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UNIPRO v3.5
Users Manual

(Version 1 - December 4, 2008)

United PROCESS CONTROLS

AFFILIATED MEMBERS

Furnace Control Corp. | Marathon Monitors Inc. | Process-Electronic | Waukee Engineering Co.

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Part # F200005

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For assistance please contact: Marathon Monitors Inc.
TEL: +1 513 772 1000 • FAX: +1 513 326 7090
Toll-Free North America +1-800-547-1055
erika.leeds@group-upc.com
www.group-upc.com

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Description and Applications

The Marathon Monitors Inc. UNIPRO Controller/Programmer represents the latest technology in microprocessor-based process control instrumentation. Through flexible PID (Proportional, Integral, Digital) control along with programmable features, even the most complex, system can be handled. For a thorough explanation of PID please refer to Zeigler and Nichols; "Optimum Settings for Automatic Controllers", Transactions of ASME, Nov. 1942. Or St. Clair, David W.; Controller Tuning and Control Loop Performance, a Primer; Straight-Line Control Company, Newark, Delaware 1989.

The UNIPRO's control actions are based upon input from a Thermocouple, RTD, Voltage or Current source. The UNIPRO allows Manual, Automatic, or Programmed control of a single loop. Its built-in RS-422 computer interface allows it to be completely supervised by a computer, either on-site or in some remote location within the plant. The Programmer can be used, and is strongly recommended, to allow complete control of temperature or other process cycles.

The following features have been included to allow use of the instrument in a wide variety of applications:

Fully site-configurable for single point control from one of three (3) fully isolated analog input sources, each separately configurable for thermocouple, RTD, voltage, or current.

Powerful process/logic programmer that can store up to two-hundred (200) programs, each consisting of nineteen (19) steps, subroutine calls, test and branch capability, and full access to all instrument parameters.

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Two (2) control output triacs for use in single or dual control mode.

Two (2) fully isolated analog outputs, each separately configurable for voltage or current output.

Two (2) configurable alarm triacs, assignable as process Alarms, deviation alarms, program alarms, or fault alarms.

Four (4) programmer events, assignable in any combination as either inputs or outputs (expandable to 16 I/O with external event boards).

Three (3) communication ports for talking with host computers, controllers, and discrete digital and / or analog event expansion racks.

This manual provides all of the information required to install, operate and maintain the MMI UNIPRO.

The manual is divided into parts: Installation, Setup and Configuration, Operation, Programming, and Maintenance and Troubleshooting. Installation and Setup and Configuration will be used initially to get the instrument into use. Operation and Programming will be used daily. Maintenance and Troubleshooting will be used for servicing the instrument periodically or if trouble occurs.

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Installation

Installation Location

The UNIPRO instrument is designed for 1/8 inch panel mounting in a DIN standard opening of 5.43 inches square (adapter panels available by special order). Required rear clearance is 10.5 inches to allow for wiring. As with all solid state equipment, the controller should be away from excessive heat, humidity, and vibration (refer to specifications). Since the unit uses red LED display devices, avoid placing it in direct sunlight to reduce interference with the display's visibility. The instrument requires 100/120/200/240 VAC (jumper selectable on power interconnect board inside the rear panel) 50/60 Hz. It should not be on the same circuit with other noise-producing equipment such as induction machines, large electrical motors, etc. All instrument wiring must be run separate from all control wiring.

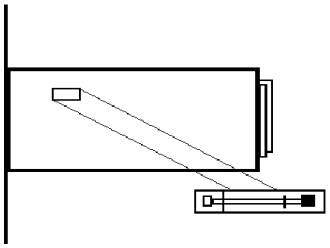
Panel Mounting/Removal

Because the instrument uses a ventilated enclosure, it is not dust-tight and should therefore always be mounted in a sealed control panel. To mount the UNIPRO in a control panel, a hole must be cut 5.43 inches square in the necessary location on the panel. The following procedure should be followed to mount the UNIPRO in the panel.

1. Insert the unit into previously cut out 5.43 inches square hole in the panel.

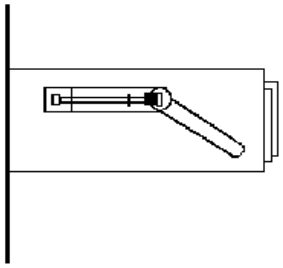
2. While supporting the unit, insert one slotted clamping bracket, with head of the bolt facing to the rear of the unit, into the 0.62 inch by 0.82 inch cutout on the side of the unit.

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3. Repeat step 2 for the opposite side of the unit.

4. With 1/8 inch HEX KEY wrench, alternately tighten bolts on either side of the instrument to a torque of 4 in-lbs. (See warning below). Insure rigidity of mounting.



Warning
To prevent warping of the unit's case, do not over tighten the clamp bolts.

To remove the unit, loosen the side clamping brackets and reverse steps 1 through 3 above.

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Note

On subsequent removals and installations the rear panel can be removed (4 screws) and the wiring does not have to be disturbed.

Warning

All connections, rear panel installations and removals; plus triac board installations and removals must be done with power removed from TBA and TBB. All PC boards should only be removed or installed with power off via the switch mounted on the triac board. Otherwise, serious personal and/or equipment damage can occur.

Thermocouples and other Signal Wires

The wiring used to connect the signal wires to the instrument should be run in a conduit, separate from any AC lines in the area. This provides noise immunity and physical protection. Thermocouples should be wired with the appropriate alloy extension wire with no termination other than at the instrument. As with all cold-junction compensating instruments, extreme care should be used when an existing thermocouple is to be used for both the Controller and another instrument at the same time.

Control Devices

The UNIPRO provides simple ON/OFF as well as Proportional control through its two contact closure Control Outputs (TBA-7, TBB-7, TBA-8, and TBB-8) and two Analog Outputs (TBD-13 through TBD-16). Refer to the Section on Control Modes for more details on the outputs. This allows control through simple ON/OFF devices or through Proportional control methods.

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SIMPLE ON/OFF CONTROL: Set Control Mode for ON/OFF Control. This provides contact closure at Control Output #1 to control absolute heat application/removal for such devices as heating elements, etc.

Three types of Proportional control are:

1. Time-Proportioning: Referring to the modulation of the duty cycle. That is, changing the ratio of On Time versus Off Time in systems that use such devices as heating elements, electronically operated/assisted valves, or servo drives that use analog command signals for control.

2. Position-Proportioning: Referring to the adjustment of a variable positioning device such as a positioning motor with slidewire feedback.

3. Voltage or Current Output Proportioning: An Analog output's (voltage or current) amplitude is varied based on input from rheostats, thermocouples, ammeters, etc. to control heat applications.

The UNIPRO provides many ways to use the above control methods. Setup has details for setting the Control Modes to determine the method to be used. Some typical applications for the Proportioning method are:

1. HIGH/LOW or HEAT COOL heat application system: Set Control Modes for Time-Proportioning. This provides that CONTROL OUTPUT #1 (TBA-7, TBB-7) and CONTROL OUTPUT #2 (TBA-8, TBB-8) are in opposite conditions at either extreme of the control range and are both OFF at the midpoint of the control range.

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2. ANALOG OUTPUT control: Set Control Modes for Time-Proportioning. This provides a 0 to 5 VDC or 4 to 20 mA output which is selectable on the ANALOG OUTPUT BOARD (TBD-13 through TBD-16, see Section 2.14 and Section 8.0 for more details). The output control is based on 0 to 99% of the output device's control range. For example, 50% control would equal 2.5 VDC out where 5 VDC equals maximum heat output of the drive. This can be used with servo drives that require a voltage or current command signal for controlling heat output or servo positioning.

3. POSITIONING MOTOR with SLIDEWIRE FEEDBACK: Set Control Modes for Single Position-Proportioning with slidewire feedback. CONTROL OUTPUT #1 will drive the motor in the open direction, CONTROL OUTPUT #2 in the close direction.

Remember, the above methods are just examples of the typical applications of the UNIPRO. Please call your MMI representative or application engineer for questions concerning your particular system.

Chart Recorders

If a chart recorder is to be used, it must have input specifications within the following ranges:

0 to 4 VDC
0 to 45 mA

corresponding to a FRONT PANEL display of 0-2000. The ideal location of the recorder is adjacent to the instrument but it may be located remotely if the connecting wires are properly shielded. Long wiring runs from the chart recorder outputs may require resistive termination (2 K ohms or so) at the chart recorder input(s) should be isolated from ground.

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Computer Interface

If you wish to take advantage of the UNIPRO's RS-422 digital communications capabilities, refer to "Communications" for more details.

Alarms

Two user-programmable triac alarm contacts are available for connection in appropriately-engineered systems.

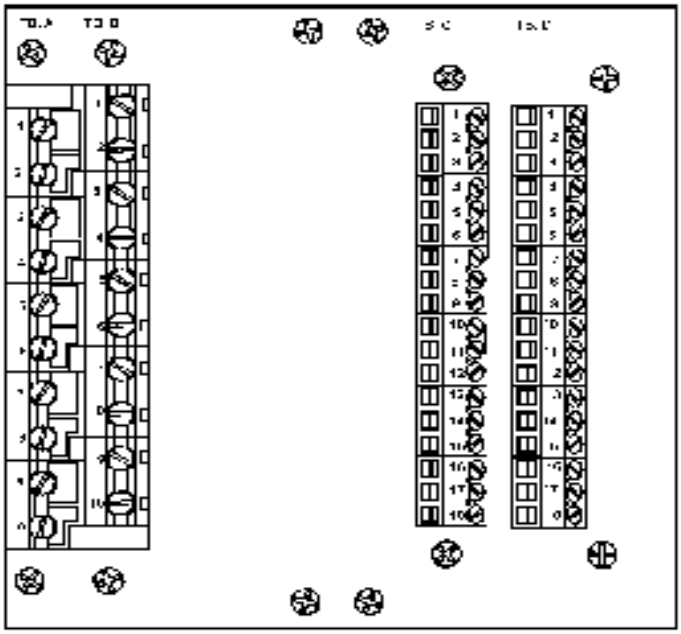
Programmer

The Programmer can run an entire process, depending on how thoroughly the capabilities are set up and used. Refer to "Operation" and "Programming" for further information.

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Electrical Connections

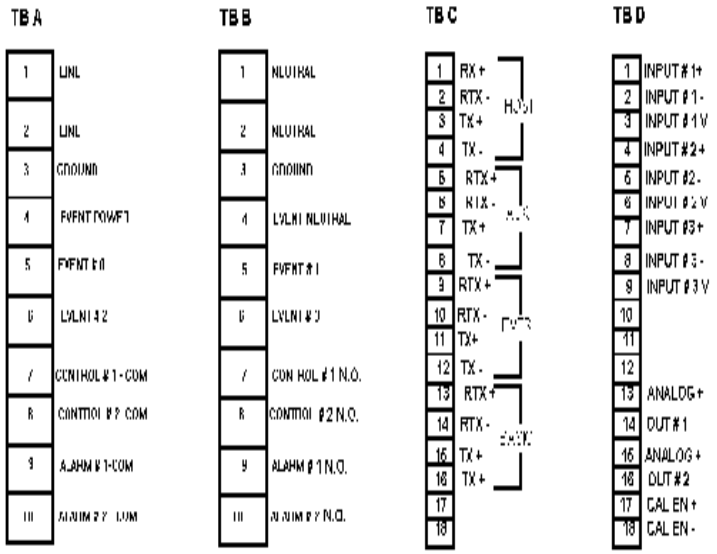
Connections to the unit are made via four terminal blocks, on the rear panel, labeled TBA, TBB, TBC, and TBD. (Position 1 is at the top the position 10 (TBA and TBB) or 18 (TBC and TBD) is at the bottom of the terminal strip.) AC power, event, control, and alarm connections are made on TBA and TBB. All communications are on TBC and all analog I/O signals are on TBD. Refer to the Figure below for a complete layout of the UNIPRO rear panel connections.



UNIPRO Rear Panel

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AC Power



The UNIPRO requires 100/120/200/240 VAC at 1 AMP,

Communications

Three communications busses are at TBC and use RS-422 full or half duplex protocol for all ports. (Refer to "Communications" in Maintenance and Troubleshooting.) Typically, the HOST port will connect to a host computer, the AUXILIARY BUSS to other instruments, and the OPTOMUX PORT to OPTOMUX I/O devices.

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Analog Inputs

The UNIPRO allows for three analog inputs with their individual functions determined by "daughter board" located on the analog input board inside the unit. The standard connection, at TBD, will have the first input as a thermocouple, the second for the oxygen probe, and the third optionally used to input voltage or milliamp signals.

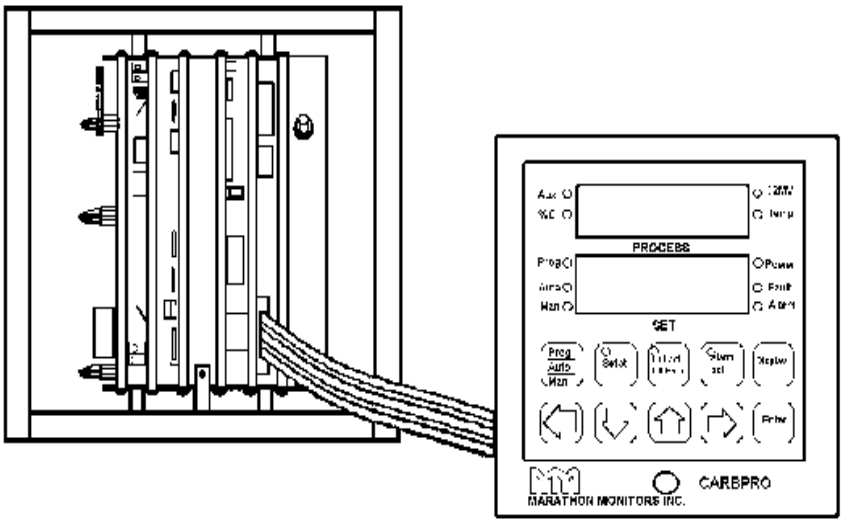
Analog Outputs

Two, separate, isolated analog outputs are provided on TBD and can be selected as 4-20 mV (for maximum accuracy, see Specifications for further details) or 0-10 V output through DIP switch settings on the analog output board. Additionally, outputs can be calibrated by placing a jumper on the two terminals supplied.

DIP Switch Setup

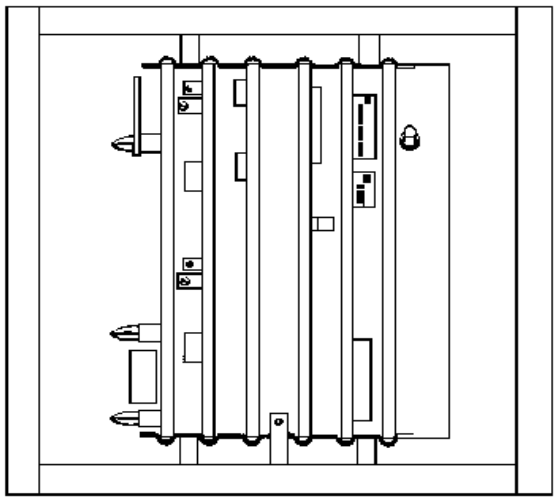
The user may use the UNIPRO in a multi-instrument system by giving the instrument a unique HOST address, specified by using the DIP switches on the Interface Board inside the UNIPRO
To get to the DIP switches, loosen the black knurled knob on the front panel by turning in a counterclockwise direction. Carefully remove the front panel but DO NOT remove the ribbon cable connecting the front panel to the Interface Board. Safely support the front panel near the instrument. Adjust the DIP switches per Section 2.16 for the desired operating mode. When switch adjustment is complete, replace the front panel to prevent contamination.

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Find the appropriate switches by referring to the figure below.



UNIPRO Internal Layout

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DIP Switch Assignments

Bank 0

Switch # Description

1 Unassigned
2 Unassigned
3 Slide wire Deadband (see the following table)
4 Slide wire Deadband (see the following table)
5 Slide wire Deadband (see the following table)
6 Unassigned
7 Unassigned
8 Service (Must be OFF)

Selectable deadband for slidewire feedback control.

Slidewire Dead Band Offset			
offset	Switch 3	Switch 4	Switch 5
0.4%	OFF	OFF	OFF
0.8%	ON	OFF	OFF
1.2%	OFF	ON	OFF
1.6%	ON	ON	OFF
2.0%	OFF	OFF	ON
2.4%	ON	OFF	ON
2.8%	OFF	ON	ON
3.2%	ON	ON	ON

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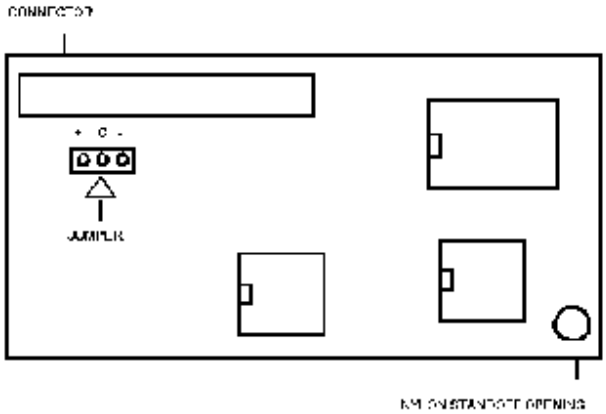
Each UNIPRO in a multiple instrument system must have a unique address for proper communications.

HOST address selection switches:
Bank 1 Address

DEC	HEX	SW1	SW2	SW3	SW4
0	0	OFF	OFF	OFF	OFF
1	1	ON	OFF	OFF	OFF
2	2	OFF	ON	OFF	OFF
3	3	ON	ON	OFF	OFF
4	4	OFF	OFF	ON	OFF
5	5	ON	OFF	ON	OFF
6	6	OFF	ON	ON	OFF
7	7	ON	ON	ON	OFF
8	8	OFF	OFF	OFF	ON
9	9	ON	OFF	OFF	ON
10	A	OFF	ON	OFF	ON
11	B	ON	ON	OFF	ON
12	C	OFF	OFF	ON	ON
13	D	ON	OFF	ON	ON
14	E	OFF	ON	ON	ON
15	F	ON	ON	ON	ON

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Thermocouple Burnout Jumper Selection



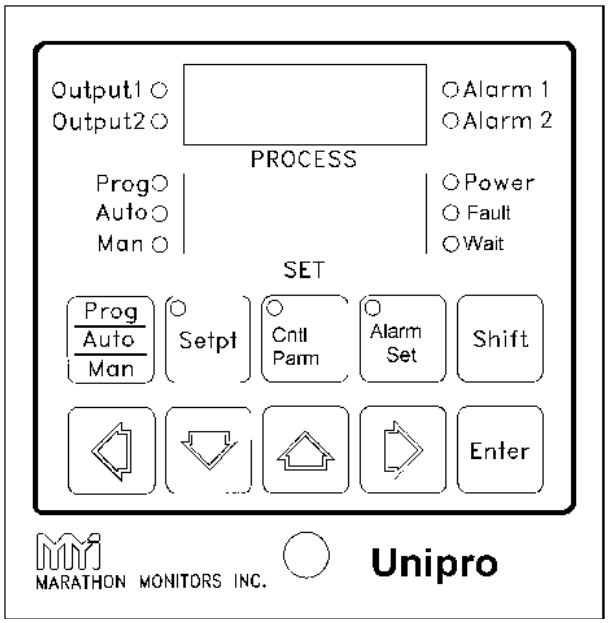
The thermocouple jumper selects either a full upscale or a full down scale reaction to take place when a thermocouple fails or becomes open. The jumper can be found on the thermocouple board, and has two possible settings (see Figure). For full scale upwards, place the jumper from the + to the C, and for full scale downwards, place the jumper from the - to the C.

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Setup And Configuration

Front Panel

The front panel of the UNIPRO consists of three main parts, two display windows and a keyboard. Refer to the figure shown below for a layout of the front panel. The display windows each contain four 14-segment digits that are used to display helpful messages and numerical parameter values.



PROCESS Display

This 4 digit 14-segment display provides the value of the current process value, along with messages for ease of operator use when setting up parameters. The PROCESS window displays the step number and OPCODE when in the Program Editor.

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SET Display

This 4 digit 14-segment display provides the value of the process setpoint value during Auto and Program operation. In Manual mode the Time-Proportioning % Output value is displayed. During operator input procedures this display shows the data being entered. The SET window displays the corresponding data for the OPCODES displayed in the PROCESS window when in the Program Editor.

LEDs

Several small LEDs indicate operations and functions of the UNIPRO. Ten are on the face and three are in the keys.

Output 1	indicates when the Output 1 Control relay is closed.
Output 2	indicates when the Output 2 Control relay is closed.
Alarm 1	indicates when the process value has closed the relay based upon trip point and type of alarm.
Alarm 2	indicates when the process value has closed the relay based upon the trip point and type of alarm. Also, if Switch 6, Bank 1 is ON the LED indicates the closed control output relay.
Prog	indicates that a program is running and Automatic control is activated. If flashing, the program is in HOLD. Refer to the section "The Programmer".
Auto	indicates that the UNIPRO is in Automatic control mode. If flashing, a program is in HOLD.
Manual	indicates that no control action is being executed by the UNIPRO. If flashing, a program is in HOLD.

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Power	indicates that the UNIPRO's 5 volt power supply is functioning.
Fault	indicates that an open circuit is detected at the signal input.
Wait	indicates that the Programmer is waiting for some condition to be satisfied before continuing.
Setpt	indicates that the Setpt Enter mode has been selected.
Cntrl Parm	indicates that the Control Parameter Enter mode has been selected.
Alarm Set	indicates that the Alarm Setup mode has been selected or one or both alarm values are non-zero.

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Keyboard

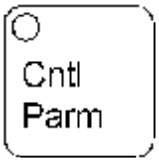
The UNIPRO keyboard consists of ten keys for operating and programming the instrument. There are no "hidden" keys on the UNIPRO keyboard.

Various operations with the UNIPRO involve dual-key operations using the [Shift] key in the same way a shift key on a typewriter is used. When activating a dual-key assignment do not try to press both keys simultaneously; rather, follow the sequence below:

1. Press and hold the[Shift] key,
2. Press and release the second key,
3. Release the [Shift] key.

KEY	DESCRIPTION
	This key selects the operating mode of the UNIPRO. The mode selected is indicated by the illuminated LED.
	This key selects the Setpoint Enter mode where the Setpoint, Setpoint Offset and Reference Number can be accessed and altered. When used in the dual-key operation Shift/Setpt it allows the operator to pull any program into the edit space or decrease the remaining time of a program step if a program is currently running.

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This key selects the Control Parameter Enter mode where the Proportional Band, Reset, Rate, Cycle Time and Percent Output values (if in solenoid mode) can be accessed and altered. When used in the dual-key operation Shift/Cntrl Parm it selects the keyboard Lock Level change mode.

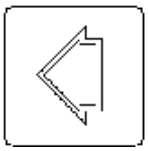


This key selects the Alarm Setup mode where the Alarm 1 and Alarm 2 conditions can be accessed and altered or Alarm 2 can be used to determine setpoint for auxiliary control loop. When used in the dual-key operation Shift/Alarm Set it selects the Thermocouple Type, Custom Features, and Events Partition. After Shift/Alarm Set the Thermocouple Type is initially displayed, if Enter is pressed the Custom Feature option is available while the second press of Enter allows the Events Partition to be observed and altered if necessary.



This key has no function by itself. The function of the Shift key is for all dual-key operations, Security Sequence and the start-up sequences.

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This key is usually used to select which digit is to be modified in a data entry mode. In Manual mode this key will cause the control output to go to the full reverse control direction while the value is displayed in the SET window. In Automatic mode pressing "left arrow" causes the % on-time valve position to be displayed in the SET window. (positive-Output 1, negative-Output 2). In the Programmer Status Display it causes the display to move to a new page.**

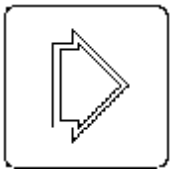


This key is usually used to decrease the value of a digit in the data entry mode or scroll through various parameter sequences. In Manual mode this key will cause the control action to move toward the Output 2 direction. When used in the dual-key operation Shift/"down arrow" it accesses the Programmer Status Display.



This key is usually used to increase the value of a digit in the data entry mode or scroll through various parameter sequences. In Manual mode this key will cause the control action to move in the Output 1 direction. When used in the dual-key operation Shift/"up arrow" an LED test is activated, where every segment and decimal point should light in both displays. If any segment or decimal point does not light a keyboard problem may exist, contact a qualified MMI representative.

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This key is usually used to select which digit is to be modified in a data entry mode. In Manual mode this key will cause the control output to go to the full Output 1 direction. In the Programmer Status Display mode it causes the display to move to a new page.



This key is used to enter data, clear alarms, or cancel programs.

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[Control Parameter]Setup Menu

MENU CON	MENU IN P	MENU A OUT	MENU COM	MEUN PROG	MENU EVTS
pb xxxx	in a xxxx	aol xxxx	host xxxx	auto xxx	ext xxx
res xxxx	cjca xxxx	aolo xxxx	auxm xxxx	aps xxx	evbd xxxx
rate xxxx	iaof xxxx	aolr xxxx	aux xxx	asev xxx	ep1 xx
cyc xxxxx	iasp xxxx	ao2 xxxx	Ssoa xxx	Lock pswd	epxa xx
hipo xxxx	iadp xxxx	ao2o xxxx	sso1 xxxx	lock X	lina xxxx
lopo xxxx	Inb *	Ao2r xxxx	: :		
ldln xxxx	inC *		sso8 xxx		
conv xxxx	Tc °X				
Cm xxx					
setp xxxx					

notes:

* full sequence of “IN A” repeats for inputs B and C.

: the screen repeats for numbers 0 - 8 decimal and hex and hex numbers 9 - f. This indicates that the repeating screens have been left out between the first and last numbers.

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Control Parameter Key Menu Selections

The following shows the order of configuration options set from the [Cntl Parm] key and their range of values. Press [ENTER] to go forward to the next option, or [Shift] to back up to a previous option. The arrow keys are used to change the option within its limits see the keys portion of this section for a complete description of how they are used. Pressing [Cntl Parm] at any time will exit from this option setup sequence.

Note
Options are saved as they are changed.

CON menu

Process display	Set display options	Description
Pb	0 to 9999	Proportional band
rEs	0 to 99.99	Reset
rAt	0 to 9.99	Rate
C4C	1 to 250	Cycle time in seconds
HIPO	0 to 100	High limit on percent output
LOPO	-100 to 100	Low limit on percent output
LdLn	-100 to 100	Load Line

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CON menu Continued...

Process display	Set display	Description
Cm	xxx XXX= X__ = D or R for direct or reverse. _XX = tp for time proportioning. tc for time proportioning with compliment td for time proportioning dual ms for motor with slide wire feedback of for OFF / ON control oc for OFF / ON with compliment od for OFF / ON dual pp for position proportioning	Control mode
SETP	LOC, IN C	Setpoint source; local or input C

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INP menu

Input A, B, or C values and actions are programmed from this menu. Display choices shown are for input A. The other input choices follow through the same cycle. Exceptions are noted in the table. Thermocouple degree choices for temperature display come at the end of the full menu cycle.

Process display	Set display choices	Description
INA	LIN, Tc, Off, Prog	Linearization for input A: LIN for linear Tc ? For thermocouple type * Off Prog for Programmed.

Input C has three more choices L 30, L50, and L100.

CJCA	YES, NO	Cold junction compensation active for input A
IAOF	-999 to 9999	Input A offset for program mode
IASP	-999 to 999	Input A span value for program mode
IADP	0 to 3	Input A displayed decimal point location for program mode.
tC	deg F, deg C	Temperature display units

Notes:

* thermocouple types are found in the specifications. Values and types are also found in Maintenance and Troubleshooting.

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AOUT menu

Process display	Set display options	Description
AO1	PO, IN B, P 20, P 21, REFN, PROG, TEMP, AUX	Analog output 1 source *
AO1O	-999 to 9999	Analog output 1 offset
AO1r	0 to 9999	Analog output 1 range

Analog out put 2 choices are the same menu items repeated.

*Analog output source 1 menu items:

PO = percent output
IN B = input B
P 20 & P 21 are specialized parameter settings. Check with your programmer before entering data.
REFN = the reference number
PROG = the program
TEMP = temperature
AUX =Auxiliary output

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COM menu

Process display	Set display	Description
HOST	H or F, E or N	Host communications setup and 0 to 3
AUXM	TEM or UDC	Aux communications port mode; MMI 10Pro or Honeywell UDC3000
AUX	H or F, E or N	Aux communications setup and 0 to 3
SSOA	NO, YES	Slave setpoint offset active
SSOn	-500 to 500	Slave temperature controller setpoint offset The UNIPRO can transfer 7 slave temperatures and have an offset for each. Address 1 is the original UNIPRO.

Notes:
communications choices for the UNIPRO are:
H = Half
or
F = full duplex
E = even
or
N = no parity

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BAUD rate code
0 = 1200
1 = 4800
2 = 9600
3 = 19.2k

PROG menu

Process display	Set display	Description
AUTO	NO, YES	Auto start-up
APS	NO, YES	Auto program start
ASEV	NO, YES	Asynchronous event
LOCK	0 to 3	Lock level The most accessible level is 3, the least is 0. To set a password See below.

Password Entry
The password can be entered by pressing the Dual-key sequence [Shift] + [Cntl. Parm] keys. Any order of keys, except for the [Shift] or [ENTER] key, can be entered as a password, up to nine keys maximum. Press [ENTER] to save the password. The number in the set display will count the number of keys entered. Pressing [ENTER] without pressing any other key (i.e. set display=0) will clear the password. So to have no password the sequence [Shift] + [Cntl Parm], [Enter], [Enter] ,[Enter] must be pressed.

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EVTS menu

Process display	Set display options	Description
EXT	NO, YES	External event boards active
EVBD	1200, 4800	Events communications baud rate
EPI	0 to 4	Events partition internal
EPXA	0 to 16	External analog board partition ? Where ? is 0,1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F Representing modules 0 through 15 respectively.
LINA	XXX	External analog board Module linearization. Where XXX = lin, prog, n/a or thermocouple type and value *

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All thermocouple displays have TC X format where X = thermocouple type. See the list below

Thermocouple list:

Display	T/c Type
	B
	C
	E
	J
	K
	N
	NM
	R
	S
	T

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[Alarm Set] key

The [Alarm Set] key also sets some parameters. Its menu is limited to alarm functions. Again [Enter] and [Shift] move forward or back through the selections while setting up, [arrow] keys change values and [Alarm Set] exits. All values are saved as they are changed.

Alarm Set key

Process display	Set display options	Description
AL1M	See notes	Alarm 1 mode. Selects which variable, type of alarm, and whether direct or reverse acting. See notes below.
AL1V	-999 to 9999	Alarm 1 value. Decimal point is automatically set based on control variable and type of alarm.
A1TN	0 to 250	Alarm 1 turn on delay time in seconds.
A1TF	0 to 250	Alarm 1 turn off delay time in seconds.

At this point, if there is no need for ALARM 2 to be set, press [Alarm Set] to exit alarm parameters.

If ALARM 2 does need to be set, press [Enter]. Use the information starting at the top of the table for ALARM 1. The process display will change only from a 1 to a 2. All other information in the table remains accurate for ALARM 2.

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Notes:
Variable Description
D This is DIRECT operation for alarm actuation (i.e. the contact is normally open until it reaches the trigger limit specified in the ALARM VALUE then the contact closes).

R REVERSE operation (opposite of NORMAL) for ALARM actuation (i.e. the alarm contact is normally closed until it reaches the trigger limit specified in the ALARM VALUE then the contact opens).

IN B Alarm actuation is based on the analog signal at Input B inputs exceeding the limit in the Alarm Value. Input B inputs is physically located at TBD-4, TBD-5, and TBD-6 on the unit's rear connectors.

AUX Alarm actuation is based on the analog signal at Input C exceeding the limit in the ALARM VALUE. Input C is physically located at TBD-7, TBD-8, and TBD-9 on the unit's rear conductors.

BND Alarm actuation uses BAND WIDTH control above and below a programmed setpoint limit. (i.e. If the band is set by the ALARM VALUE to 0.10 and the programmed setpoint is at 0.80, the alarm will trigger at 0.90 and 0.70.)

DEV Alarm actuation uses DEVIATION control above or below the programmed setpoint. The + and - symbols determine if the deviation is allowed or if it is above (+) the programmed setpoint or below (-) it. (i.e. If deviation of 0.10 is placed in the ALARM VALUE and 0.80 is the programmed SETPOINT the alarm will trigger at 0.90 or 0.70, for -0.10.)

FLT An input FAULT, or a program alarm is to be used as basis for the actuation. The ALARM VALUE is ignored.

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PRG An Internal program will actuate the alarm.

PO Alarm actuation is based on the PERCENT OUTPUT exceeding the limit in the ALARM VALUE .

PV PROCESS control mode. Alarm actuation is based on the PROCESS VARIABLE exceeding the limit in the ALARM VALUE.

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[SETPT] key

Parameter entry under the [Setpt] key is the same procedure as under the other two keys controlling parameters. [Enter] moves forward [Shift] moves back and [arrow] keys change the values in a parameter. [Setpt] exits and values are saved when changed.

Setpt key

Process display	Set display options	Description
STPT	-999 to 9999	Control loop setpoint. The location of the setpoint will be automatically set based on the control loop process variable.
REF	0 to 9999	Reference number.
NUM	-999 to 9999	Operator input which can be accessed by the host computer system.

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OPERATION

Once installation and setup and configuration are complete, the day to day operation needs of the UNIPRO depend upon the application. The basics are found in the Quick Reference Guide.

To Respond to Alarm Messages:

Note the alarm and determine what caused the alarm.
Press [ENTER] once to deactivate (silence) alarm relay contact and continue program execution.
After acknowledging the alarm, one of the following actions may be appropriate:
Abort the program by pressing the [Prog/Auto/Man] key.
In the case of a timed-out LIMIT statement (message #93), it is normally desirable to continue the program by re-executing the offending LIMIT statement to be sure it is satisfied. This is done automatically when the [ENTER] key is pressed to acknowledge the alarm. If you do not want to re-execute the LIMIT statement, pressing the [SETPT] key will cause the LIMIT statement to be skipped and the program to continue to the next STEP.
Correct the problem or do what the programmed alarm indicates: see “Maintenance and Troubleshooting”: the alarm messages for complete information on programmed alarms. Then press [Enter] to continue the program.
If any alarm is only to be acknowledged and the operation is to continue, press [ENTER] to silence the alarm and then press [SETPT] to skip to the next operation.

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SETPOINT and the Reference Number

[SETPT] is used to enter the setpoint, the Reference Number, and the Operator Inputs. The first press of [SETPT] will allow the arrow keys to adjust the value of the setpoint. Use the [LEFT ARROW] or [RIGHT ARROW] keys to select the character to be altered. Once the character to be changed is flashing, use the [UP ARROW] or [DOWN ARROW] keys to select the desired number or symbol. After all characters are as desired, press [ENTER] to place the value in nonvolatile memory and to continue paging through the parameters. Pressing [ENTER] again allows the Reference Number to be changed. Pressing [SHIFT] at any time allows the operator to "back up"to the to the step before [ENTER] was pressed. An additional press of [ENTER] allows the operator Input to be changed. Anytime during the setting of values [SETPT] may be pressed to save the value and exit.
All the parameters in this group have a lock level of 3.

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SETPOINT Parameters

Display	Parameters	Description
Stpt	Setpoint	The SET display window line represents the basic parameter for the Control Loop that the process needs.
REF	Reference Number	Assigns a number to a program for future reference. These numbers can range from 0 to 9999.
NUM	Operator Input	SET display window line = -999 to 9999. Allows the operator to enter information that may be needed by a program. This input may be used similarly to the reference number.

PROG/AUTO/MAN

The Operation Mode for control of programs is selected by the [Prog/Auto/Man] key. Pressing this key allows access to the operation mode selection controls. The first selection, after pressing [Prog/Auto/Man], allows for control of the program to be entered. The key presses that follow it depend upon the state of the program. If a program is not running see "Running A Program" below. Anytime during the selection process [Prog/Auto/Man] may be pressed to exit the selection process. All of the parameters under this key have a Lock Level of 3.

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MANual Mode

In Manual mode the process variable is displayed in the PROCESS display, the SET display shows the appropriate control value, and no control action is computed. The arrow keys can also be used to activate the control output.

Either the percent ON time (time-proportion) or valve position (position proportion) is displayed in the SET window. For single control mode operation this number is always positive (0/50/100). The [UP ARROW] and the [DOWN ARROW] keys increase or decrease the percent ON time or the valve position toward its fully opened or closed positions by approximately 1%. This continues for as long as the key is pressed. The [RIGHT ARROW] and [LEFT ARROW] keys force the CONTROL OUTPUTs to increase or decrease the percent output by approximately 10%.

AUTOmatic Mode

In Automatic Mode the process variable is displayed in the PROCESS display, the SETPOINT is displayed in the SET display, and control action is computed based upon the PID parameters and the input(s). Pressing and holding the [LEFT ARROW] key will cause the SET display to show the control action as described previously in "Manual Mode."

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PROGRAM OPERATIONS

Running a Program

1. Press [PROG/AUTO/MAN] until the instrument's Prog LED lights.
2. The Program Number is displayed in the SET display, select the program to be run using the arrow keys.

OPTIONAL: If beginning at a step other than 1 Repeatedly press the [SHIFT] key to select the step upon which the program should start. The step number will appear in the PROCESS display.

4. Press [ENTER] to run the program.

If the Program Number in the SET display begins to flash, there is something wrong with the program (i.e. memory disruption, wrong command, etc.). Press the [PROG/AUTO/MAN] key to escape, or select a new program using the arrow keys. Troubleshoot the program and then restart this procedure.

Stopping a Program

Press [PROG/AUTO/MAN] UNTIL either the Auto or Man LEDs begin to flash, indicating a program is in HOLD. Press [ENTER] to cancel the program (flashing will stop).

OR

Press the [PROG/AUTO/ MAN] key until the Auto or Man LED is flashing, indicating a program is in HOLD. Return to the program mode by pressing [PROG/AUTO/MAN] and the PROCESS window will display the word HOLd. The SET window indicates the program number that is in hold. Press any of the arrow keys to cancel the program. The hold symbol will be replaced by the run symbol.

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Placing a Program in HOLD

Press [PROG/AUTO/MAN] UNTIL the instrument is in either Auto or Man mode as indicated by the LEDs. The flashing LED signifies the program is in HOLD.

OR

Press [SHIFT]+[LEFT ARROW].

Note

If the instrument is in Manual mode and a program is in HOLD, no automatic control is taking place.

If the instrument is in Automatic mode and a program is in HOLD, automatic control is continuing.

Restarting a Program From HOLD

Press [PROG/AUTO/MAN] UNTIL the instrument is in Programmer mode as indicated by the Prog LED. The LED should be flashing signifying a program is in HOLD.

OR

Press [SHIFT] +[LEFT ARROW].

Do not alter the program number, otherwise, the program will start from the first step and not where it had left off.

Press [ENTER] and the program will continue executing with the step where the HOLD was initiated.

To Enter Program Editor*

1. Press Shift/Setpt
2. Select the program to be edited using the "arrow keys"(Edit / 0001)
3. Press Enter

* Note that the unit will allow editing of a program that might be running. This editing will not affect the currently-running copy of this program until the program is actually restarted, either manually or by a program jump.

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To Edit Program Steps

Use the [LEFT ARROW] and [RIGHT ARROW] keys to select digits to be changed (either the OPCODE or the data)
Use the [UP ARROW] and [DOWN ARROW] keys to change the selected digit
3. Press [ENTER] to move forward to the next step, or
4. Press [Shift] to move backward to the previous step

If at any point the program does not advance or back up, and the entire SET display starts flashing, the data in the SET display is invalid for the OPCODE shown. Use the [arrow keys] to enter the correct data and then press [ENTER].

To Insert A Step

Go to the step of the desired insertion, using either the [ENTER] or [Shift] keys
2. Press [Control Parm]
3. Enter the new step, OPCODE and data
4. Press [ENTER]

To Delete A Step

1. Go to the step to be deleted, using either[Enter] or [Shift]
2. Press [Alarm Set]

To Exit the Editor Without Saving the Program

1. Press [Setpt]at any time, the edited program is lost (the copy in non-volatile memory is unchanged)

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To Exit the Editor Saving the Program

1. Edit through step 19 as required, inserting NOP's wherever no operation is to be executed
2. Press [ENTER]
3. Select the program number in the SET display using the [arrow keys] until the desired program number is being displayed (SAVE / 0000)
4. Press [ENTER], the program stored in that location previously is now lost (SAVE / Done)

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CHANGING PARAMETERS

All of the UNIPRO parameters, program numbers, OPCODES, and data values can be altered using the following procedure:
Press [Pr. Fact. / Ctrl. Param.]. The word MENU will appear in the PROCESS window. The Parameter group will appear in the SET window. Press [ENTER]. The symbol for the parameter is displayed in the PROCESS window while the current alterable data is shown in the SET window. The flashing character is the one that can be altered.
Use the [LEFT ARROW] or [RIGHT ARROW] keys to select the character to be altered.
Once the character to be changed is flashing, use the [UP ARROW] or [DOWN ARROW] keys to select the desired number or symbol.
After all characters are as wanted, press the [ALARM SET] key to place the value in memory and exit,
or
press [ENTER] to save the value and continue (forward) editing other parameters,
or
[SHIFT] to save the value and continue (back) editing other parameters.

NOTE

If an entered number value is not within the acceptable data range, the maximum/minimum value will flash in the SET display. Repeat the above procedure until an acceptable value has been entered.

See “Setup and Configuration” for the Menu table and parameter definitions. The Alarms are also found there.

VIEWING A PROGRAM WHILE IT IS RUNNING
See “Status Display Page” in Maintenance and Troubleshooting

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Programmer Operations

Introduction to Programming Techniques

The UNIPRO Programmer uses a step/OPCODE approach rather than a segment approach.
The advantages of using OPCODES (operation code) are:
1) only what is to be changed is entered,
2) features can be added to older instruments, and
3) less information needs to be saved for each step therefore more programs can be stored.
The step approach is very similar to what an operator would do if he were manually controlling the process.

Some of the features in the OPCODEs may not be obvious as to how they would be used until more experience is gained. However, with a little practice and experimentation the Programmer can soon be mastered.

Each program in the UNIPRO consists of nineteen steps (one OPCODE per step). Some OPCODEs allow programs to be linked together. The UNIPRO can store up to 200 programs in non-volatile memory.

Description of OPCODEs

The following "alphabet" lists all of the available OPCODEs for the UNIPRO Programmer.

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Programmer Alphabet

MNEMONIC/ OPCODE	DATA	DESCRIPTION
ALARM A	0001-0079 80-83*	MESSAGE # Sound and display alarm to summon operator and convey a message
BRAN b	0000-0019	Specifies an "if true" and "if false" step number to jump to based upon the previous condition (b TT.FF). BRAN 0 branches out of the program.
AUXCN C	0-4000	Set Alarm 2 Setpoint value if Switch 7, Bank 1 is ON. If Switch 7, Bank 1 is OFF, interpreted as NOP.
ADREF d	-128 to 127	Add to reference number.

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Programmer Alphabet Continued...

MNEMONIC/ OPCODE	DATA	DESCRIPTION
EVENT E	1.0-15.1	Turns an output ON/OFF or waits for an input condition. The Programmer waits for an acknowledgment that the change has occurred before advancing to the next step. (.0 for OFF; .1 for ON)
GOSUB G	0-201	Allows one program to execute another program and then continue. Any program can be called a subroutine as long as it does not call another subroutine. When a subroutine ends, the calling program is reloaded and restarted at the step following the G OPCODE. A GOSUB 201 will cause a program to be called whose number is equal to the reference no.

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Programmer Alphabet Continued...

MNEMONIC/ OPCODE	DATA	DESCRIPTION
TEMPS H	0-4000	Set the temperature Setpoint.
TEMPI h	0-4000	Check to see if the temperature is above specified value.
DELAY I	2-250 sec	Insert a short delay in seconds.
JUMP J	0-201	Jump to another program and continue executing at the new program. The Programmer never returns to the program with the J OPCODE unless called with the G OPCODE. A JUMP 0000 will reload and execute the currently running program.

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Programmer Alphabet Continued...

MNEMONIC/ OPCODE	DATA	DESCRIPTION
LIMIT L	.05-40.00 hrs	Limit the amount of time the Programmer should wait for something to happen before sounding an alarm. The L OPCODE performs no operation by itself, it only performs a function when used with another OPCODE. The data in a LIMIT statement may also be interpreted as Temperature. (Refer to "Effect of Limit Statement")
REF#S n	0-255	Set the reference number.
OUTPUT O	0000 to 0255	Set a value to be used for the selected Analog Output (XXXX).
OXINQ o	000.0 to 100.0	Test input b.

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Programmer Alphabet Continued...

MNEMONIC/ OPCODE	DATA	DESCRIPTION
PID P	0-999	Allows the Proportional Band to be altered by the Programmer. It is used in conjunction with = OPCODE.*
REF#I Q	0-4000	Test to see if the reference number is above the specified value.
RAMP r	.05-40.00 hrs	Specifies the time (.05-40 hours) to ramp from the current temperature Setpoint to the new temperature Setpoint. Must be followed by an H OPCODE.
SOAK S	.05-40.00 hrs.	Soak for a specified period of time.

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Programmer Alphabet Continued...

MNEMONIC/ OPCODE	DATA	DESCRIPTION
TIMEST	0-40.00 hrs	Set the master timer to the specified value for count down. If the set value is 0, the timer will count up to a maximum of 99.99 hours and HOLD.
TIMEIt	0-40.00 hrs	Check to see if the t timer is above the specified value.
UNTILu	-99 to 99	Causes the Programmer to wait until the percent output reaches the specified value. This OPCODE is used when it is desired to know when a load is up to temperature. Since the percent output needed to maintain the furnace at a given temperature can be determined, the load will be up to temperature when the percent output returns to that value.

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Programmer Alphabet Continued...

MNEMONIC/ OPCODE	DATA	DESCRIPTION
AUXIY	0000 to 4000	Check to see if the auxiliary input is above the specified value.
PIDEQ=	0-99.99	Allows the Reset, Rate, LOPO and HIPO parameters to be changed by the Programmer. * Only if preceded by P OPCODE.
NOP -	0000	No operation. (Data is forced to 0)

* Refer to NOTE at the end of this section for further information.

Note:
The P and = OPCODEs are used together as shown in the following example which enters values for the Pb=150, Reset=.3, Rate=.05, LOPO=20 and HIPO=95

01	P	0150	Pb=150
02	=	0030	Reset=.30
03	=	0005	Rate=.05
04	=	0020	Minimum %Output=20%*
05	=	0095	Maximum %Output=95%*
06	=	0016	Cycle Time=16

* When altering the above parameters, note that no decimal point appears.

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Note:
The execution of a JUMP or a GOSUB statement always loads the program into working memory whereas an unconditional BRANCH statement does not reload the program.
Note that the Programmer counts time in hours, tenths of hours (=6 minutes) and hundredths of hours (=36 seconds) rather that in hours, minutes, and seconds.

Symbol Table of OPCODEs

DISPLAY SYMBOL	PROGRAMMER OPCODE
	**A-ALARM**
	**b-BRAN**
	**C-AUXCN**
	**d-ADREF**
	**E-EVENT**
	**F-FSOAK**
	**G-GOSUB**
	**H-TEMPS**
	**h-TEMPI**
	**I-DELAY**
	**J-JUMP**
	**L-LIMIT**

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Symbol Table of OPCODEs Continued....

DISPLAY SYMBOL	PROGRAMMER OPCODE
	n-REF#S
	O-OUTPUT
	o-OXINQ
	P-PID
	q-REF#I
	r-RAMP
	S-SOAK
	T-TIMES
	t-TIMEI
	U-TOUTI
	Y-AUXI
	=-PIDEQ
	--NOP

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Limit Statements

There are various ways to force a program to wait for something to happen. Although it may seem that the specified condition should be easily satisfied, it is still wise to put realistic time limits on how long the wait should be.
The following chart summarizes the effect the LIMIT statement has on each OPCODE.

Effect of Limit Statement on OPCODES

OPCODE	Effect of Limit Statement
A	Effective with alarm codes 80 and 81. An 80 or 81 -- limit statement sets deviation band in degrees, decimal point is ignored (i.e. 1.00 is 100 degrees)
b	No Effect*
C	No Effect*
d	No Effect*
E	No effect on event output. On event input, sets the maximum amount of time to wait for that event to occur. An alarm 93 is displayed or sounded.**
G	No Effect*
H	Forces a wait and sets the maximum amount of time to wait for the temperature to reach setpoint +10 F(+5 C).**
h	Sets maximum time to wait for a condition to be met.**
I	No Effect*
J	No Effect*
L	No Effect*
n	No Effect*
•	Sets the maximum time to wait for a condition to be met.*
P	No Effect*
q	No Effect*
r	ILLEGAL! An r OPCODE must always be

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	followed by an H OPCODE.
S	No Effect*
T	No Effect*
t	Sets maximum time to wait for a condition to be met.**
U	Sets maximum time to wait for a condition to be met.**
Y	Sets the maximum time allowed to wait for a condition to be met.*
=	No Effect*
-	No Effect*

* When a LIMIT statement follows this OPCODE it is interpreted as a NOP.

** An alarm 93 is displayed and/or sounded only if the limit statement is not followed by a branch. If the condition is not met by the time listed in the data statement, the unit will display and/or sound an Alarm #93. If the alarm need only be acknowledged and operation is to continue, press Enter once to silence the alarm and then press Setpt to skip the LIMIT OPCODE and resume operation.

The operation of a limit statement after the following OPCODEs is described in more detail below:

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E (EVENT) (INPUT) - A limit statement here will cause the program to wait for the specified event INPUT (normally event numbers 8-15) to switch to the specified state (ON OR OFF, 1 OR 0), before proceeding. If this does not occur within the specified limit time, a limit time-out alarm will occur.

Note: The event INPUT must be held in the trip state for at least 30 seconds to make sure that the Programmer will acknowledge it. Thus, a momentary push button could not be used as an event INPUT unless some type of latching scheme is employed. If a limit statement is not used, the program may wait indefinitely.

H (TEMPS) A limit statement here will cause the program to wait for the measured temperature to come to within +10 F (or +10 C) of the specified Setpoint. If this does not occur within the specified limit time, a limit time-out alarm will occur. If no limit statement is used, the Programmer simply sets the specified Setpoint and goes on to the next step. The maximum time that a limit statement will accept is 40 hours. Use the Programmer Status Display during a wait operation to reveal the time left before a limit time-out alarm will occur.

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Branch Statements

Branch statements are best utilized when placed after inquiry statements. If neither a branch nor a limit statement is placed after an inquiry the Programmer will sit at the inquiry line indefinitely. A branch statement can immediately follow an inquiry or it can placed after the limit statement, for example:

INQUIRY	**or**	**INQUIRY**
BRANCH		**LIMIT**
		BRANCH

The effect of a branch after an inquiry is to jump to a specific line in the program based upon the outcome of the inquiry. The format of the branch OPCODE is b TT.FF; therefore if the outcome is true the program jumps to the step number listed first. Whereas , if the outcome is false, the program jumps to the second step.

A limit statement between an inquiry and a branch just sets a definite time to wait for the inquiry to become true. It has no effect on the outcome of the inquiry or where the program branches to. It only effects the length of the time delay.

If a branch statement is not preceded by an inquiry, or any conditional statement, the branch is automatically assumed TRUE.

An unconditional branch is one in which the steps specified for true and false are the same. An unconditional branch to step 1 (b 01.01) will cause a program to loop back to the beginning of the program every time the above statement is encountered. The difference between a b 01.01 and a J 0000 is that the jump reloads the program and would therefore pick up any changes edited into the program after it was initially started.

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Writing and Editing a Program

Writing

Before a program can ever be written into the UNIPRO, the author must understand and perform the following process:

1. Determine what the program is to do,
2. Write, revise, and rewrite an algorithm (program in words) until part 1 works,
3. Construct the program for the UNIPRO using the OPCODEs listed in "Programmer Alphabet".

The Programmer Editor can be used to create a new program or modify an already existing program. While in Program Edit mode, the unit continues to control the furnace (as long as the Auto LED is on), and a running program continues if the program LED is on.

The Editor Mode:

To get the unit into the editor mode, perform the dual-key operation [Shift][Setpt.] The PROCESS window will have the message EDIT displayed and the SET window will have a XXXX displayed signifying the program number to be edited. At this point any of the 200 programs can be called into the edit space using the arrow keys to change the necessary digits. That is, the [left arrow] or [right arrow] keys can be used to select the digit to be changed and the [up arrow] or [down arrow] keys can be used to select 0 through 9.
Next, press the [Enter] key once more to begin entering or modifying the program. The PROCESS display will show step 01. The OPCODE character is also displayed in the PROCESS display while the SET display will show the DATA line in various formats depending on the OPCODE character. To advance through each step of the program use the [Enter] key; to move backwards in the program use the [Shift] key.

At any point, a step can be inserted or deleted. To insert a step, press Control Parm, this forces the OPCODE at step 19 to be lost and a

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-(NOP) will appear. To delete a step, press [Alarm Set key], this causes a - NOP to be pulled in at step 19.

Use the [left arrow] or [right arrow] keys to determine whether the OPCODE or DATA is to be changed. If a data character is flashing move left or right in the data by using the arrows. If the OPCODE needs to flash press the [left arrow] until the OPCODE character flashes the [right arrow] does not allow access to the OPCODE. If the OPCODE is to be changed, the [up arrow] or [down arrow] keys can be used to scroll through the OPCODES alphabetically. If either the "up arrow" or "down arrow" keys are held down, the OPCODEs will automatically be displayed with each flash of the display. When entering data, the "up arrow" and "down arrow" keys can be used to select 0 through 9 (or negative sign, if applicable).

If at any point [Enter] or [Shift] is pressed and the SET display starts flashing, the data is not valid for the OPCODE shown. Use the arrow keys to alter the data as required and press [Enter] or [Shift] to continue entering or editing the program.

Exiting

Once all 19 steps have been entered or modified as needed and the editor is sitting at step 19, press [Enter] one more time to get the message SAVE displayed in the PROCESS window. The program number, the number of the program originally pulled into the edit space, will appear in the SET display but can be changed using the arrow keys.
If the program number is changed at this point, however, the edited program will be stored as the new number.

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For example, it is possible to call up program #29, edit it, and store it back as program #4. The original #29 is still intact, and whatever was in program #4 is now replaced with the edited #29.
If, while entering data an error is made, or it is desired to exit the editing routine without making any changes, press Setpt and the unit will continue normal operation. The edited information will be lost.

NOTE:
It is recommended that program #200 be kept as a "garbage" program location to temporarily store programs as required.

Programmer messages are displayed when inputting data and using the Editor, refer to the table shown below:

Explanation of Programmer Messages

DISPLAY	MESSAGE
EDIT	Pull the program into the deitor
SAVE	Save the edited program
RUN	Run the program
HOLD	Place the running program into Hold

Effect of Start-up Sequence on Programmer

The two start-up options described in "Start-Up Procedures" affect the Programmer significantly.
If a Shift-Shift-Enter start-up was used, the program running at the time of power was lost will pick up where it left off. This includes events and soak times.
If a simple Enter-Enter start-up sequence was used, the program is canceled. All events will return to the rest position (OFF) and the setpoint is lost.

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Alarm Messages

Programmer alarms interrupt Manual display, as discussed in "Keyboard Operations". This prevents important error messages from being lost while the Manual display is activated.
Once any of the following alarms are displayed and/or sounded, the dual-key operation Shift/"down arrow" cannot be used until the alarm is silenced by pressing Enter. This does not clear the alarm, however.
Programmer Alarms appear at Event 0 on the Optomux board.

To respond to alarm displays (#01-#98)

1. Press Enter one time to deactivate alarm relay contact (silence).
2. Examine the display to determine the origin of the system alarm:

Messages #01-79:

Indicate a programmed alarm (from an "A-ALARM" OPCODE in the program) has occurred. The response should be to carry out whatever task the message code indicates. For example, Message #37 might mean put test pins in furnace, while #28 might mean to manually change the temperature setpoint to 1550`F. These codes should\d be assigned for the particular installation involved.

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Message #80-#81:

Used, in conjunction with the Programmer, for the following purpose:

81 TURN ON A TEMPERATURE DEVIATION BAND ALARM (COMMUNICATING TEMPERATURE CONTROLLER REQUIRED)

80 TURN OFF SAME

The A(Alarm) OPCODE in this case should be followed by the L(Limit) OPCODE that sets the width of the particular deviation band (i.e. +10`,+25` or +12%C, etc.). If no LIMIT statement is used, the previous deviation value will be used. Both the turn ON and turn OFF statements can set the deviation. The alarms are said to be "smart" in the sense that they are not armed until the process is actually at the required setpoint. If tripped, the alarms produce the standard programmer ALARM display and pulsing alarm. The program remains in HOLD until action is taken.

Also, after the Deviation Alarm 81 occurs, clearing the alarm also clears the inb and flag; therefore, the process must reach setpoint before the alarm can sound again. The alarm is automatically disarmed at the end of a program.

Message #82-90:

Not assigned.

Message #91:

Reserved

Message #92:

Indicates a problem on the Events Buss. This error may occur at any point in a program that attempts to use events statements.

One of the following conditions possibly exists:

a. The OPTOMUX board of interest is not present, is disconnected, or is turned off.

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b. The jumpers on the events board are improperly set. Should be configured for:

-2 pass format
-1200 baud
-Address #1
-Multidrop Mode

c. There is severe disruption of communication due to use of wrong cable, too long a cable run, routing of cable in non-recommended termination schemes (i.e. WYE), or improper or missing termination resistor connections.

Message #93:

Indicates a limit statement has timed out. This must be interpreted in the particular situation, but if the limit time specified in the program was realistic, then a flaw in the system is indicated, or an instrumentation or operator error has occurred.

Message #94:

Not assigned.

Message #95:

Indicates an illegal ramp, the r OPCODE is not followed by the H OPCODE in the currently running program.

Message #96:

Indicates that a power failure has occurred and the UNIPRO started up again in the AUTO RESTART mode as determined by DIP Switch 5 on Bank 1.

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Message #97:

Indicates that a subroutine is calling a subroutine which is illegal with the MMI Programmer.

Message #98:

Indicates that a jump from one program to another was attempted but not implemented due to memory disruption or a J201 to reference number too large.

Message #99:

Not assigned.

3. After taking the required action based upon the alarm message, there are several possible courses of action:

   a. Press Enter again to continue with the program (after either correcting the problem with the temperature or events buss in the case of error message #92, or taking the prescribed action in the case of programmable messages 01 through 89).

   b. Abort the program by pressing PROG/AUTO/MAN.

   c. In the case of a timed-out limit statement, (message #93), it is normally desirable to continue the program by re-executing the offending limit statement to be sure it is satisfied. To do this, simply press Enter. A setpoint will cause the LIMIT statement to be skipped and the program to continue on the next step

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Status Display Page

The status display is broken into “pages” and “paragraphs” the “pages” are represented here by columns and the” paragraphs”, by the individual cells. See “Setup And Configuration” for the values displayed here most of the status pages correspond to the setup menus.
Press [Shift]+[ ] to enter the page display table. Press [ ] to move from one column to the next in the display. Press [ ] to move down a column.

3.5 u r ??	PROG	EVNT	DATA	EXT ALOG	CONT	(generic)	SLVE INST
	R ? P???	EVSP ////	CJ ????	EA 0 ????	PO ????	00 = 0 C11C	HSP1 .???
	G ? p???	EVAC ////	IN A ????	EA 1 ????	PB ????	: :	HAC1 ????
	- ????	EVST X ??	IN B ????	EA -- ????	RES ????		HPO1 ????
	RT ????		IN C ????	----	RAT ????		**
	MT ????			----	CYC ????		**
	PAL			----	LOPO ????		**
				----	HIPO ????		HST1 G ??
				EA 15 ????	LDLN ????		----
				ST A X ??	SW ????		HST 8

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NOTES:

---- The item displayed in the box above this repeats through the full cycle of options. For example:

Exterior Analog has 16 displays and Slave Instrument has 8.

** Items displayed above this repeat in sequence through the full cycle of options. For example: Slave Instrument will display data for HSP, HAC, And HPO for each option in the cycle before going to the next option.

: The Generic table (the title of this page does not display) displays the parameters in hex for all the programs loaded into the UNIPRO 3.5 . These are for engineering troubleshooting purposes only. The operator should not try to use these

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Calibration Procedures

The UNIPRO instrument is shipped completely precalibrated. The drift characteristics of the input circuits are excellent but from time to time adjustment may be necessary in order to maintain high accuracy.

Analog Input Calibration.

There are three analog inputs and a cold junction compensation sensor on the UNIPRO. The input level and input features for each input are determined by changeable daughter boards that are mounted piggy back on the analog input board. There are several types of input daughter boards: thermocouple input, auxiliary input, 4 to 20 mA input, 0 to 10 V linear, RTD, and slide wire input.

The standard factory configuration is for input A to be a thermocouple input, input B to be an Oxygen probe input(auxiliary input) board, and input C to be a slidewire feedback input. If the instrument to be calibrated does not have the standard factory configuration, then identifying the configuration is necessary so that the proper procedure for each input board can be followed.

Displays And Keyboard

When operating in the calibration mode, the displays and front panel keys take on special assignments. The PROCESS display shows the value of the input being calibrated with a flashing digit. This flashing digit shows the relative sensitivity of the arrow keys, as described following the key descriptions. The SET display shows which input is being calibrated and whether the zero value or the span value is being modified.

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The SET display messages are shown below:

Message	Description
Z-A	Zero input A
Z-B	Zero input B
Z-C	Zero input C
Z-SW	Zero slide wire (from input C)
S-A	Span input A
S-B	Span input B
S-C	Span input C
S-SW	Span slide wire (from input C)

NOTE

It is very important to be sure the SET display is showing the proper mode before making an adjustment or the wrong value will be changed.

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Adjustment Sensitivity

The adjustment sensitivity works in the following manner. If the digit farthest right in the process display is flashing, then each press of the [Up Arrow] or [Down Arrow] key will change the calibration value shown by one unit. This is the least sensitive position. If the digit farthest left is flashing, then each press of the [Up Arrow] or [Down Arrow] key will change the calibration value by a thousand units. The middle digits will show sensitivities of a hundred and ten units respectively. It is not important to know the relative worth of one calibration unit. Understanding that the location of the flashing digit affects change that one key press will make on the calibration value is necessary. By observing the degree of sensitivity one key press makes at each flashing digit location, you can quickly see how to use this feature.

Preparing For Calibration

Before placing the UNIPRO into calibration mode, check to be sure that for each input:
The proper thermocouple type has been selected, and
Cold Junction compensation has been selected, if required. Cold Junction compensation can be selected by using the [Setup] key. The option is below the corresponding input type selection.
The UNIPRO is placed into calibration mode by connecting a jumper from TBD-17 to TBD-18. To make sure of the integrity of the calibration factors, power should be applied to the UNIPRO before this jumper is installed and not removed until after this jumper has been removed. The UNIPRO should be operating for at least 30 minutes before calibration to make sure that input circuits have stabilized.
For each input of the UNIPRO, follow the calibration procedure by the type of input board installed for that input. Once an input has been calibrated, be sure to press the [Enter] key to make sure that the latest calibration factors are stored.

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Calibration of The Thermocouple Board

This calibration procedure assumes that a thermocouple has been selected and internal cold junction compensation is being used. If this is not true, follow the procedure for the auxiliary board using a 0 to 40 millivolt signal. The calibration procedure is as follows:

Connect the input to be calibrated to a junction compensated calibrator (IE: Biddle Instrument Co. Versa-Cal Calibrator) using the proper extension wire for the thermocouple type selected.

Using the [Display] key, select the proper input to be calibrated (input A, if standard configuration).

Using the [Enter] key, select the zero mode (IE: if for input A, Z-A).

Set the calibrator output to the recommended zero value for the thermocouple type selected. See the table below.

Using the Arrow keys, adjust the process value to equal the calibrator output.

Press the [Enter] key to select the span mode (IE: S-A, for input A).

Set the calibrator output to the recommended span value in for the thermocouple type selected.

Using the arrow keys, adjust the process value to equal the calibrator output.

Repeat steps f. through j. until no additional change is needed.

Press the [Enter] key one more time to be sure the calibration factors are stored. Go to the next input to be calibrated or exit calibration mode by removing the calibration jumper or pressing [Setup] .

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Thermocouple type	Zero ºF(ºC)	SpanºF (C)
B	200 (90)	3000 (1800)
C	32 (0)	3000 (1800)
E	32 (0)	1300 (900)
J	32 (0)	1300 (900)
K	32 (0)	2300 (1200)
N	32 (0)	2300 (1200)
NNM	32 (0)	2000 (1100)
R	300 (150)	3000 (1800)
S	300 (150)	3000 (1800)
T	32 (0)	700 (350)

The usable ranges of the thermocouple types are shown in The table above. If having a high accuracy over a specific operating range is desirable then the input should be calibrated over that range. Follow the calibration procedure for normal calibration with the following changes. Use the low end of the desired range as the zero value and the high end as the span value. There will be more interaction between zero and span with this method. The desired operating range must fit with the limits of the table.

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Oxygen /Auxiliary Board
Calibration

To Zero the board Calibration
Turn off the power at the simulator.
Short the input by putting a banana plug shorting block into the simulator. Short the jumper (switch) wired into 17 and 18 to calibration mode.
This will produce some value in the PROCESS window and Z-A in the SET window.
Use the left and right arrow keys to change the adjustment from coarse to fine in the PROCESS window, and the up and down arrow keys to change the value. Adjust the PROCESS window value to zero (0), or as close as possible.
Press the [Enter] key twice to store the value.
Press the [Display] key to change the SET window to Z-B or Z-C and repeat steps 4 and 5 for inputs B and C.

After all the values are stored, press the [Display] key to return the SET window to Z-A and press the [Enter] key to change it to S-A (span).
To set the span
Put the meter leads into the banana plug to measure mV (300----).
Remove the jumper block from the simulator.
Using a meter to check your input voltage on the O2 side, enter 1.4 or 1.5 mV from the simulator, and turn ON the simulator.
Set the span values at 1400 or 1500 (depending on what the simulator generated) using the arrow keys to adjust the values.
Press the [Enter] key twice to save the values and press the [Display] key to change the input type.
Repeat steps 1-5 for each input (A, B, and C), pressing [Enter] twice to save the values each time. Wait 5 to 10 seconds to allow the reading to record, then take it out of calibration mode by throwing the switch.
Remove the banana plugs from the simulator (remove the load from the line) and wait for the instrument to "max out" at 3500.

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Let the reading settle at maximum (another 5 to 10 seconds) then reinsert the banana plug into the simulator to see if the instrument returns to a steady 1500 at all inputs.
Vary the input millivoltage down and verify that 1500 reduces to 1000 at a steady level for each input setting.
Check the reference voltage on TBD-5 and 6 (for input B) and 8 and 9 (for input C). Should read around +2 mV (between 1.8 and 2.2 is considered good).

Slidewire Board Calibration

Zero
Turn off the power at the simulator.
Short the input by putting a banana plug shorting block into the simulator. Short the jumper (switch) wired into 17 and 18 to calibration mode.
This will produce some value in the PROCESS window and Z-A in the SET window.
Use the left and right arrow keys to change the adjustment from coarse to fine in the PROCESS window, and the up and down arrow keys to change the value. Adjust the PROCESS window value to zero (0), or as close as possible.
Press the [Enter] key twice to store the value.
Press the [Display] key to change the SET window to Z-B or Z-C and repeat steps 4 and 5 for inputs B and C.
After all the values are stored, press the [Display] key to return the SET window to Z-A and press the [Enter] key to change it to S-A (span).
Span
Put the meter leads into the banana plug to measure mV (300----).
Remove the jumper block from the simulator.
Using a meter to check your input voltage on the O2 side, enter 1.4 or 1.5 mV from the simulator, and turn ON the simulator.
Set the span values at 1400 or 1500 (depending on what the simulator generated) using the arrow keys to adjust the values.
Press the [Enter] key twice to save the values and press the [Display] key to change the input type.

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Repeat steps 1-5 for each input (A, B, and C), pressing [Enter] twice to save the values each time. Wait 5 to 10 seconds to allow the readings to record, then take it out of calibration mode by throwing the switch.
Remove the banana plugs from the simulator (remove the load from the line) and wait for the instrument to "max out" at 3500. Let the reading settle at maximum (another 5 to 10 seconds) then reinsert the banana plug into the simulator to see if the instrument returns to a steady 1500 at all inputs.
Vary the input millivoltage down and verify that 1500 reduces to 1000 at a steady level for each input setting.
Check the reference voltage on TBD-5 and 6 (for input B) and 8 and 9 (for input C). Should read around +2 mV (between 1.8 and 2.2 is considered good).

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Digital Interfaces

Host Communications

The Host communications are able to be set from the front panel: see “Setup and Configuration”. The UNIPRO is suitable for connection to a host computer for intelligent overall process monitoring or supervision. Terminal connections are made on the rear panel: See the connections label on the instrument. Twisted pair wire with or without a shield must be used for all communications wiring. Conventional RS-232 cable is required along with a half-duplex RS-232/422 convertor (P/N FG/500-0501). With a 9-Pin or 25-Pin female connector depending on Host Computers connector, some of the pins on the computer end of the connector should be jumpered together as follows: 9-Pin: 1,4,6,8 or 25-Pin: 5,6,8,20. The UNIPRO never initiates communications, and is always in receive mode unless responding to a question.

"X" Protocol

The "X" protocol software involves a Parameter Table, a Program Run Buffer, a Program Edit Buffer, and a Serial I/O Program Buffer. The UNIPRO can be written to using a "1TXparameternumber$data" format. This entry would place the data value in the proper location as determined by the parameter number. Any parameter can be read back from the UNIPRO using the following format "1Txparameternumber". Therefore, to write a value to the UNIPRO for a specific parameter use an "X" or to read a specific parameter from the UNIPRO, use an "x".

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All of the parameters are listed below along with a short description. The numbers in the parenthesis are in Hexadecimal.*

Parameter Table

(0H-2FH) & (72H-79H)

CHSTAT	(0) -Status Word
SETPT	(1) -Setpoint of Process Variable
SETPTOS	(2) -Setpoint Offset
GAIN	(3) -PID Proportional Band
RESET	(4) -PID Reset
RATE	(5) -PID Rate
CYCTIM	(6) -PID Cycle Time
ALARM1	(9) -ALARM1 Value and Type
ALARM2	(0AH) -ALARM2 Value and Type (0H-2FH) & (72H-79H)
REFNUM	(0CH) -Reference Number
PRGNUM	(0DH) -Program Number and Step
PRGSTK	(0EH) - Program Stack (Number and Step)
PRGMT	(0FH) -Master Timer Bit 15 is DIR Flag
PRGRTIM	(10H) -Programmer Course Remaining Time
EVSETPT	(11H) -Events Buss Setpoint
PTDALM	(14H) -Programmer Temperature Deviation Alarm Value and Condition
RAMPTIM	(15H) -Programmer Ramp Time
RAMPST	(16H) -Programmer Ramp Starting Temperature
RAMPDIF	(17H) -Programmer Difference and Direction
TEMP	(19H) -Temperature
COLDJCT	(1AH) -Temperature Compensation Value
AUXIN	(1BH) -Auxiliary Input
DIPSW	(1EH) -DIP Switch Image, bit map
ALRMCON	(1FH) -Alarm Conditions

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Parameter Table (continued)

PERRCUR	(21H) -Current Process Error
PERRNO	(22H) -Process Error (N)
PERRN1	(23H) -Process Error (N-1)
PERRN2	(24H) -Process Error (N-2)
CONACC	(25H) -Control Action Accumulator
RLYTIM	(26H) -Relay ON Time and OFF Time
RLYCON	(27H) -Control Action
CONACTIM	(28H) -Control Action Timer
EVPAR	(29H) -Events Partition Bit Map
EVSTAT	(2AH) -Events Buss Status
EVACT	(2BH) -Actual Events Buss
CONSUM	(72H) -Control Summers
DACV1	(73H) -DAC1 Data
DACV2	(74H) -DAC2 Data
ALRMQ	(75H) -Programmer Alarm
HPOUT	(76H) -Temperature Percent Output

PROGRAM RUN BUFFER (30H-45H)

PRUNPRG Program Number and Step, Remaining Time, First Through Last Steps of Program Along With Opcodes, and Checksum and

PROGRAM EDIT BUFFER (46H-5BH)

PEDPRG Program Number and Step, First Through Last Steps of Program Along With Opcodes, and Checksum and Allow Byte **Location 91 is not used

SERIAL I/O PROGRAM BUFFER (5CH-71H)

PSIOPRG (50) Program Number and Step, First Through Last Steps of Program Along With Opcodes, and Checksum and Allow Byte

* Refer to Appendix A for further information on Hexadecimal Code.

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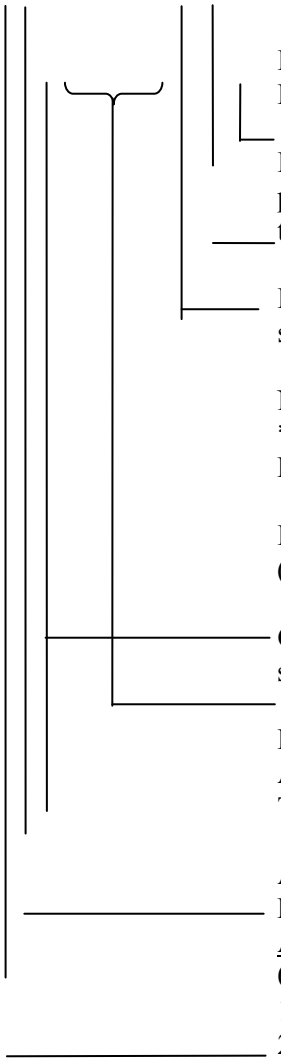
** An Alarm Queue is included in the host communications capabilities of the instruments. The Alarm Queue is simply a block of storage locations for the programmer alarms that occur within the instrument and works similar to the idea of FIFOs (first in, first out). The queue was added because various programmer alarms can occur and be acknowledged and/or corrected before the Host Software ever has the chance to "see" them. Therefore, the alarms had to be passed on to the Host Software even if they were already acknowledged and/or corrected. The Alarm Queue was created to meet this need.

The Alarm Queue works on a READ & CLEAR basis. If the Alarm Queue is read with the "x" parameter FF (Hex), the storage location will return a word comprised of a HI byte and a LO byte. The LO byte is the first alarm appearing in memory while the HI byte is the second alarm appearing in memory (thus creating the FIFO effect). If both bytes are non-zero, then the Host will look again to see if any non-zero values have been stored. Once the bytes are read from the Queue, they are cleared out of the memory block.

If there is no Host Software used, the Alarm Queue is never read, but the Queue is still written to by the instrument. Once the Queue is filled, it cannot be written to until a location has been cleared. Considering the fact that Host Software is not used, the Queue will never be cleared and will never store any of the alarms that occur after the Queue has been filled. This does not cause a problem considering the fact that the Queue is only used with Host Software and if the software is not used, we do not care if it is filled or not.

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Message Protocol Format
AICddddDLE



End of Transmission (EOT)
HEX(04).

LRC is the result of an XOR function performed on all previous characters in the message.

Delimiter marks the end of DATA and signals the upcoming EOT character.

NULL HEX(00) or Backspace HEX(08)*
*If LRC was going to be on EOT HEX(04) then D = HEX(08).

Data character, definition based on the C (command) character.

Command character from the command set table

Instrument prefix
A for 10Pro emulation
T for MMI command Set

Address of unit based, on SIO setup.
Possible inputs are :

ASCII	ASCII
0 6 B	3 9 E
1 7 C	4 A F
2 8 D	5

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Host Software

10PRO Emulation Mode

The UNIPRO will emulate the 10PRO temperature controller command set. The commands which are emulated are:

10PRO Temperature Controller Command Set

Command Letter	Description
p	Read Auto/Manual mode
o	Read Remote/Local
I	Read Remote Setpoint
h	Read Local Setpoint
I	Update Remote Setpoint
J	Update Remote Setpoint
l	Read Temperature
m	Read % Output
P	Update Auto/Manual mode

Command Set

The MMI command set supports the extensive capabilities of the UNIPRO when used with a supervisory computer software system such as AFC's Process Master. The command set consists of the following characters:

MMI Command Set

Update	Read	Description
A	a	Alarms
D	d	Derivative
E	e	Memory
*	g	Auxiliary Input
I	I	Integral (Reset)
*	j	Event Inputs

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MMI Command Set (Continued)

K	k	Event Outputs
L	l	Program Number
M	m	Mode
N	n	Program Step Number
P	p	Proportional Band
Q	q	Memory Update
R	r	Remote Program Access
S	s	Setpoint
*	t	Temperature
U	u	Status
V	v	% Output
X	x	Parameters**
Z	z	Communications mode
*	w	Read DIP Switches

* Update Not Allowed

** See X Protocol Section

OPTOMUX Protocol

The OPTO 22 format is RS-422, Full-Duplex, 1200 BAUD, 8 bit, no parity, and 1 stop bit. The message format follows the OPTOMUX two pass protocol. The UNIPRO sends messages to set up the events board per the events partition, activate the appropriate outputs, and reads the input conditions. The UNIPRO initiates messages on this buss and waits ½ second for a reply.

The Events Buss allows the Controller to receive and/or transmit discrete events in time. The XMT and REC LEDs indicate whether the OPTOMUX is transmitting or receiving data. (These LEDs should never be on at the same time.) This actual input/output switching is executed by the OPTOMUX board: see “Setup and Configuration” or “Programmer Operations” or the OPTO22 manual for specific details.

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Slave Buss
The slave buss is a broadcast only communications buss.

Broadcast Mode
The slave buss broadcasts the UNIPRO setpoint using the 10PRO broadcast protocol. The broadcast protocol format is similar to the message protocol format. Its form is

?AIddddDLE

where ?= 10PRO address symbol
A= Using 10PRO
I= Sending Setpoint
dddd= Data for Setpoint

Passwords

In "Setup and Configuration" the Password is introduced. Password protection for certain operator functions is provided for security. We do not preset passwords at the factory.

To set the password:

[Shift]+[Cntl.Parm] will produce PWEN/PSWD in the Process and Set displays. Press the sequence that you wish to use as the password then press [Enter]. Any combination of keys, up to nine strokes, except [Shift] or [Enter] can be used as the password.

To bypass the password if the old one is known:

Press [Cntl parm] press the old Password and then press [Enter] press the new password and press [Enter]. "See Setup and Configuration" for the location of the password.

To change an operating function when lock level = 1:

[Shift] [Alarm Set] [Cntl Parm] [Alarm Set]

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To bypass the password if there is none:

Press [Enter].

If you are locked out because you forgot the password, you will have to

Remove the front panel.

Find DIP switch 8 in the top bank. Turn it to ON.

Find the 4 switch (bottom) bank and set them all to OFF. This resets the address to 0.

Press [Shift],[Cntl Parm] and [Enter][Enter] to create "enter" as a new password. Return the bottom bank to its original address setting. Turn switch 8 in the top bank OFF. Replace the front panel. The new password is in effect. See “Setup and Configuration” for more details.

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SPECIFICATIONS

Alarm Outputs	**Two solid state relay contacts for the process alarms -300 to 4000. Programmer alarm provided by optional OPTOMUX interface.**
Ambient Temperature	**0 to 130 F**
Analog Outputs	**0 to 5 volts for 0-4000 F** **0 to 5 volts for -99 to +99 control output**
Auxiliary Input Impedance	**10K ohm**
Auxiliary Input Range	**0 to 2 Vdc**
Control Outputs	**Two solid state relay contacts selectable for Time-Proportioning or Position-Proportioning.**
Serial Interface	
Host	**RS-422, 1200 BAUD, Half Duplex MMI protocol and 10PRO emulation**
Events	**RS-422, 1200 BAUD, Full Duplex OPTOMUX protocol**
Slave	**RS-422, 1200 BAUD, Half Duplex BC-560 broadcast mode**
Dimensions	**5.63 in. wide by 5.63 in. high by 8.38 in. deep**
Humidity	**0 to 85%**
Line Voltage	**85 to 140 VAC, 50/60 Hz**

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Panel Cutout Requirements	**5.43 in. square**
Programs	**200, l9 steps each**
PID Constants	**1 to 999% of Range**
Proportional Band	**0 to 99.99 RPM**
Reset	**0 to 9.99 minutes**
Rate	**0 to 250 seconds**
Cycle Time	**Solid state, triacs, Mechanical, dry**
Relays	**contact, 1 ampere, 125 VAC maximum (fused at 1 amp)**
Setpoint	**-300 to 4000** **-999 to +999 setpoint offset for receipt of master broadcast**
Signal Input Impedance	**100K ohm**
Signal Input Range	**-10 to +64 mV**
Signal Display Range	**-300 to 4000 (+4)**
Depends on thermocouple type	
Thermocouple	**Linear** **Chromel-Constantan**

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L:	**Iron-Constantan**
E:	**Chromel-Alumel**
J:	**Tungsten 5% Rhenium vs.**
K:	**Tungsten 26% Rhenium**
C:	**Platinum vs. Platinum l3% Rhodium**
R:	**Platinum vs. Platinum 10% Rhodium**
S:	**Copper-Constantan**
T:	

Weight **Approximately 11 pounds**

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Glossary

Load Line
Load line (LdLn) is a manual offset to the control output (manual reset). The load line can be set from 0 to 100%. Load line must be set to zero when using ON/OFF control.

ON/OFF control
In ON/OFF control Output l is turned ON whenever the percent output exceeds l0% and Output 2 is turned ON whenever the percent output goes below -l0%. Therefore the proportional band is used to set the deadband. If the proportional band is set at 5% then an error of 5 will produce a l0% output; therefore, the deadband is 5. Reset and Rate would normally be set to zero; however, experimentation could improve the control response. Load Line must be set to zero.

Position with Feedback
This mode is used with slidewire feedback. Output l is used to drive for more feedback and Output 2 is used to drive for a smaller feedback. The percent output is used as a setpoint for the slidewire feedback. A deadband of .5% is used to prevent hunting.

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Position without Feedback
This mode is used with a motorized valve with no feedback. The change in percent output is used to compute a drive time as a percent of the cycle time. For example, if the cycle time is 30 seconds and the percent output changes from 40% to 60% then Output l will be ON for 6 seconds (20% of 30 seconds). If the change was in the opposite direction then Output 2 is turned ON. If the percent output is at its limits (0 or l00 for single, and l00 or -l00 for dual) then the appropriate output will remain ON continuously.

Proportional Band
The proportional band is based upon a range of l000. Therefore, if the proportional band is set at 10% and the error is 100 (10% of range) then the output would be 100% (presuming reset=0).

Rate
The rate setting is in minutes and is settable from 0 to 9.99 minutes in .0l steps.

Reset
The reset setting is in repeats per minute. The range is 0 to 99.99 repeats per minute in .0l steps.

Time Proportion
In time proportion mode Output l is ON for the percent of the cycle time when the percent output is plus. When the percent output is minus, Output 2 is ON for the percent of the cycle time.

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Appendix A

Hexadecimal Code

Hexadecimal code is a functional, compact method of representing certain parameters within the binary computer framework. Hexadecimal code uses four binary bits to make one hexadecimal digit.* The number range for the hexadecimal system is 0 to F where the corresponding base numbers are as follows:

Decimal System	Binary System	Hexadecimal System
0	0000	0
1	0001	1
2	0010	2
3	0011	3
4	0100	4
5	0101	5
6	0110	6
7	0111	7
8	1000	8
9	1001	9
10	1010	A
11	1011	B
12	1100	C
13	1101	D
14	1110	E
15	1111	F

To convert a binary number to the equivalent hexadecimal number, follow the procedure listed on the next page.

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1. Group the binary representation into sets of four.
   i.e. 1100 1111 0011 1101

2. Analyze each set of four separately for the equivalent hexadecimal digit determined from the chart above.

i.e.	1100	1111	0011	1101
	C	F	3	D

* For further explanation, consult any college digital systems text, such as Microcomputer-Based Design by John B. Peatman.

3. Put all of the separate HEX digits together to form the numerical word.
   i.e. CF3DH*

4. Therefore, the HEX representation CF3DH is numerically equivalent to the Binary representation 01011100111100111101 or the Decimal number 53,053. Hexadecimal code is an extremely helpful number representation when coding computer systems. Recall that most addressing systems for microprocessors involve 16 binary bits which convert to four HEX digits and 8 binary data bits that convert to two HEX digits. The HEX system allows very long binary numbers to be represented in a must shorter way.

Many of the responses to the MMI Controller's Serial Communications questions are in HEX. Therefore, in order for the user to correctly interpret an answer, a clear understanding of the Hexadecimal number system must be attained.

* An H is written after hexadecimal numbers to signify that the number is hexadecimal, it is not part of the actual number value.

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Version 3.5 UNIPRO setup sheet
Furnace #_____

[Ctrl Parm]	Unit #1	Unit #2	Unit #3	Unit #4
PB				
RES				
RAT				
CYC				
LOPO				
HIPO				
LDLN				
[Alarm set]				
A1__				
A1XX				
A2__				
A2xx				
TON1				
TOF1				
TON2				
TOF2				
[Setpt]				
STPT				
REF				
TCO				
[Shift\Alarm set]				
AO1				
AO2				
AO1O				
AO1R				
AO2O				
AO2R				
AI A				
AI B				
AI C				
CONV				
COMD				
HOST				
AUX				
AXMD				
[Shift\ Ctrlparm]				
LL				
degC				
STRT				
APS				
ASEV				
CJCA				
CJCB				
CJCC				

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EXEV	_____	_____	_____	_____
EVBD	_____	_____	_____	_____
EP 1	_____	_____	_____ __	_____
EP A	_____	_____	_____	_____
EAL0	_____	_____	_____	_____
EAL1	_____	_____	_____	_____
EAL2	_____	_____	_____	_____
EAL3	_____	_____	_____	_____
EAL4	_____	_____	_____	_____
EAL5	_____	_____	_____	_____
EAL6	_____	_____	_____	_____
EAL7	_____	_____	_____	_____
EAL8	_____	_____	_____	_____
EAL9	_____	_____	_____	_____
EALA	_____	_____	_____	_____
EALB	_____	_____	_____	_____
EALC	_____	_____	_____	_____
EALD	_____	_____	_____	_____
EALE	_____	_____	_____	_____
EALF	_____	_____	_____	_____

DIP switch settings
(circle ON)

UNIT #1

BANK 1	1 2 3 4	5 6 7 8
BANK 2	1 2 3 4	

UNIT #2

BANK 1	1 2 3 4	5 6 7 8
BANK 2	1 2 3 4	

UNIT #3

BANK 1	1 2 3 4	5 6 7 8
BANK 2	1 2 3 4	

UNIT #4

BANK 1	1 2 3 4	5 6 7 8
BANK 2	1 2 3 4	

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