` is Lo Lo Deviation alarm limit
`G` is Hi Deviation alarm limit
`H` is Lo Deviation alarm limit
Field length: 71

Remarks: Each Dimension control loop has five groups of values available to determine HiHiPvLmt, HiPvLmt, LoLoPvLmt, LoPvLmt, HiHiDevLmt, HiDevLmt, LoLoDevLmt, and LoDevLmt (group range is 1 to 5).

When changing those values, all eight positions must have a number even if all the numbers are the same value.

Examples: PRINT request: `PR AGP(1,1)`
PRINT response:
`^^3276.7,^-3276.7,^^3276.7,^-3276.7,`
`^^3276.7,^-3276.7,^^3276.7,^-3276.7`
LET request: `LE AGP(1)="3ØØ,Ø,2ØØ,1Ø,1Ø,1Ø,5,5"`
LET response: `#`

AHY — Alarm Hysteresis

Purpose: To view or change the hysteresis values of a Loop alarm.
Use: PRINT format: `PR AHY(L)`, where `L` is loop number.
LET format: `LE AHY(L)="A,B,C,D"`
Where: `A` is Hi Hi & Lo Lo PV alarm hysteresis value
`B` is Hi & Lo PV alarm hysteresis value
`C` is Hi Hi & Lo Lo Deviation alarm hysteresis value
`D` is Hi & Lo Deviation alarm hysteresis value
Field length: 35

Remarks: Hysteresis range for loop alarms is equal to the input range in use. All four values must be specified in a LET command.

Examples: PRINT request: `PR AHY(1)`
PRINT response: `^^^^1Ø.Ø,^^^^^Ø.Ø,^^^^^Ø.Ø,^^^^^Ø.Ø`
LET request: `LE AHY(1)="5,5,2,2"`
LET response: `#`

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AI — Analog Input

Purpose: To view the current value of an analog input.

Use: PRINT format: **PR AI(I)**, where **I** is analog input number.
Field length: 8
Value: XXXXXX.X (analog input value)

Examples: PRINT request: **PR AI(1)**
PRINT response: **^^^^21.Ø**

AK — Alarm Acknowledge

Purpose: This is a write-only parameter which acknowledges loop or analog input alarms.

Use: LET format: **LE AK(X)="A"** where **X** is a loop or input number
Field length: 8

Remarks: If desired, use alarm status (AS) to view current alarms for a loop, or input alarm status (IAS) to view alarms for an analog input. AK(X) will acknowledge all alarms for loop X and input X at the same time. If there is no loop X, then only alarms for input X will be acknowledged. The quotation marks should contain "A" or "ALL", although any characters will be accepted. There is no way to acknowledge some alarms for a loop and not others.

Examples: LET request: **LE AK(1)="A"** (for loop 1 and input 1)
LET response: **#**
LET request: **LE AK(12)="A"** (for input 12)
LET response: **#**

AL — Alarm Screen Titles

Purpose: To view or change the titles of Alarm Display screens.

Use: STAG format: **PR AL(S)**, where **S** is alarm screen number.
CTAG format: **LE AL(S)="X"**, where **S** is alarm screen number, **X** is screen title.
Field length: 8

Remarks: Default screen titles include **LOOP_ALM, ALM_SET, INP_ALM, INP_ALM2**.

Examples: STAG request: **STAG AL(1)**
STAG response: **LOOP_ALM**
CTAG request: **CTAG AL(1)="ALM1^^^^"**
CTAG response: **#**

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ALL — All Input Range Names

Purpose: To view all input ranges supported by an analog card.

Use: PRINT format: **PR ALL(A)**, where **A** is analog card number (1, 2 or 3).
Field length: Variable

Remarks: This command lists, in a string, all input ranges supported by the analog card.

Examples: PRINT request: **PR ALL(2)**
PRINT response: **[RANGE NAME],[RANGE NAME],[RANGE NAME],....**

ALT — Alarm Latch

Purpose: To view or change whether an alarm condition for a given alarm will be latched or unlatched when an alarm occurs. Setting applies to both high and low alarms.

Use: PRINT format: **PR ALT(L)**, where **L** is loop number.
LET format: **LE ALT(L)="A,B,C,D"**, where:
A is Hi Hi & Lo Lo PV alarm latch/unlatch value
Bis Hi & Lo PV alarm latch/unlatch value
Cis Hi Hi & Lo Lo Deviation alarm latch/unlatch value
Dis Hi & Lo Deviation alarm latch/unlatch value
Field length: 35
Value: Latch, Unlatch

Remarks: Alarm condition latched = **Latch**
Alarm condition unlatched = **Unlatch**
All four values must be specified in a LET command.

Examples: PRINT request: **PR ALT(1)**
PRINT response:
Latch^^^,Latch^^^,Unlatch^,Unlatch^
LET request:
LE ALT(1)="Unlatch^,Latch^^^,Unlatch^,Unlatch^"
LET response:
LE ALT(L)="Latch^^^,Latch^^^,Unlatch^,Unlatch^"

AO — Analog Output

Purpose: To view or change the value of an analog output.

Use: PRINT format: **PR AO(O)**, where **O** is output number.
Field length: 8
Value: XXXXXX.X (0 to 100 percent)

Remarks: Default value is 0 percent.

Examples: PRINT request: **PR AO(1)**
PRINT response: **^^^^25.Ø**

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AS — Alarm Status

Purpose: Read only parameter.

Use: PRINT format: **PR AS(L)**, where **L** is loop number.
Field length: 8

Remarks: Will always return one of the following eight character strings.

Opensens	Open Sensor
Hi_Hi_PV	high high process variable alarm is active
Lo_Lo_PV	low low process variable alarm is active
High__PV	high process variable alarm is active
Low__PV	low process variable alarm is active
HiHi_Dev	high high deviation alarm is active
LoLo_Dev	low low deviation alarm is active
High_Dev	high deviation alarm is active
Low_Dev	low deviation alarm is active
No_Alarm	no alarm is active

Examples: PRINT request: **PR AS(1)**
PRINT response: **No_Alarm**

ATD — Activate Time of Day Start

Purpose: To view or change the enabled/disabled status of clock-driven programmer time-of-day start.

Use: PRINT format: **PR ATD(P)**, where **P** is programmer number.
LET format: **LE ATD(P)="X"**, where **X** is Enable or Disable.
Field length: 8
Value: **Enable, Disable**

Remarks: Activate time-of-day programmer start = **Enable**
Disable time-of-day programmer start = **Disable**

Examples: PRINT request: **PR ATD(1)**
PRINT response: **Disable^**
LET request: LE ATD(1)=**"Enable^^"**
LET response: **#**

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BC2 — EIA-232 Bits/Character

Purpose: To view or change the number of bits per character used for EIA-232 communications.

Use: PRINT format: **PR BC2**
LET format: **LE BC2="X"**, where **X** is 7 or 8.
Field length: 1
Value: **7, 8**

Remarks: 7 bits per character = **7**,8 bits per character = **8**

Examples: PRINT request: **PR BC2**
PRINT response: **7**
LET request: **LE BC2="8"**
LET response: **#**

Note: *Dimension must be powered down and then powered up again if serial communications parameters are changed.*

BC4 — EIA-422 Bits/Character

Purpose: To view or change the number of bits per character used for EIA-422 communications.

Use: PRINT format: **PR BC4**
LET format: **LE BC4="X"**, where **X** is 7 or 8.
Field length: 1
Value: **7, 8**

Remarks: 7 bits per character = **7**, 8 bits per character = **8**

Examples: PRINT request: **PR BC4**
PRINT response: **7**
LET request: **LE BC4="8"**
LET response: **#**

Note: *Dimension must be powered down and then powered up again if serial communications parameters are changed.*

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BD2 — EIA-232 Baud Rate

Purpose: To view or change the baud rate used for EIA-232 communications.

Use: PRINT format: **PR BD2**
LET format: **LE BD2="X"**, where **X** is baud rate.
Field length: 8
Value: 300, 1200, 2400, 4800, 9600, 19200

Remarks: Terminal and Dimension must have matching baud rate.

Examples: PRINT request: **PR BD2**
PRINT response: **48ØØ^^^^**
LET request: **LE BD2="96ØØ"**
LET response: **#**

> ***Note:*** *Dimension must be powered down and then powered up again if serial communications parameters are changed.*

BD4 — EIA-422 Baud Rate

Purpose: To view or change the baud rate used for EIA-422 communications.

Use: PRINT format: **PR BD4**
LET format: **LE BD4="X"**, where **X** is baud rate.
Field length: 8
Value: 300, 1200, 2400, 4800, 9600, 19200

Remarks: Terminal and controller must have matching baud rate.

Examples: PRINT request: **PR BD4**
PRINT response: **48ØØ^^^^**
LET request: LE BD4=**"96ØØ"**
LET response: **#**

> ***Note:*** *Dimension must be powered down and then powered up again if serial communications parameters are changed.*

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BEU — CLC Basic Engineering Units

Purpose: To view or change the engineering units used with numeric CLC variables provided with a custom feature.

Use: PRINT format: **PR BEU (V)**, where **V** is variable number (1–32).
LET format: **LE BEU(V)="XXX"**, where **V** is variable number and **XXX** is a three character string.

Field length: 3

Remarks: **BEU(V)** is used as the units for **BNV(V)**, **BHL(V)**, and **BLL(V)**.
V can be any number from 1 to 32.

Examples: PRINT request: **PR BEU (1)**
PRINT response: **F^^**
LET request: **LE BEU (23)="C^^"**
LET response: **#**

BF — Blend Factor

Purpose: To view or change the blend factor value used with cascade control functions.

Use: PRINT format: **PR BF(L)**, where **L** is loop number.
LET format: **LE BF(L)="X"**, where **X** is the blend factor.
Field length: 8
Value: XXXXXX.X (–32767 to +32767)

Remarks: Blend factor is used as follows: (percent output * ratio + setpoint * blend factor) / scale factor

Examples: PRINT request: **PR BF(1)**
PRINT response: **^^^^^^^5**
LET request: **LE BF(1)="6"**
LET response: **#**

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BHL — CLC Basic High Limit

Purpose: To view or change the highest accepTable value for the corresponding BNV variable.

Use: PRINT format: **PR BHL(V)**, where **V** is variable number (1–32).
LET format: **LE BHL(V)="X"**, where **V** is variable number, and **X** is anumber.
Field length: 8

Remarks: **BHL(V)** is used to check operator input for **BNV(V)**. No number higher than **BHL(V)** will be accepted for **BNV(V)**. **V** can be any number from 1 to 32.

Examples: PRINT request: **PR BHL(1**)
PRINT response: **^^^1ØØ.v**
LET request: **LE BHL(12)="25Ø"**
LET response: **#**

BLL — CLC Basic Low Limit

Purpose: To view or change the lowest accepTable value for the corresponding BNV variable (custom feature).

Use: PRINT format: **PR BLL(V)**, where **V** is variable number (1–32).
LET format: **LE BLL(V)="X"**, where **V** is variable number, and **X** is a number.
Field length: 8

Remarks: **BLL(V)** is used to check operator input for **BNV(V)**. No number lower than **BLL(V)** will be accepted for **BNV(V)**. **V** can be any number from 1 to 32.

Examples: PRINT request: **PR BLL(1)**
PRINT response: **^^^1Ø.Ø**
LET request: **LE BLL(12)="Ø"**
LET response: **#**

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BLV — CLC Basic List Variable

Purpose: To view or change the four selections available for the corresponding BSV variable (custom feature).

Use: PRINT format: **PR BLV(V)**, where **V** is variable number (1–32).
LET format:
LE BLV(V)="AAAAAAAA,BBBBBBBB,CCCCCCCC,DDDDDDDD", where **AAAAAAAA,BBBBBBBB,CCCCCCCC,DDDDDDDD** are 8-character strings.
Field length: 35

Remarks: **BLV(V)** is the set of four string values which **BSV(V)** may take. The meaning and use of these strings is determined by the user via CLC programming. When changing **BLV**, the full 35 characters MUST be entered, with a comma as the 9th, 18th, and 27th characters. **V** can be any number from 1 to 32. **PR BLV(V)** is equivalent to **LI BSV(V)**.

Examples: PRINT request: **PR BLV(2)**
PRINT response: **Run^^^^^^,Hold^^^^,Abort^^^,^^^^^^^^**
LET request:
LE BLV(14)=**"Up^^^^^^,Down^^^^,Left^^^^,Right^^^"**
LET response: **#**

BND — CLC Basic Number of Decimals

Purpose: To view or change the number of decimal places used for the corresponding **BNV**, **BHL**, and **BLL** (custom feature).

Use: PRINT format: **PR BND(V)**, where **V** is variable number (1–32).
LET format: **LE BND(V)="X"**, where **V** is variable number, and **X** is a number.
Field length: 1

Remarks: **BND(V)** is the number of decimal places which are shown when displaying **BNV(V)**, **BHL(V)** and **BLL(V)**. **V** can be any number from 1 to 32.

Examples: PRINT request: **PR BND(1)**
PRINT response: **2**
LET request: **LE BND(4)="1"**
LET response: **#**

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BNV — CLC Basic Numeric Variable

Purpose: To view or change a CLC numeric variable (custom feature).

Use: PRINT format: **PR BNV(V)**, where **V** is variable number (1–32).
LET format: **LE BNV(V)="X"**, where **V** is variable number, and **X** is a number.
Field length: 8

Remarks: **BNV(1)** to **BNV(32)** are general-use numeric variables for CLC programming. Their meaning and use is determined by the user. **BHL(V)** and **BLL(V)** control accepTable input for **BNV(V)**, and **BND(V)** and **BEU(V)** control how it is displayed on the Dimension operator interface.

Examples: PRINT request: **PR BNV(4)**
PRINT response: **^^^123.4**
LET request: **LE BNV(1)="1ØØ"**
LET response: **#**

BSV — CLC Basic String Variable

Purpose: To view or change a CLC string variable (custom feature).

Use: PRINT format: **PR BSV(V)**, where **V** is variable number (1–32).
LET format: **LE BSV(V)="XXXXXXXX"**, where **V** is variable number, and **XXXXXXXX** is an 8 character string.
Field length: 8

Remarks: **BSV(1) to BSV(32)** are general-use string-type variables for CLC programming. Their meaning and use is determined by the user. **BLV(V)** controls the choices available on the Dimension operator interface for **BSV(V)**.

Examples: PRINT request: **PR BSV(1)**
PRINT response: **Enable^^**
LET request: **LE BSV(1)="Disable^"**
LET response: **#**

CAG — Current Alarm Group

Purpose: To view the number of the currently active alarm group.

Use: PRINT format: **PR CAG(P)**, where **P** is the programmer number.
Field length: 8
Value: 1–5

Remarks: Displays the number of the alarm group currently being utilized. The value of P is limited to the number of available programmers.

Examples: PRINT request: **PR CAG(1)**
PRINT response: **^^^^^^^3**

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CC — ReCycle Counter

Purpose: To monitor the number of recycles left for a programmer.

Use: PRINT format: **PR CC(P)**, where **P** is programmer.
Value: XXX
Field length: 8

Remarks: Dimension can recycle (repeat a segment sequence) up to 255 times, i.e., the recycle value can be from 0 to 255. When the recycle value reaches zero, the programmer ignores **NEXT SEG** and proceeds to **SEG+1**.

Examples: PRINT request: **PR CC(1)**
PRINT response: **^^^^^^1Ø**
(indicating that the programmer has 10 recycles left).

CCY — Contact Output Time-Proportioning Cycle Time

Purpose: To view or change the cycle time of a contact output being used as a time-proportioned output.

Use: PRINT format: **PR CCY(C)**, where **C** is contact output number.
LET format: **LE CCY(C)="XXX"**, where **C** is contact output number, **XXX** is number of seconds.
Field length: 3
Value: (1–255 seconds)

Remarks: Default (dead start) cycle time is 0 seconds (output functions as non-time-proportioned contact output). Range is 1 to 255 seconds.

Examples: PRINT request: **PR CCY(1)**
PRINT response: **ØØØ**
LET request: **LE CCY(1)="1Ø"**
LET response: **#**

CD — Calculated Rate

Purpose: To view the rate calculated by the auto-tuning function.

Use: PRINT format: **PR CD(L)**, where **L** is loop number.
Field length: 8
Value: XXXXX.XX

Remarks: Displays the rate that will be used if auto-tuning values are accepted.

Examples: PRINT request: **PR CD(1)**
PRINT response: **^^^^2.ØØ**

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CEV — Current Events

Purpose: To view or change the state into which a programmer is attempting to place the events.

Use: PRINT format: **PR CEV(P)**, where **P** is programmer.
LET format: **LE CEV(P)="XXXXXXXXXXXX"** where **P** is programmer, and **XXXXXXXXXXXX** is a 12 character string of event states.
Field length: 12
Value: If specific events (1, 2, 3, 4, 5, 6, 7, 8, 9, a, b, c) are displayed or included in the LET command, the programmer is set to turn those events on. If underscores "_" are displayed or included in the LET command, the programmer is set to turn events in those locations off.

Remarks: The LET command will only work if the programmer's status is Hold or PG_END. Otherwise CEV reverts to the event state programmed by the current segment. This variable is different from EV (Event Outputs) in that EV displays the actual current state of a single event, and CEV displays the state into which a specific programmer is programmed to set all events.

Examples: PRINT request: **PR CEV(1)**
PRINT response: **1__4__7___b_**
LET request: **LE CEV(1)="___45__8___c"**
LET response: **#**

CI — Configuration Image

Purpose: Allows uploading and downloading of EEPROM information (including operator interface and network configuration).

Use: PRINT format: **PR CI(C,B)**, where **C** is CPU number, B is Block number.
LET format: **LE CI(C,B)="_____________"**, where the information inside the quotation marks depends on the block being changed.
Field length: Block 0 = 3, all other blocks = 128. All other blocks: 128

Remarks: **CI** is useful in network mode only when information is being uploaded or downloaded. Block 0 contains the number of blocks for the complete configuration image (e.g., 64). The information in all other blocks depends on the block being viewed. **C** is always **1**.

Examples: PRINT request: **PR CI(1,Ø)**
PRINT response: **64**
LET request: **LE CI(1,1)="ØØØAFC76ED..."** (128 characters).
LET response: **#**

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CIN — Contact In

Purpose: To view the state of a contact input.

Use: PRINT format: **PR CIN(C)**, where **C** is the contact input number
Field length: 8
Value: Tag name from one of the four possible sets of on/off labels for contacts.

Remarks: Each Dimension has four pairs of on/off labels. Each contact input or output can be configured to use one of these four sets of labels. So, the four pairs might be "On"/"Off", "Open"/"Closed", "True"/"False" and "Run"/"Stop" and the user can assign contact input 4 to read "Open" or "Closed". The CIN parameter returns the state of the contact input using the labels chosen for the particular contact.

Examples: PRINT request: **PR CIN(3)**
PRINT response: **Off^^^^^**

CJ — Cold Junction Temperature

Purpose: To view the actual cold junction temperature for a thermocouple input.

Use: PRINT format: **PR CJ(I)**, where **I** is the input number.
Field length: 8
Value: XXXXXX.X (temperature in degrees C)

Remarks: Thermocouple cold junction temperature is always expressed in degrees C.

Examples: PRINT request: **PR CJ(1)**
PRINT response: **^^^^25.Ø**

CJE — Cold Junction Error

Purpose: To view or change the cold junction error for a thermocouple input.

Use: PRINT format: **PR CJE(I)**, where **I** is input number.
LET format: **LE CJE(I)="X"**, where **I** is input number and **X** is amount of cold junction error compensation.
Field length: 8

Remarks: Cold junction error can be set from –10.0 to +10.0°C.

Examples: PRINT request: **PR CJE(1)**
PRINT response: **^^^^^2.2**
LET request: **LE CJE(1)="2.5"**
LET response: **#**

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CM — Cascade Multiplier

Purpose: To view or change the multiplier used for cascade control with a remote setpoint.

Use: PRINT format: **PR CM(L)**, where **L** is loop number.
LET format: **LE CM(L)="X"**, where **L** is loop number, **X** is the multiplier.
Field length: 8
Value: XXXXXXXX (–32767 to +32767)

Remarks: A decimal point in the multiplier is not permitted.

Examples: PRINT request: **PR CM(1)**
PRINT response: **^^^^^^^2**
LET request: **LE CM(1)="3"**
LET response: **#**

CO — Contact Out

Purpose: To view the state of a contact output.

Use: PRINT format: **PR CO(C)**, where **C** is the contact output number.
Field length: 8
Value: Tag name from one of the four possible sets of on/off labels for contacts.

Remarks: Each Dimension has four pairs of on/off labels. Each contact input or output can be configured to use one of these four sets of labels. So, the four pairs might be "On"/"Off", "Open"/"Closed", "True"/"False" and "Run"/"Stop" and the user can assign contact output 2 to read "Open" or "Closed". The CO parameter returns the state of the contact output using the labels chosen for the particular contact.

Examples: PRINT request: **PR CO(2)**
PRINT response: **Off^^^^^**

CP — Calculated Gain

Purpose: To view the gain calculated by the auto-tuning function.

Use: PRINT format: **PR CP(L)**, where **L** is loop number.
Field length: 8

Remarks: Displays the gain that will be used if auto-tuning values are accepted.

Examples: PRINT request: **PR CP(1)**
PRINT response: **^^^^1.ØØ**

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CPG — Current PID Group

Purpose: To view the currently active PID group for a programmer.

Use: PRINT format: **PR CPG(P)**, where **P** is the programmer number.
Field length: 8
Value: 1–5

Remarks: Displays the number of the PID group currently being utilized. The value of P is limited to the number of available programmers.

Examples: PRINT request: `PR CPG(1)`
PRINT response: `^^^^^^^2`

CRS — Calculated Reset

Purpose: To view the reset calculated by the auto-tuning function.

Use: PRINT format: `PR CRS(L)`, where `L` is loop number.
Field length: 8

Remarks: Displays the reset that will be used if auto-tuning values are accepted.

Examples: PRINT request: `PR CRS(1)`
PRINT response: `^^^^1.ØØ`

CS — Current Segment Number

Purpose: To monitor the current segment number for a given programmer.

Use: PRINT format: `PR CS(P)`, where `P` is programmer.
Field length: 8

Remarks: Dimension units have segments 0 to 255 (0 to 749 with Extended Segments Option).

Examples: PRINT request: `PR CS(1)`
PRINT response: `^^^^^^^3`
(The response indicates that the current segment for programmer 1 is segment 3.)

CSP — Current Span Reference

Purpose: To view or change the span reference determined during calibration.

Use: PRINT format: `PR CSP(I)`, where `I` is analog input number.
LET format: `LE CSP(1)="X"`, where `I` is analog input number, `X` is span reference value.
Field length: 8
Value: XXXX.XXX

Remarks: This reference number should not be changed unless an input channel is being recalibrated.

Examples: PRINT request: `PR CSP(1)`
PRINT response: `^1ØØ.323`
LET request: `LE CSP(1)="1ØØ.356"`

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LET response: #

CZE — Current Input Zero

Purpose: To view or change the current input zero value determined during calibration.

Use: PRINT format: PR CZE(I), where I is analog input number.
LET format: LE CZE(I)="X", where I is analog input number, X is input zero value.
Field length: 8
Value: XXXXXX.X

Remarks: This reference number should not be changed unless an input channel is being recalibrated.

Examples: PRINT request: PR CZE(1)
PRINT response: ^^^^^7.9
LET request: LE CZE(1)="7.7"
LET response: #

DF — Digital Filter

Purpose: To monitor or change the digital filter value of an analog input.

Use: PRINT format: PR DF(I), where I is input number.
LET format: LE DF(I)="XXX", where I is input number, XXX is filter value.
Field length: 8
Value: XXX (Ø to 1ØØ)

Remarks: The filter is used to "average" the input reading so that minor fluctuations are eliminated. The digital filter setting may be from 0 to 100; the higher the number, the greater the amount of filtering. When set to 0, the filtering feature is disabled.

Examples: PRINT request: PR DF(1)
PRINT response: ^^^^^^Ø
LET request: LE DF(1)="12"
LET response: #

DH — Direct Output High Limit

Purpose: To monitor or change the direct output high limit (DH) for a control loop. This feature allows the user to set the maximum output percentage for direct outputs.

Use: PRINT format: PR DH(L), where L is loop.
LET format: LE DH(L)="XXX.X"
Field length: 8
Value: XXX.X

Remarks: The high limit can be set anywhere from 00.0% to 100.0%. The direct output high limit can never be less than the direct output low limit.

Examples: PRINT request: PR DH(1)
PRINT response: ^^1ØØ.ØØ
LET request: LE DH(1)="9Ø.ØØ"
LET response: #

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DL — Direct Output Low Limit

Purpose: To monitor or change the direct output low limit (DL) for a control loop. This feature allows the user to set the minimum output percentage for direct outputs.

Use: PRINT format: **PR DL(L)**, where **L** is loop.
LET format: **LE DL(L)="XXX.X"**
Field length: 8
Value: XXX.X

Remarks: The low limit can be set anywhere from 00.0% to 100.0%. The direct output low limit can never be greater than the direct output high limit.

Examples: PRINT request: **PR DL(1)**
PRINT response: **^^^^Ø.ØØ**
LET request: **LE DL(1)="1Ø.Ø"**
LET response: **#**

DO — Direct Output (in percent)

Purpose: To monitor or change the direct output.

Use: PRINT format: **PR DO(L)**, where **L** is loop.
LET format: **LE DO(L)="XXX.X"**
Field length: 8
Value: XXX.X (0.00–100.00)

Remarks: The direct output may be monitored (displayed) at any time. Control outputs may be changed only when the control loop is in the manual mode.

Examples: PRINT request: **PR DO(1)**
PRINT response: **^^^5Ø.ØØ**
LET request: **LE DO(1)="75"**
LET response: **#**

DOW — Day of Week Start

Purpose: To view or change the day of the week on which a specific programmer is to start.

Use: PRINT format: **PR DOW(P)**, where **P** is programmer number.
LET format: **LE DOW(P)="X"**, where **P** is programmer number, **X** is day of week.
Field length: 8
Value: See remarks.

Remarks: Enter days as follows: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday.

Examples: PRINT request: **PR DOW(1)**
PRINT response: **Sunday^^**
LET request: **LE DOW(1)="Monday^^"**
LET response: **#**

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DT — Date

Purpose: To monitor or set the date.

Use: PRINT format: `PR DT`
LET format: `LE DT="MM/DD/YY"`
Field length: 8
Value: MM/DD/YY

Remarks: MM = month, DD = day, YY = year.

Examples: PRINT request: `PR DT 93`
PRINT response: `12/Ø3/89`
LET request: `LE DT="12/15/93"`
LET response: `#`

DV — Deviation

Purpose: To monitor the deviation.

Use: PRINT format: `PR DV(L)`, where `L` is loop.
Field length: 8
Value: Depends on the range in use.

Remarks: The format for the deviation value matches the range in use.

Examples: PRINT request: `PR DV(1)`
PRINT response: `^^^^21.3`

EO2 — EIA-232 Terminal Echo Mode

Purpose: To view or change the terminal echo mode (on/off) used during EIA-232 communications.

Use: PRINT format: `PR EO2`
LET format: `LE EO2="X"`, where `X` is echo mode.
Field length: 8
Value: See remarks.

Remarks: Echo mode on = ON
Echo mode off = OFF

Examples: PRINT request: `PR EO2`
PRINT response: `ON^^^^^^`
LET request: `LE EO2="OFF^^^^^"`
LET response: `#`

Note: *Dimension must be powered down and then powered up again if serial communications parameters are changed.*

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EO4 — EIA-422 Terminal Echo Mode

Purpose: To view or change the terminal echo mode (on/off) used during EIA-422 communications.

Use: PRINT format: **PR EO4**
LET format: **LE EO4="X"**, where **X** is echo mode.
Field length: 8
Value: See remarks.

Remarks: Echo mode on = ON
Echo mode off = OFF

Examples: PRINT request: **PR EO4**
PRINT response: **ON^^^^^^**
LET request: **LE EO4="OFF^^^^^"**
LET response: **#**

Note: Dimension must be powered down and then powered up again if serial communications parameters are changed.

EU — Engineering Units

Purpose: To monitor or select the engineering units of an analog input.

Use: PRINT format: **PR EU(I)**, where **I** is input.
LET format: **LE EV(I)="XXX"**, where **I** is input and **XXX** is the 3 alphanumeric characters.
Field length: 3

Remarks: F = Fahrenheit, **C** = Celsius, and **XXX** = Linear.

Linear engineering units are user-configurable.

Examples: PRINT request: **PR EU(1)**
PRINT response: **^C^**
LET request: **LE EV(3)="%^H"**
LET response: **#**

EV — Event Outputs

Purpose: To monitor the actual state of the programmed event outputs.

Use: PRINT format: **PR EV(E)**, where **E** is event # (1–12).
Field length: 8
Value: "ON" or "OFF"

Remarks: This reports the on/off state of the Dimension events. Each programmer may set them, but each event has only one state at a time.

Examples: PRINT request: **PR EV(1)**
PRINT response: **OFF^^^^^**

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FPC — Full Passcode

Purpose: To view or change the passcode required to change the security access level to **"FULL"** status.

Use: PRINT format: **PR FPC**
LET format: **LE FPC="X"**, where **X** is passcode.
Field length: 8
Value: XX-XX-XX

Remarks: The **FULL** passcode permits access to all system Operation and Configuration functions.

Examples: PRINT request: **PR FPC**
PRINT response: **Ø1-Ø2-Ø3**
LET request: **LE FPC="Ø1-Ø3-Ø5"**
LET response: **#**

GAS — Global Alarm Status

Purpose: To view global alarm status.

Use: PRINT format: **PR GAS**
Field length: 8
Value: No_Alarm, Alarm

Remarks: No active global alarm = No_Alarm
Active global alarm = Alarm

Examples: PRINT request: **PR GAS**
PRINT response: **No_Alarm**

GN — Gain

Purpose: To view or change the actual gain (proportional) value.

Use: PRINT format: **PR GN(L)**, where **L** is loop.
LET format: **LE GN(L)="X"**, where **L** is loop and **X** is the new gain value.
Field length: 8
Value: XX.XX

Remarks: This system variable prints the actual gain value for a control loop. LET sets gain for the current PID group.

Examples: PRINT request: **PR GN(1)**
PRINT response: **^^^^3.5Ø**
LET request: **LE GN(2)="1.ØØ"**
LET response: **#**

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HH2 — EIA-232 Hardware Handshaking

Purpose: To view or change the hardware handshaking mode (on/off) used during EIA-232 communications.

Use: PRINT format: **PR HH2**
LET format: **LE HH2="X"**, where **X** is handshaking mode.
Field length: 8
Value: Enable, Disable

Remarks: Hardware handshaking on = Enable, Hardware handshaking off = Disable

Examples: PRINT request: **PR HH2**
PRINT response: **Disable^**
LET request: **LE HH2="Enable^^"**
LET response: **#**

> ***Note:*** *Dimension must be powered down and then powered up again if serial communications parameters are changed.*

HH4 — EIA-422 Hardware Handshaking

Purpose: To view or change the hardware handshaking mode (on/off) used during EIA-422 communications.

Use: PRINT format: **PR HH4**
LET format: **LE HH4="X"**, where **X** is handshaking mode.
Field length: 8
Value: Enable, Disable

Remarks: Hardware handshaking on = Enable, Hardware handshaking off = Disable

Examples: PRINT request: **PR HH4**
PRINT response: **Disable^**
LET request: **LE HH4="Enable^^"**
LET response: **#**

> ***Note:*** *Dimension must be powered down and then powered up again if serial communications parameters are changed.*

IH — Input High Alarm

Purpose: To view or change the input high alarm limit for an analog input.

Use: PRINT format: **PR IH(I)**, where **I** is analog input number.
LET format: **LE IH(I)="X"**, where **I** is analog input number, **X** is input high alarm limit value.
Field length: 8

Remarks: Range is dependent on input range.

Examples: PRINT request: **PR IH(I)**
PRINT response: **^^^^25.6**
LET request: **LE IH(1)="29.2"**
LET response: **#**

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IHL — Input High Limit

Purpose: To view or change the input high limit for an analog input.

Use: PRINT format: **PR IHL(I)**, where **I** is analog input number.
LET format: **LE IHL(I)="X"**, where **I** is analog input number, **X** is input high limit value.
Field length: 8

Remarks: The value range defaults to the range of the configured input type. The set-point and process variable will never exceed this limit. PID calculations and other limits are affected when a change is made.

Examples: PRINT request: **PR IHL(I)**
PRINT response: **^^^^25.6**
LET request: **LE IHL(1)="29.2"**
LET response: **#**

IHY — Input Alarm Hysteresis

Purpose: To view or change the hysteresis value of an input alarm.

Use: PRINT format: **PR IHY(I)**, where **I** is input number.
LET format: **LE IHY(I)="XXXXXX.X"**, where **I** is input number, **XXXXXX.X** is hysteresis value.

Field length: 8
Value: XXXXXX.X (–1392.8 to +1392.8)

Remarks: Range is same as input range (e.g. IHL ILL)

Examples: PRINT request: **PR IHY(I)**
PRINT response: **^^^^11.Ø**
LET request: **LE IHY(1)="13"**
LET response: **#**

IL — Input Low Alarm

Purpose: To view or change the input low alarm limit for an analog input.

Use: PRINT format: **PR IL(I)**, where **I** is analog input number.
LET format: **LE IL(I)="X"**, where **I** is analog input number, **X** is input low alarm limit value.
Field length: 8

Remarks: Range is dependent on input range.

Examples: PRINT request: **PR IL**
PRINT response: **^^^^12.5**
LET request: **LE IL(1)="14.2"**
LET response: **#**

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ILL — Input Low Limit

Purpose: To view or change the input low limit for an analog input.

Use: PRINT format: **PR ILL(I)**, where **I** is analog input number.
LET format: **LE ILL(I)="X"**, where **I** is analog input number, **X** is input low limit value.
Field length: 8

Remarks: The value range defaults to the range of the configured input type. The set-point and process variable will never exceed this limit. PID calculations and other limits are affected when a change is made.

Examples: PRINT request: **PR ILL(1)**
PRINT response: **^^^^12.2**
LET request: **LE ILL(1)="16.3"**
LET response: **#**

ILT — Input Alarm Latch

Purpose: To view or change whether an alarm condition for a given input will be latched or unlatched when an alarm occurs. Setting applies to both high and low alarms.

Use: PRINT format: **PR ILT(I)**, where **I** is input number.
LET format: **LE ILT(I)="X"**, where **I** is input number, **X** is Latch or Unlatch.
Field length: 8
Value: Latch, Unlatch

Remarks: Alarm condition latched = Latch, Alarm condition unlatched = Unlatch

Examples: PRINT request: **PR ILT(1)**
PRINT response: **Latch^^^**
LET request: **LE ILT(1)="Unlatch^"**
LET response: **#**

LG — Logic Screen Titles

Purpose: To view or change the titles of Logic Display screens.

Use: STAG format: **STAG LG(S)**, where **S** is a logic screen number.
CTAG format: **CTAG LG(S)="X"**, where **S** is logic screen number, **X** is screen title.
Field length: 8

Remarks: Default screen titles include LOGIC__1 through LOGIC__8.

Examples: STAG request: **STAG LG(1)**
STAG response: **LOGIC__1**
CTAG request: **CTAG LG(1)="LOG1^^^^"**
CTAG response: **#**

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LND — Linear Analog Input Decimal Position

Purpose: To view or change the decimal position for a linear analog input.

Use: PRINT format: **PR LND(I)**, where **I** is analog input number.
LET format: **LE LND(I)="X"**, where **I** is analog input number, **X** is number representing decimal position.
Field length: 1
Value: decimal position (1–5)

Remarks: This variable can be changed only for linear analog inputs.

Examples: PRINT request: **PR LND(1)**
PRINT response: **3**
LET request: **LE LND(1)="2"**
LET response: **#**

LNS — Linear Analog Input Span

Purpose: To view or change the span for a linear analog input determined during calibration.

Use: PRINT format: **PR LNS(I)**, where **I** is analog input number.
LET format: **LE LNS(I)="X"**, where **I** is analog input number, **X** is span value.
Field length: 8
Value: 0 to 100 percent

Remarks: This number defaults to 100 percent.

Examples: PRINT request: **PR LNS(1)**
PRINT response: **^1ØØ.ØØØ**
LET request: **LE LNS(1)="99.356"**
LET response: **#**

LNZ — Linear Analog Input Zero

Purpose: To view or change the input zero value for a linear analog input determined during calibration.

Use: PRINT format: **PR LNZ(I)**, where **I** is analog input number.
LET format: **LE LNZ(I)="X"**, where **I** is analog input number, X is input zero value.
Field length: 8
Value: XXXXXX.X

Remarks: This value defaults to zero percent.

Examples: PRINT request: **PR LNZ(1)**
PRINT response: **^^^^^Ø.Ø**
LET request: **LE LNZ(1)="2.2"**
LET response: **#**

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LP — Loop Screen Titles

Purpose: To view or change the titles of Loop Display screens.

Use: STAG format: **STAG LP(S)**, where **S** is a loop screen number.
CTAG format: **CTAG LP(S)="X"**, where **S** is loop screen number, **X** is screen title.
Field length: 8

Remarks: Default screen titles include LOOP___1 through LOOP___8.

Examples: STAG request: **STAG LP(1)**
STAG response: **LOOP___1**
CTAG request: **CTAG LP(1)="LP1^^^^^"**
CTAG response: **#**

LPC — Limited Passcode

Purpose: To view or change the passcode required to change the security access level to **"LIMITED"** status.

Use: PRINT format: **PR LPC**
LET format: **LE LPC="X"**, where **X** is passcode.
Field length: 8
Value: XX-XX-XX

Remarks: The LIMITED passcode permits access to all system Operation functions.

Examples: PRINT request: **PR LPC**
PRINT response: **Ø3-Ø2-Ø1**
LET request: **LE LPC="Ø5-Ø3-Ø1"**
LET response: **#**

LS — Loop Status

Purpose: To set a control loop's mode of operation (auto or manual).

Use: PRINT format: **PR LS(L)**, where L is loop.
LET format: **LE LS(L)="M" or "A"**
Field length: 8
Value: Manual or Auto

Remarks: In the LET message above:
A = Control loop is in the automatic mode.
M = Control loop is in the manual mode.
In the manual mode, the operator may adjust the output.
No control action occurs in the manual mode.
In the auto mode, the output is determined automatically by the PID feature.

Examples: PRINT request: **PR LS(1)**
PRINT response: **Auto^^^^**
LET request: **LE LS(1)="M"**
LET response: **#**

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MC1 — Macro Name #1

Purpose: To view or change the tag name for Macro Key 1 displayed on the Operator Interface display.

Use: STAG format: **STAG MC1**
CTAG format: **CTAG MC1="X"**, where **X** is tag name.
Field length: 8

Remarks: Default tag name is [START].

Examples: STAG request: **STAG MC1**
STAG response: **[START]^**
CTAG request: **CTAG MC1="ON^^^^^^"**
CTAG response: **#**

MC2 — Macro Name #2

Purpose: To view or change the tag name for Macro Key 2 displayed on the Operator Interface display.

Use: STAG format: **STAG MC2**
CTAG format: **CTAG MC2="X"**, where **X** is tag name.
Field length: 8

Remarks: Default tag name is [STOP].

Examples: STAG request: **STAG MC2**
STAG response: **[STOP]^^**
CTAG request: **CTAG MC2="OFF^^^^^"**
CTAG response: **#**

MI — Memory Image

Purpose: Allows uploading and downloading of battery-backed memory (including patching and parameters).

Use: PRINT format: **PR MI(C,B)**, where **C** is CPU number, **B** is Block number.
LET format: **LE MI(C,B)=" "**
where the information inside quotation marks varies according to the block being changed.
Field length: Block 0 = 3, all other blocks = 128

Remarks: Memory image is useful in network mode only when downloading or uploading information.
Block 0 contains the number of blocks for the complete memory image (e.g., 64). All other blocks contain different information depending on which block is viewed. C is always 1.

Examples: PRINT request: **PR MI(1,Ø)**
PRINT response: **64**
LET request: **LE MI(1,1)="ØØØAFC76ED..." (128 characters)**
LET response: #

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MR — Manual Reset

Purpose: To monitor or change the manual reset (bias) value.

Use: PRINT format: **PR MR(L)**, where **L** is Loop.
LET format: **LE MR(L)="+–XX.X"**
Field length: 8
Value: +–XX.X (–100.00 to 100.00)

Remarks: Manual reset adds a fixed bias onto the control calculation when a control loop is in automatic mode.

Examples: PRINT request: **PR MR(1)**
PRINT response: **^^^^Ø.ØØ**
LET request: **LE MR(1)="2.ØØ"**
LET response: **#**

NA2 — EIA-232 Network Address

Purpose: To view or change the network address of the controller for EIA-232 communications in network mode.

Use: PRINT format: PR NA2
LET format: **LE NA2="X"**, where **X** is network address number.
Field length: 2
Value: Network address 1 through 99.

Remarks: This address (1–99) must match on both the host computer and the controller.

Examples: PRINT request: **PR NA2**
PRINT response: **Ø1**
LET request: **LE NA2="23"**
LET response: **#**



Note: *Dimension must be powered down and then powered up again if serial communications parameters are changed.*

NA4 — EIA-422 Network Address

Purpose: To view or change the network address of the controller for EIA-422 communications in network mode.

Use: PRINT format: **PR NA4**
LET format: **LE NA4="X"**, where **X** is network address number.
Field length: 8
Value: Network address 1 through 99.

Remarks: This address (1–99) must match on both the host computer and the controller.

Examples: PRINT request: **PR NA4**
PRINT response: **^^^^^^22**
LET request: **LE NA4="23"**
LET response: **#**

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Note: *Dimension must be powered down and then powered up again if serial communications parameters are changed.*

NAI — Number of Analog Inputs

Purpose: To view the number of analog inputs used by the Dimension.

Use: PRINT format: **PR NAI**
Field length: 2

Remarks: Dimension accommodates up to six analog inputs per card, with a maximum of three cards per Dimension.

Examples: PRINT request: **PR NAI**
PRINT response: **Ø4**

NAO — Number of Analog Outputs

Purpose: To view the number of analog outputs used by the instrument.

Use: PRINT format: **PR NAO**
Field length: 2
Value: See remarks.

Remarks: Dimension accommodates up to four analog outputs per card, with a maximum of three cards per Dimension.

Examples: PRINT request: **PR NAO**
PRINT response: **Ø4**

NCI — Number of Contact Inputs

Purpose: To view the number of contact inputs used by the Dimension.

Use: PRINT format: **PR NCI**
Field length: 2
Value: See remarks.

Remarks: Dimension can have both local and remote contacts. This variable returns the total number of them configured as contact inputs.

Examples: PRINT request: **PR NCI**
PRINT response: **Ø8**

NCO — Number of Contact Outputs

Purpose: To view the number of contact outputs used by the Dimension.

Use: PRINT format: **PR NCO**
Field length: 2
Value: See remarks.

Remarks: Dimension can have both local and remote contacts. This variable returns the total number of them configured as contact outputs.

Examples: PRINT request: **PR NCO**
PRINT response: **Ø4**

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NL — Number of Loops

Purpose: To monitor the number of loops in a Dimension.

Use: PRINT format: **PR NL**
Field length: 2

Remarks: Dimension units have up to 8 PID control loops.

Examples: PRINT request: **PR NL**
PRINT response: **Ø2**

NM2 — EIA-232 Network/Terminal Mode

Purpose: To view or change the protocol (network/terminal) mode used for EIA-232 communications.

Use: PRINT format: **PR NM2**
LET format: **LE NM2="X"**, where **X** is mode.
Field length: 8

Remarks: Terminal mode = Terminal

Network mode = Network

Examples: PRINT request: **PR NM2**
PRINT response: **Terminal**
LET request: **LE NM2="Networkˆ"**
LET response: **#**

Note: *Dimension must be powered down and then powered up again if serial communications parameters are changed.*

NM4 — EIA-422 Network/Terminal Mode

Purpose: To view or change the protocol (network/terminal) mode used for EIA-422 communications.

Use: PRINT format: **PR NM4**
LET format: **LE NM4="X",** where **X** is mode.
Field length: 8

Remarks: Terminal mode = Terminal
Network mode = Network

Examples: PRINT request: **PR NM4**
PRINT response: **Terminal**
LET request: LE NM4=**"Networkˆ"**
LET response: **#**

Note: *Dimension must be powered down and then powered up again if serial communications parameters are changed.*

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NP — Number of Programmers

Purpose: To monitor the number of programmers in a Dimension.

Use: PRINT format: **PR NP**
Field length: 2
Value: XX

Remarks: Dimension units have up to 8 programmers.

Examples: PRINT request: **PR NP**
PRINT response: **Ø4**

NS — Number of Segments

Purpose: To monitor the number of segments in a Dimension.

Use: PRINT format: **PR NS(P)**, where **P** is programmer.
Field length: 3
Value: XXX

Remarks: Dimensions have a single Table of 750 segments which are shared by all programmers. This parameter returns the same number no matter what **P** is.

Examples: PRINT request: **PR NS(1)**
PRINT response: **256**

OA — Output Action

Purpose: To view or change the output action of a loop output for auto tuning.

Use: PRINT format: **PR OA(L)**, where **L** is loop number.
LET format: **LE OA(L)="X"**, where **X** is output action type.
Field length: 8
Value: Reverse, Direct

Remarks: Output action types = Reverse, Direct

Examples: PRINT request: **PR OA(1)**
PRINT response: **Direct^^**
LET request: LE OA(1)=**"Reverse"**
LET response: **#**

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OC — Output Change

Purpose: Used for auto tuning. To view or change an analog output value.

Use: PRINT format: **PR OC(L)**, where **L** is loop number.
LET format: **LE OC(L)="X"**, where **L** is loop number and **X** is output change.
Field length: 8
Value: 0.0 to 100.0 percent

Remarks: To change an output value, type the percentage by which you wish to increase (bump) the output. The example below reflects an output increase from 5 to 15 percent.

Examples: PRINT request: **PR OC(1)**
PRINT response: **^^^^5.ØØ**
LET request: **LE OC(1)="1Ø"**
LET response: **#**

OLS — Analog Output Linear Span

Purpose: To view or change the span for a linear analog output determined during calibration.

Use: PRINT format: **PR OLS(O)**, where **Ø** is output number.
LET format: **LE OLS(O)="X"**, where **Ø** is loop number, **X** is span value.
Field length: 8
Value: XXXX.XXX (0.0 to 100.0 percent)

Remarks: This number defaults to 100 percent.

Examples: PRINT request: **PR OLS(1)**
PRINT response: **^1ØØ.ØØØ**
LET request: **LE OLS(1)="99.5ØØ"**
LET response: **#**

OLZ — Analog Output Linear Zero

Purpose: To view or change the zero value for a linear analog output determined during calibration.

Use: PRINT format: **PR OLZ(O)**, where **O** is output number.
LET format: **LE OLZ(O)="X"**, where **O** is output number, **X** is zero value.
Field length: 8
Value: XXXX.XXX

Remarks: This number defaults to zero percent.

Examples: PRINT request: **PR OLZ(1)**
PRINT response: **^^^Ø.ØØØ**
LET request: **LE OLZ(1)="1.4ØØ"**
LET response: **#**

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OT — Output

Purpose: To view or change the output of a loop.

Use: PRINT format: **PR OT(L)**, where **L** is loop number.
LET format: **LE OT(L)="X"**, where **X** is output value.
Field length: 8
Value: –100.0 to 100.0 percent

Remarks: Range is from –100 to +100 percent, where –100 is full reverse out and +100 is full direct out. In this way, the output of specific loops can be changed.

Examples: PRINT request: **PR OT(1)**
PRINT response: **^^^^^1ØØ**
LET request: **LE OT(1)="-1ØØ"**
LET response: **#**

OV — Overview Screen Titles

Purpose: To view or change the titles of Overview Display screens.

Use: STAG format: **STAG OV(S)**, where **S** is overview screen number.
CTAG format: **CTAG OV(S)="X"**, where **S** is overview screen number, X is screen title.
Field length: 8
Value: See remarks.

Remarks: Default screen titles include OVIEW__1 through OVIEW__8.

Examples: STAG request: **STAG OV(1)**
STAG response: **OVIEW__1**
CTAG request: **CTAG OV(1)="OVW1^^^^"**
CTAG response: **#**

P1 — Programmer 1 Profile Values

Purpose: To view or change a given profile value (loop setpoint) for the first programmer.

Use: PRINT format: **PR P1(P)**, where **P** is profile number.
LET format: **LE P1(P)="X"**, where **P** is profile number and **X** is the setpoint value for profile **P**.
Field length: 8
Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 1 will have if loop 1 is configured to take its setpoint from the selected programmer. A LET command for **P1(P)** will be overridden if programmer 1 is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more information on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: **PR P1(1)**
PRINT response: **^^^98.6Ø**
LET request: **LE P1(3)="1ØØ.7"**
LET response: **#**

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P2 — Programmer 2 Profile Values

Purpose: To view or change a given profile value (loop setpoint) for the second programmer.

Use: PRINT format: **PR P2(P)**, where **P** is profile number.
LET format: **LE P2(P)="X"**, where **P** is profile number and **X** is the setpoint value for profile **P**.
Field length: 8
Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 2 will have if loop 2 is configured to take its setpoint from the selected programmer. A LET command for **P2(P)** will be overridden if programmer 2 is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more information on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: **PR P2(1)**
PRINT response: **^^^98.6Ø**
LET request: **LE P2(3)="1ØØ.7"**
LET response: **#**

P3 — Programmer 3 Profile Values

Purpose: To view or change a given profile value (loop setpoint) for the third programmer.

Use: PRINT format: **PR P3(P)**, where **P** is profile number.
LET format: LE P3(P)="X", where **P** is profile number and **X** is the setpoint value for profile **P**.

Field length: 8

Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 3 will have if loop 3 is configured to take its setpoint from the selected programmer. A LET command for **P3(P)** will be overridden if programmer 3 is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more information on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: **PR P3(1)**
PRINT response: **^^^98.6Ø**
LET request: **LE P3(3)="1ØØ.7"**
LET response: **#**

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P4 — Programmer 4 Profile Values

Purpose: To view or change a given profile value (loop setpoint) for the fourth programmer.

Use: PRINT format: **PR P4(P)**, where **P** is profile number.
LET format: LE P4(P)="X", where **P** is profile number and **X** is the setpoint value for profile **P**.
Field length: 8
Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 4 will have if loop 4 is configured to take its setpoint from the selected programmer. A LET command for **P4(P)** will be overridden if programmer 4 is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more information on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: **PR P4(1)**
PRINT response: **^^^98.6Ø**
LET request: **LE P4(3)="1ØØ.7"**
LET response: **#**

P5 — Programmer 5 Profile Values

Purpose: To view or change a given profile value (loop setpoint) for the fifth programmer.

Use: PRINT format: **PR P5(P)**, where **P** is profile number.
LET format: LE P5(P)="X", where **P** is profile number and **X** is the setpoint value for profile **P**.
Field length: 8
Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 5 will have if loop 5 is configured to take its setpoint from the selected programmer. A LET command for **P5(P)** will be overridden if programmer 5 is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more information on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: **PR P5(1)**
PRINT response: **^^^98.6Ø**
LET request: **LE P5(3)="1ØØ.7"**
LET response: **#**

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P6 — Programmer Profile 6 Values

Purpose: To view or change a given profile value (loop setpoint) for the sixth programmer.

Use: PRINT format: **PR P6(P)**, where **P** is profile number.
LET format: LE P6(P)="X", where **P** is profile number and **X** is the setpoint value for profile **P**.
Field length: 8
Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 6 will have if loop 6 is configured to take its setpoint from the selected programmer. A LET command for **P6(P)** will be overridden if programmer 6 is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more information on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: **PR P6(1)**
PRINT response: **^^^98.6Ø**
LET request: **LE P6(3)="1ØØ.7"**
LET response: **#**

P7 — Programmer 7 Profile Values

Purpose: To view or change a given profile value (loop setpoint) for the seventh programmer.

Use: PRINT format: **PR P7(P)**, where **P** is profile number.
LET format: **LE P7(P)="X"**, where **P** is profile number and **X** is the setpoint value for profile **P**.
Field length: 8
Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 7 will have if loop 7 is configured to take its setpoint from the selected programmer. A LET command for **P7(P)** will be overridden if programmer 7 is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more information on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: **PR P7(1)**
PRINT response: **^^^98.6Ø**
LET request: **LE P7(3)="1ØØ.7"**
LET response: **#**

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P8 — Programmer 8 Profile Values

Purpose: To view or change a given profile value (loop setpoint) for the eighth programmer.

Use: PRINT format: **PR P8(P)**, where **P** is profile number.
LET format: LE P8(P)="X", where **P** is profile number and **X** is the setpoint value for profile **P**.
Field length: 8
Value: Any valid setpoint, depends on range in use.

Remarks: This parameter is the setpoint loop 8 will have if loop 8 is configured to take its setpoint from the selected programmer. A LET command for **P8(P)** will be overridden if programmer 8 is in the "Run" mode.

See the description of the SPS (Setpoint Source) parameter for more information on configuring a loop to take its setpoint from a given programmer.

Examples: PRINT request: **PR P8(1)**
PRINT response: **^^^98.6Ø**
LET request: **LE P8(3)="1ØØ.7"**
LET response: **#**

PDD — Power Down Date

Purpose: To view the date on which the Dimension was last powered down.

Use: PRINT format: **PR PDD**
Field length: 8
Value: MM/DD/YY

Remarks: Displayed in standard month/day/year format.

Examples: PRINT request: **PR PDD**
PRINT response: **Ø8/15/9Ø**

PDT — Power Down Time

Purpose: To view the time at which the Dimension was last powered down.

Use: PRINT format: **PR PDT**
Field length: 8
Value: HH:MM:SS

Remarks: Displayed in standard hours/minutes/seconds 24-hour time format.

Examples: PRINT request: **PR PDT**
PRINT response: **Ø4:19:22**

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PG — Programmer Screen Titles

Purpose: To view or change the titles of Programmer Display screens.

Use: STAG format: **STAG PG(S)**, where **S** is programmer screen number.
CTAG format: **CTAG PG(S)="X"**, where S is programmer screen number, **X** is screen title.
Field length: 8

Remarks: Default screen titles include PROGRUN1 through PROGRUN8.

Examples: STAG request: **STAG PG(1)**
STAG response: **PROGRUN1**
CTAG request: **CTAG PG(1)="PGM1^^^^"**
CTAG response: **#**

PID — PID Group

Purpose: To display or change the PID parameters for a specific loop and specific group number.

Use: PRINT format: **PR PID(L,G)**, where **L** is loop, **G** is group.
LET format: **LE PID(L,G)"X,Y,Z"**, where **L** is loop, **G** is group, and **X**, **Y**, and **Z** are gain, reset and rate respectively.
Field length: 26

Remarks: Each control loop has five different groups of PID parameters (1–5). If a loop has dual PID Type (PT), Group 1 is always the reverse-acting PID parameters and Group 2 is always the direct-acting PID parameters. If a loop has single PID Type, then Group 1 is used no matter whether reverse or direct acting. If the PID Type is programmed, then all 5 groups may be used, depending on the current programmer segment.

Examples: PRINT request: **PR PID(1,1)**
PRINT response: **^^^^1.ØØ,^^^^Ø.ØØ,^^^^Ø.ØØ**
LET request: **LE PID(1,2)="3.5,2.5,.5"**
LET response: **#**

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PS — Programmer Mode Status

Purpose: To monitor or change the programmer's mode of operation. This system variable can start or hold a programmer.

Use: PRINT format: **PR PS(P)**, where **P** is programmer number.
LET format: **LE PS(P)="X"**, where **P** is programmer number and **X** is R, S, or H.
Field length: 8

Remarks: The programmer mode system variable has two different formats: one for displaying (PRINT commands) and one for changing the status (LET commands).
Status display (PRINT commands):

Run^^^^^ = Run mode.
Hold^^^^ = Hold mode.
PG_END^^ = Programmer in hold after completing a program run.

Programmer status change format (LET command):

R = PrgMode placed into run mode at current segment.
H = PrgMode placed into hold mode.
S = Starts a programmer run starting at segment in PS4 (operator start segment)

Dimension considers a start command from the network (using PS) as an Operator start. In order to start a programmer using the PS variable, the programmer must be configured for Operator start. The CONF_PRG screen for programmer X should have the **OPStart** field set to **"OPStrtØX"**.

Examples: PRINT request: **PR PS(1)**
PRINT response: **Run^^^^^**
LET request: **LE PS(1)="S"**
LET response: **#**

PS1 — Programmer Start Segment 1 (Remote Start)

Purpose: This parameter is the same as RSS. See RSS.

PS2 — Programmer Start Segment 2

Purpose: Unused, reserved for future use.

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PS3 — Programmer Start Segment 3 (Time-of-Day Start)

Purpose: To view or change the state of the Time-of-Day Start segment of the selected programmer.

Use: PRINT format: **PR PS3(P)**, where **P** is programmer.
LET format: **LE PS3(P)="X"**, where **P** is programmer number, **X** a segment number.
Field length: 8
Value: 0–255 (0–749 with Extended Segments Option)

Remarks: This is the segment where the indicated programmer will start if started by the Time-of-Day Start feature.

Examples: PRINT request: **PR PS3(1)**
PRINT response: **^^2**
LET request: **LE PS3(4)="2Ø"**
LET response: **#**

PS4 — Programmer Start Segment 4 (Operator Start)

Purpose: To view or change the Operator Start segment for a particular programmer.

Use: PRINT format: **PR PS4(P)**, where **P** is programmer).
LET format: **LE PS4(P)="X"**, where **P** is programmer number, **X** is a segment number.
Field length: 8
Value: 0–255 (0–749 with Extended Segments Option)

Remarks: This is the segment where the indicated programmer will start if started by the operator from the Dimension graphic operator interface or by use of the command **LE PS(P)="S"**.

Examples: PRINT request: PR PS4(2)
PRINT response: ^^1
LET request: LE PS4(3)="5"
LET response: #

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PT — PID Type

Purpose: To view or change the PID type for a control loop.

Use: PRINT format: **PR PT(L)**, where **L** is loop.
LET format: **LE PT(L)="X"**, where **X** is **S**, **D**, **P** or **A**.
Field length: 1

Remarks: PID type determines whether a control loop uses single PID (S), dual PID (D), programmed PID (**P**), or Select Adaptive (**A**).
The **PID** system variable sets or views the values for each group, whereas the **PT** system variable sets or views the type of PID control.
When programmed PID is selected, the programmer determines the PID group to be used for each segment in the programmer.

Examples: PRINT request: **PR PT(1)**
PRINT response: **Single**
LET request: **LE PT(1)="D"**
LET response: **#**

Valid LET Requests: Single (or S)
Dual (or D)
Programmed (or P)
AdaptSel (or A)

Dimension responses to PRINT requests: Single_ _
Dual _ _
Progrmmed
AdaptSel

Note: *Underscore represents trailing spaces.*

PUD — Power Up Date

Purpose: To view the date on which the Dimension was last powered up.

Use: PRINT format: **PR PUD**
Field length: 8
Value: MM/DD/YY

Remarks: Displayed in standard month/day/year format.

Examples: PRINT request: **PR PUD**
PRINT response: **Ø8/16/9Ø**

PUT — Power Up Time

Purpose: To view the time at which the Dimension was last powered up.

Use: PRINT format: **PR PUT**
Field length: 8
Value: HH:MM:SS

Remarks: Displayed in standard hours/minutes/seconds 24-hour time format.

Examples: PRINT request: **PR PUT**
PRINT response: **Ø6:21:Ø1**

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PV — Process Variable

Purpose: To monitor the process variable of a control loop.

Use: PRINT format: **PR PV(L)**, where **L** is loop.
Field length: 8

Remarks: The format for the process variable value matches the range in use.

Examples: PRINT request: **PR PV(1)**
PRINT response: **^^^25.74**

QS2 — EIA-232 Xon/Xoff Mode

Purpose: To view or change the state of the Xon/Xoff mode for EIA-232 communications.

Use: PRINT format: **PR QS2**
LET format: **LE QS2="x"**, where **x** is the state of the Xon/Xoff communications mode.
Field length: 8
Value: Enable, Disable

Remarks: Xon/Xoff enabled = Enable
Xon/Xoff disabled = Disable

Examples: PRINT request: **PR QS2**
PRINT response: **Disable^**
LET request: **LE QS2="Enable^^"**
LET response: **#**

> ***Note:*** *Dimension must be powered down and then powered up again if serial communications parameters are changed.*

QS4 — EIA-422 Xon/Xoff Mode

Purpose: To view or change the state of the Xon/Xoff mode for EIA-422 communications.

Use: PRINT format: **PR QS4**
LET format: **LE QS4="x"**, where **x** is the state of the XON/XOFF communications mode.
Field length: 8
Value: Enable, Disable

Remarks: Xon/Xoff enabled = Enable
Xon/Xoff disabled = Disable

Examples: PRINT request: **PR QS4**
PRINT response: **Disable^**
LET request: **LE QS4="Enable^^"**
LET response: **#**

> ***Note:*** *Dimension must be powered down and then powered up again if serial communications parameters are changed.*

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RH — Reverse Output High Limit

Purpose: To monitor or change the reverse output high limit (RH). This feature allows the user to set the maximum output percentage for reverse outputs.

Use: PRINT format: **PR RH(L)**, where **L** is loop.
LET format: **LE RH(L)="XXX.X"**, where **L** is loop and **X** is the limit.
Field length: 8
Value: XXX.X (0.0 to 100.0%)

Remarks: The reverse output high limit (RH) can never be less than the reverse output low limit (RL).

Examples: PRINT request: **PR RH(1)**
PRINT response: **^^100.00**
LET request: **LE RH(1)="50"**
LET response: **#**

RI — Recipe Image

Purpose: Permits uploading and downloading of recipe information.

Use: PRINT format: **PR RI (C,B)**, where **C** is CPU number, **B** is block number.
LET format: **LE RI(C,B)="x"**, where **C** is CPU number, **B** is block number, **x** is the block of information being read or written.
Field length: Block 0 = 3, all other blocks = 128
Value: See remarks.

Remarks: RI is useful in the network mode only, when information is being uploaded or downloaded. This function creates a direct image of memory storing recipe values only (profiles, segment time, recycles, segments, alarm groups, PID groups). Block 0 contains the number of blocks for the complete recipe image. The information in all other blocks depends on the block being viewed. **C** is always 1.

Examples: PRINT request: **PR QS(1,0)**
PRINT response: **128**
LET request: **LE QS(1,1)="000AFC76ED..." (128 characters)**
LET response: **#**

RL — Reverse Output Low Limit

Purpose: To monitor or change the reverse output low limit (RL). This feature allows the user to set the minimum output percentage for reverse outputs.

Use: PRINT format: **PR RL(L)**, where **L** is loop.
LET format: **LE RL(L)="XXX.X"**, where **L** is loop and **X** is the limit.
Field length: 8
Value: XXX.X (0.0 to 100.0%)

Remarks: The reverse output low limit (**RL**) can never be greater than the reverse output high limit (**RH**).

Examples: PRINT request: **PR RL(1)**
PRINT response: **^^^75.00**
LET request: **LE RL(1)="25"**
LET response: **#**

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RO — Reverse Output (in percent)

Purpose: To monitor or change the reverse output for a control loop.

Use: PRINT format: **PR RO(L)**, where **L** is loop.
LET format: **LE RO(L)="XXX.X"**, where **L** is loop and **X** is the new reverse output value.
Field length: 8
Value: XXX.X (0.0 to 100.00%)

Remarks: The reverse output (**RO**)may be monitored (displayed) at any time. Control outputs may be changed only when the Dimension is in manual mode.

Examples: PRINT request: **PR RO(1)**
PRINT response: **^^^^15.Ø**
LET request: **LE RO(1)="2Ø"**
LET response: **#**

RS — Reset

Purpose: To monitor or change the reset (integral) value currently in use for a control loop.

Use: PRINT format: **PR RS(L)**, where **L** is loop.
LET format: **LET RS(1)="X"**, where **L** is loop and **X** is the reset value.
Field length: 8
Value: XX.XX

Remarks: This system variable prints or changes the actual reset value currently in use for a control loop.

Examples: PRINT request: **PR RS(1)**
PRINT response: **^^^^1.ØØ**
LET request: **LE RS(1)="2.ØØ"**
LET response: **#**

RSD — Response Speed

Purpose: To view or change the process speed (fast, medium, slow) for which you wish to auto-tune parameters.

Use: PRINT format: **PR RSD(L)**, where **L** is loop number.
LET format: **LE RSD(L)="x"**, where **L** is loop number, **x** is response type.
Field length: 8
Value: Fast, Medium, Slow

Remarks: Before auto-tuning a loop, select the response speed of the process you are controlling. A process which responds quickly to a change in control output will be tuned differently from a process which responds slowly.

Examples: PRINT request: **PR RSD(1)**
PRINT response: **Fast^^^^**
LET request: **LE RSD(1)="Medium^^"**
LET response: **#**

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RSS — Remote Start Segment

Purpose: To change or view the remote start segment for a given programmer.

Use: PRINT format: PR RSS(P), where P is programmer.
LET format: LE RSS(P)="X", where P is programmer and X is a segment number.
Field length: 8
Value: 0–255 (0–749 with Extended Segments Option)

Remarks: Each programmer has one Remote Start Segment (RSS) number. This is the segment where the programmer will start running if a remote start is executed. Note that a programmer start done via the network with the PS parameter is considered an Operator start, NOT a Remote start.

Examples: PRINT request: **PR RSS(1)**
PRINT response: **^^^^^^^3**
LET request: **LE RSS(1)="2"**
LET response: **#**

RT — Rate

Purpose: To monitor or change the rate (derivative) value for a control loop.

Use: PRINT format: **PR RT(L)**, where **L** is loop.
LET format: **LE RT(L)="X"**, where **L** is loop number, **X** is the new rate value.
Value: XX.XX

Remarks: This system variable prints or changes the actual rate value currently in use for a control loop.

Examples: PRINT request: **PR RT(1)**
PRINT response: **^^^^1.5Ø**
LET request: **LE RT(4)="1.1"**
LET response: **#**

SA — Setpoint Adjust

Purpose: Displays or changes the biasing of a profile setpoint.

Use: PRINT format: **PR SA(L)**, where **L** is loop number.
LET format: **LE SA(L)="X"**, where **L** is loop number, **X** is bias value.
Field length: 8

Remarks: This number is added to the profile setpoint of a loop when its setpoint source is "Programr". The setpoint of the loop will be equal to its profile value in the current segment plus the setpoint adjust. This allows a whole setpoint program to be shifted up or down by a fixed constant amount.

Examples: PRINT request: **PR SA(1)**
PRINT response: **^^^^1Ø.Ø**
LET request: **LE SA(1)="1.5"**
LET response: **#**

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SB2 — EIA-232 Stop Bits

Purpose: To view or change the number of stop bits used during EIA-232 communications.

Use: PRINT format: `PR SB2`
LET format: `LE SB2="X"`, where `X` is the number of stop bits.
Field length: 1
Value: 1 or 2

Remarks: Set number of stop bits to 1 or 2. This must match your host computer's setting.

Examples: PRINT request: `PR SB2`
PRINT response: `2`
LET request: `LE SB2="1"`
LET response: `#`

Note: *Dimension must be powered down and then powered up again if serial communications parameters are changed.*

SB4 — EIA-422 Stop Bits

Purpose: To view or change the number of stop bits used during EIA-422 communications.

Use: PRINT format: `PR SB4`
LET format: `LE SB4="X"`, where `X` is the number of stop bits.
Field length: 1
Value: 1 or 2

Remarks: Set number of stop bits to 1 or 2. This must match your host computer's setting.

Examples: PRINT request: `PR SB4`
PRINT response: `2`
LET request: `LE SB4="1"`
LET response: `#`

Note: *Dimension must be powered down and then powered up again if serial communications parameters are changed.*

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SC — Scale

Purpose: To view or change the scale value used with cascade control functions.

Use: PRINT format: **PR SC(L)**, where **L** is loop number.
LET format: **LE SC(L)="x"**, where **L** is loop number, **x** is the scale value.
Field length: 8
Value: XXXXXX.X (0 to 32767)

Remarks: Scale is used as follows: (percent output * ratio + setpoint * blend factor) / scale factor. How this value is used is configurable by the user.

Examples: PRINT request: **PR SC(1)**
PRINT response: **^^^^^^^6**
LET request: **LE SC(1)="9"**
LET response: **#**

SG — Segment Data

Purpose: To view or change the values of a programmer segment.

Use: PRINT format: **PR SG(P,S)**, where **P** is programmer, **S** is segment.
LET format: **LE SG(P,S) =". . . ."**, where **P** is Programmer, **S** is segment, and all segment values are listed between the quotes.
Field length: 105

Remarks: This variable views or changes an entire segment in the controller's segment Table. Valid segment numbers are 0–749. The programmer number is irrelevant since all programmers use the same segment Table, but it must be specified in the command.
The format is as follows: **P1,P2,P3,P4,P5,P6,P7,P8,HH:MM:SS,EEEEEEEEEEEE, CCC,NNN,A,P**
where

P1–P8 = The 8 profile setpoints. There are always 8 even if the controller has less than 8 loops. P1 corresponds to loop1, P2 to loop2, and so on. With the LET command, all 8 MUST be specified – use zeros for unused profiles.
HH:MM:SS = Segment time in Hours:Minutes:Seconds
EEEEEEEEEEEE = Events. All 12 MUST be specified – use 1–9, a, b, and c for events which should be on and underscores "_" for events which should be off.
CCC = Recycles (0–255)
NNN = Next segment
A = Alarm group
P = PID group

When using a LET command, ALL 14 parameters must be specified.

Examples: PRINT request: **PR SG(1,15)**
PRINT response: (one continuous message):
^^^15Ø.Ø,^^^2ØØ.Ø,^^^^45.Ø,^^^^^Ø.Ø,^^^^^Ø.Ø,^^^^^Ø.Ø,
^^^^^Ø.Ø,^^^^^Ø.Ø,ØØ:Ø5:ØØ,__34_6____b_,ØØØ,Ø16,1,1
LET request: (one continuous message):
LE SG(1,1)="25,3Ø,44.5,1ØØ,Ø,Ø,Ø,Ø,ØØ:1Ø:ØØ, 1____6_____,Ø,2,3,3"
LET response: #

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SMD — System Mode

Purpose: To view or change the mode in which the Dimension will restart after the next power-down.

Use: PRINT format: **PR SMD**
LET format: **LE SMD="x"**, where **x** is mode.
Field length: 8
Value: WarmStrt, ColdStrt

Remarks: **WarmStrt** = All current settings saved.
ColdStrt = Calibration settings saved, all others reset to factory defaults. For the LET command, **"W"** and **"C"** may be used.

Examples: PRINT request: **PR SMD**
PRINT response: **ColdStrt**
LET request: **LE SMD="WarmStrt"**
LET response: **#**

SP — Setpoint

Purpose: To monitor or change the setpoint.

Use: PRINT format: **PR SP(L)**, where **L** is loop.
LET format: **LE SP(L)="+-XXX."**, where **L** is loop.
Field length: 8
Value: Depends on the range in use.

Remarks: The format for the setpoint (**SP**) value matches the range in use.
The setpoint may be changed only when the setpoint source (SPS) is set to Operator.

Examples: PRINT request: **PR SP(1)**
PRINT response: **^^^^54.Ø**
LET request: **LE SP(1)="87"**
LET response: **#**

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SPS — Setpoint Source

Purpose: To view or change the setpoint source for a loop.

Use: PRINT format: **PR SPS(L)**, where **L** is loop.
LET format: **LE SPS(L)="X"**, where **L** is loop, **X** is **O**, **R** or **P**.
Field length: 8
Value: Operator, Remote, Programr

Remarks: This parameter determines whether a control loop receives its setpoint from the operator, a programmer, or a remote source. A calculated setpoint is considered remote.
To configure a loop to take its setpoint from a given programmer, the Setpoint Source (SPS) must be set to **Programr**, and the loop's Remote Setpoint Source must be set to **ProgramX** where **X** is the programmer you would like to control the loop. On the Dimension graphic operator interface, the Setpoint Source appears as **SptSrcØX** in the window accessed by clicking on the **LpModeØX** field of the main screen for loop X. The Remote Setpoint Source appears as **RemSPsrc** on the CONF_LOP screen. There is no network parameter available to set the Remote Setpoint Source.

Examples: PRINT request: **PR SPS(1)**
PRINT response: **Operator**
LET request: **LE SPS(1)="P"**
LET response: **#**

SR — Sampling Rate

Purpose: To view or change the sample rate of a loop input for tuning.

Use: PRINT format: **PR SR(L)**, where **L** is loop number.
LET format: **LE SR(L) = "x"**, where **L** is loop number, **x** is sampling rate.
Field length: 8
Value: Range is 0 to 1000.

Remarks: The number of input samples taken should be at least 200. The sampling rate is in multiples of 200 milliseconds.

Examples: PRINT request: **PR SR(1)**
PRINT response: **^^^^^2Ø2**
LET request: **LE SR(1)="22Ø"**
LET response: **#**

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SS — System Status

Purpose: To indicate whether control functions are running. Also, to download information to Memory Image (MI) or Configuration Image (CI).

Use: PRINT format: PR SS
LET format: LE SS="X"
Field length: 1
Value: R, I

Remarks: System Status (SS) indicates the current status of the functions:
R indicates functions are running (functioning normally).
I indicates idle or off line. When downloading Memory Image (**MI**) or Configuration Image (**CI**), change the **SS** status to **I**.

When the downloading process is finished, change the **SS** status back to **R**.

Examples: PRINT request: **PR SS**
PRINT response: **I**
LET request: **LE SS="R"**
LET response: **#**

SY — System Screen Title

Purpose: To view or change the title of the system (UNIT) screen.

Use: STAG format: **STAG SY**
CTAG format: **CTAG SY="x"**, where **x** is screen title.
Field length: 8
Value: See remarks.

Remarks: Default screen title is UNIT.

Examples: STAG request: **STAG SY**
STAG response: **UNIT^^^^**
CTAG request: **CTAG SY="UNIT1^^^"**
CTAG response: **#**

TCY — Time-Proportioning Cycle Time

Purpose: To view or change the time-proportioning cycle time of a relay contact output on an analog I/O card.

Use: PRINT format: **PR TCY(C)**, where **C** is contact number.
LET format: **LE TCY(C)="XXX"**, where **C** is contact number, **XXX** is number of seconds.
Field length: 3
Value: XXX (1–255 seconds)

Remarks: Default (dead start) cycle time is 0 seconds (output functions as non-time-proportioned contact output). Range is 1 to 255 seconds.

Examples: PRINT request: **PR TCY(1)**
PRINT response: **ØØ1**
LET request: **LE TCY(1)="15"**
LET response: **#**

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TD — Time-of-Day (TOD)

Purpose: To monitor or set the time-of-day (TOD) clock.

Use: PRINT format: **PR TD**
LET format: **LE TD="HH:MM:SS"**
Field length: 8
Value: HH:MM:SS

Remarks: HH = hour, MM = minutes, and SS = seconds.
The TOD clock displays military time and increments the date every 24 hours.

Examples: PRINT request: **PR TD**
PRINT response: **Ø2:49:34**
LET request: **LE TD="14:55:ØØ"**
LET response: **#**

TDD — Tuning Complete

Purpose: To view the status of loop auto-tuning.

Use: PRINT format: **PR TDD(L)**, where **L** is loop number.
Field length: 8
Value: Yes, No

Remarks: Yes = auto-tuning complete
No = auto-tuning not complete

Examples: PRINT request: **PR TDD(1)**
PRINT response: **No^^^^^^**

TDS — Time of Day Start

Purpose: To view or change the time for the clock-driven programmer time-of-day start.

Use: PRINT format: **PR TDS(P)**, where **P** is programmer number.
LET format: **LE TDS(P)="x"**, where **P** is programmer number, **x** is time of day.
Field length: 8
Value: HH:MM:SS

Remarks: Time is displayed or set in hours/minutes/seconds 24-hour format.

Examples: PRINT request: **PR TDS(1)**
PRINT response: **Ø4:14:12**
LET request: **LE TDS(1)="Ø4:15:ØØ"**
LET response: **#**

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TEN — Tuning Error Number

Purpose: To view the number of an error that occurred during loop auto-tuning.

Use: PRINT format: **PR TEN(L)**, where **L** is loop number.
Field length: 8

Remarks: 600 = Loop not in manual mode.
604 = PV not responding to output change.
605 = Process not moving fast enough; increase sample rate.
606 = Manual output changed during tuning process.
607 = System error.
608 = Buffer full.
609 = User abort.

Examples: PRINT request: **PR TEN(1)**
PRINT response: ^^^^^**6ØØ**

TER — Tuning Error

Purpose: To view the yes/no error status of loop auto-tuning.

Use: PRINT format: PR TER(L), where **L** is loop number.
Field length: 8
Value: Error, or blank

Remarks: Error = Error occurred during auto-tuning.
(Blank) = No errors during auto-tuning.

Examples: PRINT request: **PR TER(1)**
PRINT response: **Error**^^^

TL — Time Left in Segment (SEG time)

Purpose: To monitor the amount of time left in the current segment.

Use: PRINT format: **PR TL(P)**, where **P** is programmer.
Field length: 8
Value: HH:MM:SS

Remarks: This system variable monitors the amount of time left in the current segment for a specific programmer.

Examples: PRINT request: **PR TL(1)**
PRINT response: **ØØ:Ø8:34**

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TLP — Time Left in Program

Purpose: To view the amount of time left in a program.

Use: PRINT format: **PR TLP(P)**, where **P** is programmer number.
Field length: 8
Value: HH:MM:SS or DD-HH:MM. A "–" between DD and HH instead of a ":" indicates days field in effect.

Remarks: Displays time in hours/minutes/seconds 24-hour time format or days-hours-minutes format if remaining time exceeds 24 hours.
If end of program can't be found or if nested program recycles are present, will display XX:XX:XX.

Examples: PRINT request: **PR TLP(1)**
PRINT response: **ØØ:Ø9:13**

TP — Time into Program

Purpose: To monitor the amount of time the current program has been running.

Use: PRINT format: **PR TP(P)**, where **P** is programmer.
Field length: 8
Value: HH:MM:SS or DD-HH:MM

Remarks: This variable displays how long a program has been running.
The DD-HH:MM format is used only when a program has been running longer than one day.

Examples: PRINT request: **PR TP(1)**
PRINT response: **Ø1:3Ø:23**

TS — Tuning Status

Purpose: To view the status of, or initiate, or abort loop auto-tuning.

Use: PRINT format: **PR TS(L)**, where **L** is loop number.
LET format: **LE TS(L)="x"**, where **L** is loop, x is status.
Field length: 8
Value: Start, Abort

Remarks: If status is "Start", auto tuning is not in progress and a command of **LE TS(L)="S"** will start it. If status is "Abort" auto tuning is in progress and command of **LE TS(L)="A"** will abort it.

Examples: PRINT request: **PR TS(1)**
PRINT response: **Start^^^**
LET request: **LE TS(1)="A"**
LET response: **#**

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TYP — Analog Input Type

Purpose: To view or change the types of inputs used on an analog I/O card.

Use: PRINT format: **PR TYP(I)**, where **I** is analog input number.
LET format: **LE TYP(I)="x"**, where **I** is analog input number, **x** is input type.
Field length: 8
Value: See remarks.

Remarks: Use the command PR ALL(I), where I is the input number to display a list of all permissible input types.

Important: Input type changes also require wiring and sensor changes.

Examples: PRINT request: **PR TYP(1)**
PRINT response: **Type..B.**
LET request: **LE TYP(1)="Type..G."**
LET response: **#**

UT — Engineering Units Type

Purpose: To view or change the engineering unit type used with an analog input.

Use: PRINT format: **PR UT(I)**, where **I** is analog input number.
LET format: **LE UT(I)="x"**, where **I** is analog input number, **x** is engineering units.
Field length: 8
Value: Centigrd, Fahrenht, Linear

Remarks: Centigrd = TC or RTD
Fahrenht = TC or RTD
Linear = Linear input

Examples: PRINT request: **PR UT(1)**
PRINT response: **Centigrd**
LET request: **LE UT(1)="Fahrenht"**
LET response: **#**

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Example of System Variable Use

This section gives an example of getting something done using the system variables via a Dimension communications port. We explain the steps necessary to set up programmer 1 to control loops 1 and 2 (we'll call them Temperature and Humidity) through a three segment recipe which ramps up, soaks for a while, then ramps back down. We assume a few things here to make the example simpler:

A. The Network communications mode is used, but we will leave out the mechanics of the protocol (STX, address, ETX, checksum). The commands shown will work via either the EIA-232 or EIA-422 ports.

B. Correct tuning parameters have already been set for loops 1 and 2. If you wish to set tuning parameters over the network, see the description of the PID Group parameter.

C. Loops 1 and 2 are configured to take their setpoints from programmer 1. Each loop should have its Setpoint Source (SptSrc) set to Programr and its Remote Setpoint Source (RemSPsrc) set to Program1. For help in configuring them as such, see Section 4. The description of the SPS parameter in this appendix is also helpful.

D. Programmer 1 is configured to be started by the operator. Dimension considers a start command from the network (using the PS system variable) as an Operator start. The CONF_PRG screen for programmer 1 should have the OPStart field set to OPStrt01. For help on this, (see *"Real-Time Programmer"* Section 5).

Starting a setpoint program requires several steps via the network, just as it does via the Dimension graphic operator interface:

Step 1: Place the Programmer in Hold.

```
LE PS(1)="H"
```

The programmer really should be in `Hold` or at `PG_END` before you start another recipe program, but this sets programmer 1 status to `Hold` if it happens to be in `Run`. If it is at `PG_END` it will remain at `PG_END`. If it is in `Run`, it will stop and hold its present setpoints. This should ensure that the following commands will be accepted.

Step 2: Create a Recipe in the Segment Table.

```
LE SG(1,1)="9Ø,8Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø1:3Ø:ØØ,_____,Ø,2,1,1,"
LE SG(1,2)="9Ø,8Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø4:ØØ:ØØ,_____,Ø,3,1,1,"
LE SG(1,3)="25,5Ø,Ø,Ø,Ø,Ø,Ø,Ø,Ø1:15:ØØ,_____,Ø,3,1,1,"
```


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This program will increase the temperature to 90 degrees and humidity to 80% over one hour thirty minutes, hold these settings for four hours, then ramp back down to 25 degrees and 50% humidity in one hour fifteen minutes. It sets no event outputs and it uses Alarm Group 1 and PID Group 1 for the entire program.

Step 3: Set the Operator Start Segment for the programmer.

`LE PS4(1)="1"`(Set the Operator Start Segment for programmer 1 to segment 1)

Step 4: Set modes of programmed loops to Auto.

`LE LS(1)="A"` (Set Loop Status for loop 1 to `Auto`)
`LE LS(2)="A"` (Set Loop Status for loop 2 to `Auto`)

Step 5: Issue the Start Programmer command.

`LE PS(1)="S"` (Start programmer 1 at segment in `PS4(1)`)

Once this last command is given, programmer 1 will start running segment 1 and controlling the setpoints of loops 1 and 2. While the programmer is running, it may be held and resumed with the following commands:

`LE PS(1)="H"` (Hold programmer 1 at current segment)
`LE PS(1)="R"` (Run programmer 1 at current segment)

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Error Messages

If the host computer makes an illegal request message to Dimension, or if a syntax error occurs, Dimension will return an error message to the host computer. All error messages use the same six-byte format: an E followed by a space, followed by a four-digit error identification number. Each type of error condition has a separate error identification number. For example, E 0403 is the error identification number for an illegal system variable. Table B-5 lists all error identification numbers and the error condition to which they call attention.

Table B-5. Dimension Communication Error Messages

Error Message	Error Condition
E 0215	Illegal pathname
E 0242	Write protect (read only)
E 0244	Read error
E 0245	Write error
E 0401	Bad assignment parameter
E 0402	Bad string variable
E 0403	Illegal system variable
E 0404	Illegal assignment
E 0405	Bad pathname
E 0406	Incomplete path list
E 0407	Read only parameter
E 0408	Buffer overflow
E 0409	Illegal tagname assignment

EIA-422/RS-423 Communications Watchdog

A communications watchdog is applicable for EIA-422 and RS-423 communications. The communications watchdog ensures that a CPU failure within a Dimension does not disable an entire communications network. Dimension's processor updates a watchdog timer every 20 milliseconds. If the timer is not updated after 40 milliseconds, the watchdog is activated.

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When the communications watchdog is activated, the port 1 **XMIT** terminals are switched to high impedance, i.e., the **XMIT** terminals are electrically removed from the network.

IEEE-488 Option Installation and Configuration

IEEE-488 Introduction

The IEEE-488 bus is also known as the "General Purpose Interface Bus" (or GPIB). The purpose of the IEEE-488 bus is to transfer information between two or more devices. A device may either be an instrument or a computer. Devices may 'Talk' (send), 'Listen' (receive), or be idle on the bus. Only one device can be 'addressed' (allowed) to Talk on the bus at a time, while one or more devices may Listen.

One device on the bus must be the System Controller. The Controller determines which device will talk and which devices will listen. The Controller is usually a computer containing a IEEE-488 interface card and application programs. The IEEE-488 specification allows the System Controller to pass its duties to another device, making it the 'Active Controller'.

There are two types of messages sent over the IEEE-488 bus: interface messages and device dependent messages. Interface messages manage the IEEE-488 bus, using commands to clear the interface, address devices to talk or listen, and so forth. Device dependent messages transfer commands specific to the device (Dimension Industrial Process Managers for example).

IEEE-488 and Dimension

The Dimension Industrial Process Manager handles the basic IEEE-488 commands. It uses a selectable primary address (0–31) and handles the Talker and Listener functions. Dimension will act as a peripheral device, answering information asked of it. Serial and parallel polling, and the Controller functions have not been implemented.

IEEE-488 Installation

Cabling and Connections

Dimension uses the standard 24 position IEEE-488 connector for the IEEE-488 bus. The recommended cable style to use with Dimension is an "In-Line" mating cable(see Fig. B-13). This allows clearance for other cables and connectors on the rear panel of the Dimension.

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Cable lengths should be kept as short as possible and a good quality shielded cable is recommended. IEEE-488 specifies:

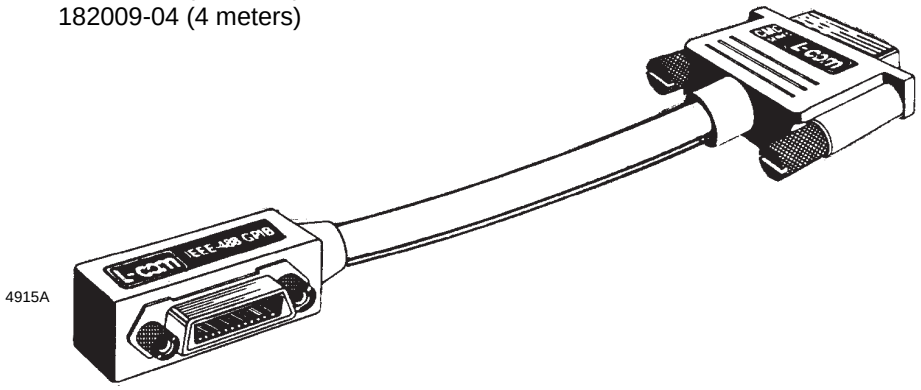
(1) Maximum of 15 devices per system, and

(2) Total combined length of all cables is 20 meters or less.

Figure B-13.
IEEE-488 In-Line Mating Cable

IN-LINE MATING CABLE

National Instruments Part #
182009-01 (1 meter)
182009-02 (2 meters)
182009-04 (4 meters)



IEEE-488 Configuration

Configuration parameters must be selected for each of the devices on the IEEE-488 bus, including the System Controller. The parameters are adjusted to match the communication characteristics of each device. Frequently, the default settings of these parameters will work if the correct address has been selected.

Dimension 8705 Configuration/Set up

Dimension's 8705 configuration parameters are set from the IEEE-488 configuration screen. This screen, displayed in Fig. B-14, is accessed from the Communications Configuration Screen.

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Figure B-14.
8705 IEEE-488 Configuration Screen



PrimAddr: Selects the Primary IEEE-488 Address of the Dimension, which is different than the Network Address. The address range is 0 to 31; address 4 is the factory default.

EOM_Char: Selects the END of Message Character. This is set to the factory default, CR-LF (Carriage Return and Line Feed). The choices are:

CR-LF
LF-CR
LF
CR

Dimension 8725 Configuration/Set up

Dimension's 8725 configuration parameters are also set from the IEEE-488 configuration screen. This screen, displayed in Fig. B-14, is accessed from the Communications Configuration Screen.

Figure B-15.
8725 IEEE-488 Configuration Screen



PrimAddr: Selects the Primary IEEE-488 Address of the Dimension, which is different than the Network Address. The address range is 0 to 31; address 4 is the factory default.

EOM_Char: Selects the END of Message Character. This is set to the factory default, CR-LF D of Message Character. This is set to the factory default, CR-LF (Carriage Return and Line Feed). The choices are:

CR-LF
LF-CR
LF
CR
None **** Uses the EOI hardware line to signal the End of Message.

ScndAddr: Enables or disables the use of Secondary addressing. This is set to "disable" from the factory.

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ScndAddr: Selects the Secondary IEEE-488 Address of the Dimension. The choices are 96 to 126. This is set to 0 when secondary addressing is disabled.

System Controller Configuration

The System Controller will need to be configured for Dimension and the other devices connected to the IEEE-488 Bus. Below are the parameters that can be set when using a National Instruments AT-GPIB interface board and software, with an IBM AT compatible personal computer.

```
            DEVICE CHARACTERISTICSDevice :DEV4

ParameterDefault SettingsRecommended
         Settings
Primary GPIB Address1-164
Secondary GPIB AddressNoneNone
Timeout SettingT10sT10s
EOS byte00H0AH
Terminate Read on EOSnoyes
Set EOI with EOS on Writenono
Type of compare on EOS7-bit8-bit
Set EOI w/last byte of Writeyesyes
Repeat Addressingno
```

Note: *Please consult the documentation supplied with your IEEE-488 interface card for more information.*

Primary GPIB Address

The Primary GPIB Address is selectable from both Dimension and the National Instruments software. Each device on the IEEE-488 bus must have a unique primary address and will have its own Device Characteristic setup screen when using National Instruments software. The primary address for the Dimension must match the selected primary address in the Device Characteristics if they are to communicate.

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Secondary GPIB Address

Secondary Addressing is typically used in special applications that require extended addressing. If used, the address selected must be the same as selected on the Dimension in order to communicate. The normal setting for this item is `Disable`.

Timeout Setting

The Timeout setting is the maximum length of time that an I/O operation can take before a timeout occurs. One way this is used is as a Time out Error on the IEEE-488 bus. The default timeout setting of 10 seconds is more than adequate for most devices. Shortening the timeout delay will decrease the length of time spent waiting for a communication error to be handled, too short of time may cause communication errors. Values of 10 msec. to 10 seconds will work for most Dimension applications.

EOS Byte

The End Of String (EOS) byte is an optional character that is sent at the end of the message string to indicate the end. Dimension defaults with Carriage Return and Line Feed characters (0D + 0A Hex) as the End of String byte.



Note: *The selection made for this device characteristic on National Instruments software is for reference only.*

Messages can be terminated by an EOS byte, setting the EOI line, or by sending a specified number of characters. The application program used will determine which method should be selected.

Dimension will always set the EOI line when sending a message and will terminate the reception a message if the EOI line gets set. The EOS character(s) will be sent by Dimension if selected in the Configuration screen. The Sample Programs on page B-97 were written to use the CR-LF as the EOS byte.

Terminate Read on EOS

Terminate Read on EOS, if set, will cause the interface board to terminate a Read operation when the EOS byte has been received. Dimension can be used with this parameter set to either yes or no. If an EOS character on Dimension has been selected to be something other than 'None', this parameter should be set to 'yes'. However, the application software that will be used will determine the correct setting.

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Set EOI with EOS on Write

Set EOI with EOS on Write, if set, will cause the interface board to set the EOI line whenever it sends the EOS byte. Dimension can be used with this set to either yes or no. The application software that will be used will determine the correct setting.

Type of Compare on EOS

Type of compare on EOS byte selects whether all 8 bits of the character are compared or if only the first 7 bits are compared to see if they match. Dimension comes from the factory set for 8 bit characters. Most applications will work in either setting.

Set EOI with Last Byte of Write

Set EOI with last byte of write, if set, will cause the interface board to set the EOI line with the last byte of every message sent. If Dimension has been set up with the EOS character set to 'None', this feature must be set to 'yes' to receive messages. For other the other selections of the EOS character on Dimension, this feature can be set to either yes or no. The recommended setting is 'Yes'.

Repeat Addressing

Normally, devices are addressed each time a read or write operation is performed. If no is selected, the read and write operations will not readdress the selected device if the same operation was just performed. This saves time when repeated operations are preformed with the same device.

IEEE-488 and Data Transfer

Data Transfer

Data transfer on the IEEE-488 bus is handled by the following hardware and software:

IEEE-488 hardware bus
Driver software
Application software

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Application software controls the driver software which in turn controls the hardware bus. Each is explained in general terms in the following section. Detailed information on IEEE-488 can be found in the following documents:

ANSI/IEEE 488.1-1987: IEEE Standard Digital Interface for Programmable Instrumentation, and ANSI/IEEE 488.2-1987: IEEE Codes, Formats, Protocols, and Common Commands, and Standard Commands for Programmable Instruments.

IEEE-488 Hardware Bus

The IEEE-488 Bus consists of 24 wires or 'lines' (see Fig. B-15): 8 data lines, 8 ground lines, 3 handshake lines, and 5 interface management lines.

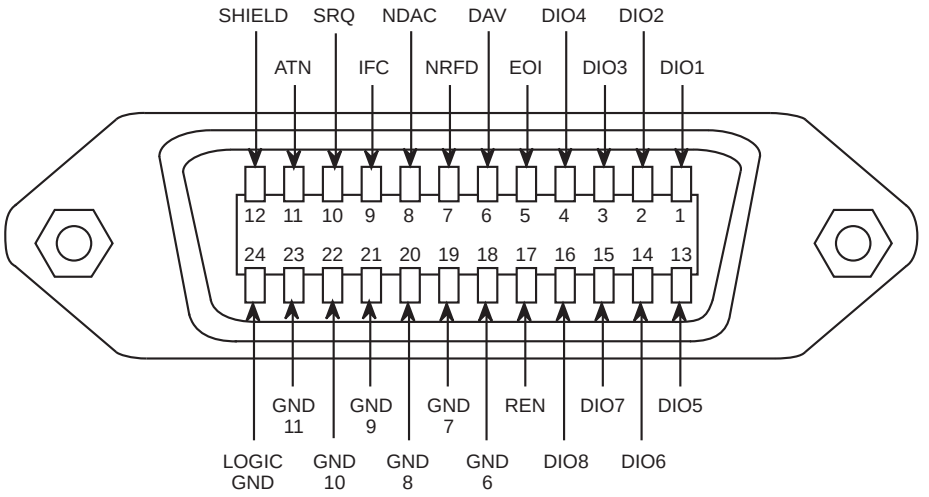


Figure B-16.
IEEE-488 Standard Connector

Data lines: DIO1 through DIO8

Data lines carry both data and command messages to and from the devices.

Handshake Lines

Handshake lines control the transfer of messages between devices. The handshaking process guarantees that the bytes on the data lines are sent and received without transmission errors.

DAV (Data Valid) – indicates when the information on the data lines are stable or valid and can be accepted by devices. This line is controlled by the Talker when sending data messages and by the Controller when sending commands.

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NRFD (Not Ready For Data) – indicates when a device is ready to receive a message. The line is controlled by all devices when receiving commands and by Listeners when receiving data messages. Note, this line will not be released (ready to accept data) until ***all*** devices have released it.

NDAC (Not Data Accepted) – indicates when a device has accepted the data or control byte on the data lines. The line is controlled by all devices when receiving commands and by Listeners when receiving data messages. Note, this line will not be released (data accepted) until ***all*** devices have released it.

Interface Management Lines

Interface management lines manage the flow of control and data bytes across the interface.

ATN (Attention) line is set by the Controller to indicate that it is putting an address or control byte on the data bus. ATN is released to allow the Talker to put data or status information on the bus.

IFC (Interface Clear) line is set by the Controller in order to initialize all devices to a known state.

REN (Remote Enable) line is set by the Controller and is used to place devices in remote or local program mode.

EOI (End of Identify) line is used in two ways. A Talker uses this line to indicate the end of a message. The Controller can use this line to tell devices to identify their response in a parallel poll.

SRQ (Service Request) line can be set by any device to request that the Controller take some action. The Controller will in turn determine which of the devices is requesting service and then take the appropriate action.

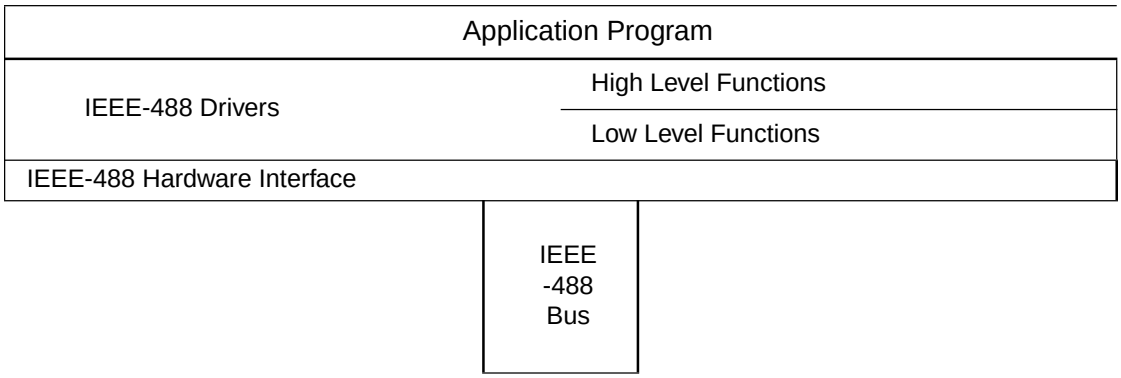
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Driver Software

The Driver software is the lowest level of IEEE-488 software which interfaces directly with the IEEE-488 hardware. Driver software automatically handles the IEEE-488 protocol and bus management details.

There are three popular software command sets for programming the IEEE-488 bus: HP style commands, IEEE-488.1 commands, and the enhanced IEEE-488.2-1987 commands. The command syntax varies based on the programming language, type of computer, and vender of IEEE-488 hardware.

A pictorial representation of how the different levels of software and hardware fit together is shown below.



IEEE-488 Bus Commands

The commands associated with the IEEE-488 bus can be grouped into three general categories: Uniline Commands, Multiline Commands, and Device-Dependent Commands. See Table B-6 for a partial listing of these commands.

Uniline Commands – effect only one of the IEEE-488 bus lines. These commands are executed by setting or clearing the appropriate line.

Multiline Commands – effect more than one of the IEEE-488 bus lines. Multiline commands are sent by the Controller with the ATN line set.

Device-Dependent Commands – are those commands that are specific to a particular device, such as Dimension. These commands are transmitted by the data lines while the ATN line is not set. An example would be sending the characters "PR TD" over the data lines to the Dimension. This would request the time of day information from Dimension. See page B-22 for a list of system variable commands and Table B-4, page B-25, for a list of the available system variables.

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Table B-6. IEEE-488 Bus Command Summary

Command Type	Command	Description
UNILINE		
	REN (Remote Enable)	Sets up device for remote operation.
	EOI (End or Identify)	Marks end of transmission.
	IFC (Interface Clear)	Clears interface.
	ATN (Attention)	Defines data bus contents
	SRQ (Service Request)	Controlled by external device. (Currently not implemented on Dimension)
MULTILINE		
Universal	LLO (Local Lockout)	Locks out local operation. (No effect on Dimension)
	DCL (Device Clear)	Returns device to default. (See "*System Variable Commands"* on page B-22)
	SPE (Serial Poll Enable)	Enable serial polling. (No effect on Dimension)
	SPD (Serial Poll Disable)	Disable serial polling. (No effect on Dimension)
Addressed	MTA (My Talk Address)	Selects device to be talker.
	MLA (My Listen Address)	Selects device to be listener.
	MSA (My Secondary Address)	Selects device's secondary address.
	SDC (Selective Device Clear)	Returns unit to default. (See "*System Variable Commands"* on page B-22)
	GTL (Go To Local)	Returns device to local.
	GET (Group Execute Trigger)	Triggers device for reading.
Unaddressed	UNL (Unlisten)	Removes all listeners from bus.
	UNT (Untalk)	Removes any talkers from bus.
DEVICED-DEPENDENT	See Table B-4 for list of commands.	

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Application Software

Application software performs an overall process by interfacing with the IEEE-488 driver programs. Application software is typically written using a programming language such as 'Basic' or 'C' to control a process. The process may be as simple as taking a voltage measurement or complex enough to control an Environmental Chamber throughout its series of tests. Software vendors have many useful tools and libraries of functions to program the IEEE-488 bus.

Each programming language has its own language interface which contains the functions necessary for the language to access the IEEE-488 drivers. National Instruments has many language interface utilities available including a utility called Universal Language Interface (ULI). ULI is set up for users who are familiar with programming Hewlett-Packard controllers. It interfaces between MS-DOS and the IEEE-488 drivers using HP style functions.

Dimension Commands

Dimension uses five commands to access system variables (see "*System Variable Commands"* on page B-22).

Sample Programs

Listed is a short program for testing the communication from your IEEE-488 system to your Dimension. Three versions of the program have been listed, each using a different command set (HP style commands, IEEE-488.1 commands, and IEEE-488.2-1987 commands). The output of the program is shown in Fig. B-16.

The programs are written for the 'Basic' programming language. The test setup used was: the MS-DOS operating system on a AT style computer, National Instruments GPIB IEEE-488 hardware and corresponding software drivers, and Microsoft QuickBasic version 4.5. Information following the single quotes (') are program comments and do not need to be entered. Refer to pages B-96 through B-98 for sample programs.

Figure B-17.
Test Program Output Screen

```
    DATE        TIME         LS         SP         PV         RO
= ═══ ═══ ═══ ═══ ═══ ═══ ═══ ═══ ═══ ═══ ═══ ═══ ═══ ═══ ═══ ═══ =
  01/01/9    17:00:0                              Opensen
    6          0          MANUAL      0.0          s          0.00
```


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```
'     Sample Program Using HP-Style Commands
' ------------------------------------------------------
'
'     A UNIVERSAL LANGUAGE INTERFACE PROGRAM MAY NEED TO BE LOADED.
'     THE DEFAULT IEEE-488 ADDRESS IS 4.
'     THE EOM CHARACTER FOR THE DIMENSION IS LF-CR.
'     USE THE ESCAPE KEY TO END THE PROGRAM.
'
          IEEEAD$ = "4"                    ' Set the IEEE address to 4
          OPEN "GPIB0" FOR OUTPUT AS #1      ' Open GPIB bus for output
          OPEN "GPIB0" FOR INPUT AS #2       ' Open GPIB bus for input
          PRINT #1, "ABORT"                ' Initialize GPIB Bus
          PRINT #1, "CLEAR "; IEEEAD$       ' Clears Dimension device (SDC)
          PRINT #1, "RESET"            ' Sets EOS character to CR
          PRINT #1, "Remote "; IEEEAD$       ' Sets Dimension to remote
          CLS                              ' Clears Screen
CYCLE:
'    Print header line starting at line 3 column 1.
          LOCATE 3, 1
          PRINT " DATE       TIME    LS       SP       PV         RO     "
```


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```
'     Sample Program Using IEEE-488.1 Commands
' ------------------------------------------------------
'
'     THE DEFAULT IEEE-488 ADDRESS IS 4.
'     THE EOM CHARACTER FOR THE DIMENSION IS CR
'     USE THE ESCAPE KEY TO END THE PROGRAM.
'
'     Load file QBDECL.BAS - Quick Basic initialization code
          REM $INCLUDE: 'C:QBDECL.BAS'

          IEEEAD% = 4                    ' Set the IEEE address to 4
          IEEEAD$ = "4"
          DEVNAME$ = "DEV" + IEEEAD$     ' Make device name DEV4 (default)

          CALL IBFIND(DEVNAME$, D%)      ' Find identifier for Dimension
          CALL IBSIC(brd0%)              ' Initialize GPIB Bus
          CALL IBCLR(D%)                 ' Clears Dimension device (SDC)
          CALL IBSRE(brd0%, D%)          ' Sets Dimension to remote
          CLS                            ' Clears Screen
CYCLE:
```


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```
'     Sample Program Using IEEE-488.2-1987 Commands
' ----------------------------------------------------
'
'     THE DEFAULT IEEE-488 ADDRESS IS 4.
'     THE EOM CHARACTER FOR THE DIMENSION IS CR.
'     USE THE ESCAPE KEY TO END THE PROGRAM.
'
'     Load file QBDECL.BAS - Quick Basic initialization code
          REM $INCLUDE: 'C:QBDECL.BAS'


          IEEEAD% = 4                    ' Set the IEEE address to 4
          IEEEAD%(0) = 4
          CALL SendIFC(0)                ' Initialize GPIB Bus
          CALL DevClear(0, IEEEAD%)      ' Clears Dimension device (SDC)
          CALL EnableRemote(0, IEEEAD%())  ' Sets Dimension to remote
          CLS                            ' Clears Screen
CYCLE:
'    Print header line starting at line 3 column 1.
          LOCATE 3, 1
          PRINT " DATE       TIME    LS       SP       PV         RO     "
```


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Appendix C

Worksheets

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For Systems without Control Loops or Programmers C–5
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Dimension Model 8725 "Out of the Box" Defaults
For Systems without Control Loops or Programmers C–7
Dimension Model 8725 "Out of the Box" Defaults
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8781Remote Digital I/O Expansion Card
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Worksheets

Overview

This appendix contains worksheets and forms you may find useful in the installation and wiring of your Dimension, in configuring Dimension parameters, and in diagnostics/troubleshooting. Two copies of each worksheet are provided and they can be photocopied as necessary to retain at least one blank copy of each. The worksheets and forms included in this appendix are as follows:

Dimension Technical Support Phone/Fax Cover Sheet. Copy this form and use it when phoning or faxing for Dimension technical support.

Dimension Model 8705 "Out of the Box" Defaults for Systems *without* Control Loops or Programmers. This form documents the default settings for model 8705 configured without control loops or programmers.

Dimension Model 8705 "Out of the Box" Defaults for Systems *with* Control Loops or Programmers. This form documents the default settings for model 8705 configured with control loops or programmers.

Dimension Model 8725 "Out of the Box" Defaults for Systems *without* Control Loops or Programmers. This form documents the default settings for model 8705 configured without control loops or programmers.

Dimension Model 8725 "Out of the Box" Defaults for Systems *with* Control Loops or Programmers. This form documents the default settings for model 8705 configured with control loops or programmers.

Analog I/O Card Field Wiring Documentation Form. Copy this form and fill it in as you define the analog I/O field wiring assignments.

8781 Remote Digital I/O Expansion Card Field Wiring Documentation Form. Copy this form and fill it in as you define contact I/O types and connect field wiring to the 8781 Digital I/O Expansion Cards.

System Glossary Documentation Form. Copy this form and fill it in as you define system tag names.

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Real-Time Programmer Glossary Documentation Form. Copy this form and fill it in as you define programmer tag names.

Control Loop Glossary Documentation Form. Copy this form and fill it in as you define control loop tag names.

Analog Input/Output Glossary Documentation Form. Copy this form and fill it in as you define analog input/output tag names.

Digital Input/Output Glossary Documentation Form. Copy this form and fill it in as you define digital input/output tag names.

Analog Inputs and Outputs Documentation Form. Copy this form and fill it in as you configure analog inputs and outputs.

Digital Outputs Documentation Form. Copy this form and fill it in as you configure digital outputs.

Dimension Model 8705 Input/Output Assignments Form. Copy this form and fill it in as you make analog and digital input and output assignments.

Dimension Model 8725 Input/Output Assignments Form. Copy this form and fill it in as you make analog and digital input and output assignments.

Control and Monitor Loop Documentation Form. Copy this form and use it as you configure your control and monitor loops.

Real-Time Programmer Documentation Form. Copy this form and use it as you configure your real-time programmer.

Real-Time Program Worksheet. Copy this form and use it to plan your recipe entries.

Logic Documentation Form. Copy this form and use it as you configure your logic functions.

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Dimension Technical Support
Phone/Fax Cover Sheet
Phone (703) 471-4870
Fax (703)787-3436

Before calling or faxing:

1. Please read Appendix D, *Diagnostics & Troubleshooting*.
2. If you are getting any error messages on the display, please include the exact terminology of the error message.
3. Copy this form and complete the information below. If calling for assistance, have the Dimension available if possible.

> **Important:** The Configuration/Setup of your Dimension should be documented using the Configuration Worksheets found in Appendix C, *Worksheets*. This will help you in the event a repair or update requires the Dimension to be reset to factory default "coldstart" condition.

From: Name: _____

Company: _____

Phone: _____

Fax: _____

Number of pages, including this cover sheet: _____

System Information:

Model Numbers (from Label):

_____ _____

_____ _____

_____ _____

Serial Number (from label) _____

Firmware Version (see Appendix D, *Diagnostics & Troubleshooting*):

Analog Board 1: _____

Analog Board 2: _____

Analog Board 3: _____

Operator Interface: _____

CPU: _____

Model 8781 Digital Input/Output Expansion Cards: Yes_____No____

Problem:

Please be as descriptive as possible. Try to include block diagrams, worksheets, input/output connections, computer logged data, and any other data that would be useful in diagnosing the problem. Attach additional pages if necessary.

_____

_____

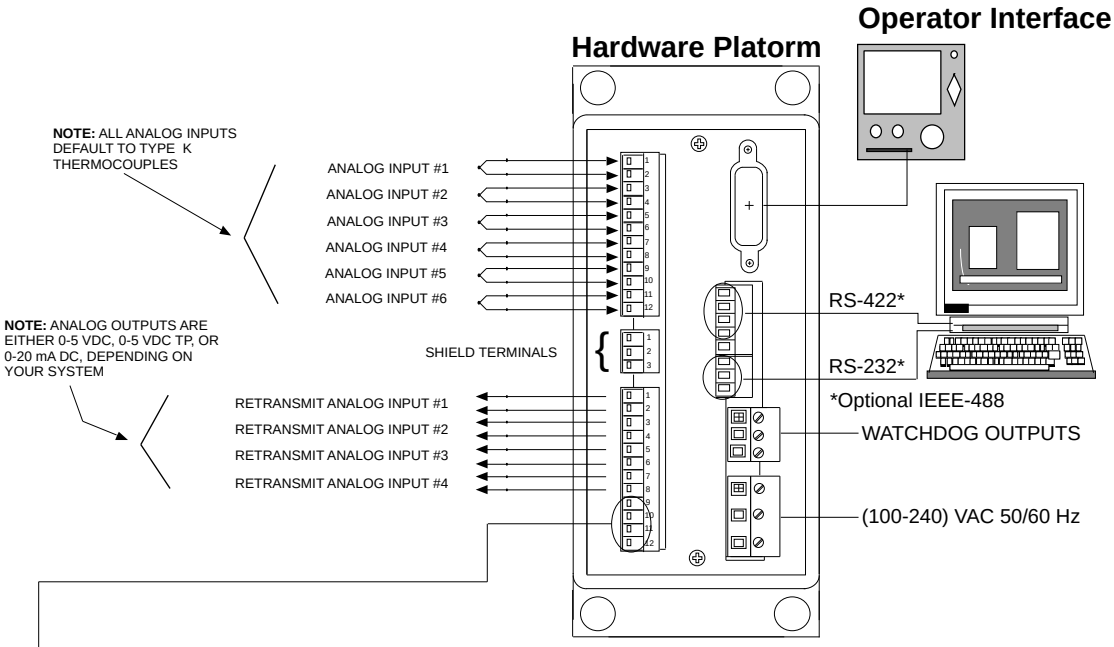
_____

_____

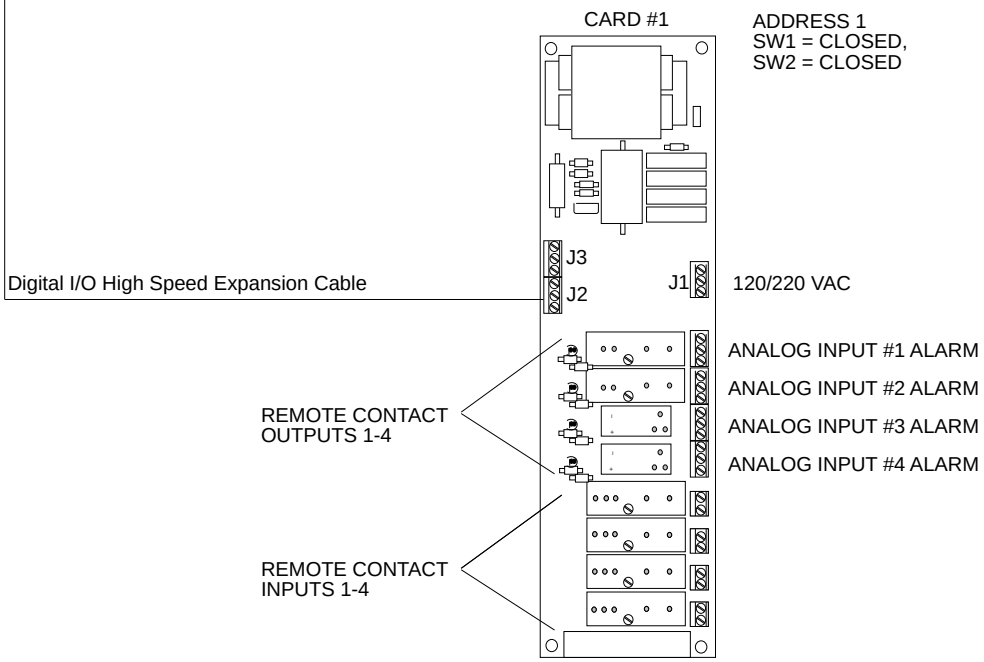
_____

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Dimension Model 8705 "Out of the Box" Defaults For Systems *without* Control Loops or Programmers



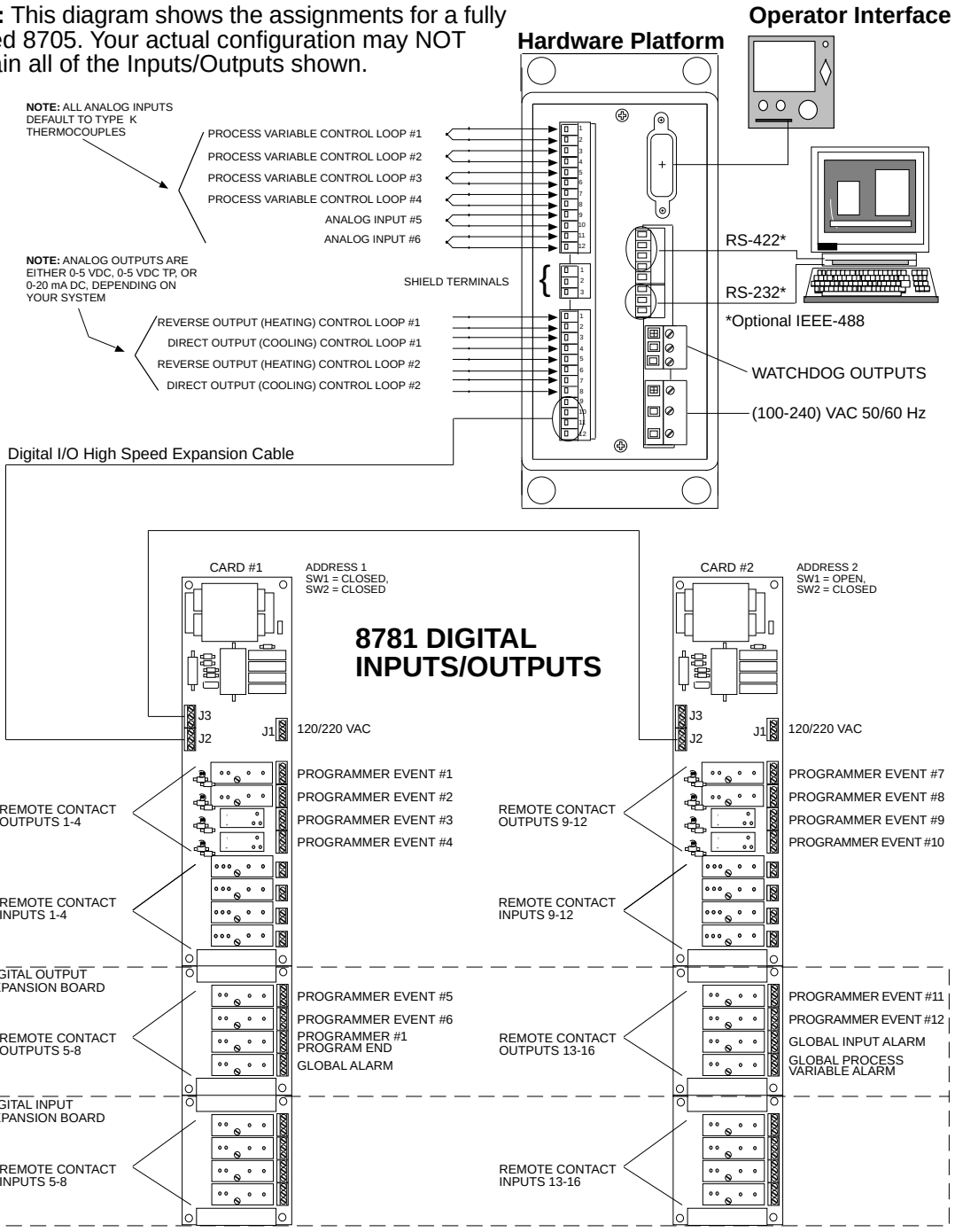
8781 DIGITAL INPUTS/OUTPUTS



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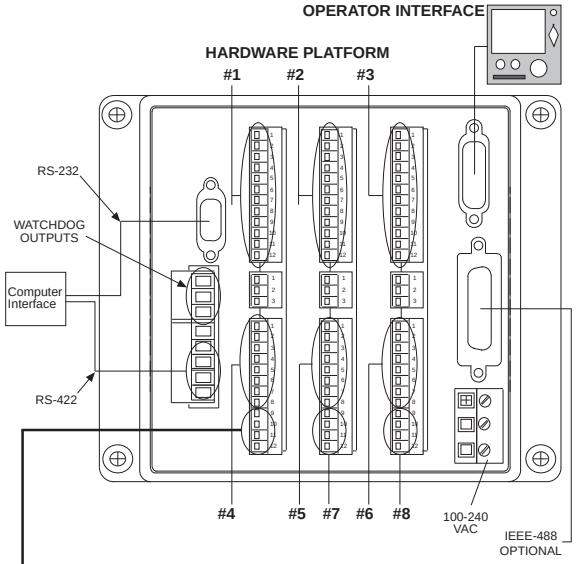
Dimension Model 8705 "Out of the Box" Defaults For Systems *with* Control Loops or Programmers

Note: This diagram shows the assignments for a fully loaded 8705. Your actual configuration may NOT contain all of the Inputs/Outputs shown.



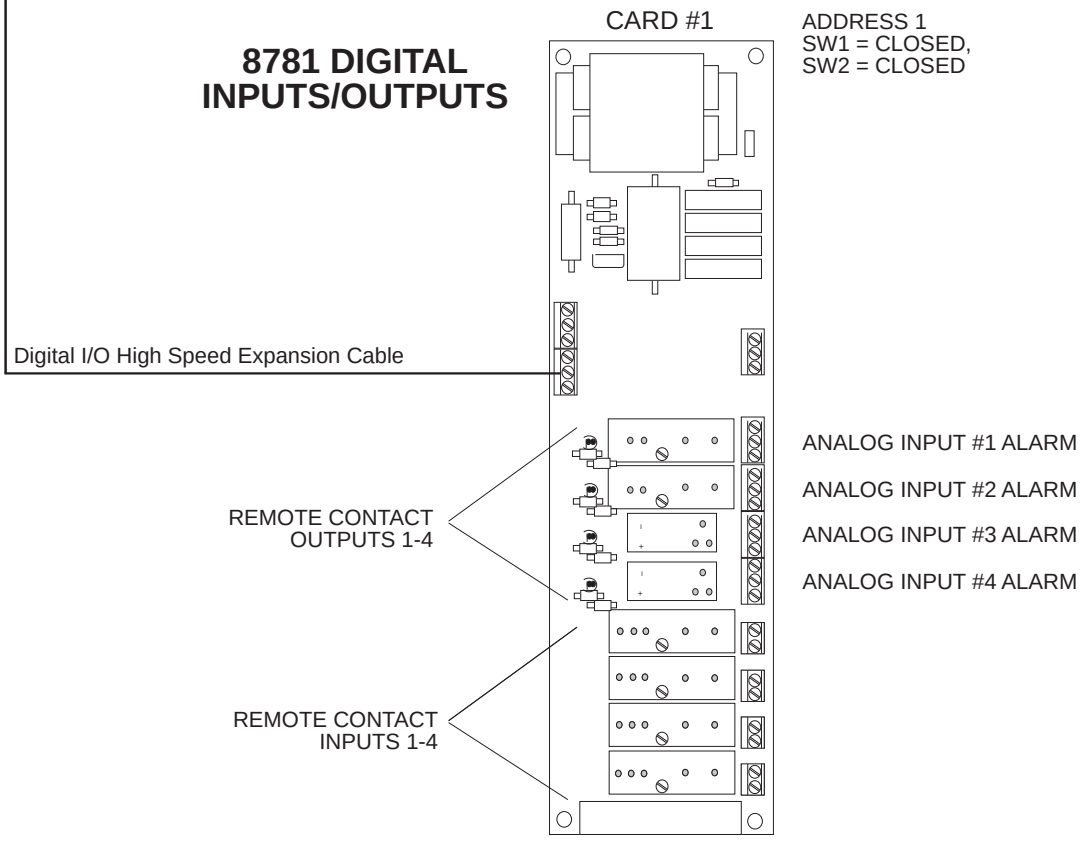
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Dimension Model 8725 "Out of the Box" Defaults For Systems *without* Control Loops or Programmers



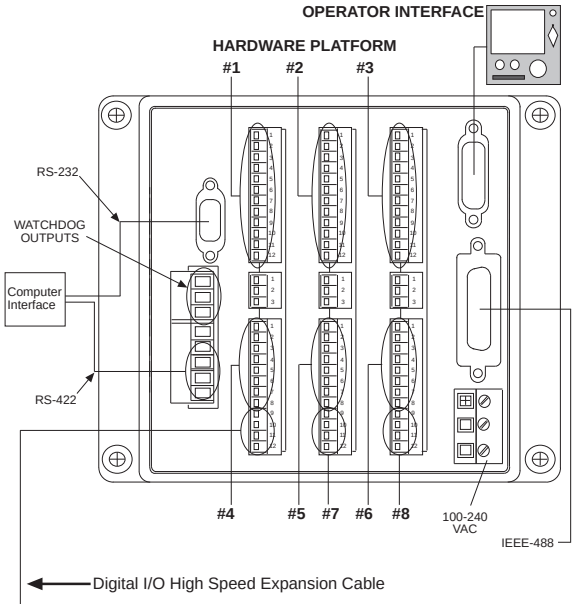
Analog Inputs		Analog Outputs	
#1.	Analog Input #1 Analog Input #2 Analog Input #3 Analog Input #4 Analog Input #5 Analog Input #6	#4.	Retransmit Analog Input #1 Retransmit Analog Input #2 Retransmit Analog Input #3 Retransmit Analog Input #4
#2.	Analog Input #7 Analog Input #8 Analog Input #9 Analog Input #10 Analog Input #11 Analog Input #12	#5.	Retransmit Analog Input #5 Retransmit Analog Input #6 Retransmit Analog Input #7 Retransmit Analog Input #8
#3	Analog Input #13 Analog Input #14 Analog Input #15 Analog Input #16 Analog Input #17 Analog Input #18	#6.	Local Contact Output (TTL) #1 Local Contact Input (TTL) #1
		#7.	Alarm Output #1 Alarm Output #2 Alarm Output #3 Alarm Output #4
		#8.	Local Contact Output (TTL) #2 Local Contact Input (TTL) #2

8781 DIGITAL INPUTS/OUTPUTS



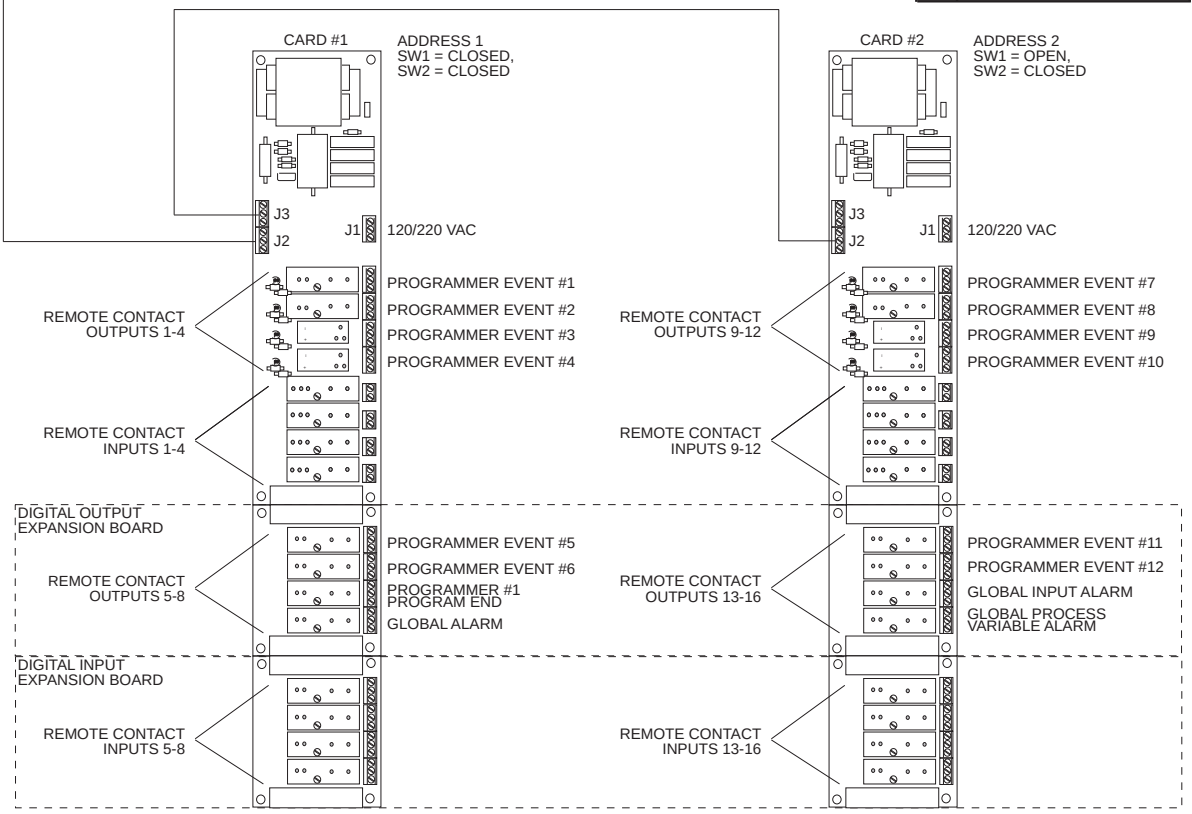
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Dimension Model 8725 "Out of the Box" Defaults For Systems *with* Control Loops or Programmers



Analog Inputs		Analog Outputs	
#1.	Process Variable Control Loop #1 Process Variable Control Loop #2 Process Variable Control Loop #3 Process Variable Control Loop #4 Process Variable Control Loop #5 Process Variable Control Loop #6	#4.	Reverse Output (Heating) Control Loop #1 Direct Output (Cooling) Control Loop #1 Reverse Output (Heating) Control Loop #2 Direct Output (Cooling) Control Loop #2
#2.	Process Variable Control Loop #7 Process Variable Control Loop #8 Analog Input #9 Analog Input #10 Analog Input #11 Analog Input #12	#5.	Reverse Output (Heating) Control Loop #3 Direct Output (Cooling) Control Loop #3 Reverse Output (Heating) Control Loop #4 Direct Output (Cooling) Control Loop #4
#3	Analog Input #13 Analog Input #14 Analog Input #15 Analog Input #16 Analog Input #17 Analog Input #18	#6.	Local Contact Output (TTL) #1 Local Contact Input (TTL) #1
		#7.	Reverse Output (Heating) Control Loop #5 Direct Output (Cooling) Control Loop #5 Reverse Output (Heating) Control Loop #6 Direct Output (Cooling) Control Loop #6
		#8.	Local Contact Output (TTL) #2 Local Contact Input (TTL) #2

8781 DIGITAL INPUTS/OUTPUTS



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Analog I/O Card Field Wiring Documentation Form

Dimension ID: _____

Analog I/O Card Installation Slot: 1, 2 or 3

Point	Tag Name	Description
Analog In 1	_____	_____
Analog In 2	_____	_____
Analog In 3	_____	_____
Analog In 4	_____	_____
Analog In 5	_____	_____
Analog In 6	_____	_____
Analog Out 1	_____	_____
Analog Out 2	_____	_____
Analog Out 3	_____	_____
Analog Out 4	_____	_____
Digital Out 1	_____	_____
Digital In 1	_____	_____

Notes:

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8781Remote Digital I/O Expansion Card Field Wiring Documentation Form

Dimension ID: _____

Digital I/O Card: 1 or 2

Point	Tag Name	Description
Relay Out 1	_____	_____
Relay Out 2	_____	_____
Relay Out 3	_____	_____
Relay Out 4	_____	_____
Expansion Relay Out 5	_____	_____
Expansion Relay Out 6	_____	_____
Expansion Relay Out 7	_____	_____
Expansion Relay Out 8	_____	_____
Contact In 1	_____	_____
Contact In 2	_____	_____
Contact In 3	_____	_____
Contact In 4	_____	_____
Expansion Contact In 5	_____	_____
Expansion Contact In 6	_____	_____
Expansion Contact In 7	_____	_____
Expansion Contact In 8	_____	_____

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System Glossary Documentation Form

Dimension ID: _____

Default	User	Default	User
UNIT	_____	LOOP _ _ _1	_____
UNIT_CNF	_____	LOOP _ _ _2	_____
OVIEW _ _1	_____	LOOP _ _ _3	_____
OVIEW _ _2	_____	LOOP _ _ _4	_____
OVIEW _ _3	_____	LOOP _ _ _5	_____
OVIEW _ _4	_____	LOOP _ _ _6	_____
OVIEW _ _5	_____	LOOP _ _ _7	_____
OVIEW _ _6	_____	LOOP _ _ _8	_____
OVIEW _ _7	_____		
OVIEW _ _8	_____	LOGIC _ _ 1	_____
OVIEW _ _9	_____	LOGIC _ _ 2	_____
OVIEW _ _10	_____	LOGIC _ _ 3	_____
OVIEW _ _11	_____	LOGIC _ _ 4	_____
OVIEW _ _12	_____	LOGIC _ _ 5	_____
OVIEW _ _13	_____		
OVIEW _ _14	_____	LOOP _ ALM	_____
OVIEW _ _15	_____	INP_ALM1	_____
OVIEW _ _16	_____	INP_ALM2	_____
		ALM_SET	_____
PROGRUN 1	_____		
PROGRUN 2	_____		
PROGRUN 3	_____		
PROGRUN 4	_____		
PROGRUN 5	_____		
PROGRUN 6	_____		
PROGRUN 7	_____		
PROGRUN 8	_____		

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Real-Time Programmer Glossary Documentation Form

Dimension ID: _____

Default	User	Default	User	Default	User
PROGRUN1	_____	PgMode01	_____	Pg1Spt01	_____
T_Seg01	_____	T_Into01	_____	T_Left01	_____
CurSeg01	_____	CycCnt01	_____	Alm_Grp1	_____
PID_Grp1	_____	RemSeg01	_____	RemSeg01	_____
PROGRUN2	_____	PgMode02	_____	Pg2Spt02	_____
T_Seg02	_____	T_Into02	_____	T_Left02	_____
CurSeg02	_____	CycCnt02	_____	Alm_Grp2	_____
PID_Grp2	_____	RemSeg02	_____	RemSeg02	_____
PROGRUN3	_____	PgMode03	_____	Pg3Spt03	_____
T_Seg03	_____	T_Into03	_____	T_Left03	_____
CurSeg03	_____	CycCnt03	_____	Alm_Grp3	_____
PID_Grp3	_____	RemSeg03	_____	RemSeg03	_____
PROGRUN4	_____	PgMode04	_____	Pg4Spt04	_____
T_Seg04	_____	T_Into04	_____	T_Left04	_____
CurSeg04	_____	CycCnt04	_____	Alm_Grp4	_____
PID_Grp4	_____	RemSeg04	_____	RemSeg04	_____
PROGRUN5	_____	PgMode05	_____	Pg5Spt05	_____
T_Seg05	_____	T_Into05	_____	T_Left05	_____
CurSeg05	_____	CycCnt05	_____	Alm_Grp5	_____
PID_Grp5	_____	RemSeg05	_____	RemSeg05	_____
PROGRUN6	_____	PgMode06	_____	Pg6Spt06	_____
T_Seg06	_____	T_Into06	_____	T_Left06	_____
CurSeg06	_____	CycCnt06	_____	Alm_Grp6	_____
PID_Grp16	_____	RemSeg06	_____	RemSeg06	_____
PROGRUN7	_____	PgMode07	_____	Pg7Spt07	_____
T_Seg07	_____	T_Into07	_____	T_Left07	_____
CurSeg07	_____	CycCnt07	_____	Alm_Grp7	_____
PID_Grp7	_____	RemSeg07	_____	RemSeg07	_____
PROGRUN8	_____	PgMode08	_____	Pg8Spt08	_____
T_Seg08	_____	T_Into08	_____	T_Left08	_____
CurSeg08	_____	CycCnt08	_____	Alm_Grp8	_____
PID_Grp8	_____	RemSeg08	_____	RemSeg08	_____

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Control Loop Glossary Documentation Form

Dimension ID: _____

Default	User	Default	User	Default	User
LOOP___1	_____	ProcVr01	_____	SetPnt01	_____
RevOut_1	_____	DirOut_1	_____	OutPut_1	_____
LpMode01	_____				
LOOP___2	_____	ProcVr02	_____	SetPnt02	_____
RevOut_2	_____	DirOut_2	_____	OutPut_2	_____
LpMode02	_____				
LOOP___3	_____	ProcVr03	_____	SetPnt03	_____
RevOut_3	_____	DirOut_3	_____	OutPut_3	_____
LpMode03	_____				
LOOP___4	_____	ProcVr04	_____	SetPnt04	_____
RevOut_4	_____	DirOut_4	_____	OutPut_4	_____
LpMode04	_____				
LOOP___5	_____	ProcVr05	_____	SetPnt05	_____
RevOut_5	_____	DirOut_5	_____	OutPut_5	_____
LpMode05	_____				

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Control Loop Glossary Documentation Form (continued)

LOOP___6	_____	ProcVr06	_____	SetPnt06	_____
RevOut_6	_____	DirOut_6	_____	OutPut_6	_____
LpMode06	_____				

LOOP___7	_____	ProcVr07	_____	SetPnt07	_____
RevOut_7	_____	DirOut_7	_____	OutPut_7	_____
LpMode07	_____				

LOOP___8	_____	ProcVr08	_____	SetPnt08	_____
RevOut_8	_____	DirOut_8	_____	OutPut_8	_____
LpMode08	_____				

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Analog Input/Output Glossary Documentation Form

Dimension ID: _____

Default	User	Default	User	Default	User
Analog I/O Card #1					
AnlgIn_1	_____	AnlgIn_2	_____	AnlgIn_3	_____
AnlgIn_4	_____	AnlgIn_5	_____	AnlgIn_6	_____
AN_OUT_1	_____	AN_OUT_2	_____	AN_OUT_3	_____
AN_OUT_4	_____				
Analog I/O Card #2					
AnlgIn_7	_____	AnlgIn_8	_____	AnlgIn_9	_____
AnlgIn_10	_____	AnlgIn_11	_____	AnlgIn_12	_____
AN_OUT_5	_____	AN_OUT_6	_____	AN_OUT_7	_____
AN_OUT_8	_____				
Analog I/O Card #3					
AnlgIn_13	_____	AnlgIn_14	_____	AnlgIn_15	_____
AnlgIn_16	_____	AnlgIn_17	_____	AnlgIn_18	_____
AN_OUT_9	_____	AN_OUT_10	_____	AN_OUT_11	_____
AN_OUT_12	_____				

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Digital Input/Output Glossary Documentation Form

Dimension ID: _____

Default	User	Default	User	Default	User	Default	User
8781 Digital I/O Card #1							
RmCOut01	_____	RmCOut02	_____	RmCOut03	_____	RmCOut04	_____
RmCOut05	_____	RmCOut06	_____	RmCOut07	_____	RmCOut08	_____
RmtIN_01	_____	RmtIN_02	_____	RmtIN_03	_____	RmtIN_04	_____
RmtIN_05	_____	RmtIN_06	_____	RmtIN_07	_____	RmtIN_08	_____
8781 Digital I/O Card #2							
RmCOut09	_____	RmCOut10	_____	RmCOut11	_____	RmCOut12	_____
RmCOut13	_____	RmCOut14	_____	RmCOut15	_____	RmCOut16	_____
RmtIN_09_	_____	RmtIN_10	_____	RmtIN_11	_____	RmtIN_12	_____
RmtIN_13_	_____	RmtIN_14	_____	RmtIN_15	_____	RmtIN_16	_____

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Analog Inputs and Outputs Documentation Form

Dimension ID: _____

Analog I/O Card #1

AnlgIn1: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter:	_____
AnlgIn2: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter:	_____
AnlgIn3: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter:	_____
AnlgIn4: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter:	_____
AnlgIn5: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter:	_____
AnlgIn6: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter:	_____

	Source	Cycle Time	Span	Zero
Analog Output 1:	_____	_____ sec.	_____	_____
Analog Output 2:	_____	_____ sec.	_____	_____
Analog Output 2:	_____	_____ sec.	_____	_____
Analog Output 2:	_____	_____ sec.	_____	_____

Analog I/O Card #2

AnlgIn7: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter:	_____
AnlgIn8: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter:	_____
AnlgIn9: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter:	_____
AnlgIn10: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter:	_____
AnlgIn11: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter:	_____
AnlgIn12: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter:	_____

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Analog Inputs and Outputs Documentation Form (continued)

	Source	Cycle Time	Span	Zero
Analog Output 1:	_____	_____ sec.	_____	_____
Analog Output 2:	_____	_____ sec.	_____	_____
Analog Output 2:	_____	_____ sec.	_____	_____
Analog Output 2:	_____	_____ sec.	_____	_____

Analog I/O Card #3

AnlgIn13: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter: _____
AnlgIn14: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter: _____
AnlgIn15: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter: _____
AnlgIn16: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter: _____
AnlgIn17: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter: _____
AnlgIn18: Type:	_____	Range:	_____	to	_____	C/F or	_____	Filter: _____

	Source	Cycle Time	Span	Zero
Analog Output 1:	_____	_____ sec.	_____	_____
Analog Output 2:	_____	_____ sec.	_____	_____
Analog Output 2:	_____	_____ sec.	_____	_____
Analog Output 2:	_____	_____ sec.	_____	_____

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Digital Outputs Documentation Form

Dimension ID: _____

8781 Remote Digital I/O Card #1

	Source	Cycle Time	
Rmt Cont Out 1:	_____	_____	sec.
Rmt Cont Out 2:	_____	_____	sec.
Rmt Cont Out 3:	_____	_____	sec.
Rmt Cont Out 4:	_____	_____	sec.
Rmt Cont Out 5:	_____	_____	sec.
Rmt Cont Out 6:	_____	_____	sec.
Rmt Cont Out 7:	_____	_____	sec.
Rmt Cont Out 8:	_____	_____	sec.

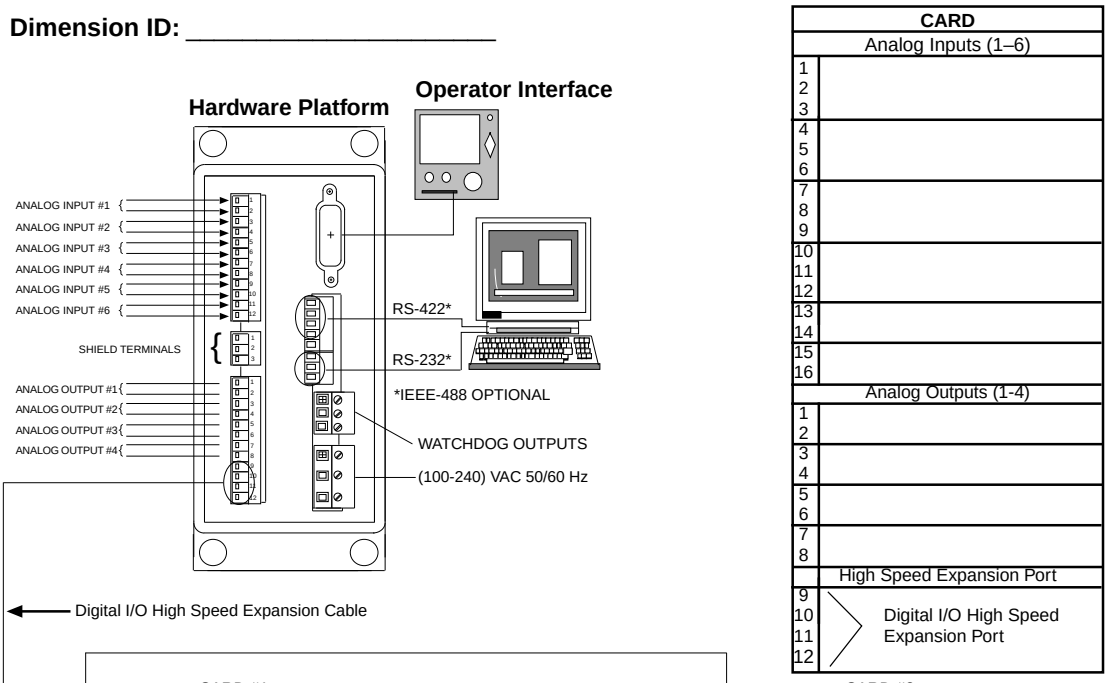
8781 Remote Digital I/O Card #2

	Source	Cycle Time	
Rmt Cont Out 1:	_____	_____	sec.
Rmt Cont Out 2:	_____	_____	sec.
Rmt Cont Out 3:	_____	_____	sec.
Rmt Cont Out 4:	_____	_____	sec.
Rmt Cont Out 5:	_____	_____	sec.
Rmt Cont Out 6:	_____	_____	sec.
Rmt Cont Out 7:	_____	_____	sec.
Rmt Cont Out 8:	_____	_____	sec.

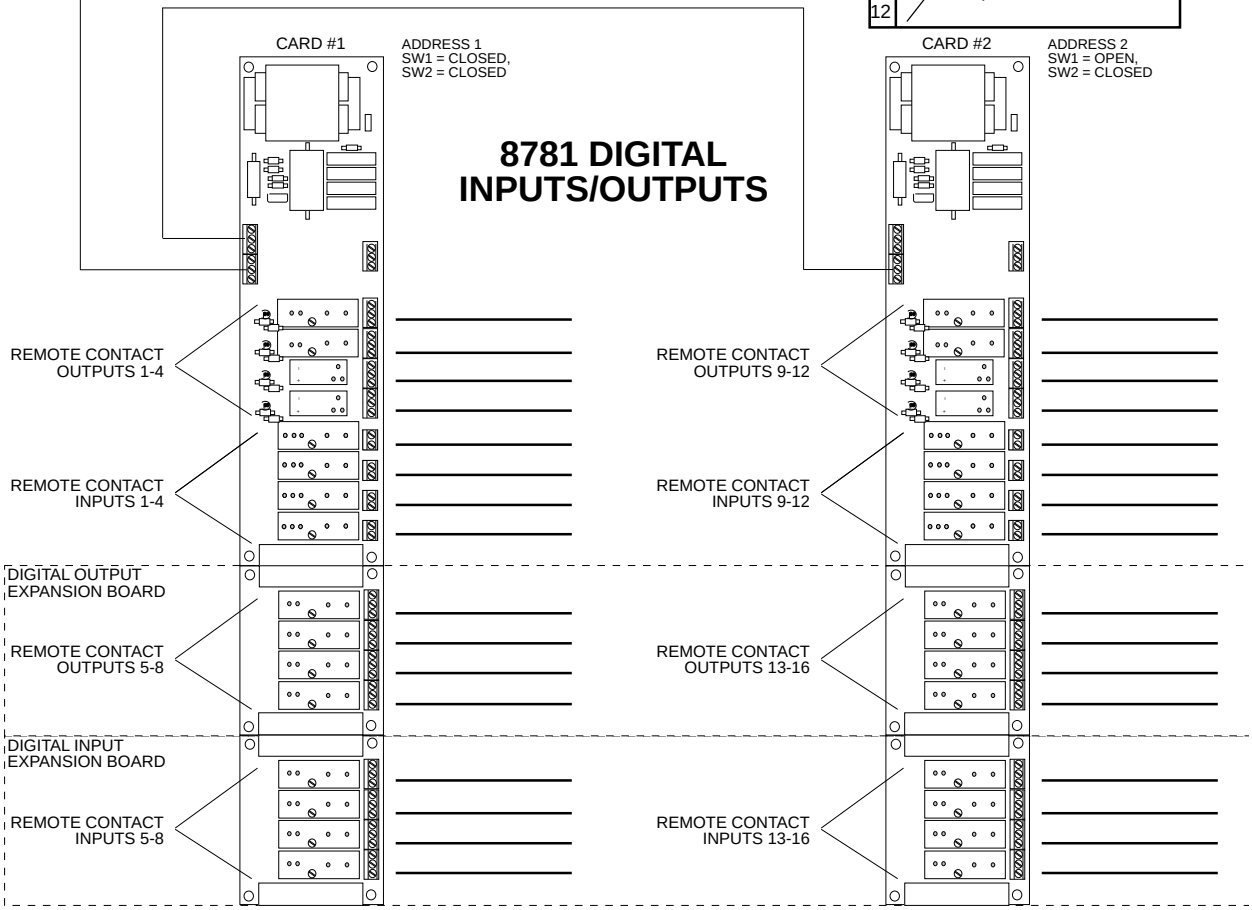
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Dimension Model 8705 Input/Output Assignments Form

Dimension ID: _____



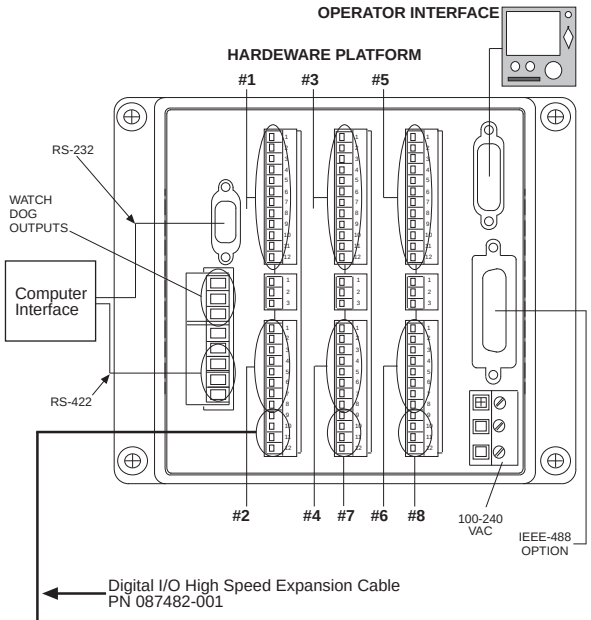
CARD	
Analog Inputs (1–6)	
1 2 3	
4 5 6	
7 8 9	
10 11 12	
13 14	
15 16	
Analog Outputs (1-4)	
1 2	
3 4	
5 6	
7 8	
High Speed Expansion Port	
9 10 11 12	Digital I/O High Speed Expansion Port



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Dimension Model 8725 Input/Output Assignments Form

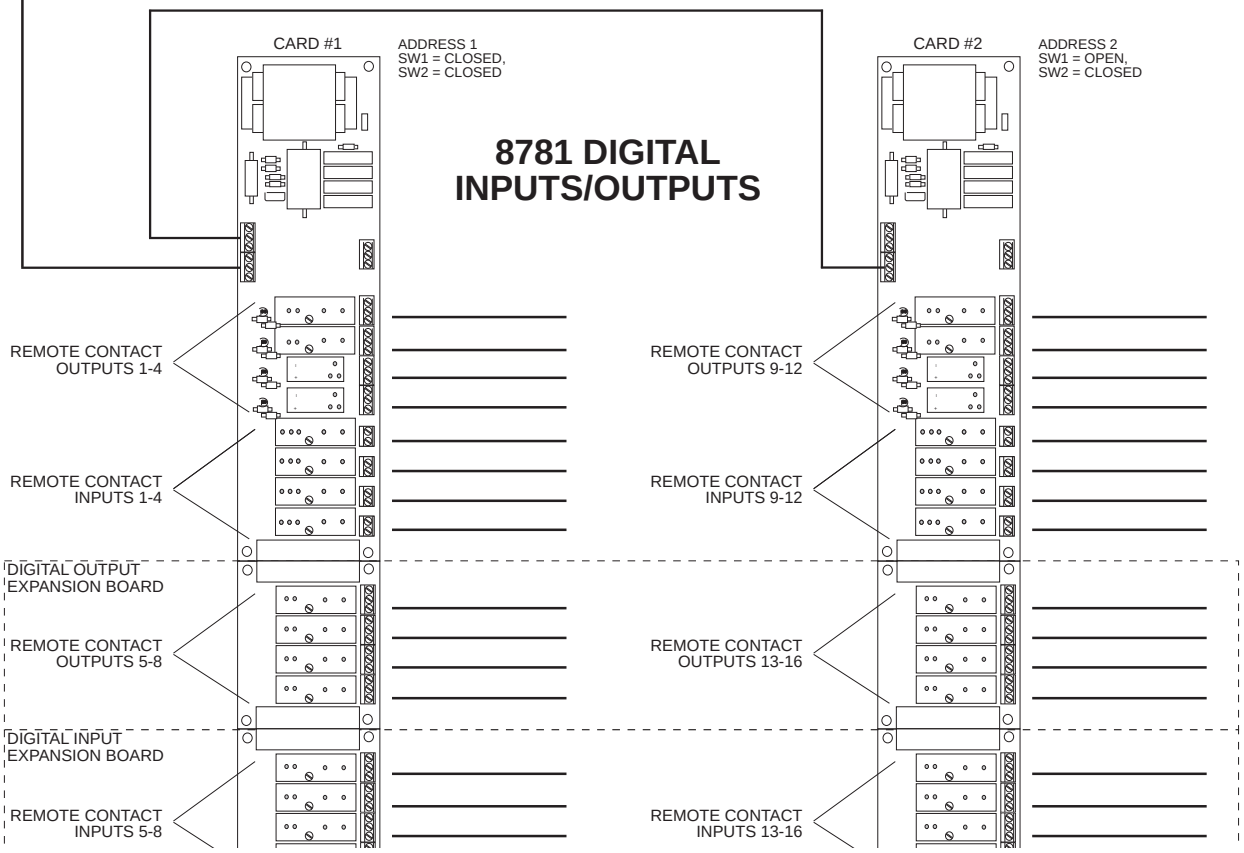
Dimension ID: _____



CARD #1	
Analog Inputs (1–6) #1	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
Analog Outputs (1-4) #2	
1	
2	
3	
4	
5	
6	
7	
8	
High Speed Expansion Port	
9	
10	Digital I/O High Speed Expansion Port
11	
12	

CARD #2	
Analog Inputs (7–12) #3	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
Analog Outputs (5-8) #4	
1	
2	
3	
4	
5	
6	
7	
8	
Local Digital I/O #7	
9	(Out)
10	+5VDC
11	(In)
12	Common

CARD #3	
Analog Inputs (13–18) #5	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
Analog Outputs (9-12) #6	
1	
2	
3	
4	
5	
6	
7	
8	
Local Digital I/O #8	
9	(Out)
10	+5VDC
11	(In)
12	Common



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Control and Monitor Loop Documentation Form

Dimension ID: _____

Control Loop # _____

PVSource Analog Input #____ Calc RH

AnlgIn#_____ **Type**_____ **Range**_____ **to** _____ **Units**_____ **Filter**_____

AnlgIn#_____ **Type**_____ **Range**_____ **to** _____ **Units**_____ **Filter**_____

AnlgIn#_____ **Type**_____ **Range**_____ **to** _____ **Units**_____ **Filter**_____

AnlgIn#_____ **Type**_____ **Range**_____ **to** _____ **Units**_____ **Filter**_____

Input Alarm Limits

Input#	**High**	**Low**	**Input#**	**High**	**Low**
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Control Action Reverse Direct Bimodal

Reverse Output High Limit_____ **Direct Output High Limit**_____

Reverse Output Low Limit_____ **Direct Output Low Limit**_____

Deadband_____

Control Output Analog Out#_____ Remote COut#_____ LocCOut#_____

PID Type Single Dual Programmed Select Adaptive

Setpoint Source Programmer#_____ Analog In#_____ Setpoint Loop#_____
Output Loop#_____ (Ratio_____ Blend_____ Scale_____)

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Control and Monitor Loop Documentation Form (continued)

Auto/Manual Operator#_____ OR/NOR Set#_____ AND/NAND Set#____
RemCI#_____ LocCI#_____

Manual Output Source Operator Analog Input#_____
Output Loop#_____ (Ratio_____ Blend_____ Scale_____)

Open Sensor Default Output Value_____%

Loop Alarm Limits (G#-Group Number, H-Hysteresis Value, L-Latch/Unlatch Status)

G#	HiHiPV	LoLoPv	HiPV	LoPV	HiHiDV	LoLoDV	HiDV	LoDV
1	_____	_____	_____	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____	_____	_____	_____
4	_____	_____	_____	_____	_____	_____	_____	_____
5	_____	_____	_____	_____	_____	_____	_____	_____
H	_____		_____		_____		_____	
L	_____		_____		_____		_____	

Loop PID Parameters (G#-Group Number)

G#	**Gain**	**Reset**	**Rate**
1	_____	_____	_____
2	_____	_____	_____
3	_____	_____	_____
4	_____	_____	_____
5	_____	_____	_____

Output_Off Alarms

1st _____
2nd _____
3rd _____
4th _____

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Real-Time Programmer Documentation Form

Dimension ID: _____

Real-time Programmer# _____

Operator Start: OPStrt_____ or _____

Remote Start: RmStrt_____ or _____

Remote Start Segment Number: _____

Fast Forward Enable Source: OperFF_____ or _____

Fast Forward Warp Factor: _____

Programmer Status Source: OperRH_____ or _____

Programmer Abort Source: OprAbrt_____ or _____

Guaranteed Soak: Disable_____ or Enable_____

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Real-Time Program Worksheet

Program # Recipe 1-15											
Start Segment											
Segment # 0-749											
Profile/Setpoint	1										
	2										
	3										
	4										
	5										
	6										
	7										
	8										
Segment Time 00:00:00 to 99:59:59											
Events On											
	1										
	2										
	3										
	4										
	5										
	6										
	7										
	8										
	9										
	A										
	B										
	C										
(0-255) Recycles											
Next Segment											
Alarm Group (1-5)											
PID Group (1-5)											

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Logic Documentation Form

Dimension ID: _____

	First Alarm	Second Alarm	Third Alarm	Fourth Alarm
Output Assign Sets				
OUTset01	_____	_____	_____	_____
OUTset02	_____	_____	_____	_____
OUTset03	_____	_____	_____	_____
OUTset04	_____	_____	_____	_____
Logic 'OR/NOR' Sets				
OR_set01	_____	_____	_____	_____
OR_set02	_____	_____	_____	_____
OR_set03	_____	_____	_____	_____
OR_set04	_____	_____	_____	_____
Logic 'AND/NAND' Sets				
ANDset01	_____	_____	_____	_____
ANDset02	_____	_____	_____	_____
ANDset03	_____	_____	_____	_____
ANDset04	_____	_____	_____	_____

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Appendix D

Diagnostics and Troubleshooting

Diagnostic Testing **D–2**
Help Messages **D–3**
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Troubleshooting General Functions **D–7**
Troubleshooting Digital I/O **D–8**
Troubleshooting Analog to SSR Output **D–9**
Troubleshooting Process Control and Monitor Loops **D–10**
Troubleshooting Real-Time Programmer **D–13**
Troubleshooting/Verifying Alarm Configuration **D–14**
Input and PV Limit Alarms D–14
Loop Deviation Alarms D–15
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Diagnostics and Troubleshooting

This section explains how to diagnose and correct Dimension operation and communication problems. Descriptions of self-diagnostics, built-in help functions, error/advise messages, and a troubleshooting checklist are included.

CAUTION!

Dimension maintenance and repair philosophy is based on unit replacement. Do not attempt to perform troubleshooting or repair procedures that are not described in this section.

If you need assistance from Dimension technical support personnel, call:

Dimension Technical Support
Eurotherm Controls Inc, Reston, Virginia
Phone 703-471-4870/Fax 703-787-3436

See Appendix C, *Worksheets*, for a Dimension Technical Support Phone/Fax Cover Sheet.

Diagnostic Testing

As shown in Fig. D-1, the Unit Configuration display provides access to a Dimension self-diagnostics function. The **DIAGNOST** field opens a series of windows used to display the current software version number and run diagnostic performance tests on both analop I/O and operator interface components.



Figure D-1. Unit Configuration Display

Run Dimension self-diagnostics as follows:

1. From the Unit display in the operation group, use the knob to scroll to the **Configur_Select** parameter and press **ENTER**.
2. Turn the knob CW until the cursor moves to the **DIAGNOST** field (Fig. D-1).

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3. Press **ENTER**. The system will display the Diagnostics window shown in Fig. D-2. This window provides access to analop I/O and graphic operator interface diagnostic test functions.



Figure D-2. Dimension Diagnostic Window

4. To initiate analop I/O diagnostics, move the cursor to the `CC_Diag_Run` field and press **ENTER**.
5. The system will check the status and version number of CPU (8725), and Analog I/O cards installed in the analop I/O, and then will display the status window shown in Fig. D-3. Press **ENTER** to close the window.



Figure D-3. Hardware Platform Test Status Window

6. To initiate graphic operator interface diagnostics, move the cursor to the `OI_Diag_Run` field and press **ENTER**.

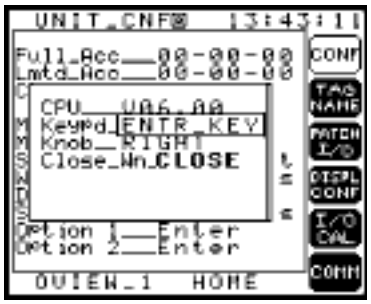


Figure D-4. Graphic Operator Interface Test Status Window

7. The system will display the version number of the operator interface board. Use the `Keypd` and `Knob` fields (Fig. D-4) to check diamond key and knob directional functions. Move the cursor to the `CLOSE` field and press **ENTER** to close the window.
8. To display the time and date of the last occurrence of Dimension power down and power up, move the cursor to `Time-Diag_Run` and press **ENTER**. Press **ENTER** to close the window.

Help Messages

On some Dimension operator interface display screens, "help" messages are displayed that will tell you how to proceed or how to correct an error. Also, pop-up help windows can be called up at most screens and fields by pressing the **Help** key (?). When a help window is displayed, press the **Help** key a second time, or the knob, to make the window disappear.

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Input Fluctuation Conditions

The Dimension user may find the analog inputs connected to the Dimension to be unstable, or jump around with some applications. This section should guide the user to correct this type of problem.

The Dimension uses multiplexed inputs. This means the analog inputs on the same Dimension analog input card are not electrically isolated from one another. A voltage between the inputs greater than the specifications allow will cause fluctuation, or inaccurate process variable readings.

Another cause of input fluctuation problems is due to common mode voltages exceeding specifications. Common mode voltages are measured from the Dimension input to frame ground. Sometimes it is difficult to measure this voltage accurately due to the impedance of the measuring device, and characteristics of the induced electrical voltages. These voltages can be caused by electromechanical interference (EMI), radio frequency interference (RFI), or resistive coupling from an electrical heater (or source) to the Dimension input. For example, a Dimension input may pick up common mode voltages from an electrical heater through a ceramic thermocouple, as the resistance of hot ceramic is not infinite.

Solutions to Fluctuation Problems:

1. It is important that the Dimension Frame ground connection on the power input is used.
2. Jumper the plus and minus connections of unused Dimension inputs. This is particularly important with unused inputs configured as "thermocouple with burnout".
3. When using thermocouple inputs that are electrically floating (for example a ceramic sheathed thermocouple), ground the negative lead of each thermocouple to frame ground. This will eliminate the common mode voltages.
4. Wire 4–20 mA transmitters that are powered by an external supply as follows: Power supply positive to the transmitter positive, transmitter negative to Dimension analog input positive, and Dimension negative to the power supply negative.
5. Determine if fluctuation problems are being caused by adjacent channel voltage differences. The easiest way to test for this is to remove one input from the Dimension and jumper the terminals on the Dimension where the input was connected. Then note if the fluctuation is eliminated. Repeat this test using the other input. If the fluctuation is eliminated in both cases, the problems are input to input related. The user should determine if the inputs can be made "common" to one another. Otherwise they require isolation.

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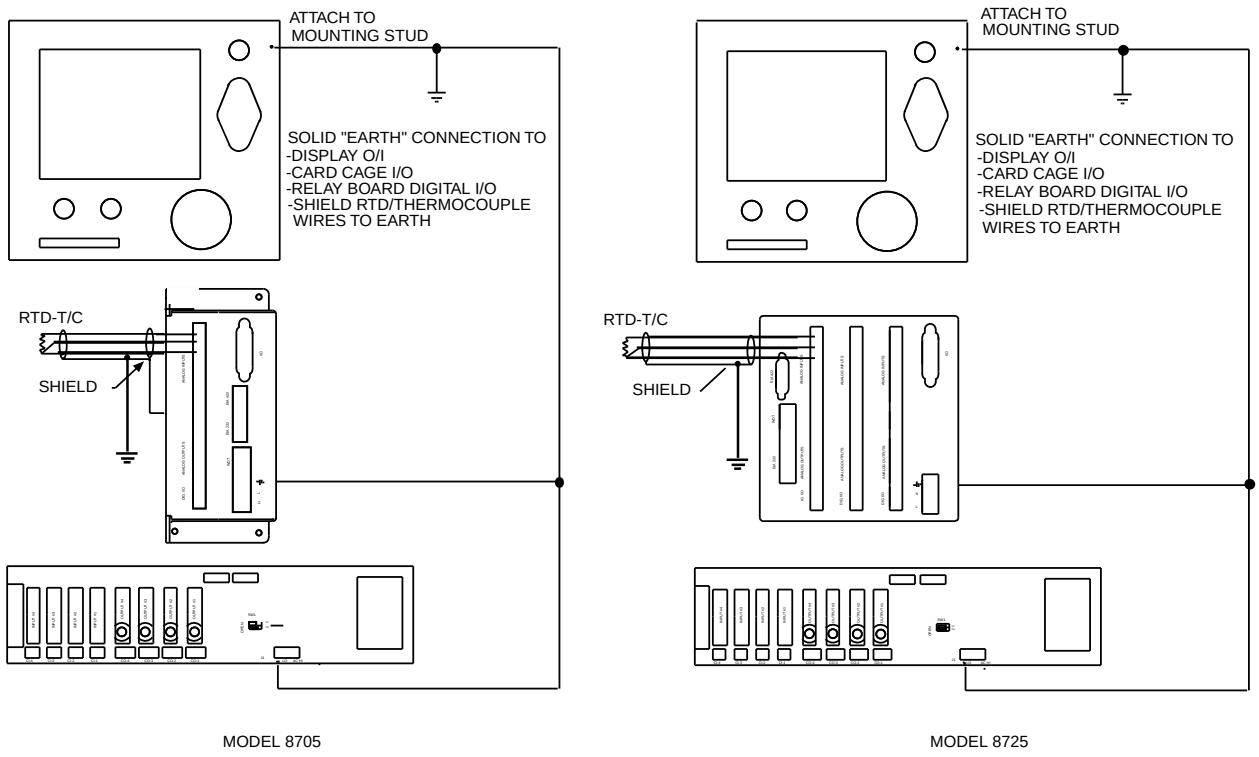
6. On units with the older version 6 analog cards, an A.C. line filter should be installed on the power source. A Corcom model 3VW1 has been used successfully

Proper Earth Grounding

If the controller occasionally resets and/or locks up (does not respond to operator input) check the following:

- Ensure Operator Interface cable is tightly connected
- Ensure all power wiring is tightly connected
- Install or verify the instrument is properly grounded per the diagram in Fig. D-5. Remove any paint or debris inhibiting a good connection.

Figure D-5.
Dimension Recommended Installation–Earth Grounding Procedures.



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Transient Noise Conditions

If transient noise exists, the digital I/O electronics will be affected. The noticeable conditions will be:

- Operator interface lock up (no response to commands)
- Dimension locks up or does not respond to the actual process variable
- Process variable jumps
- Dimension "cold starts" or resets itself

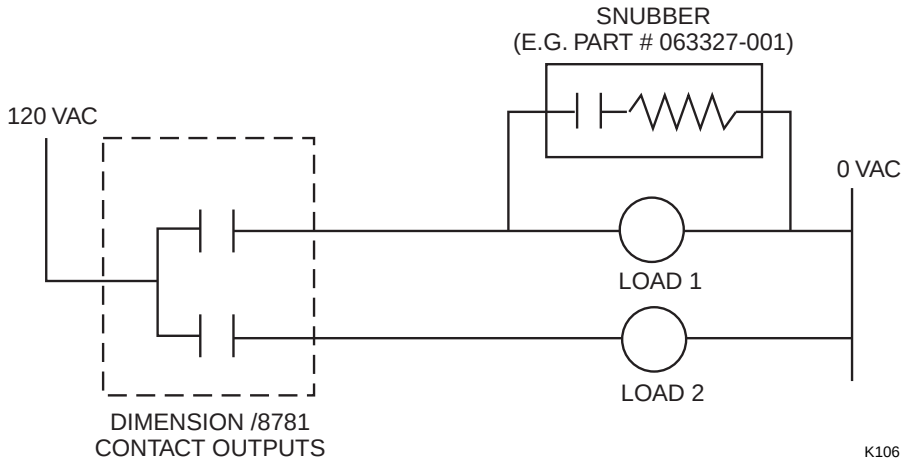
These conditions can be caused by inductive loads (see note below) which generate switching transients. Ensure the proper wiring and install snubbers across the load.

CAUTION!

Route all input and analog output signal wiring in a separate bundle from Digital I/O and AC power wiring.

! **Important:** In applications where inductive loads (e.g. solenoids, contactors, large relays) are used, large switching transients may be generated. To eliminate possible misoperation or damage of contact outputs from large switching transient, we recommend the installation of transient suppressors or snubbers, (e.g. RI part number 063327-001) across the load, as illustrated in Fig. D-6. Suppressing the transient at the load is more effective than suppressing the transient at the controller.

Figure D-6.
Sample Digital Output Wiring Diagram



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Troubleshooting General Functions

If you encounter Dimension operation or communication problems, we recommend that you first check your system against the troubleshooting checklists in this section. If problems still exist, contact Dimension Technical Support. See Appendix C, *Worksheets*, for a Dimension Technical Support Phone/Fax Cover Sheet.

Symptom	Action
No display	Check AC power source and cable connection. Check operator interface-to-hardware platform cable connection. Check for low line condition. Cold start or send the unit to factory as the contrast/brightness could have been set to 0.
RAM verify error message	Battery low or dead. Defective RAM memory chip.
EPROM verify error message	Noise may have corrupted memory. Defective EPROM memory chip.
Switches/jumpers error message	I/O board may have improper address settings.
On startup, indicates missing I/O board	I/O board may not be plugged in. I/O board may have improper address settings.
No process variables appear on display	Incorrect range numbers. I/O board not found. Faulty I/O connections.
Analog outputs are off	Check for open sensor alarm condition.
Entered value not accepted	Out of range.
System locks up when relay/event turns on	Noise interference.
Communications do not work.	Incorrect setting (RS-232/RS-422). Faulty connection.

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Troubleshooting Digital I/O

Symptom	Action
Digital I/O not functional	Check I/O card communication address. Check Communication Link wiring. Check 120V/240V AC supply and ensure jumper is set for correct supply. Check fuse F1 (two each spare fuses are located at the lower right corner of the I/O card). Check the +5VDC supply voltage. Use a Digital voltmeter and measure across capacitor C5.
Load connected to Digital Output Relay is not energized when required.	Check that Output Relay LED is lighted. If LED is on: Check Output Relay fuse. Check Load voltage source and load wiring. Check Output Relay. If LED is not on: Verify that the host Dimension is addressing the correct Output Relay. Check Output Relay.
Digital Input Module not functional	Verify that the host Dimension is addressing the correct Input Module. Check the input, verify that input voltage is present at Input terminals. Check the Input Module.

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Troubleshooting Analog to SSR Output

Symptom	Action
Load connected to SSR Output (Model 8782) is not energized when required.	Check that Output relay LED is lighted. *If LED is on* Check Output relay fuse. Check Load voltage source and load wiring. Check Output relay. *If LED is not on* Verify that the Host Dimension is addressing the correct Output relay Check Output relay.

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Troubleshooting Process Control and Monitor Loops

Symptom	Action
Process Variable Unreasonable.	Verify that the correct PV Source is selected. Refer to "Configuration" on page 4-7. If a thermocouple is selected for an input type, verify that Cold-Junction is ENABLED. Refer to "Analog Input Setup" on page 4-21. Verify that PV Bias is set to zero. Refer to "Analog Input Setup" on page 4-21. Check input calibration. Refer to "Analog Input Setup" on page 4-21. Verify that input type is configured and the ranges are set correctly. Refer to "Configuration," page 4-7, and "Analog Input Setup" on page 4-21. Verify that the input is wired properly. Refer to "Analog I/O Module Field Wiring" on page 2-13 of Section 2, *Hardware Installation and Field Wiring*. Verify that the input sensor functions properly using a Volt/Ohm/Milliamp meter. Simulate an input to the Dimension using a voltage or current source.
An Operator setpoint cannot be entered.	Verify that the Setpoint source is set to Operator. Refer to "Operation" on page 4-29. Verify that the Input High or Low Limit is not being exceeded. Refer to "Analog Input Setup" on page 4-21.
Programmer/Remote setpoint is not being accepted.	If using cascade control, verify that the Ratio, Blend, and Scaled settings are set properly. Refer to "Configuration" on page 4-7. Verify that the Setpoint source is set to Programmer or Remote and not to Operator. Refer to "Operation" on page 4-29. Verify that the proper Remote setpoint source is assigned to the loop. Refer to "Configuration" on page 4-7. Verify that the selected programmer is active and has a valid profile (setpoint) value. Refer to Section 5, *Real-Time Programmer*.

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Symptom	Action
Not able to set a Manual Output percent value.	Verify that the loop is in manual mode. Refer to "Operation" on page 4-29. Verify that the LoopOFFX(X = loop number) does not have an active alarm or parameter that is true in manual mode. Refer to "Configuration" on page 4-7. Verify that the Manual Output source is set to Operator. Refer to "Control Loop Extended Configuration" on page 4-36.
Output percent has no effect on physical output.	Verify that the control output is patched to the proper physical (hardware) output. Verify output patching as described in "Physical Outputs Patching" on page 4-18. Verify that the physical output device has a matching input to the Dimension output. Refer Section 2, page 2-17. Verify that a thermocouple input is not reading Opensensor. Verify that LoopOFFX(X = loop number) does not have an active alarm or parameter that is true in manual mode. Refer to "Configuration" on page 4-7. Check that output is wired properly. Refer to "Analog I/O Module Field Wiring" on page 2-13 of Section 2, *Hardware Installation and Field Wiring*, and the Series 8781 Digital I/O Expansion Card Instructions on page 2-37 of Section 2. Verify the output type selected on the analog board using jumpers. Refer to "Analog I/O Module Field Wiring" on page 2-13 of Section 2, *Hardware Installation and Field Wiring*. Verify that the Time Proportioned cycle time is not set. Refer to "Physical Outputs Configuration on" on page 4-26. Verify that the External I/O card (8781) is powered up before or at the same time as the Dimension.

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Symptom	Action
Dimension will not communicate with 8781 I/O card.	Verify that the connection to the I/O card is on the first Analog Output card. Verify that the External I/O card (8781) is powered up before or at the same time as the Dimension. Verify wiring between Dimension and the 8781 card. Refer to "Series 8781 Digital Input/Output Expansion Instructions" on page 2-37 of Section 2, *Hardware Installation and Field Wiring*. Verify the address switch settings of the 8781 card. The first 8781 must be address 2. Refer to "Selecting the Digital I/O Address" on page 2-44 of Section 2, *Hardware Installation and Field Wiring*.
The alarm icon is flashing but no alarm is present.	Any unused analog inputs should be shorted. The unused input (+) and (–) terminals should be connected. Refer to "Analog I/O Module Field Wiring" on page 2-13 of Section 2, *Hardware Installation and Field Wiring*.
Reading from the Memory card causes configuration problems.	Verify that the same firmware version is installed in the unit being loaded as was used to write the Memory card.
The process variable overshoots or undershoots when approaching the setpoint.	The PID parameters (Gain, Reset, Rate) may need to be changed. Refer to "Operation" on page 4-29.
Changing PID values has no response on the output percent.	Verify that the PID Type is set properly. Refer to "Configuration" on page 4-7.

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Troubleshooting Real-Time Programmer

Symptom	Action
The programmer is running but the loop setpoint does not change.	Verify that the Setpoint source (**SptSrc0#**) for the selected loop is set to Programr. Refer to Section 4, *Process Control and Monitor Loops*, "Operation," page 4-29. Verify that the Remote setpoint source (**RemSPsrc**) is set to the correct programmer.Refer to Section 4, *Process Control and Monitor Loops*, "Configuration," page 4-7.
The time left in the program reads XX:XX:XX.	Check for an endless loop in the active recipe segments. Refer to "Building a Real-Time Program," page 5-16.
The program does not end when it should.	Check the last executing segment in the currently running recipe and verify that the **NextSeg** parameter is the same as the current segment number. Refer to "Building a Real-Time Program," page 5-16.
The Program mode is always in "Hold".	Check to see if Guaranteed Soak is enabled. Refer to "Configuration," page 5-5. If guaranteed soak is to be used, verify that the correct **Alm_Group** is selected for the current segment number. Refer to "Guaranteed Soak," pages 5-14 and 5-28, and Fig. 5-36. Verify that a digital input is not in a TRUE condition with a digital input patched to the Run/Hold source for the Programmer. Refer to "Configuration," page 5-5.
The Program is running faster than it should.	Check to see if Fast Forward is enabled. Refer to "Program Options," page 5-32.
An event remains on when the program runs even if it is not turned on in the segment.	This may occur with multiple programmers, where the event may be turned on in a different programmer.
Programmer does not run.	Check to see if **Abort_##** (## is programmer number) is enabled. Refer to "Program Options," page 5-32.
Programmer will not start from the PROGRUN screen.	Verify that the Operator start (**OPStart**) parameter is set to **OPStrt##** (where ## is the Programmer number). Refer to "Programmer Extended Configuration, Parameters," page 5-33.

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Troubleshooting/Verifying Alarm Configuration

After the setup of the alarm parameters has been completed, it is important to verify the result of the configuration. The following sections describe how to check out your alarm configurations.

Input and PV Limit Alarms

Input and PV alarms are detected whenever the selected input exceeds a specified high or low limit. The best way to verify the alarm is configured properly is to simulate or vary the input until it exceeds the set alarm limit value. To do this, connect a calibration or variable input source (voltage, current, thermocouple) to the individual analog inputs and adjust the output of the source so that the input (PV) exceeds the set limit. The LOOP display, shown in Fig. D-7, may be used to monitor the actual value (ProcVr#) of a loop input as it is adjusted using the variable source. An Overview display may also be created that can display selected Analog Inputs or Loop Process Variables as shown in Fig. D-8.



Figure D-7. (L) Loop Status display



Figure D-8. (R) User-Configured Overview Display

By adjusting your variable input source you can cause an alarm to occur. When the alarm limit has been exceeded, the *Alarm Icon* will begin to blink, indicating that an alarm has been detected. Next, view the appropriate LOOP_ALM or INP_ALM display screen to verify the alarm detected was as expected.

Note: *Refer to Section 3, Graphic Operator Interface, for more information on configuring Overview displays.*

The next step is to alter the input source to a level that should clear the alarm condition. Then verify that the alarm clears. Remember that a **Latched** alarm requires the operator to acknowledge the alarm, while **Unlatched** will clear without any operator action.

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If you set a value for hysteresis, verify the proper hysteresis action by adjusting the input below the alarm limit. The alarm should not clear until the input is below the alarm limit by the hysteresis value. (This is assuming a high limit alarm; a low limit alarm would need to be above the limit by the hysteresis value.)

Loop Deviation Alarms

Deviation alarms are detected whenever the actual process variable (PV) differs from the desired variable (setpoint, SP) by more than the set limit value. Deviation alarms are only applicable to control loops. The best way to verify the alarm is configured properly is to simulate or vary the input or the setpoint until it exceeds the set alarm limit value. This can be done from the LOOP display, shown in Fig. D-9. From this display verify that the Setpoint Source for the selected loop is in **Operator** mode. To do this, select **Operator** from the **SptSrc##** line in Fig. D-9. Next select the **SetPnt##** parameter and alter the setpoint until it differs from the **ProvVr##** value by more than the deviation alarm limit value set in alarm configuration. This should cause the *Alarm Icon* to blink, indicating an alarm. Next, access the LOOP_ALM display shown in Fig. D-10. Verify that the expected Deviation alarm is displayed.

Figure D-9. (L)
Loop Status Display



Figure D-10. (R)
Loop Alarm Status Display



The next step is to alter the setpoint to a level that should clear the alarm condition. Then verify that the alarm clears. Remember that a **Latched** alarm requires the operator to acknowledge the alarm, while **Unlatched** will clear without any operator action.

If you set a value for hysteresis, verify that the proper hysteresis action by adjusting the deviation value below the alarm limit. The alarm should not clear until the deviation is below the alarm limit by the hysteresis value. (This is assuming a high deviation alarm, a low deviation alarm would need to be above the limit by the hysteresis value.)

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Troubleshooting Logic Functions

When using Dimension logic functions to control internal functions or to control digital outputs, the following tips may assist in the checkout and troubleshooting of the configured functions:

- Configure a diagnostic LOGIC display to show the state of any related digital inputs, outputs and programmer events that are part of the logic configuration.
- Isolate and verify individual OR/NOR#, AND/NAND# outputs by temporarily patching them to a Remote Digital Output using an Outset. This will allow you to view the TRUE/FALSE output state of each part of your logic configuration before they are all combined. If each part works as expected, the combined result should also function properly.

Symptom	Action
ORset/NORset output does not activate function.	If any input to an OR function is TRUE the output will be TRUE. Verify that unused inputs to an OR function are set to FALSE. Verify that the correct output, either ORset or NORset is patched to the function.
ANDSet/NANDset output does activate function	All inputs to an AND function must be TRUE for the output to be TRUE. Verify that unused input to an AND function are set to TRUE. Verify that the correct output, either ANDset or NANDset is patched to the function.

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Appendix E

Examples

Example 1: Thermocouple/Pyrometer Switchover B–2
Operation B–2
Configuration B–3
Example 2: Using Cascade Control B–6
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Starting Autotune B–18
Monitoring Autotune B–18
Accepting PID parameters B–18
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Configure [STOP] Key B–21

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Examples

Example 1: Thermocouple/Pyrometer Switchover

The response provided by one temperature sensor may not be accurate enough or have a wide enough temperature span when trying to control temperature over a wide range. In these cases, using two different temperature sensors to measure temperature can provide better accuracy and control.

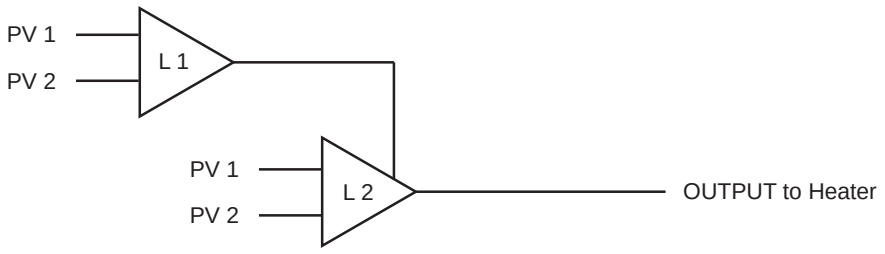
In this example, we will use a thermocouple to measure temperatures up to 1000 degrees F, and a Pyrometer to measure temperatures above 1000 degrees F as shown in Fig. E-2. An event from the programmer will be used as a trigger for the switchover to occur. Utilizing the Manual Output Source and internal logic, the Dimension Control System can successfully accomplish this task. For this example, Loop1 will be the thermocouple loop and Loop 2 will be the Pyrometer loop.

Operation

During the ramping up, Event 1 is off and Loop 2 is in manual mode, causing the output of Loop 2 to come from the Output of Loop 1 (Manual output source - Fig. E-1). When the switchover point is reached, Segment 3, (see Fig. E-2) Event 1 is turned on. This will put Loop 2 into auto mode (see Fig. E-3), causing the output calculated from the Pyrometer loop to be in control. PV1 Hi alarm will now be active latching the Loop 2 mode into Auto; therefore Event 1 is turned off in segment 5.

During the ramp down of the temperature, the PV1 Hi alarm will be cleared causing Loop 2 to return to manual mode and the Output will again come from the thermocouple loop (Loop 1).

Figure E-1.
Manual Output Source



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Figure E-2.
Switchover Point

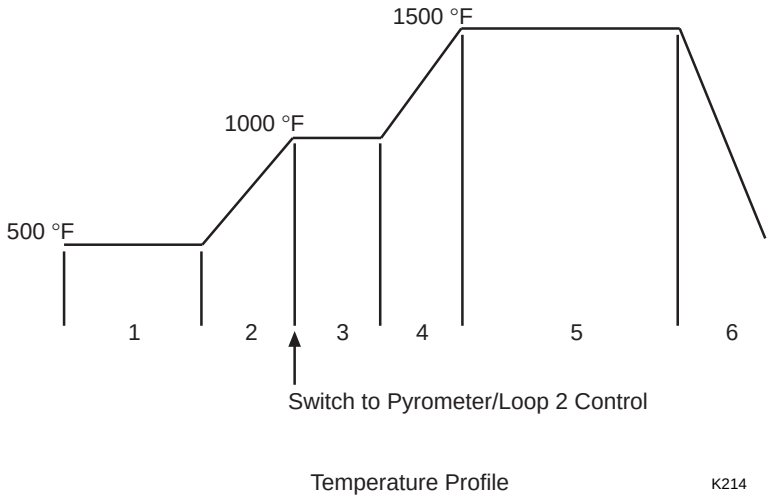
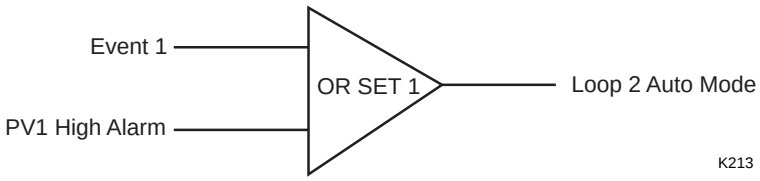


Figure E-3.
Auto Mode



Configuration

This example requires Dimension to be in the Extended configuration mode. The **Extended** configuration is accessed by selecting `Extended` at the `Conf_Lvl` parameter as shown in Fig. E-4. After selecting `Extended`, select `Configur` to switch to the configuration side of the Dimension. Next, access the **Patch I/O** icon and select the `ControlLoop` parameter shown in Fig. E-5. The window shown in Fig. E-6 displays.

Figure E-4. (L)
UNIT Display

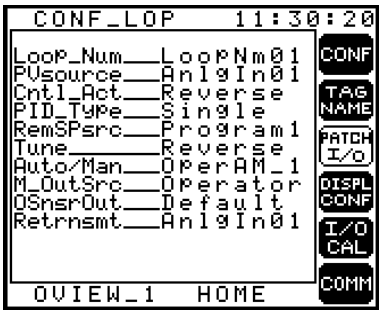


Figure E-5. (R)
Patch I/O Display



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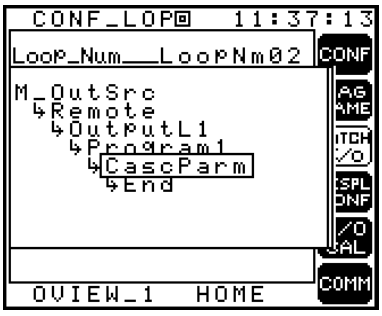
Figure E-6.
CONF_LOP Extended Configuration Display



Set up the following parameters:

1. **Loop_Num** - select **LoopNm01**.
2. **Pvsource** - select **AnlgIn01**. This is the thermocouple input. You will need to go to the I/O CAL screen to select the correct input type. See Section 4, *Process Control and Monitor Loops*, for a detailed description.
3. **Cntl_Act** - select **Reverse** (for heating in this example).
4. **RemSPsrc** - select **Program1** to run the temperature profile with Programmer 1.
5. Return to the **Loop_Num** parameter and select **LoopNm02** to set up the Pyrometer loop.
6. **Pvsource** - select **AnlgIn02**. This is the Pyrometer input. Again, you will need to select the correct input type.
7. **Cntl_Act** - select **Reverse** (for heating in this example).
8. **RemSPsrc** - select **Program1**. The temperature profile will be running from Programmer 1.
9. **Auto/Man** - select **OR_set01**. This will allow several inputs to be "OR'd" together to control the status of the Auto/Manual parameter for Loop 2.
10. **M_OutSrc** - select **Remote**. This will display a configuration tree.

Figure E-7.
Manual Output Source



11. Under **Remote** - select **OutPutL1** (see Fig. E-7). Whenever Loop 2 (Pyrometer) is in manual mode the Loop 2 Output will be sourced from the Output of Loop 1. Next, select the Cascade parameters as follows:

    Ratio=-1
    Blend=0
    Scale=1

By selecting Manual Output Source (**M_OutSrc**) for Loop 2 to be Remote and **OutPutL1**, Loop 1 will control the Output percentage of Loop 2 when Loop 2 is in Manual mode. When Loop 2 is in Auto mode, the output is calculated from Loop 2's input.

Next set up when to switch Loop 2 from Manual to Auto for the switchover to be complete. This can be done as follows:

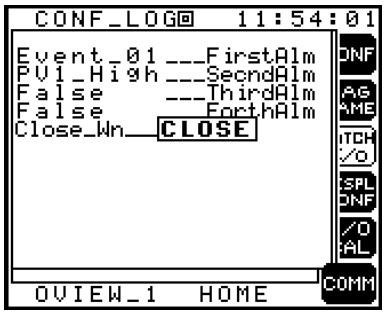
1. Access the CONF_LOG display (see Fig. E-8) at the Patch I/O icon.
2. For **Logic**, select **OR/NOR_1**. This will open the window shown in Fig. E-9, with four input selections.

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Figure E-8. (L)
CONF_LOG Display

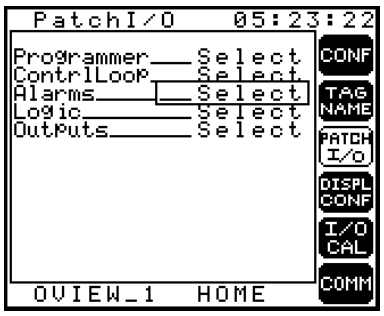


Figure E-9. (R)
CONF_LOG Display



3. For the **FirstAlm** (1st input) select **Event_01**. This will be the trigger for Loop 2 to go into Auto and initiate the switchover.
4. For the **SecndALm** (2nd input) select **PV1_High**. This will latch the Dimension into an Auto condition. Select **CLOSE** to complete.
5. Access the Alarm display shown in Fig. E-10 from the Patch I/O icon.
6. Select **xLoopNm01** from the **LpAlmSet** parameter on the CONF_ALM display. This will open the window shown in Fig. E-11. Set the Loop 1 **HiPV** alarm at 1000 degrees F. This will be the switchover point. Select **CLOSE** to return to the CONF_ALM display.

Figure E-10.
Alarm Display



Select **LoopNm01** from the **Loop Alm** parameter on the CONF_ALM display. This will open the window shown in Fig. E-12. Set Loop 1 **HiPvLtch** parameter to **Unlatch**. This will ensure the switch back to thermocouple control during the cool down period.

Figure E-11. (L)
Alarm Limit Configuration Window

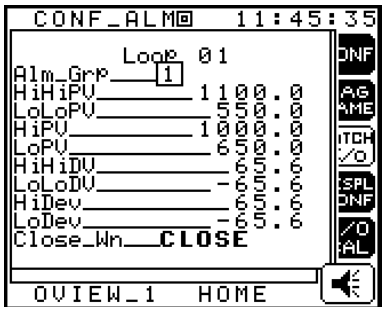
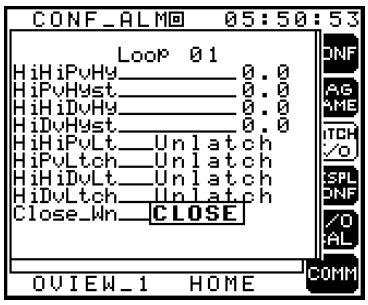


Figure E-12. (R)
Loop Alarm Setup Window



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Example 2: Using Cascade Control

To obtain precise part temperature control needed in many applications, a single loop of control may be insufficient. Other processes that may have a slow response rate may be unstable when only one PID control loop is implemented. For these reasons, a Cascade control scheme using the Dimension Control System is utilized. In this configuration, the primary loop output sets the setpoint of the secondary loop. Refer to Fig. 5-13 and Fig. 5-14.

Figure 5-13.
Cascade Control Scheme

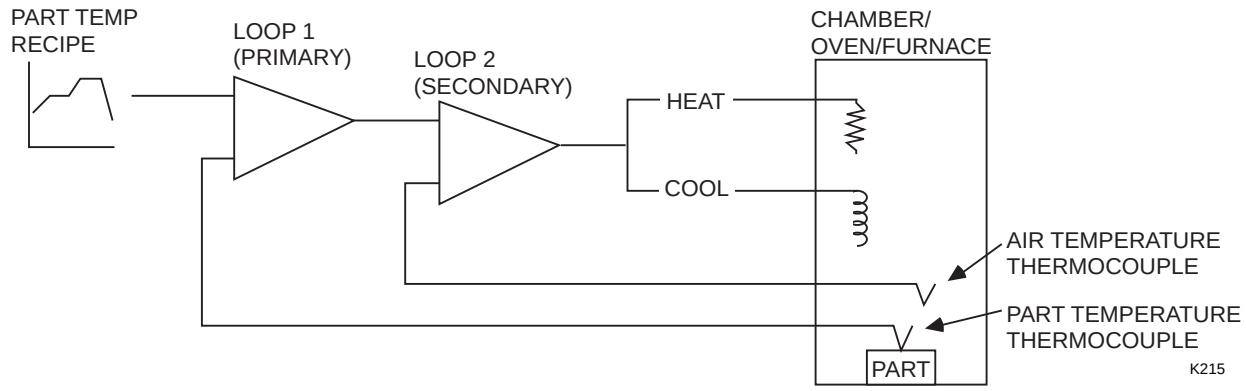
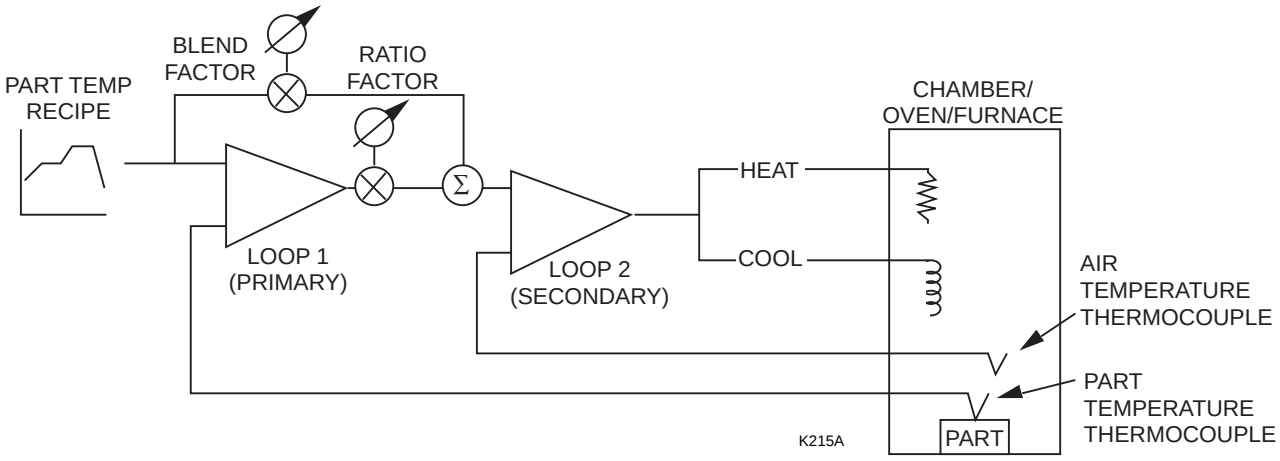


Figure 5-14.
Blended Cascade/Part Temperature Control Scheme



In this example, Loop 1 will be the primary (part temperature) loop and Loop 2 will be the secondary (air temperature) loop. Cascade control can be set up in the following manner:

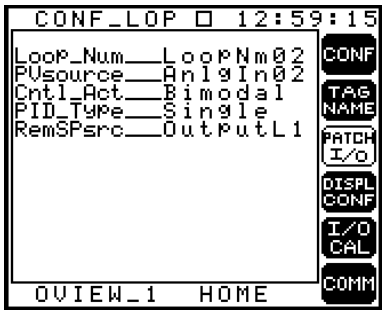
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1. Access the Patch I/O icon (see Fig. E-15) on the configuration side of the Dimension. From this display select the **ControlLoop** parameter. This will display the CONF_LOP display (see Fig. E-16).

Figure E-15. (L)
Patch I/O Display

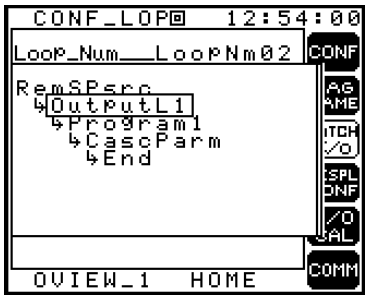


Figure E-16. (R)
CONF_LOP Display



2. At the **Loop_Num** parameter select **LoopNm02**. The Loop 2 parameters will now be displayed on the screen.
3. Move the cursor down to the **RemSPsrc** parameter. Press **ENTER** to open a window as shown in Fig. E-17.

Figure E-17.
Control Action



4. Change the entry in the window to **OutputL1**. A configuration tree displays. The configuration tree will allow you to select the Program to be used and the cascade parameters used to determine the Loop 2 setpoint.
5. Select which programmer (**Program#**) will be used in the calculation.
6. Move the cursor down to the **CascParm** parameter. By entering on this parameter, a window will open at the top of the screen to allow you to enter values for the Ratio, Blend and Scale Factor as defined in the formula:

   (%Output * Ratio + Profile setpoint * Blend) / Scale Factor

7. Select **CLOSE** to close the window and then select **End** to close the **RemSPsrc** window.

Figure E-18.
Control Action



8. To monitor the effect of each parameter, build an Overview display like the one shown in Fig. E-18 with all relative parameters on a single screen.
9. The Setpoint Source(**SptSrc02**) parameter must be set to Remote. This can be done from either the Overview screen just configured or from the LOOP__2 screen.

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A practical example of implementing the equation is shown below. The equation is as follows:

$$\text{Loop 2 Setpoint} = \frac{(\text{Output\% of Loop1} \times \text{Ratio}) + (\text{Profile Setpoint} \times \text{Blend})}{\text{Scale Factor}}$$

To calculate what affect each parameter has on the Loop 2 setpoint, initially start with the following:

Scale = 100
Blend = 100
Ratio = -10

The Ratio is a negative value because when there is a reverse output (typically a heating process) the output percent is a negative number. The Scale and Blend values will usually be about the same value and they will be a factor of 10 greater than the Ratio.

When these initial values are entered into the equation, it appears as follows:

$$\text{Loop 2 Setpoint} = \frac{(\text{Output\% of Loop1} \times (-10)) + (\text{Profile Setpoint} \times 100)}{100}$$

The value as Output percent is dependent upon the decimal position of the input for that loop. Table E-1 shows the Output percent value in relation to decimal points.

Table E-1. Output Percent Value in Relation to Decimal Points

Decimal Positions	Output = 100% Output Percent Value	Output = 50% Output Percent Value
0	10000	5000
1	1000	500
2	100	50
3	10	5
4	1	0.5

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If the output percent of Loop 1 is at 0% heating and the profile value is at 200 degrees F, the equation reads:

$$\text{Loop 2 Setpoint} = \frac{(0 \times (-10)) + (200 \times 100)}{100} = 200 \text{ F}$$

With 0% output, the ratio term drops out and Loop 1 has no effect as would be expected.

If the output percent of Loop 1 is at 100% heating and the profile value is at 200 degrees F, the equation reads:

$$\text{Loop 2 Setpoint} = \frac{((-1000) \times (-10)) + (200 \times 100)}{100} = 300 \text{ F}$$

Therefore, a 1% change in the output of Loop 1 relates to a 1 degree change in the setpoint of Loop 2.

If the output percent of Loop 1 remains at 100% heating and the profile value is at 200 degrees F but our Ratio value is changed to –1, the equation reads:

$$\text{Loop 2 Setpoint} = \frac{((-1000) \times (-1)) + (200 \times 100)}{100} = 210 \text{ F}$$

Therefore, a 1% change in the output of Loop 1 relates to a 0.1 degree change in the setpoint of Loop 2.

If higher resolution is still required, change the Blend and Scale factors to a higher number, such as 1000. If Ratio is still at 1 and we still have 100% output on Loop 1, the equation reads:

$$\text{Loop 2 Setpoint} = \frac{((-1000) \times (-1)) + (200 \times 1000)}{100} = 201 \text{ F}$$

A 100% output only adds 1 degree to the setpoint value.

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Example 3: Pump Control

This example will show how the Dimension can be set up to turn a pump on or off based upon the position of a valve, a temperature sensor, a programmer event and an override switch. We will assume that during normal operation the pump should be allowed to turn on only if the valve is in the open position and either the programmer event is on or a low temperature limit is exceeded. For maintenance functions, an operator override switch may be used turn the pump on/off at any time. This is accomplished in Dimension using an OR_Set, an ANDSet, and an OUTSet, and can be graphically described as shown in Fig. 5-19.

Figure 5-19.
Pump Control Logic

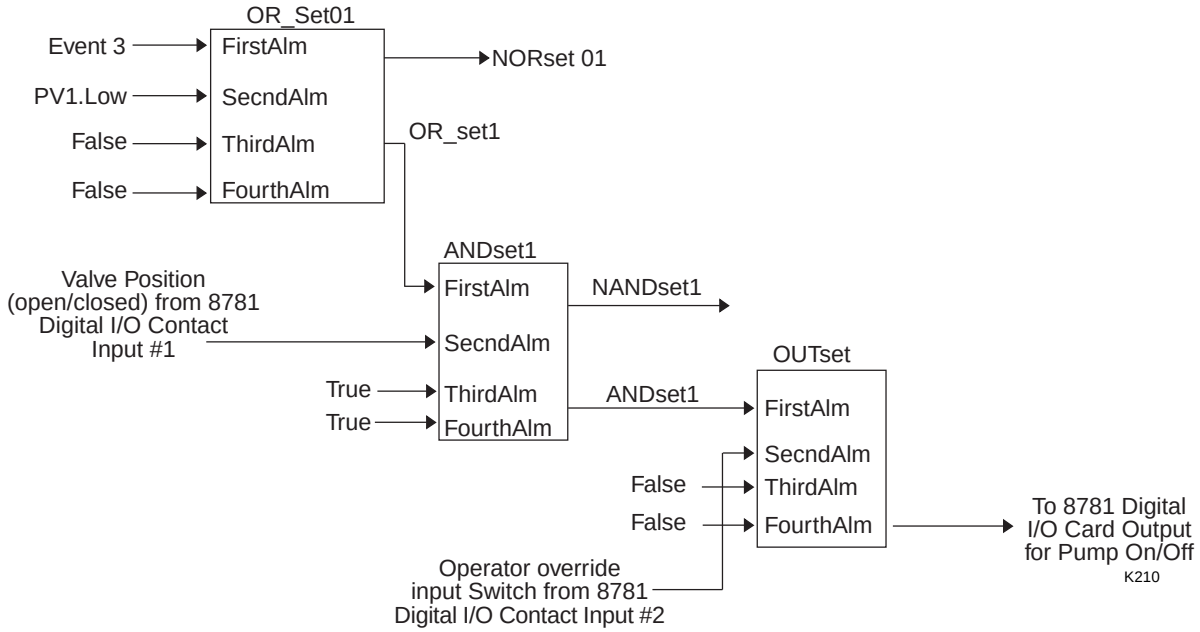
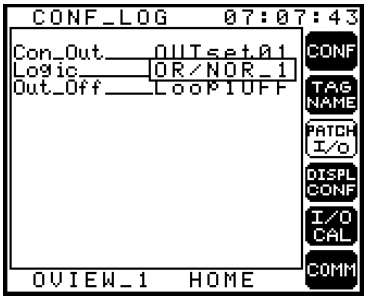


Figure E-20.
Logic Configuration Selection Display



The first step in setting up the pump control is to define the inputs to the OR_Set. To do this, position the cursor on the **Logic** parameter on the CONF_LOG display (see Fig. E-20) and press **ENTER**.

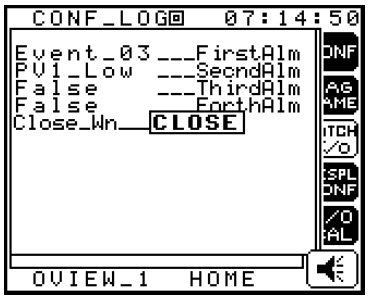
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Figure E-21.
Logic Set Configuration Display



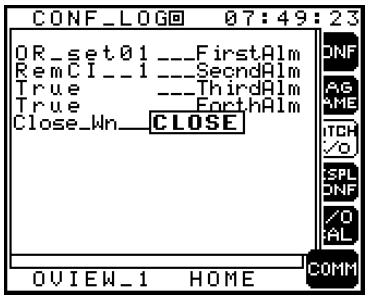
Select the **OR/NOR_1** logic set and press **ENTER** to open the configuration window shown in Fig. E-21.

Figure E-22.
OR/NOR_1 Set Configuration Display for Pump Control Example



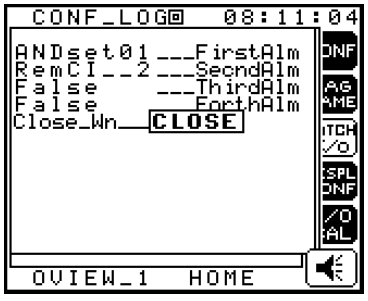
Referring to the drawing in Fig. 5-19, we will define the inputs to the **OR_Set**. Assign **Event_03** to the **FirstAlm** parameter, select **PV1_Low** as the **SecndAlm** parameter, and **False** for the **Third** and **ForthAlm's** (see Fig. E-22). Then select **CLOSE** to finish this **Or_Set** configuration and return to the CONF_LOG display. Next select the **ANDNAND1** logic set from the **Logic** parameter to open the window as shown in Fig. E-21.

Figure E-23.
ANDNAND1 Set Configuration Display for Pump Control Example



Select **OR_set01** for the **FirstAlm** parameter, **RemCI__2** for the **SecndAlm** parameter and **True** for the **Third** and **ForthAlm** parameters. Remember that all input parameters for an AND set must be TRUE for the output of the set to be true; thus the need to default the third and fourth alarms to True (see Fig. E-23). Next select **CLOSE** to complete the ANDset portion of the configuration and return to the display shown in Fig. E-20.

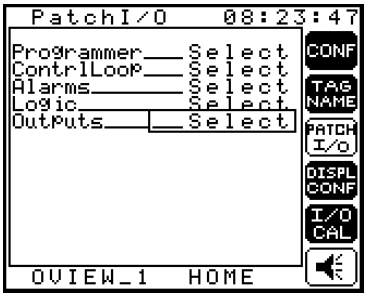
Figure E-24.
OutSet01 Configuration Display for Pump Control Example



Then select the **OUTSet01** parameter from the **Con_Out** line to open the window shown in Fig. E-21. Assign **ANDset01** to the **FirstAlm** and **RemCI__2** to the **SecndAlm** and **False** to the **Third** and **ForthAlm** parameters (see Fig. E-24). Select **CLOSE** to complete the Outset portion of the configuration.

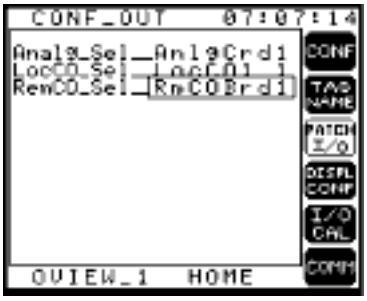
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Figure E-25.
Patch I/O Display



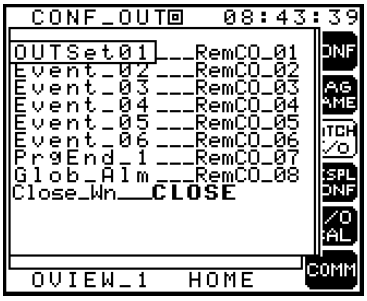
Next press the **Home** key to return to the main **PatchI/O** display as shown in Fig. E-25. From this display select the `Outputs` parameter to begin the physical Output patching process. Once `Outputs` is selected, the screen shown in Fig. E-26 displays and the patching of the `OutSet` to a remote digital output may be completed.

Figure E-26.
Remote Digital Output Configuration Display



Selecting the desired Remote Contact Output Board will highlight the selection, and clicking the knob a second time will cause a window as shown in Fig. E-27 to display.

Figure E-27.
Remote Digital Output Configuration Display for Pump Control Example



From this window select the desired output number to which to assign the pump control output. For this example select `OUTSet01` as the source for `RemCO_01` to patch the outset to the physical output. Next select `CLOSE` to complete the configuration process.

The next step is to verify the actual operation of the logic sequence configured. This may be done by monitoring the status of the **Events**, the **Remote Digital Inputs**, and the **Remote Digital Outputs**. The status of these items may be displayed on a **LOGIC** display as shown in Fig. E-28. Logic displays are accessible from the operation group of icons by highlighting the Logic icon. This display was set up to show the status of remote contact output #1, named `PumpStat`, remote contact input #1, named `ValvePos`, remote contact input #2, named `ManPCtrl`, and programmer `Event__3`.

Note: *Refer to Section 3,* Graphic Operator Interface, *for instructions on configuring displays and setting up custom tagnames for inputs/outputs as shown in this example*

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This display can now be monitored as the inputs, events, and alarm limits are altered. The `PumpStat` should display ON whenever the `ManPCtrl` input is ON or if the `ValvePos` is Open and either `Event__3` is ON or **Loop 1 Low PV** alarm is active. The `LOOP_ALM` display, shown in Fig. E-29, may be viewed to monitor the status of the Loop Low limit alarm input.



Figure E-28. (L) Logic Status Display for Pump Control Example



Figure E-29. (R) Loop Alarm Status Display for Pump Control Example

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Example 4: Programmer Run/Hold Status

This example will show how the Run/Hold state of the setpoint programmer in Dimension may be altered using an Operator Interface function as well as a remote contact input. This is accomplished using an NORset, an ANDset, and a programmer configuration selection and is graphically shown in Fig. E-30.

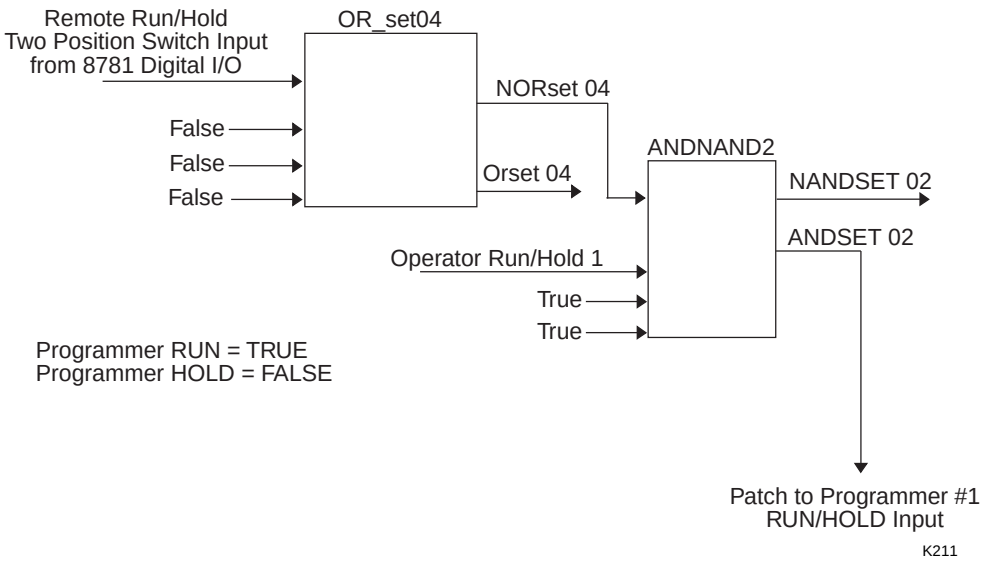


Figure E-30.
Programmer Status Logic

The first step in the **configuration** process is to access the configuration displays and the **PATCH I/O** icon as described earlier in this section. From the **PATCH I/O** icon, select the **Programmer** configuration parameter to access the display shown in Fig. E-31.

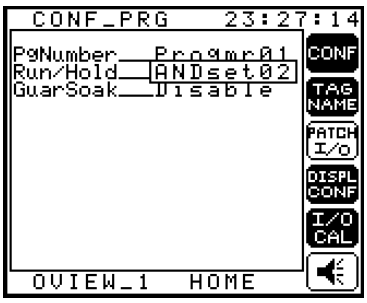
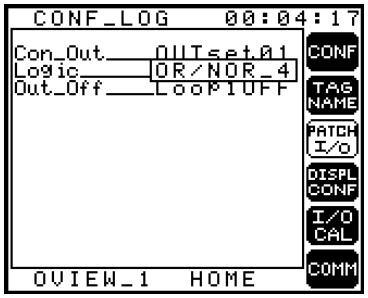


Figure E-31.
Configure Programmer Display

From this display access the **Run/Hold** parameter and patch **ANDset02** as the source for this function. Next press the **HOME** key to return to the main Patch I/O display and select the **Logic** configuration parameter to access the display shown in Fig. E-32.

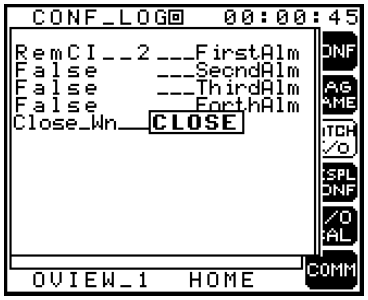
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Figure E-32.
Configure Logic Display



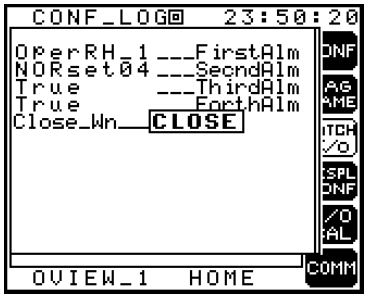
From this display select the **OR/NOR** set to be configured from the **Logic** parameter. This will open a window as shown in Fig. E-33 that will allow you to assign **RemCl__2** to the **FirstAlm** and **False** to the rest of the inputs. Select **CLOSE** to complete the configuration of the OR/NOR set. Next select the **ANDNAND2** from the **Logic** parameter for configuration.

Figure E-33.
OR_Set04 Configuration



After selecting **ANDNAND2**, the window shown in Fig. E-34 opens. Select **OperRH_1** for the **FirstAlm**, **NORSet04** for the **SecondAlm**, and **True** for the **Third** and **ForthAlms**. Select **CLOSE** to complete the configuration.

Figure E-34.
LOOP_ALM Display



***Note:** The **NOR** output was selected to invert the Remote Run/Hold input switch.*

The next step is to verify the operation of the configuration just completed. This can be done by starting a program (see Section 5 *"Real-Time Programmer"* , for details on programmer operation/configuration), monitoring the **PgMode** parameter and switching the Status from Run to HoldOper and back using the Operator Interface. Next toggle the switch input and view the programmer status. The On/Off status of the remote Run/Hold switch may also be viewed from a Logic display.

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Example 5: Autotune

The Dimension autotuning algorithm will attempt to model a process by monitoring the process response to a step input to the process. Once the PID parameters are calculated, the operator can select the type of response desired, FAST, MEDIUM, or SLOW. The FAST selection is designed to give a quarter amplitude damped response and the SLOW selection gives a critically damped response. This example uses Loop 1 for autotuning.

Setting Up Autotune

Prior to starting autotuning, it is necessary to set some parameters for the autotuning run. The parameters may be set from either the CONF_LOP screen at the Patch I/O icon or from the Autotune window entered from the LOOP_# screen. For this example we will set up the Autotune parameters from the Autotune window. First move to the LOOP_1 screen and select the **SetUp** parameter at the bottom of the screen (see Fig. E-35). This will open the set up window (see Fig. E-36). In this window verify that the Loop mode (**LpMode01**) is set to **Manual**. Move the cursor down to the **AutoTune** parameter and select to open the Autotune window shown in Fig. E-37.



Figure E-35. (L) **LOOP _ _ _1** Display

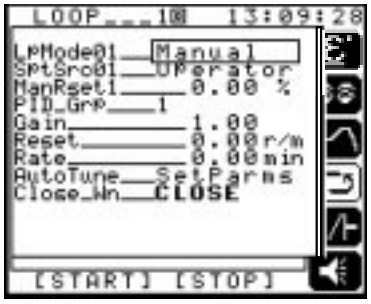


Figure E-36. (R) Set Up Window



Figure E-37. Autotune Window

The following parameters will be displayed:

- **Autotune** -Selecting **Start** will start the autotuning process. This function changes to **Abort** once the process has been started. Selecting **Abort** will halt the autotune process. The autotuning will be complete when **%_change** reaches 1%(The difference of the last 50 samples taken is 1 % of the **Pvchange**) or the number of samples reaches 2048 (buffer is full).

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- **AT_ErrNo** - If an autotune error occurs, select this parameter to display a description of the autotune error number. Press the **Help** key to close this window.
- **Accept** - Select **Yes** to save the PID parameters just generated from the run into the selected PID group. Selecting **No** will abandon the PID parameters.

  When autotuning is complete the following parameters will change:

  Samples to **CalcGain**
  Pvchange to **CalcRst**
  %_change to **CalcRate**
- **Samples** - Displays the number of samples taken during the run.
- **PVchange** - Displays the amount that the process variable has changed.
- **%_change** - Displays the % that the process variable has changed.
- **PIDGrp** - Set the PID group the Autotuned PID values will be saved into when they are accepted at the completion of an autotune run.
- **TuneAct1** - Set the control loop tuning action. Reverse causes the bump to increase the Reverse output. Direct causes the bump to increase the Direct output.
- **RespTyp1** - Select the Response type that determines what type of PID parameters to calculate. The choices are **Fast, Medium** and **Slow**. **Fast** uses the most energy and brings the process variable up to setpoint quickly but may produce overshoot. **Slow** takes longer, but produces less overshoot.
- **Bump** - Set the amount that the output will be increased by when Autotuning is started.
- **SmplRate** (RespTime)- Set the time (minutes) that the process takes to stabilize after a step change in the output. This time determines the time required for autotune to complete.

To set up autotune, configure the **PIDGrp, TuneAct, RespTyp1, Bump,** and **SampleRate** parameters. For this example we will run the Autotune process on the reverse (or heating) action. Set up the parameters as follows:

PIDGrp_1 - 1
TuneAct1 - Reverse
RespTyp1 - Don't need to set until the autotune run has completed.
Bump__01 -10.00%
SmplRate - 5 minutes

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Starting Autotune

1. Verify that the Loop mode of Loop 1 is set to manual as shown in Fig. E-36 above.
2. Once selections are made and the control loop is set up, an autotuning run can be started. Enter the autotune window once again to start the process.
3. Move the cursor to the **Autotune** parameter and select **Start**. The Autotune parameter will automatically change from Start to Abort.

Upon start up, the autotuning algorithm will attempt to allocate enough memory to take a minimum of 2048 samples. It is recommended that only one loop at a time be in the autotuning mode to give it enough memory to complete. The memory will be returned for system use upon the completion of the autotuning run.

Monitoring Autotune

Monitor the variables **Samples**, **Pvchange**, and **%_change**. The sampling rate is based on the **RespTime** (response time). The time between samples can be calculated by:

$$\frac{\text{Resp Time} \times 60 \text{ seconds}}{500}$$

The autotuning algorithm is designed to take a minimum of 500 samples during the length of the **RespTime**. The **Pvchange** parameter should be monitored for a response. The autotuning algorithm will begin to calculate the **%_change** entry after 100 samples. This entry gives an indication of the nearness to completion for the autotuning algorithm. The **%_change** is calculated by taking the difference of the last 50 samples and comparing that to the overall **Pvchange**. When it reaches 1% the autotuning algorithm will complete by calculating the PID parameters.

Accepting PID parameters

Upon completion of the autotuning run the parameters **Sample**, **Pvchange**, and **%_change** will change to **CalcGain**, **CalcRst**, and **CalcRate** respectively, when PID parameters are calculated (see Fig. E-38).

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Figure E-38.
Autotune Window After PID Parameters Calculated

At this time the PID parameters can be reviewed by moving the cursor box to the **RespTyp1** entry and selecting either **Fast**, **Medium**, or **Slow**. The PID parameters for each selection will be displayed. To accept the parameters, the **Accept** parameter should be selected to **Yes**. Once accepted, autotune will reset and be ready for another run if desired. If the parameters are not to be saved, the autotune entry **Abort** can be selected and autotune will reset and be ready to run again.

Autotune Errors

If an autotune error occurs, select the **AT_ErrNo** parameter to display a description of the autotune number. The list below gives a description of each error number.

600	The loop is not in manual
604	The process variable is not responding to the output change.
605	The process is not moving fast enough
606	The manual output changed
607	System error
608	Buffer is full
609	The user aborted the autotune run.

If errors 604 or 605 occur, it is possible that the **RespTime** is too short or the output is not configured or connected properly.

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Example 6: Macro Keys as Start/Stop of the Programmer

The two macro keys may be configured to execute a series of functions simply by pressing one button. For this example, we will use Loop 1 and Programmer 1. The "START" macro key will be configured to start Recipe 1 for Programmer 1. At the same time the loop mode for Loop 1 will be set to Auto, and the setpoint source for Loop 1 will be set to Programmer. The "STOP" macro key will be configured to start Recipe 15 which has been configured with a setpoint profile that will provide an ambient setpoint for Loop 1.

Configure [START] Key

From the UNIT screen move the cursor to the **Configur** parameter and select. The UNIT_CNF screen displays (see Fig. E-39). Move the cursor down to the **MacroKy1** ([**START**]) parameter and select. A window displays (see Fig. E-40) allowing you to select the desired functions to be executed when the macro key is pressed. The **LpPgNmbr** parameter allows for the selection of the loop and programmer number to configure. This should be set to **LoopNm01**.

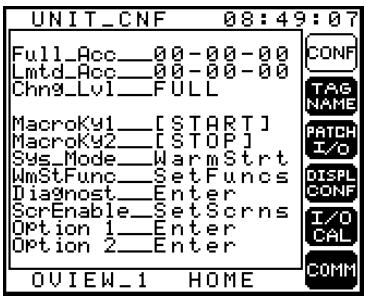


Figure E-39. (L) UNIT_CNF Display



Figure E-40. (R) Macroky1 Configuration Window

The remaining parameters should be setup as follows:



Figure E-41. Loop Mode Window

1. Move the cursor down to the loop mode (**LpMode**) parameter and set to **Activatd**. A window will open (shown in Fig. E-41) for choices that may be made. Select **Auto** and then select **CLOSE** to finish the selection.

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Figure E-42.
Program Start Window



2. Move the cursor down to the program start (`PgStart`) parameter and set to `Activatd`. A window will open (see Fig. E-42) for choices that may be made. Select `Recipe_1` and then select `CLOSE` to finish the selection.

Figure E-43.
Program Mode Window



3. Move the cursor down to the program mode (`PgMode`) parameter and set to `Activatd`. A window will open (see Fig. E-43) for choices that may be made. Select `Start` and then select `CLOSE` to finish the selection.

Figure E-44.
Setpoint Source Window



4. Move the cursor down to the setpoint source (`SptSrc`) parameter and set to `Activatd`. A window will open (see Fig. E-44) for choices that may be made. Select `Programr` to setpoint Loop 1 from programmer 1 and then select `CLOSE` to finish the selection.

Move the cursor to the `Close_Wn` parameter and select. This will close the MacroKy1 window and complete the configuration.

Configure [STOP] Key

Now we will configure MacroKy2. Move the cursor down to the `MacroKy2` ([`STOP`]) parameter and select. A window displays (see Fig. E-45) allowing you to select the desired functions to be executed when the macro key is pressed. The `LpPgNmbr` parameter allows for the selection of the loop and programmer number to configure. This should be set to `LoopNm01`.

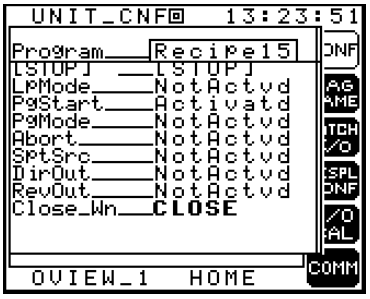
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Figure E-45.
Macroky2 Configuration Window



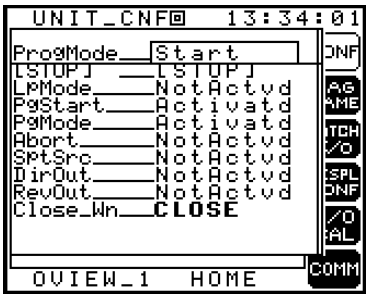
The remaining parameters should be setup as follows:

Figure E-46.
Program Start Window



1. Move the cursor down to the program start (`PgStart`) parameter and set to `Activatd`. A window will open (see Fig. E-46) for choices that may be made. Select `Recipe_15` and then select `CLOSE` to finish the selection.

Figure E-47.
Program Mode Window



2. Move the cursor down to the program mode (`PgMode`) parameter and set to `Activatd`. A window will open (see Fig. E-47) for choices that may be made. Select `Start` and then select `CLOSE` to finish the selection.

Move the cursor to the `Close_Wn` parameter and select. This will close the MacroKy2 window and complete the configuration.

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Appendix F

Verification/Calibration Procedure

Required Prerequisites **F–2**
Required Equipment **F–2**
Equipment Specifications **F–3**
Digital Voltmeter 6 1/2 Digit Example: Keithley Model 196 ..... F–3
Millivolt/Volt Calibration Source Example: EDC Model 521B F–3
Output Specifications: F–3
Temperature Calibrator/Simulator Example: Ectron Model 1120 ..... F–4
RTD Calibration Source Example: ESI Model DB 62 ..... F–4
Resistance Decade Box F–4
Dimension Input Verification **F–5**
Cold Junction - Calibration **F–7**
Input Calibration **F–9**
Example: Zero/Span Calibration F–10
Example: Zero/Span RTD Calibration F–12
Thermocouple Error **F–13**

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Verification/Calibration Procedure

Verification and Calibration

Dimension 8705e and 8725e with Version 7 hardware and firmware

The verification and calibration procedures were under review at the time this manual was published. To obtain a copy of the current information, please contact Eurotherm at:

Internet: www.eurotherm.com/controls.htm
Fax on demand: (703) 787-3441
Phone: (703) 471-4870
or call your local sales representative

Verification and Calibration

Dimension 8705 and 8725 with Version 6 hardware and firmware

The following pages pertain to the verification and calibration of the **models 8705 and 8725 with version 6 hardware and software only**.

Required Prerequisites

Allow a minimum of two hours of stabilization time for the Dimension, the Analog Input connector, and Verification/Calibration equipment.

Room ambient should be stable (±3 degrees C) with minimum air flow at the Analog Input connector. Measure the ambient air temperature. This will be required to calculate the actual tolerance in step 2 of the Input Verification.

Required Equipment

- Digital Voltmeter
- Millivolt/Volt Calibration Source
- Temperature Calibrator/Simulator
- RTD Calibration Source/Simulator

When using a Temperature Calibrator/Simulator, use special limits thermocouple wire of 24 ga or heavier, 3 feet or less in length for calibration.

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Equipment Specifications

Digital Voltmeter 6 1/2 Digit Example: Keithley Model 196

		ACCURACY ±(%rdg+counts)			TEMP COEF ±(%rdg+counts)/°C
	24 HOURS			1 YEAR	
RANGE	RESOL	INP RES.	23±1°C	18-28°C	0-18 & 28-50°C
300mV	100nV	>1G ohm	0.0020+20	0.008+20	0.0006 + 10
3V	1uV	>1G ohm	0.0013+10	0.0038+20	0.0004 + 1
30V	10uV	11 M ohm	0.0015+10	0.008+30	0.0013 + 3

Millivolt/Volt Calibration Source Example: EDC Model 521B

Output Specifications:

	0-100 MV range	0-10 volt range
Resolution (1PPM)	100 nV	10 uV

Accuracy Statement ±(0.002% of setting + 0.0005% of range + 3 uV)

Stability: 1 year: ±0.002%

NOTE: *If The Digital Voltmeter Is Used To Measure And Set The Output Of The Calibrator, The Primary Spec Of The Calibrator Is The Stability.*

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Temperature Calibrator/Simulator Example: Ectron Model 1120

Accuracy specs = or better than published Dimension specs for thermocouple inputs.

For example:

At 22 degrees C ambeint, type K thermocouple, spec = ±0.45°C

At 22 degrees C ambeint, type T thermocouple, spec = ±0.35°C

RTD Calibration Source Example: ESI Model DB 62

Resistance Decade Box

		ACCURACY	
RANGE	INITIAL %	LONG TERM %	TEMP COEF(PPM/C)
1000 ohm	0.01	0.02	5
100 ohm	0.012	0.025	15
10 ohm	0.03	0.07	20
1 ohm	0.2	0.5	60
0.1 ohm	2	5	400

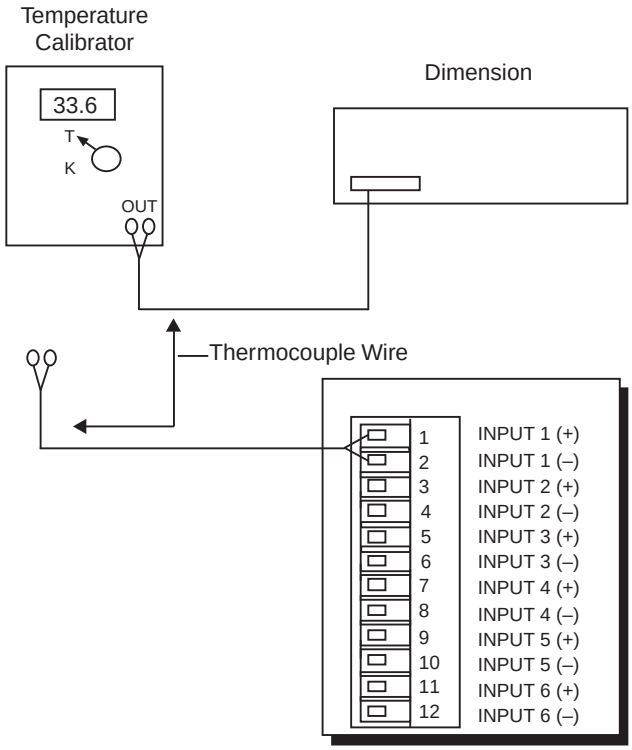
__NOTE:__ Rtd Simulators Must Be Capable Of Operating With 160 Microamps Of Excitation Voltage

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Dimension Input Verification

1. Connect a Temperature Calibrator with thermocouple wire to terminals 1 and 2 of the Analog input connector on the Dimension. See Fig. F-1.

Figure F-1.
Temperature Calibrator Connection



NOTE: *Allow two hours to stabilize operating temperature of the Dimension, analog input connector and the Temperature Calibrator.*

For RTD's, connect an RTD source as shown in Fig. F–8.

2. Pick several temperatures from the Temperature Calibrator and read the value of temperature on the Dimension for "T" thermocouple. See Fig. F–2.

   Tolerance: Dimension Accuracy + Dimension Temperature Coeffcient + Tolerance of Calibrator + Thermocouple Leadwire Error

   Assuming minimal or no error from the temperature calibrator and thermocouple wire, will leave just the Dimension tolerance. For example, the "T" thermocouple at a room temperature of 30° C would be:

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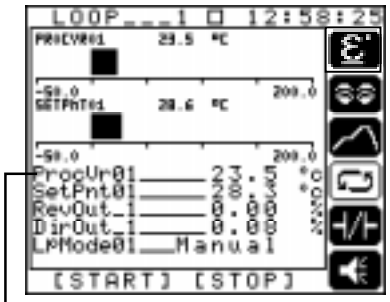
Dimension Accuracy + Temp. Coeff. = Tolerance

.35 + .16 = ± .51° C

Temperature Coefficient is calculated from the specification given in Table 4–4 and multiplying that by the difference between room temperature and 22° C (72° F). In the example, the room temperature was 30 and the temperature coefficient was .02.

(30 – 22) x .02 = .16

Figure F–2.
Temperature Reading



Note: *The temperature range is –200° to +400° C for a "T" thermocouple.*

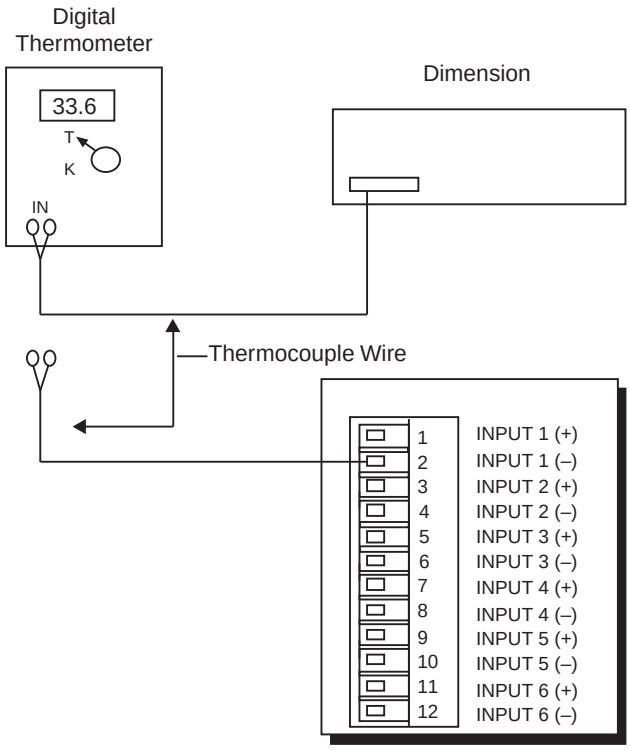
3. If unit is found outside of specifications:
   A. Allow additional time for instrument and connector stabilization (2-hour minimum time required).
   B. Verify Cold Junction calibration (see page F-7).
   C. See "*Input Calibration*" on page F-9.

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Cold Junction - Calibration

1. Connect a digital thermometer to terminal #2 of the Analog input connector on the Dimension. See Fig. F–3.

Figure F–3.
Digital Thermometer Connection



NOTE: *Allow two hours to stabilize operating temperature of the Dimension, analog input connector and the Digital thermometer.*

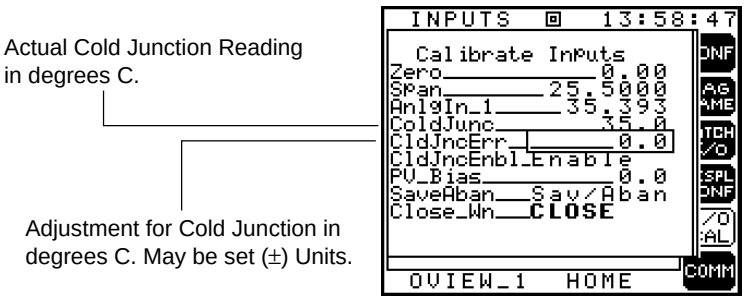
Cold Junction on the Dimension is only displayed and able to be set in degrees C.

Tighten thermocouple in screw connector.

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2. Adjust **CldJncErr** (Cold Junction Error) so the actual value of **ColdJunc** matches the digital thermometer reading. See Fig. F–4.
3. After **CldJncErr** has been set, scroll down to **SaveAban**, select **Save** and press **ENTER**.

Figure F–4.
Cold Junction Reading and Adjustment



NOTE: *Any inaccuracy in the cold junction calibration introduces a direct error in the Process Variable reading.*

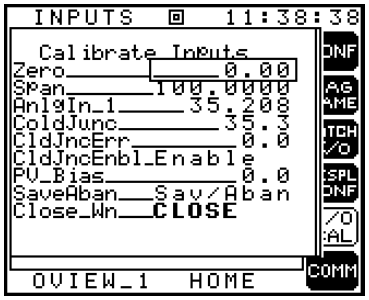
CldJncEnble *must be set to ENABLE when a thermocouple is selected as a sensor.*

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Input Calibration

1. If the **Zero/Span** calibration numbers have been changed from the factory settings, select "**abandon**" on the **Save/Aban** selection on the calibrate window. See Fig. F–5. This will restore previous values *unless* **Zero/Span** has been changed and SAVED.

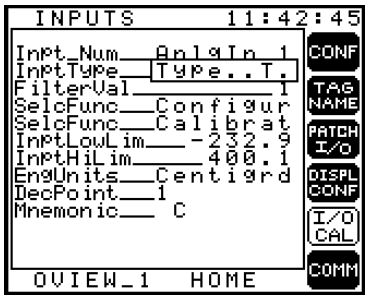
Figure F–5.
Calibrate Inputs Window



2. If **Zero/Span** numbers have been changed and saved they cannot be restored to the factory supplied numbers. Refer to Fig. F–6 and the following procedure.
   - Select appropriate PG Channel in the **InptType** field for the sensor type used on the input being selected.
   - If sensor type is RTD, select RTD. am.1.

	Input Range	Input Type
PG_CH_01	-17 to 109 Millivolts	J,K, E, N, t/c
PG_CH_02	Reserved for special ranges	Special
PB_CH_03	-1.0 to 10 Volts DC	Linear, Volt, Milliamp
PG_CH_04	-14 to 26 Millivolts	T, S, R, B, t/c
RTD	-200 to 630 °C	100 W American Alpha or European

Figure F–6.
Inputs Screen



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Example: Zero/Span Calibration

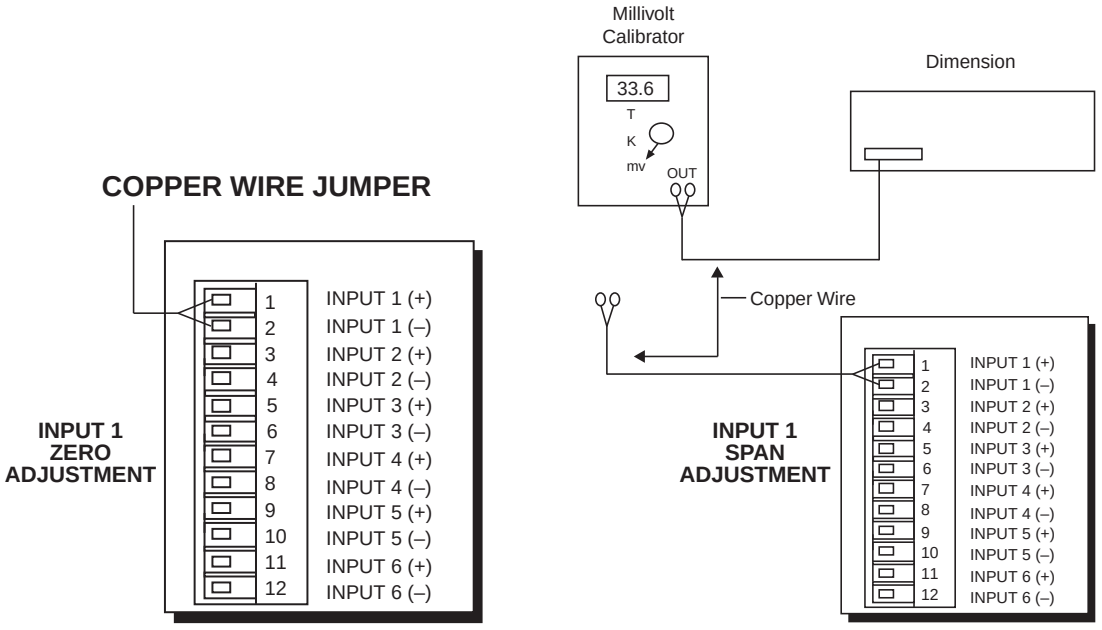
If calibrating a "T" thermocouple on channel 1 and if the factory calibration numbers have been changed, perform the following procedure:

1. Select the **InptType** to PG_CH_04 (Fig. F–6)
2. Set **PV_Bias** = 0.0 (Fig. F–5)
3. Install **jumper** in place of thermocouple on the Analog input connector, terminals 1, 2 (Fig. F–7) (input #1). Note: jumper is used as a precision 0.0 millivolt input and may be used for the Zero Calibration for any of the PG_CH input ranges. No calibrator necessary.
4. Allow minimum **warm-up** time of 10 minutes.

> ***NOTE:*** *2 hours minimum warm-up time required for cold junction calibration.*

5. Adjust **Zero** number on the Dimension Calibrate window (Fig. F–5) so the **AnlgIn_1** value reads 0.00. Remember units are in direct millivolts and the procedure is calibrating two points within the input range. Remove jumper when complete.
6. Connect **millivolt calibrator** to input number 1 terminals 1(+) and 2(-) (Fig. F–7) and apply **25.000** millivolts. Note any millivolt value can be used within the PG_CH_04 range selected. Main concern is precision and stability of the input signal source.

Figure F–7.
Millivolt Calibrator Connection



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7. Adjust **Span** number on the Dimension Calibrate window (Fig. F–5) so the **AnlgIN_1** value reads 25.000 (if 25.000 mv applied).
8. When both **Zero/Span** adjustments have been completed, select **SAVE** on the **SaveAban** line within the calibrate window (Fig. F–5), and click the knob to save the new calibration values.
9. Return **InptType** selection to Type T (Fig. F–6).

➥ ***NOTE:*** *The channel (analog input) has now been calibrated. Return now to "Dimension Input Verification Procedure."*

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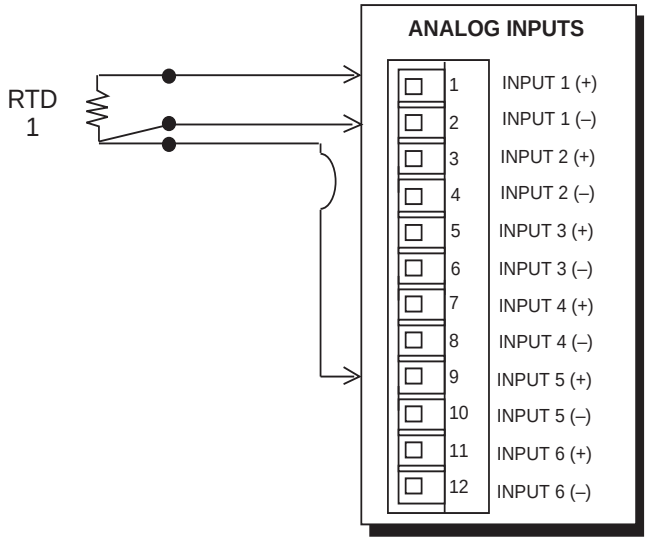
Example: Zero/Span RTD Calibration

If calibrating an RTD input on channel 1 and if the factory calibration numbers have been changed and saved, perform the following procedure:

1. Select the **InptType** to RTD.am.1 (Fig. F–6).
2. Set **PV_Bias** = 0.0 (Fig. F–5).
3. Connect an "RTD" source as shown in Fig. F–8.
4. Allow minimum **warm-up** time of 10 minutes.
5. Input (apply) 17.14 ohms on the "RTD" source. Adjust **Zero** number on the Dimension Calibrate window (Fig. F–5) so the **AnlgIn_1** value reads -200.00.
6. Input (apply) 327.02 ohms on the "RTD" source. Adjust the **Span** number on the Dimension Calibrate window (Fig. F–5) so the **AnlgIn_1** value reads 630.0.
7. When both **Zero/Span** adjustments have been completed, select **SAVE** on the **SaveAban** line within the calibrate window (Fig. F–5), and click the knob to save the new calibration values.

NOTE: *The channel (analog input) has now been calibrated. Return now to "Dimension Input Verification Procedure."*

Figure F–8.
RTD Connection



TERMINAL	* ASSIGNMENT	
1	ANALOG IN 1+	RTD1 + IN
2	ANALOG IN 1–	RTD1 – IN
3	ANALOG IN 2+	RTD2 + IN
4	ANALOG IN 2–	RTD2 – IN
5	ANALOG IN 3+	RTD3 + IN
6	ANALOG IN 3–	RTD3 – IN
7	ANALOG IN 4+	RTD4 + IN
8	ANALOG IN 4–	RTD4 – IN
9	ANALOG IN 5+	RTD1 SENSE IN
10	ANALOG IN 5–	RTD2 SENSE IN
11	ANALOG IN 6+	RTD3 SENSE IN
12	ANALOG IN 6–	RTD4 SENSE IN
1	SHIELD 1 (CHASSIS GND)	
2	SHIELD 2 (CHASSIS GND)	
3	SHIELD 3 (CHASSIS GND)	

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Thermocouple Error

The Dimension burnout circuit uses 10 Meg Ω resistors to ± 15V to sense an open thermocouple. Resistance in the thermocouple wire, especially in small gauge wire, will create an offset error on the input reading. The length and gauge of the thermocouple wire used will also affect accuracy. To calculate the error in millivolts, use the following formula:

$$\frac{30 \text{ volts}}{20 \text{ Meg } \Omega} \times R \times FT = \text{Millivolt Offset}$$

Where:

R is the thermocouple resistance per double ft. (See Table F–1.)

FT is the length of thermocouple wire.

For example: 6 feet (1.8 meters) of "K" thermocouple, 36 gauge would be calculated as follows:

$$\frac{30 \text{ volts}}{20 \text{ Meg } \Omega} \times \frac{24.08 \ \Omega}{FT} \times 6 \text{ FT} = 0.2167 \text{ mv}$$

At 25°C a "K" thermocouple has 0.040 mv/°C

At 25°C $\frac{0.2167 \text{ mv}}{0.040 \text{ mv/°C}} = 5.418$ °C offset.

Setting the PV_Bias to -5.4 would correct for this error.

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Table F–1. Resistance Vs. Wire Diameter (Resistance in Ohms per Double Foot at 68° F)

AWG No.	Diameter (Inches)	Type K Chromel/ Alumel	Type J Iron/ Constantan	Type T Copper/ Constantan	Type E Chromel/ Constantan	Type S Pt/ Pt10% Rh	Type R Pt/ Pt13% Rh	Type C W5% Re/W26% Re
6	0.162	0.023	0.014	0.012	0.027	0.007	0.007	0.009
8	0.128	0.037	0.022	0.019	0.044	0.011	0.011	0.015
10	0.102	0.058	0.034	0.029	0.069	0.018	0.018	0.023
12	0.081	0.091	0.054	0.046	0.109	0.028	0.029	0.037
14	0.064	0.146	0.087	0.074	0.175	0.045	0.047	0.058
16	0.051	0.230	0.137	0.117	0.276	0.071	0.073	0.092
18	0.040	0.374	0.222	0.190	0.448	0.116	0.119	0.148
20	0.032	0.586	0.357	0.298	0.707	0.185	0.190	0.235
24	0.0201	1.490	0.878	0.7526	1.78	0.464	0.478	0.594
26	0.0159	2.381	1.405	1.204	2.836	0.740	0.760	0.945
30	0.0100	5.984	3.551	3.043	7.169	1.85	1.91	2.38
32	0.0080	9.524	5.599	4.758	11.31	1.96	3.04	3.8
34	0.0063	15.17	8.946	7.66	18.09	4.66	4.82	6.04
36	0.0050	24.08	14.20	12.17	28.76	7.40	7.64	9.6
38	0.0039	38.20	23.35	19.99	45.41	11.6	11.95	15.3
40	0.00315	60.88	37.01	31.64	73.57	18.6	19.3	24.4
44	0.0020	149.6	88.78	76.09	179.2	74.0	76.5	60.2
50	0.0010	598.4	355.1	304.3	716.9	185	191	240
56	0.00049	2408	1420	1217	2816	740	764	1000

Excerpted from Omega Temperature Handbook #28

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