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CLM01.3-R/Z
Feed-To-Length Control

User´s Manual

DOK-CONTRL-CLM01.3*R/Z-ANW1-AE-P

Indramat

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FOREWORD

Special Notations:

Special notations are used in this manual to assist the reader in identifying unique conditions or information that is important. Three categories of notations are listed below in ascending order of importance.

Note: *A **NOTE** is a tip, suggestion or emphasized procedure for operating the equipment.*

Caution: *A **CAUTION** appears when a condition exists which could cause operating faults or damage to the equipment.*

Warning: ***WARNING** statements identify conditions which could cause bodily harm and/or severe damage to the equipment if the operator is not careful operation the equipment. A **WARNING** will typically describe the potential hazard, its possible effect, and measures that must be taken to avoid the hazards.*

Please ***NOTE* that due to variations found in the operating conditions of certain applications and their working environments, the notations in this manual cannot identify all potential problems or hazards. Caution and discretion must always be used in operating machinery and especially when using electrical power. Equipment should only be installed and operated by trained personnel.**

* ***Repair and Training services are available from*** **REXROTH INDRAMAT.**

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RECORD OF REVISIONS

Revision Level	Date	Description of Change
A	5/92	Initial Release, covers hardware versions CLM-01.3-R and -Z with respective software versions LR01.3-006.0 and LZ01.3-002.0
B	12/93	General update to software version LR01.3-006.3 and LZ01.3-002.2

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CHAPTER 1. GENERAL DESCRIPTION

The CLM-01.3-R/Z is a modular, microprocessor-based, feed-to-length positioning control. The CLM module is illustrated in Figure 1.1. The CLM controls an Indramat maintenance-free AC servo system to drive feed rolls or some other positioning device. This is a closed-loop feedback system which provides precise control of speed and position at all times.

The CLM/servo system is used for material positioning applications. It controls the feeding of metal, foil, film and similar materials through a shear, punch press, bagmaking machine, thermoforming machine or similar production machine. The typical system consist of an Indramat CLM control, combined with a MAC AC servo motor (with integral encoder for position feedback), power supply and Servo controller (amplifier) to comprise a precise feed control system. Complete interconnect cable sets are also available from Indramat. The components are chosen to best fit the specific application. Figure 1.2 is a block diagram of a typical system configuration.

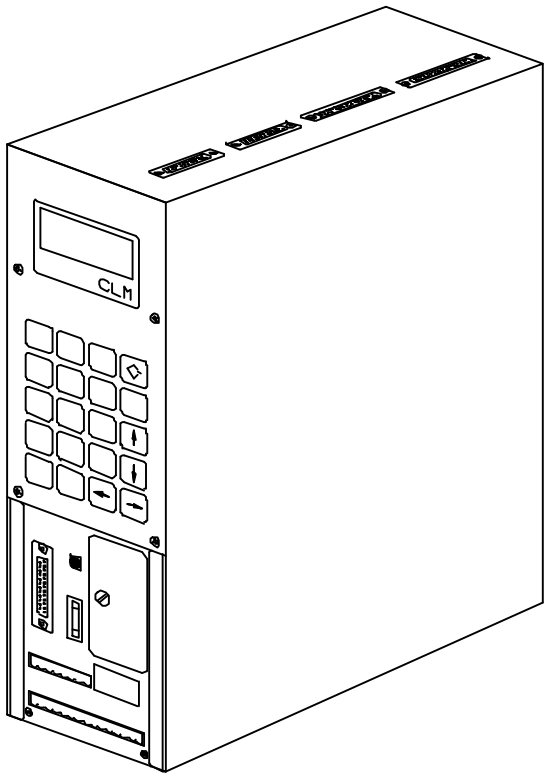


Figure 1.1 CLM-01.3-R/Z Feed-To-Length Positioning Control Module

Note that this CLM is available with either LR01.3-006.3 or LZ01.3-002.2 software versions. Both versions are designed to conduct intermittent incremental moves. The LR01.3-006.3 software is a highly specialized application-specific package for the CLM. It is used to control single-axis roll feed indexing applications in the metalforming industry. The LZ01.3-002.2 software is designed for application with two feed axes operating in conjunction with one press (or similar device). In addition to controlling the entry feed rolls (axis), it also controls the exit side feeder (second axis) in synchronization with the entry side feeder. The user simply enters the desired feed length and speed, and the control provides maximum productivity with a high degree of accuracy.

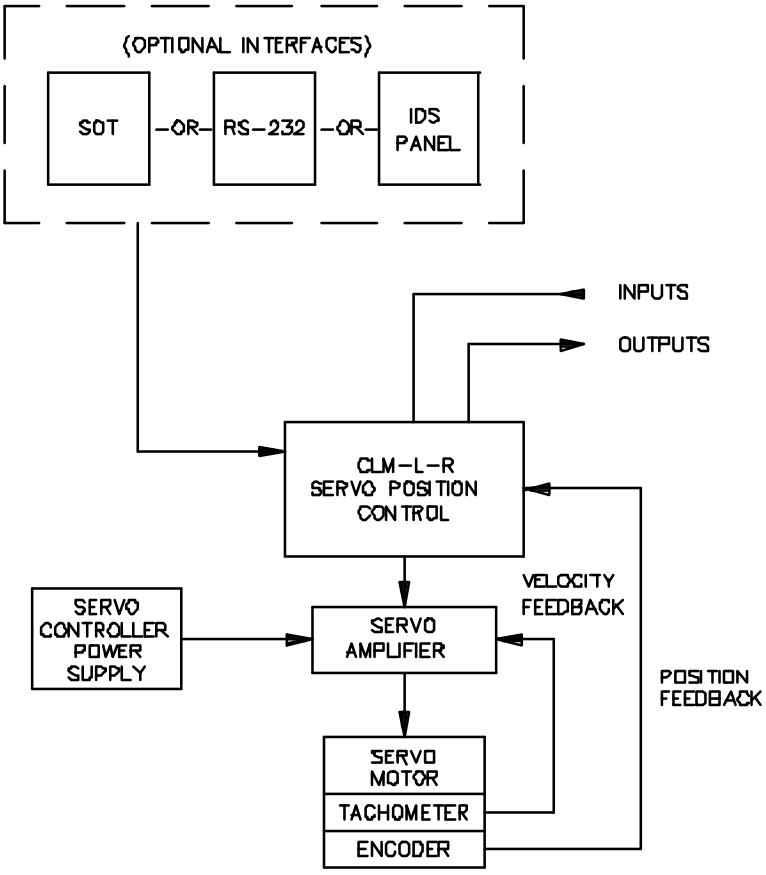


Figure 1.2 Block Diagram

1.1 About this Manual

This document is written for both operating personnel and the machine builder. It explains how to interface, install, setup and operate the Indramat CLM Positioning Control with LR01.3-006.3 and LZ01.3-002.2 software versions.

1.1.1 Hardware and Software Support

This manual describes the CLM-01.3-R/Z hardware, used with software version LR01.3-006.3 and LZ01.3-002.2. The manual notes any specific differences in function for the control with the different software versions. This hardware and software includes new features and capabilities which were not available on earlier versions of the CLM system.

1.1.2 Problem Assistance

Indramat provides assistance for any problems you may encounter with this system. Your first source of information should be this manual. To report a problem or request assistance, call Indramat at (708) 860-1010, between 9:00 AM and 5:00 PM Central time. Ask for a CLM-R Service Engineer. You may also write or FAX to the following:

Rexroth-Indramat
Attn: CLM-R Service Engineering
255 Mittel Drive
Wood Dale, Illinois 60191 v FAX Number [708] 530-4631

1.2 How To Use This Manual

The manual is organized such that Chapters 1 and 2 describe the control and its operation. These chapters, plus Chapter 8 on diagnostics, will be sufficient for most operating personnel. Chapters 3-8 provide functional description, installation, setup, parameter, and diagnostic and troubleshooting information required by the machine builder and setup personnel.

Chapter 1. General Description	Describes the CLM-01.3-R/Z control and the features which make it well suited for roll feed control. Describes and illustrates various options. Lists specifications.
Chapter 2. Controls & Indicators	Describes the controls and indicators of the CLM and its options. Describes a typical machine builder's control panel.
Chapter 3. Functional Description of Standard Features	Describes all input and output signals and the various interfacing and operating modes of the CLM. This information is necessary for interfacing the CLM into the system, control panel design and troubleshooting.

Chapter 4. Functional Description of Special Features	Provides same type of information as Chapter 3 for the enhanced features of batching, registration, roll lifting, material loop control and the multi-format RS-232/422/485 interface features.	
Chapter 5. Parameters	Describes all user-entered parameters which are provided to allow the user or machine builder to adapt the CLM to the mechanical and electrical characteristics of each application.	
Chapter 6. Installation	Describes procedures for installing a CLM control system.	
Chapter 7. Start-up	Provides an example of a CLM start-up.	
Chapter 8. Diagnostics & Troubleshooting	Describes the CLM's self-diagnostic system, lists and explains all diagnostic messages and describes troubleshooting procedures.	
Appendices	Appendix A -	Display Map (CLM control panel display screens)
	Appendix B -	References to other Indramat documentation
	Appendix C -	Blank parameter record forms for use in documenting your system parameters
	Appendix D -	Drawings & schematics of the CLM and its connections
	Appendix E -	Installation drawings & details for the CLM and options: CLM keypad (remote mounting), IDS Thumbwheel Switch Panel and Remote Display Module
	Appendix F -	Clm-R/Z Feature Cross-Reference Chart
	Appendix G-	Index
Supplement	User's Guide for the Station Operators Terminal (SOT), an optional operator interface terminal for the CLM	

1.3 System Features

Refer to Appendix F for a cross-reference of features in previous software versions.

Superior Performance and Ease of Operation

The system offers press rates up to 1200 strokes per minute and feed resolution of 0.001 inch, which minimizes scrap and lowers cost. Note that maximum system performance depends on the mechanical characteristics of the user's system.

The user simply and easily operates the feed control system by entering feed rate and feed length using front panel controls. Operating status messages appear on the display in English, German, French or Spanish - as selected by parameter. Other input and display options are described later in this section. The CLM system includes features to make setup quick and easy, eliminating time consuming mechanical setup or complex programming when changing parts. System operation is described in detail in Chapter 3.

Parameter-adaptable to Multiple Machines

The feeder manufacturer or the user easily adapts the CLM to the mechanical and electrical characteristics of an application by entering data into a set of parameters, using the CLM's 20 digit keypad and liquid crystal display (LCD), or from a host via the serial port. These parameters define the characteristics of the machine, such as: maximum and minimum feed lengths, jog, acceleration and deceleration rates, units of feed measurement, communications port characteristics, etc. This allows one single type of CLM control to handle the mechanics of various roll feed units. Thus, plant personnel need be familiar with only one feed control system.

Generally, parameters are entered once when the system is set up, then changed only if the configuration changes or if different types of materials are fed. The factory installed CLM executive program interprets the parameters to match the CLM to the machine, and translates operator-entered commands into motion control signals, coordinating the feed motion with the press or other machinery. Complicated system programming is not required.

Parameters are described in Chapter 5.

Fully Self-Diagnostic

System protection is paramount. The CLM detects normal operating status, operator errors, errors in the control itself and machine faults. For example, in a metalforming application, the CLM monitors the press crank angle and halts the system if the selected feed cannot be made without damaging the press, tooling or material. If a feed is not completed during the allowable press feed angle, a diagnostic error message is displayed and the feed and press automatically stop. If necessary, the ram can be inched back, the press speed can be reduced and press/feed operation can be resumed without loss of material or damage to the tool or die. An indicator informs the operator when the speed can be increased without causing this problem and when the speed is set so high that it may cause the problem.

Both fault and normal status messages are displayed on the CLM control panel (or host device via the serial port) in the user-selected language . Thus, the operator is informed of the current operating status of the system and is alerted to any condition that causes a fault. This helps the operator quickly locate and correct problems.

The CLM processor models and predicts the motion profile and continuously compares it with the actual response of the servo drive, thereby detecting irregularities in drive conditions, such as drive runaway or

stalled conditions. Parameters allow the user to set the magnitude of certain variations, as required for the application, before a deviation error is considered a fault condition.

Diagnostics are described in detail in Chapter 8.

Jerk Limited Acceleration

Parameters allow the user to generate a jerk limited (S-shaped) acceleration profile, which increases machine life and allows handling difficult, slippery, compliant or delicate materials at increased production rates.

Independent Accel/Decel Ramps

Parameters allow different acceleration and deceleration rates for linear profiles. This allows the user to most effectively accommodate differing material characteristics, such as stretching susceptibility, in various applications.

Batching

The user can program the control for the sequence required to make different parts. Then, through simple keyboard entry, select the quantity of one or several different parts to be made automatically. The program allows multiple feed lengths for each part, gagging outputs/ acknowledgments, and shear operation. It also allows branching from one part program to another, to make different parts, and looping to continuously make the same part. Up to 99 parts and 594 feeds can be entered and stored in the battery protected memory of the CLM. With the expanded version (option) of the CLM, 99 sets of gagging outputs with optional input acknowledgments may be programmed/defined by the user.

Registration Control

Registration control maintains each feed as close as possible to a registration mark printed on the material. This ensures that printed patterns are kept in alignment with the finished product. The user can select from different modes of position correction for this function. This allows for maximum production and consistency, as required for the application.

Roll Lifting Control

The CLM allows for manual control to open and close the feed rolls and anti-backup rolls. The change is automatic upon a change in feed direction. This feature is often required when handling sensitive materials or when using progressive dies in metalforming.

Entry/Exit Feed Control

The LZ01.3-002.2 software version is designed for controlling two feed axes operating in conjunction with one press (or similar device). In addition to controlling the entry feed rolls (axis 1), it also controls the exit side feeder (axis 2) in synchronization with the entry side feeder.

Material Loop Control

With the LR01.3-006.3 software version, the second axis can be used to control a straightener or leveler. A velocity output (to an open-loop/no feedback servo) corresponding to the average throughput (of

material through the press) can be used to replenish material removed from a material loop. An input is provided to adjust this velocity based on the depth of the material loop. Interrupt inputs are provided for both axes to prevent tight loop and full loop conditions.

RS-232/422/485 Serial Interface

A multi-format serial interface allows communication with a programmable logic control, a Indramat IDS or SOT, a personal computer or other host device. Every function (and more) that can be entered with the keypad and displayed on the LCD can be communicated between the CLM and host device at rates of up to 19200 Baud.

Remote Keypad/Display Mounting

The CLM front panel with keypad/display can be mounted separately from the CLM, up to 2 meters away (requires Remote Mounting Kit, Part # 303171). Thus the CLM can be panel-mounted inside a cabinet, with the controls separately mounted on the cabinet surface.

Optional Thumbwheel Switch Panel And Alphanumeric Display

An optional thumbwheel switch module (IDS) and an optional alphanumeric display, illustrated in Figure 1.3, are available for the CLM. The IDS connects to the serial port of the CLM. The remote display is available only with the IDS option. These units are remotely mounted, up to fifteen (15) meters from the CLM. The operator selects the required feed length and a feed rate on different sets of thumbwheel switches. The decimal place (resolution) for the feed length is set by parameter. The feed rate is selected as a percentage of the maximum feedrate set in parameter. Status and diagnostic messages appear on the alphanumeric vacuum tube fluorescent display or status and diagnostic message codes appear on the two digit LED numeric display on the IDS.

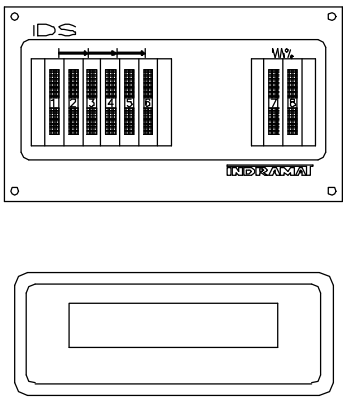


Figure 1.3 Optional Thumbwheel Switch & Alphanumeric Display Modules

Optional Station Operator Terminal (SOT)

The Indramat SOT is a remote mounted, operator control device for the CLM (see Figure 1.4). It allows for the same input functions and displays the same information as the CLM control panel, but provides several additional features.

The SOT has a viewing area that measures 4-7/8" by 2-3/4" and can display 16 lines of 40 characters per line. The SOT screen is a non-glare LCD with cold cathode fluorescent lamp backlighting for high black and white contrast. The level of contrast is user adjustable for optimum viewing. It can display much more information at a time than the standard four line by 16 character display on the CLM control panel. The software in the SOT provides Help screens to assist the operator in using the SOT and for entering information correctly.

The SOT is pre-programmed with appropriate screens for CLM-R/Z type applications. The SOT can also be programmed using Indramat's ScreenManager™ when further customized screens are desired. This command line editor software package runs on a DOS based PC computer. This program can be used to customize/write information and prompt lines for the operator that will appear on the SOT display. When downloaded to the SOT, these lines cannot be changed from the SOT keypad but data can be entered in response to the prompts.

The SOT keypad includes "click contact" keys for entering/changing data in the CLM, as well as several inputs normally provided on the user's control panel by the machine builder. These include the mode selection, axis jog - forward/reverse, and cycle start-stop-resume.

The SOT connects to the serial communications port of the CLM and can be mounted up to 1000 meters away with an RS-485 cable. An SOT User's Guide is provided at the end of this manual as a supplement.

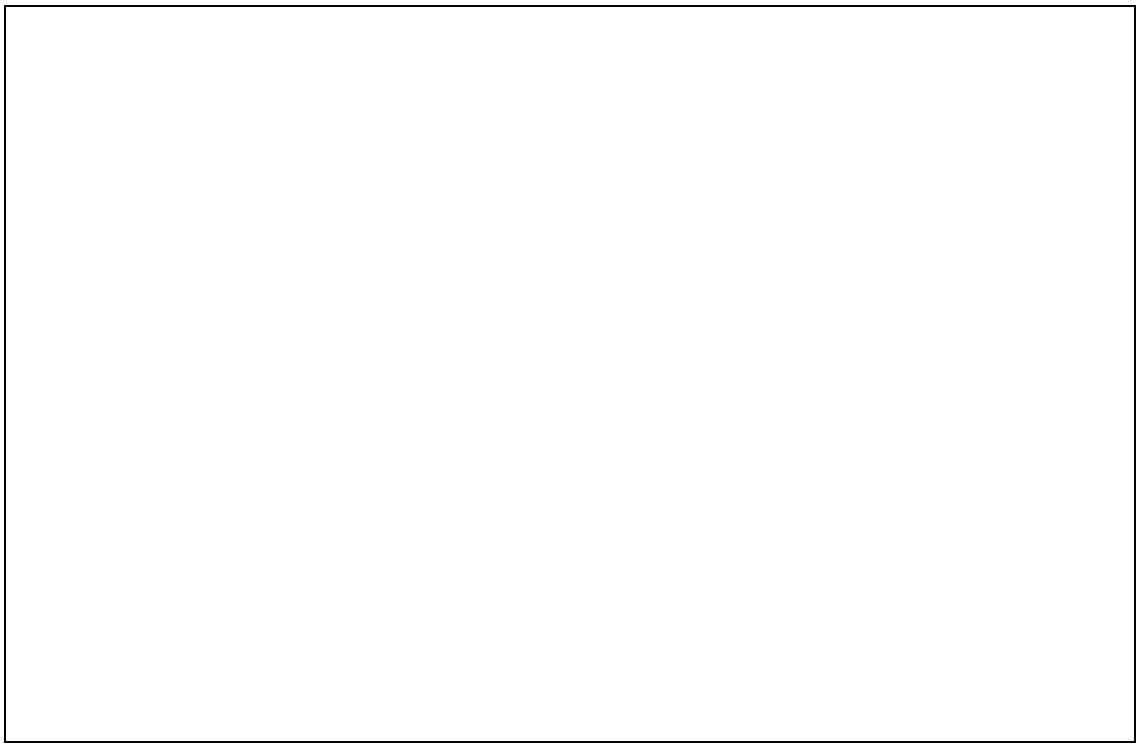


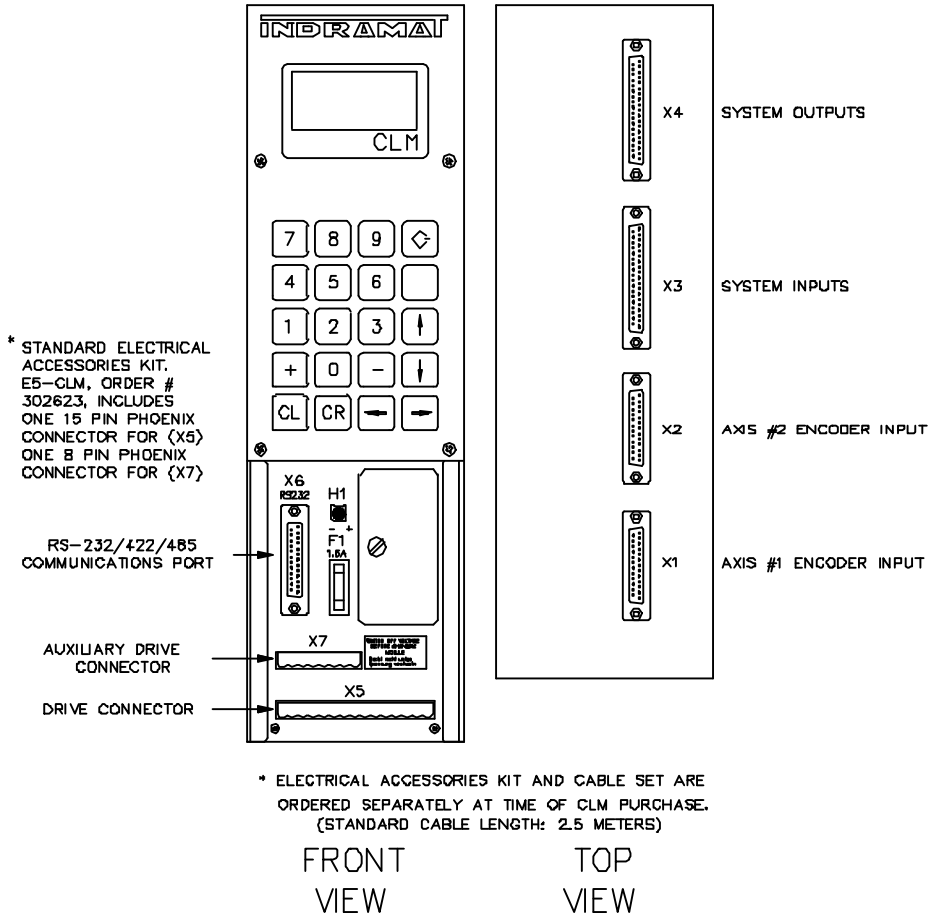
Figure 1.4 SOT - Station Operator Terminal

1.4 Physical Description of the CLM Control

The modular CLM Control mounts to the panel of a control cabinet (electrical enclosure) using two screws. It is designed for mounting side-by-side with a servo amplifier and servo power supply. Installation procedures are described in Chapter 6.

The CLM control panel includes a keypad for entering operating data and a liquid crystal display which shows operating status and diagnostic fault conditions. This keypad / display module can be remotely mounted -- up to 2 meters from the CLM module (i.e. on the user's control panel). The functions and use of the keypad and display are described in detail in Chapter 2.

The CLM includes a set of inputs and outputs which are pre-defined for controlling and acknowledging machine functions. The standard CLM, illustrated in Figure 1.5, includes 32 inputs and 32 outputs. The expanded version CLM, illustrated in Figure 1.6, allows up to 99 gag sets to be controlled by 30 auxiliary outputs (and 30 acknowledgment inputs) which may be programmed/defined by the user. The description of the I/O signal connections is provided in Chapters 3 and 4 by functional use.



CLM INTERFACE TERMINAL LOCATIONS
STANDARD MODEL

Figure 1.5 Standard CLM Controls and Connections

The CLM includes:

- A 32 Bit microprocessor.
- 256K of EPROM -- Contains the executive program, exclusively designed for positioning control, eliminating the need for complicated system user programming. It cannot be altered or changed by the user.

- 128K of RAM -- Contains the user-entered parameter data. A lithium backup battery maintains stored memory when power is OFF. The battery is located on the slide out memory card (Figure 2.3).

- 32 inputs and 32 outputs dedicated for the CLM/machine interface (described in Chapter 3).

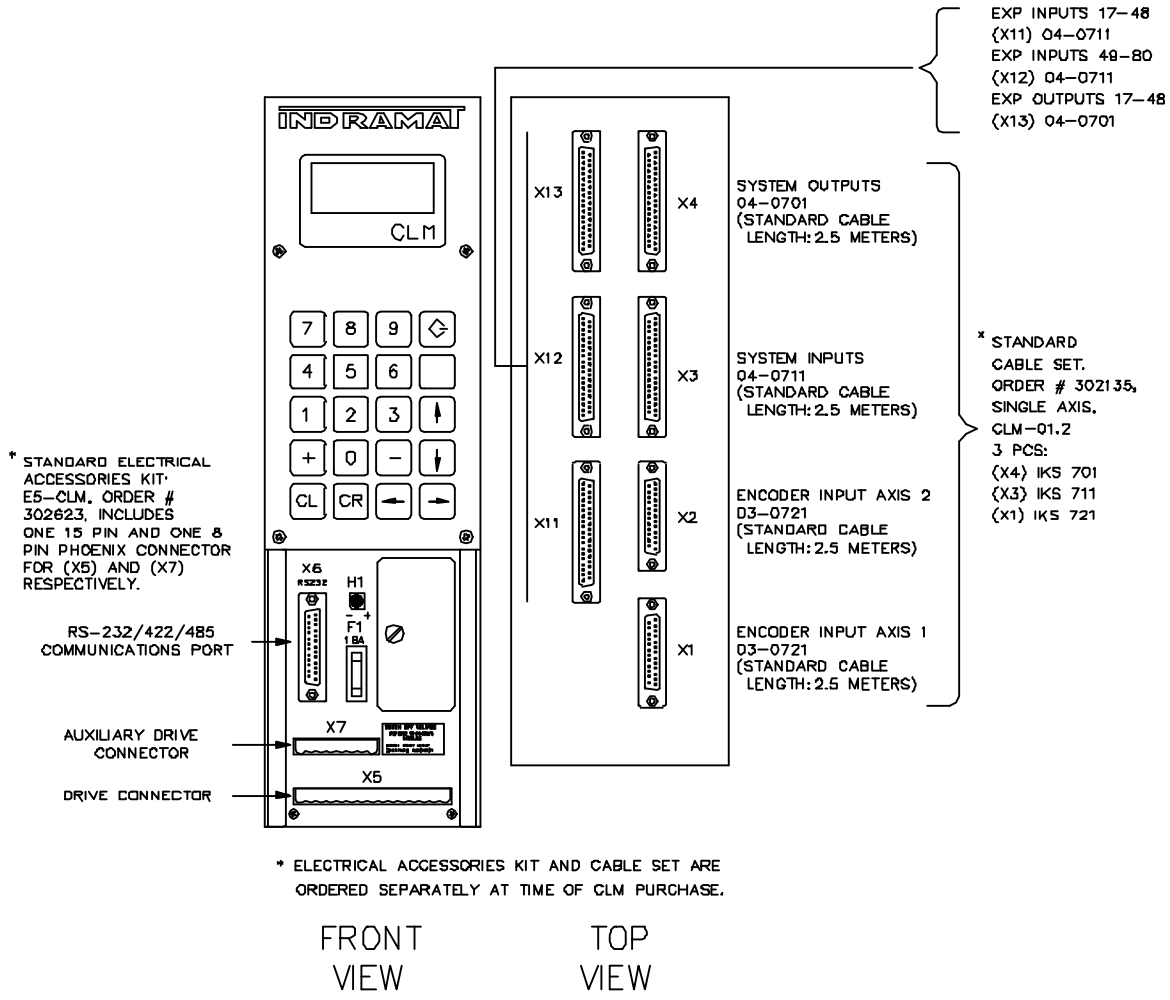


Figure 1.6 Expanded Version CLM Controls and Connections

1.5 Brief Operational Description

The CLM, servo amplifier, servo power supply and servomotor are designed into a mechanical feed system, which feeds some type of material into another processing station, such as a punch press, thermoforming station, etc.

The machine builder or user enters data into the CLM parameters to specify the mechanical and operating characteristics of the system. Based on this data, plus the feed length and feed rate entered by the operator, the CLM issues velocity commands to the servo amplifier, which controls the current driving the servomotor, which drives the mechanical feed mechanism.

The servomotor includes a tachometer and encoder which provide velocity and position feedback to the control, ensuring precise, repeatable positioning of the material being fed. The final accuracy of the feed system depends on various factors, such as type of material, gearbox backlash and other machine mechanics.

System components are modular, thus installation and replacement of any component of the control system is fast and easy. The CLM module, servo amplifier and servomotor have quick-connect cabling. The servo amplifier and motor are matched for optimum operation using a plug-in "personality" module. Thus, should a failure occur, module replacement is accomplished quickly without the need for electronic fine tuning. This results in a minimum of lost production.

The system is designed to ensure operating integrity and safety, using various inputs and outputs for handshaking to assure that the feeder and subsequent processing station or device operate in harmony. A complete diagnostic system monitors all inputs / outputs and operating conditions and stops the system if a fault is detected. Diagnostic messages are displayed to aid the operator in troubleshooting problems and quickly getting the system back into production.

1.6 Specifications

The following sections provide full specifications for the CLM Control and options.

NOTE: *Performance specifications can vary, depending on the mechanical limitations of the system.*

1.6.1 Physical

Dimensions

Height	15.35 in. (390 mm)
Width	4.13 in. (105 mm)
Depth	12.80 in. (325 mm)
Weight	14 lbs. (6 kg)

Operating Environment

Cooling	Convection
Allowable Ambient Temperature Range	41 to 113 deg. F (5 to 45 deg. C)
Storage and Transport Temperature Range	-22 to 185 deg. F (-30 to 85 deg. C)
Maximum Operating Altitude at Rated Values	3,280 ft. (1000 meters), higher altitudes permitted with proper cooling
Protection System	IP 10 - Open Frame Module suitable for mounting in a control cabinet (e.g., NEMA 12)

1.6.2 Control Specifications

Number of Axes	Two (second axis for specific function: Loop Control on the CLM-R, exit feeder control on the CLM-Z)
Position Feedback	One Incremental Encoder (one per axis on CLM-Z, second axis on CLM-R is open loop - no encoder)
Feed Length Resolution	0.0001 inches (0.001 mm)
Feed Rate	
Normal -	0.1 - 99.9% of Maximum Feed Rate (Operator Selected)
Jog -	0.1 - 99.9% of Maximum Feed Rate (Parameter Selected)

NOTE: *Maximum Feed Rate will vary, depending on the mechanical design of the system.*

Jogging	Forward/Reverse (Manual / Setup Modes only)
Status/Fault Display	LCD, Four lines, Alphanumeric, 16 Characters/ Line
Entry Keypad	20 membrane switch keys

Power Requirements

Control Voltage	
CLM-01.3-R/Z (w/Incremental Encoder) -	250 mA @ 24 Vdc

Optional IDS Module -	50 mA @ 24 Vdc (additional)

I/O Interface

Inputs	32 (+24 Vdc @ 10 mA) (pre-defined function)
Outputs	32 (+24 Vdc @ up to 50 mA) (pre-defined function)

NOTE: *Inputs will have a 10 mA current draw at 24 Vdc. Outputs are thermally protected by a current limiter circuit which eliminates the requirement for added fuses. If the load on the output causes a current draw in excess of 50 mA, the output comes on, but then fades. The higher the overload, the faster the fade occurs (within seconds).*

1.6.3 Options

Remote Keypad/Display	A cable allows remote mounting of the CLM control panel module (keypad / display)
RS-232 Interface Options	This interface allows remote operation and other data transfer between the CLM and a host device, such as a computer, programmable controller, the IDS / Remote Display or SOT,
IDS Assembly	A remote thumbwheel switch assembly used for entering feed length and feed rate for operation; displays status and fault codes
Remote Display	A remote mounted, vacuum florescent tube display (requires the IDS option)
SOT	Station Operator Terminal - Used for displaying diagnostics, entering feed length, feed rate, etc. It also contains Cycle Start, Stop, Jog, Mode, Micro-adjust and other control pushbuttons.

CHAPTER 2. CONTROLS AND INDICATORS

The CLM-01.3-R/Z keypad and display module consist of a keypad with 20 pressure-sensitive membrane type keys and a liquid crystal display (LCD) which shows four lines of up to 16 alphanumeric characters each. The number of lines and characters showing depends on the selected display mode and the current operating status of the control.

The display informs the operator of the operating status of the CLM system. It displays all status and diagnostic messages. It is used when entering or editing parameters, batch programming or other operations from the CLM keypad.

The keypad contains all the keys used for data entry, cursor movement, clearing fault/error messages, entering feed length and feed rate data, and storing entries.

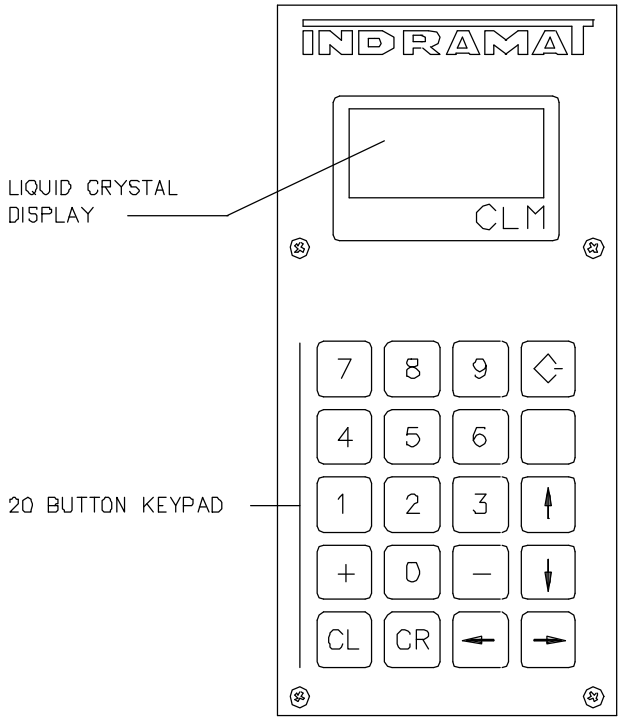


Figure 2.1 Display/Keypad Module

2.1 Data Entry Keys

This section describes the general function of each key on the CLM keypad. Their use is further described throughout the manual for specific functions.

CL Clear -- Use to clear the a displayed fault message, if the fault can be cleared. It also clears parameter entry errors. (See Store key for additional uses.)

CR Carriage Return -- When changing data values, press this key before pressing the Store key to cancel the change and leave the data as previously stored (clear entry).

In Parameter Mode, use this key to change between parameter sets A1, A2 and B1.

In other modes, use to move the cursor to the home position of the particular display. Use to toggle between certain displays (see next section).



Store -- Press to store (save) values entered while in Parameter Mode or feed rate, feed length and batch program values while in other modes.

When on the respective display: press this key to freeze the Total Length value for two seconds or to change state of Jog Step Mode; press the CL key and the Store key together to reset the Piece Count or to clear the Total Length value to zero.

+ & **-** Plus and Minus -- Use to specify the feed length direction; micro-adjust data fields.

0 - 9 Numerical Keys -- Use for entering data values.

¬ ® Left and Right Arrow -- Use to move the cursor to the left or right one position at a time when in Parameter Mode, when editing the feed length and feed rate, or when entering batch data. Press the key to change between display pages on the same row of the display map (see next section).

- ¯ Up and Down Arrows -- Use to scroll through display pages (see next section), or parameters (see Chapter 5).

ÛÛ Blank Key (unlabeled) -- Press from any other page displaying to cause the Status Page to display. Press before typing-over a parameter number to change displays.

2.2 Display Screens

The CLM uses its liquid crystal display for several screens. The operating mode and keyboard selections determine the resulting display. When in Parameter Mode, data for each parameter can be viewed, entered or edited. Refer to Chapter 5 for procedures to scroll through parameter displays. While in Automatic, Setup or Manual Mode, display screens show operation status messages, status of each input and output, etc., and allows entry of feed length, feed rate, etc.

The following section describes procedures for scrolling through each of these display screens. Refer to the "Display Map" in Figure 2.2 for a full illustration of the display access procedure. The same illustration is included in Appendix A for convenience. This section describes the basic procedures for reading this "map" to scroll through the different display screens and describes the information on each screen. Following sections in this manual further describe the information provided, procedures to edit the screens data, etc. as required for a specific function.

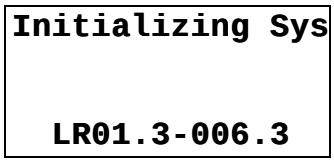
To allow easier description, each row of the map is labeled A, B, C, etc. In general, use the up or down arrow keys to change to the "home" display screen of the proceeding or following row. Use the left or right arrow keys to scroll through the displays on each row. Screens that allow editing data have a cursor. Use the right/left arrow key to move the cursor in the data field and type-over data to change. Continue pressing the arrow key to change to the next display screen on the row. Rows allow wrapping from the last screen on the row back to the first screen. Certain displays on the same row have alternate pages, such as Total Piece and Total Length. Use the CR key to toggle between them. Batching display screens require the CR key and the +/- keys for scrolling. Procedures are described below for each screen.

The example displays shown in the following descriptions show batching, loop control and registration features enabled (by parameter). If a feature is not enabled, its respective display pages do not appear when scrolling through the screens. Pressing the down arrow key from a screen on row C will scroll back to row A or to the first enabled option in row D, E, or F.

NOTES:

- *The current CLM display provides four lines with 16 character spaces on each line. However, all screens do not require all the lines or character spaces. For simplicity, this manual typically illustrates the example displays at the size required for the screens data.*
- *All displays illustrated in this manual use an underline character (_) to represent the cursor.*
- *The cursor must be in home position of the display to scroll up/down to different rows.*
- *All example screens are the same for both the CLM-R and CLM-Z, except where noted.*

The following display appears only at power-up, when clearing a hard fault, or when exiting from Parameter Mode. It shows the CLM internal software version (current versions are LR01.3-006.0 or LZ01.3-002.2) while the "Initializing Sys" message is displayed (during system initialization).



CLM Initializing System Display

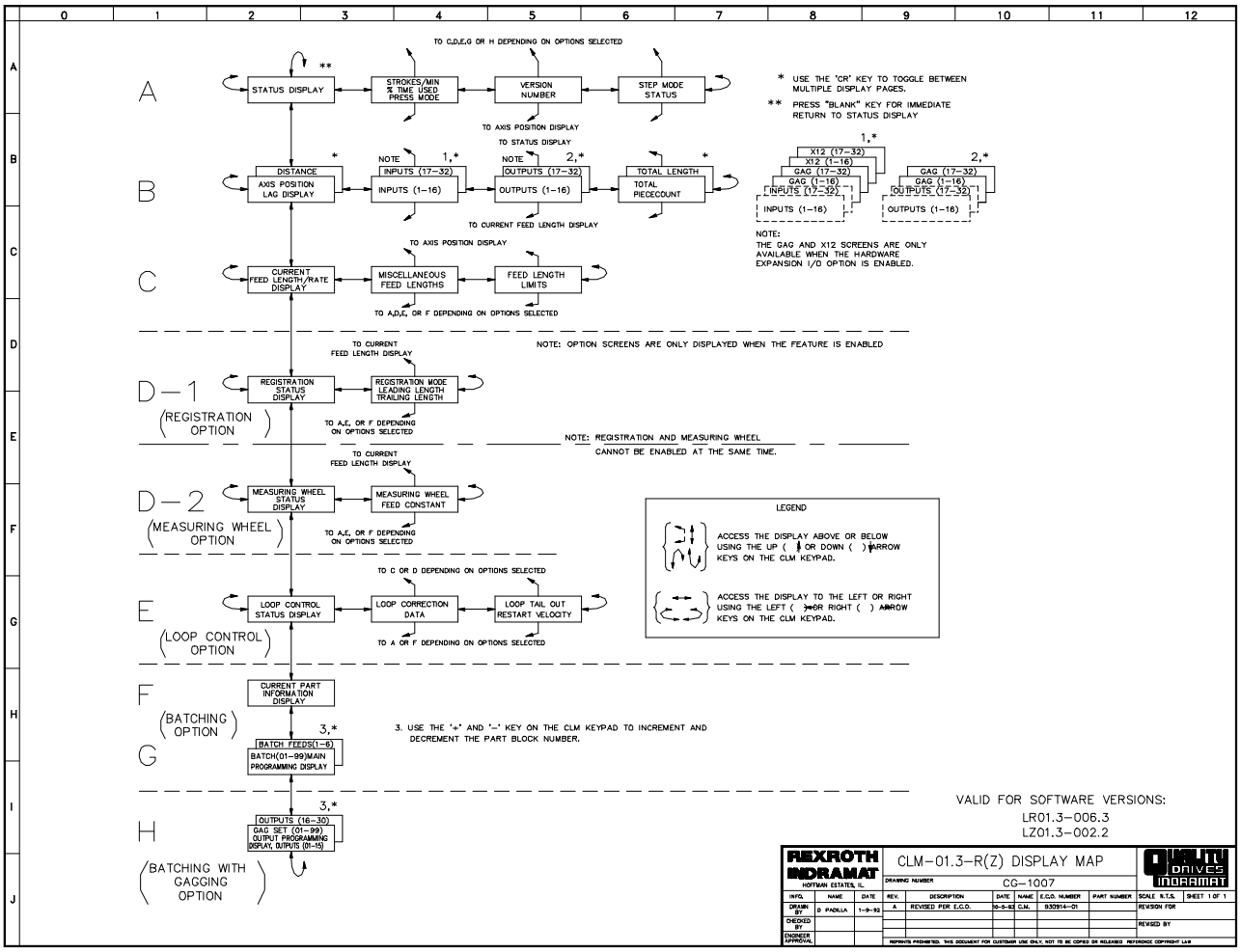


Figure 2.2 Map of CLM Control Panel Display Pages

Row A (Refer to the "Display Map" in Figure 2.2)

After system initialization, the display shows the current operating condition of the CLM control, including fault diagnostic messages. The following example indicates that the CLM is ready for automatic operation - awaiting a Cycle Start input to begin automatic cycling.

```
A: No Cycl Start
```

Example Status Display

This **Status Display** is the home display of the first line (Row A on display map). Each status display page is described in Chapter 8, along with corrections for fault/error diagnostic status display messages.

Press the right arrow key once. The display changes to the **Strokes/Minute Display**, which also shows the time used and current press mode selection. Each line of the display is described below.

```
Strokes/Min 200
Time Used   80%

PBF Continuous
```

Strokes/Minute Display

The Strokes/Minute display page shows the current stroke rate of the press during an Automatic Mode cycle. The CLM measures the time between press strokes and updates the Strokes per Minute display when the feed angle signal goes from high to low.

The display page also shows Time Used. Time Used is the amount of time during a high feed angle that is used by the programmed feed. The percent value displayed provides an estimate of the maximum press stroke rate that can be used with the current feed length, feed rate, and feed angle. For example, if the current hit rate is 100 strokes/min. and the time used is 75%, the maximum hit rate would be approximately 100/0.75 = 133 strokes/min. (SPM).

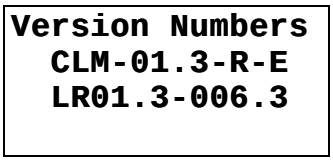
When the time used approaches 100%, the soft fault 'Feed Angle Lost During Feed' will be issued, because the press rate is too fast and the feed angle will go low before the feed is complete. In Press Intermittent mode, the maximum Strokes/Minute is limited by the minimum cycle time specified in the Press Interface Parameter. The Time Used display does not go above 99 percent. A Time Available output can be used to indicate when the stroke rate can be safely increased without loss of the feed angle. A light can indicate when the feed time is within 90% of the maximum hit rate allowed. See Chapter 3 for further description.

When an Automatic mode cycle is not in progress, the last Strokes per Minute/ Time Used values will be displayed. After a cycle stop, the data can be read even though the press is not cycling. The page is not updated in Manual, Setup, and Parameter modes. Hard faults, soft faults, and minor errors also will not affect the Strokes per Minute value. At power-up, the values are reset to zero. Pressing the Store key freezes the display for two seconds.

The current press mode selection is displayed in the bottom line of the Strokes/Min. display. These modes of operation are described in Chapter 3.

- Press Interface Mode: PBF=Press Before Feed, FBP=Feed Before Press.
- Press Cycle Mode: Intermittent or Continuous. This is changed whenever the corresponding input is changed. It may be changed during a cycle.

Press the right arrow key once. The display changes to the **Software Version Display**. The following display shows the current hardware version CLM-01.3-R-E (-E appears only when the Expanded I/O option is included) and the current internal software version LR01.3-006.3. The Infeed/Outfeed version of the CLM, the current hardware version is CLM-01.3-Z and the current two-axis software version is LZ01.3-002.2.



Software Version Display

Note Regarding Display Compatibility with CLM-01.2: *If using the current software version on hardware version CLM-01.2, scroll to this screen and press the STORE key to toggle between two line/four line display modes. Most displays will then appear similar to the examples shown in this section. However, the third and fourth lines of information displayed with the current version will not show and cannot be edited on the earlier, two-line display version CLM.*

Press the right arrow key once. The display changes to the **Jog Step Mode Display**. This feature allows defining the distance that the CLM will feed when the Jog button is pressed in Manual Mode. Jog velocity is set in parameter.



Jog Step Mode Display

With normal jog (Jog Step Mode set to OFF), the CLM will feed as long as the forward or reverse jog button is pressed, and stops when the button is released. With Jog Step Mode set to ON, the CLM will feed a parameter-defined distance when a jog button is pressed.

To change the jog mode from Normal Jog to Step Jog, press the STORE key while on the Jog Step Mode page. The display will indicate the Step Mode is ON or OFF. Jog Step mode is enabled in Manual Mode only.

The CLM feeds material at jog velocity until the jog input goes low (jog button released) or until the step length has been reached. Once the step length is nearing completion, the motor(s) will be ramped down to zero velocity and a 1.5 second delay occurs to provide time to release the jog button. After the delay, another feed will start if the jog button has not been released. If the jog button is released before the step feed has completed, the CLM will complete the parameter set feed length.

Any time the motor is ramped down to zero velocity the Feed Complete output will go high. If the step mode ON/OFF is toggled while the motors are in motion, the motors will be ramped down and "Jog Input Active" will be displayed.

Row B (Refer to the "Display Map" in Figure 2.2)

Pressing the down arrow key from any of the displays on the top row, changes to the **Axis Position Displays**. This is the "home" display set of the second row (Row B) of displays. Use the left or right arrow keys to scroll through the input / output status and total piece count displays on this row. Use the CR key to toggle between certain pages, as described below.

The Position Display shows either axis lag or distance moved.

The Distance Moved Display shows the distance moved by the axis during each feed (the actual position read from the encoder). The display for CLM-Z shows the information for both axes.

```
Axis Position
Dist  +00123.456
```

Axis Position Distance Moved Display on CLM-R

```
Axis Position
Dist1 +00123.456
    2 +00123.456
```

Axis Position Distance Moved Display on CLM-Z

The Lag Display shows the following error - the difference between actual and commanded position - used by the CLM to calculate the command voltage to the servo amplifier.

```
Axis Position
Lag   -00001.234
```

Axis Position Lag Display on CLM-R

```
Axis Position
Lag 1 -00001.234
    2 -00001.234
```

Axis Position Lag Display on CLM-Z

*Pressing the **CR** key* toggles between the Lag Display and the Distance Moved Display pages. The "Lag" or "Dist" indicates the Lag or Distance page of the position display respectively.

A (+) or (-) indicates direction. Both display pages have eight (8) digits and are shown in the unit of measurement selected by parameter for the application (inches, millimeters, degrees, etc.).

The Distance Moved Display has the same number of decimal places as the feed length resolution (set in Parameter A100). In Manual Mode, the total distance jogged displays. In Automatic and Setup Modes, the distance moved during each feed displays. At the start of a feed in Automatic or Setup Modes, the display is cleared to zero (0). Pressing the **CL** key will also clear the display to zero (when this page is showing on the display).

The Lag Display has the same number of decimal places as the feed constant (one more decimal place than the Distance). When the axis is not moving, a small lag value will display. In order for the axis to be "in-position," the In-Position Threshold (set in Parameter A110) must be greater than this lag value. When the axis is moving at maximum velocity, the display lag should be within 10% of the calculated maximum lag.

Pressing the right arrow key from the Position Display causes the display of pages which show the status of the system inputs and outputs. These displays are helpful to verify wiring during start up or troubleshooting. They also provide a quick summary of system I/O status during normal operation. The first line of these displays also show the system status.

From the Position Display, press the right arrow key to see the **System Inputs Display**. Press the right arrow key again to see the System Outputs Display. The status of 16 of the 32 inputs or outputs display on a page. The numbers "1-16" or "17-32" in the top row of the display indicates which of the lines of connector X3 (input) or X4 (output) are being monitored.

```
A: No Cycl Start

Sys Inputs  1-16
.11..1....11.11.
```

System Inputs Display

*Press the **CR** key* to display either the inputs or outputs as shown on the map.

The status of each of the 16 input or output signal lines are represented by a character in the bottom row of the display. A Low signal (0 volts) is represented by a decimal (.). A High signal (+24 volts) is indicated by a one (1). The signal lines count from left to right on the display (1-16, 17-32).

Note that only the System inputs/outputs can be displayed on the Standard CLM. With the Expansion I/O option, GAG or AUX inputs or outputs can be displayed, depending on the setting in the batching parameter. The following list the CLM connector being monitored and displayed with the respective message on the display for the Inputs and Outputs.

Message	CLM Connector
Sys Inputs	X3
GAG (AUX) Inputs	X11
X12 Inputs	X12
Sys Outputs	X4
GAG (AUX) Outputs	X13

Press the right arrow key to see the **System Outputs Display**. Press the CR key to cycle through the display pages that show outputs, as described for input display pages above. Interpret the information displayed the same as described for inputs.

```
A: No Cycl Start

Sys Outputs 1-16
..1.11...1..1...
```

System Outputs Display

Press the right arrow key to see the **Total Piececount Display**.

```
Total Piececount
     000123
```

Total Piececount Display

*Press the **CR** key* to toggle between Total Piececount Display and the **Total Length Display**.

```
 Total Length
 +1234567.890
```

Total Length Display

The total number of pieces and length of material run through the feeder are displayed on these Length and Piece Accumulator Displays. These totals may be reset at any time.

The piece count is incremented when one full cycle of the press is completed in the Automatic mode or after each part is completed when batching mode is selected. Normally, 6 digits are displayed, but up to 8 can be shown as they are needed. The count is retained in memory at power-down.

To reset the counter to zero:

1. Press the CL key. The count display is replaced by a prompt.

```
Total Piececount
  RESET DATA?
```

2. If you wish to reset the counter to zero, press the STORE key to clear the count. The added step of pressing the STORE key prevents the count from being reset inadvertently.

3. If you do not wish to reset the counter to zero, press any other key or leave the page. This action will restore the original count.

The Total Length Display is accessed by pressing the CR key while in the Total Piececount display. The length is accumulated in Automatic mode only, and includes all batching and auxiliary feed lengths. The CLM displays from 6 to 10 digits of data with a floating decimal point. The display may be frozen for 2 seconds by pressing the STORE key. The total length is retained in memory at power-down.

To clear the length, press the CL key, then the STORE key, as described in the steps above for the Total Piececount.

Row C (Refer to the "Display Map" in Figure 2.2)

Pressing the down arrow key from any display in the B row changes to the **Feed Length Display**, the home display of the C row. Other displays on this row show relevant parameter settings. The parameter data display pages are for information only. Parameter data can be edited/changed only in Parameter Mode.

The feed length display allows entering the feed length and feed rate desired for system operation. The display looks and functions differently, depending on the interface option set in Parameter B102. This parameter selects the method of entering the feed length and feed rate into the CLM. The displays also vary slightly between the CLM-R and CLM-Z versions of CLM. Each of the options are described individually, as follows.

Feed Length and Feed Rate on a CLM with *Standard Interface Option*

The standard option setting allows entering/editing the feed length and feed rate directly from the keypad on the CLM control panel. Use the left/right arrow keys to position the cursor on the data line. Type over an existing entry to edit. Press the STORE key to save the new value. The cursor returns to home position.

```
Current Feed:
  Length   Rate
 _001.234  12.2%
```

Feed Length and Feed Rate Display - Standard Interface, CLM-R

To scroll up or down to the previous or next row of displays from this display page, note that the cursor must be in the home position. It automatically returns to home after storing new data. Press the CR key or use the left/right arrow keys to properly position. Micro-adjust (explained later in this section) is allowed only when the cursor is in home or the first digit position.

When changing the feed length or feed rate value while the CLM is in cycle (on-the-fly), this new value typically takes effect on the next cycle. If you press the CR key, or leave the keyboard inactive for 30 seconds before pressing the STORE key, the cursor returns to home position and the program (and display) returns to the last stored information (data).

The decimal placement in the feed length depends on the setting in Parameter A100. The feed rate is a percentage of the Maximum Feed Rate set in Parameter A104.

```
Current Feed:
A Length   Rate
1_001.234  12.2%
2 001.235  12.1%
```

Feed Length and Feed Rate Display - Standard Interface, CLM-Z

This display on the CLM-Z allows editing the feed length and feed rate for both axis 1 and axis 2. Use the up/down arrow keys to move the cursor between the two axis lines of data (except when in home position). When entering data, the cursor will automatically wrap to the next row. Press the STORE key and data is saved for both axes simultaneously, and the cursor returns to home position.

Micro-adjust (explained later in this section) is allowed when the cursor is in home or the first digit position of either axis. This allows performing a separate micro-adjust of each axis independently.

If you press the CR key, or leave the keyboard inactive for 30 seconds before pressing the STORE key, the cursor returns to home position and the program (and display) returns to the last stored information (data).

Asterisks (*) will display in place of data for a disabled axis. Only the enabled axis data may be edited.

Feed Length and Feed Rate on a CLM with the *IDS Interface Option*

When using the IDS option, the feed length and feed rate are entered into the CLM using the IDS thumb-wheel switches. This display shows IDS in the first line, indicating the option is selected. It does not contain a cursor or allow editing from the keypad. The display is only for information of the settings made through the IDS (connected to the RS-232 connector of the CLM). The display shows the last data entry processed after a two second delay from when the thumb-wheel switch is changed. If the serial port transmits an invalid character, a (*****) will display instead of a digit (or digits). Enter the settings again, check connections, etc., until the display data is valid.

```
IDS Feed
  Length  Rate
  001.234 12%
```

Feed Length and Feed Rate Display - CLM-R/Z, with the IDS Interface Option

Feed Length and Feed Rate display, when using the IDS option, is the same for the CLM-R and CLM-Z versions of the CLM (axis 1 data shows on display).

Feed Length and Feed Rate on a CLM with the *Batching Option Enabled*

The batching option allows setting multiple feed lengths and feed rates for each part and up to 99 different parts. The Current Part feed length display on Row C shows information for the current feed of the part currently executing or ready to be executed.

Procedures for entering/changing data (feed lengths, feed rates, gagging outputs, etc.) for the batching/gagging option are described in this section under Rows G and H.

```
Current Feed
  Length   Rate
 +001.234  12.2%
```

Feed Length and Feed Rate Display - CLM-R with Batching Option Selected

No cursor appears on this display for the CLM-R. However, micro-adjust (described later in this section) is allowed.

```
Current Feed
A  Length  Rate
1_+001.234 12.2%
2 +001.234 12.2%
```

Feed Length and Feed Rate Display - CLM-Z with Batching Option Selected

On this display for the CLM-Z, a cursor appears beside the axis number, to indicate which axis can be micro-adjusted. Press the CR key to toggle the cursor between axis 1 and 2.

Additional Information Pages on Row C

From the CLM feed length / feed rate display, you can view additional information pages. These show settings made in different parameters. You cannot edit the parameter values from these pages. They are for information only.

Press the left (or right) arrow key from the feed length / feed rate display, until the desired Parameter Information page displays. The following summarizes the lines of information on these displays. Refer to Chapter 5 for further information on parameter entries.

```
Aux Fd  -010.000
Jog Step 000.500
Fd Incr. 000.050
Slug Cmp 000.650
```

Parameter Information Display

Auxiliary Feed Length - is a secondary feed length - entered in Parameter B103. Use an external switch to trigger the CLM to use this feed length instead of the standard one entered.

Jog Step - setting is entered in Parameter B108. This function is enabled/ disabled from a display on Row A. In Manual Mode, pressing a jog key will cause the CLM to feed the length entered in the parameter, then stop (if the function is enabled, as further described under Row A).

Feed Length "micro-adjust" Increment - is set in Parameter B107. It allows you to fine tune (micro-adjust) the programmed feed length by adding or subtracting the value entered in the parameter.

To use this **micro-adjust** feature

- Press the arrow keys to display the main feed length / feed rate page (home display of this row). On the CLM-Z, press CR to move the cursor to home position; press the up/down arrow keys to move the cursor between axis 1 and axis 2 (select the axis to micro-adjust). Simply pressing the (+) or (-) key on the keyboard adds or subtracts the increment to or from the previously programmed feed length and automatically stores the new value. The micro-adjust feature works from this display page for both the standard CLM and batching interface options, and on the Batch Feed Programming display (row G), and other pages as noted.

- A (+) key will add the value entered in Parameter B107 to the programmed feed length and store the new value. If the Feed Length Maximum Limit (B104) or the Maximum Change (B106) are exceeded, a minor error is issued. A (-) key will subtract the value entered in Parameter B107 from the programmed feed length and store the new value. If the Feed Length Minimum Limit (B105) or the Maximum Change (B106) are exceeded, or the change results in a zero feed length, a minor error is issued. Micro-adjust will not cause the digits to roll-over (past 000000 to 999999) or a change in feed direction (past 000000 to negative).

- If one of the limits is exceeded (Maximum Limit, Minimum Limit, Maximum Change), the respective error occurs. The error may be cleared while the Batch Feed Programming page displays by entering a correct feed length and pressing the Store key, or by pressing the (+), or (-) keys until a correct feed length is entered. A Feed Length Limit minor error can be cleared also by storing a legal value while in the Batch Feed Length / Feed Rate Programming page (Row F).

Press the left (or right) arrow key from the feed length / feed rate display, until the desired Parameter Information page displays. These displays are for information only.

```
Min Feed 000.500
Max Feed 100.000
Max Chg. 010.000
Units    in.
```

Parameter Information Display

Minimum and Maximum Feed Length Limits - are set in Parameters B105 and B104 respectively. These limit the range of the feed length entry that the CLM will accept.

Maximum Change - setting is made in Parameter B106. This parameter limits the amount that the programmed feed length can change during an Automatic Mode cycle before causing a fault to occur.

Units Setting - selection is set in Parameter B101, as desired for the application. It can be set for inches (in), feet (ft), millimeters (mm), degrees (deg), etc.

Row D-1 (Refer to the "Display Map" in Figure 2.2)

Pressing the down arrow key from any display in Row C, changes to the **Registration Display** (Row D), if enabled in Parameter B112. This feature allows the CLM to adjust each feed, based on a printed mark on the material, to compensate for slip or stretch of material. If using the Measuring Wheel feature instead of Registration, refer to its description in this section, under Row D-2.

The registration search status, missed mark count, and current length are displayed in real time on the main registration page. The message "Locked Out" indicates the mark has already been found or is not being searched for. When a reference mark search is in progress, "Ref Search" is displayed. A "Disabled" message indicates that registration is disabled by input. An "A" is displayed in the last character of the first row if the reference mark is aligned.

```
REG Locked Out A
Missed:  000
Length:  012.330
```

Registration, Cont. Mode (w/o Offset) Display

Press the left or right arrow key. The registration mode, leading distance, and trailing distance parameters are displayed on a page.

```
Continuous Mode
Leading  001.000
Trailing 000.125
```

Registration Cont. Mode, Parameter Display

For averaging mode, the sample number is displayed in the bottom row of the main registration display.

```
REG Locked Out A
Missed:  000
Average: 012.330
Samples: 01
```

Registration, Averaging Mode Display

The registration parameter display page shows Averaging Mode. The registration parameter display is the same for Continuous Mode with or without offset.

```
Averaging Mode
Leading  001.000
Trailing 000.125
```

Registration Avg. Mode, Parameter Display

If the offset function is enabled for continuous mode, the offset distance appears in the bottom row. It may be edited and micro-adjusted the same as any other CLM length. If the programmed offset is greater than the programmed feed length, a minor error "Offset Exceeds Feedlength" will be issued. A zero offset distance is allowed for normal continuous mode with no registration input filter.

```
REG Locked Out A
Missed:  000
Length:  012.000
Offset: _001.000
```

Registration, Continuous Mode (with Offset) Display

Refer to Chapter 4 and to the Parameters B112 - B115 in Chapter 5 for further information on the Registration feature.

Row D-2 (Refer to the "Display Map" in Figure 2.2)

Pressing the down arrow key from any display in Row C, changes to the **Measuring Wheel (M.W.) Display** (Row D), if enabled for Axis 1 (or Axis 2 with CLM-Z only) in Parameter B112. The Measuring Wheel Select input must be high to enable Length Compensation in Automatic Mode.

The Measuring Wheel Information Pages replace the Registration Pages when Measuring Wheel is enabled. The Measuring Wheel position page shows the current position of the measuring wheel and the Axis being used for Length Compensation and Percent Deviation. The STORE key will freeze the display for two seconds.

```
Axis 1  +001.234
M.Wheel +001.240
```

M.W. Position Display

The M.W. position display is active in all modes regardless of the M.W. Select input so that deviation can always be checked.

Pressing the right or left arrow key will cause display of the axis and measuring wheel feed constants, as set by parameter. These are useful when fine-tuning the system. Editing of parameters is allowed only in Parameter Mode.

```
A101    0001.0000
B116    0001.0020
```

M.W. Parameter Display

Refer to Chapter 4, and to the Parameters B112, B116, and B117 in Chapter 5 for further information on the Measuring Wheel feature.

Row E (Refer to the "Display Map" in Figure 2.2)

Press the down arrow key from either option display in Row D (or from any page in Row C, if options are disabled on row D) to see the Loop Operating Status page (if **Loop Control** option is selected). This section overviews the display pages used in this feature. Refer to Chapter 4 for additional information.

```
LOOP Automatic R
Velocity 01000
Correct. +0020
```

Loop Control Display

This page provides a real-time display of the loop operating status as explained below.

Loop status message: One of six messages can show on the display to indicate loop status:

Manual	When Loop Manual is selected and jogs are not high.
Jog Fwd.	When Axis 2 Jog Forward input is activated during Loop Manual.
Jog Rev.	When Axis 2 Jog Reverse input is activated during Loop Manual.
Automatic	Displayed when Loop Automatic is selected.
Max. Loop	Indicates $\overline{\text{MAXIMUM LOOP}}$ input is active, and takes precedence over all the above messages.
Ax1 Slave	Displayed at all times when Feeder Slave mode is enabled.

Commanded Axis 2 Velocity: This is the velocity commanded to axis 2 based on throughput and the Run Loop state. Normally, 5 digits are displayed, but up to 7 will be displayed if there is overflow. (Integer value, in units/min.)

Axis 2 Velocity Correction: This is the current correction that is being added to the throughput velocity. It is displayed as a signed value in units/min. with from 4 to 6 digits. The correction works as an integrator, and it stays the same when the correct velocity is being commanded (i.e., when Run Loop changes). Its absolute value will increase with the distance of the Loop depth from the Run Loop sensor.

Run Loop Indicator: If the Run Loop input is high, an "R" is displayed here. If it is low, the character is blank.

Press the right-arrow key from the Loop Control page to display the **Loop Correction Data** page. The Correction Interval and Velocity Adjustment Factor are control variables which may be adjusted from this page when fine-tuning the system. Parameter B121 is set to enable/disable data entry on this page. If disabled, the cursor is not present on the display.

```
Loop Correction
Start Vel:_50.0%
Interv: 0100.000
Factor:   05.0
```

Loop Correction Data Display

The Starting Velocity, Correction Interval and Velocity Adjustment factor are entered on this page, which is accessed by pressing the right arrow key from the Loop Control page. These are control variables that may be adjusted when fine-tuning the system. The Edit digit of Parameter B121 must be set to 1 to enable data entry. A cursor is present if editing is enabled.

To lock out this data from the operator, the parameter digit should be set to 0. The cursor will not appear if data entry is disabled.

Section 4.4 provides additional information on Start Velocity, Correction Interval and Velocity Adjustment Factor.

```
Loop Tail Out
Restart
Velocity: 25.0%
```

Loop Tail Out Display

By pressing the left arrow key when on the Loop Control Display, the Loop Tail Out display is entered. When Tail Out mode is enabled, this display allows the operator to enter the Tail Out Restart velocity for the loop axis. When Tail Out is not enabled, stars are displayed. The default value for Restart Velocity is 50.0%

Row F (Refer to the "Display Map" in Figure 2.2)

Press the down arrow key from any page in Row C (or Row D or Row E if those options are enabled) to see the Batch **Current Part Information Display** (if Batching option is selected). This section overviews the display pages used in batching. Refer to Chapter 4 for additional information on batch programming options.

```
INFO_01 11111111
Qty   000100  G#
Count 000001  01
Feed  1  Cnt 001
```

Current Part Information Display

This is a real-time display that shows most current information for the current part (part currently executing or selected to execute next). The part block and part ID number will change as each part executes in the batch program. The part quantity and count show the quantity of the current part to execute and the number executed. The count mode can be selected in parameter to count up or count down. The current feed number changes with each feed, as does the current GAG set (G#). The current feed count increments or decrements, depending on the count mode selected. The current feed length and feed rate display on the Feed Length page (Row C).

If the part is programmed to execute continuously, FREERUN will display in place of quantity and count will always increment. If the part is linked to use more than six feeds, quantity is replaced by "++++++" or "Linking Part" until feeds execute to the page which includes the quantity for the part. Then, the quantity displays and "INFO" changes to "LINK" on this display.

In addition to displaying real-time part information, the selection of the starting part number and micro-adjustment of the current part count are done from this page.

Use the arrow keys to move the cursor in the data fields. Type over the part block number or the part ID number to select the starting part to execute (can start with any of the up to 99 parts programmed). Press the STORE key. If the current part is selected as the starting part, the batching program will be reset to the start of the current part. The starting part entry is allowed only when the CLM is not in an Automatic Mode cycle. Note that batching information must be programmed into pages on the following rows before using this page to start the batching program.

The current part count can be micro-adjusted from this page. Press the right arrow key to move the cursor out of home position, then press the down arrow key to move the cursor to the first digit of the Count data field. Press the + key to add to the count; press the - key to subtract from the count. Key use for increasing/decreasing the total number of parts to execute is dependent on the count mode selected (count up or count down).

Row G (Refer to the "Display Map" in Figure 2.2)

Press the down arrow key to see the **Batch Main Programming Display** page.

```
Main_01 11111111
Jump to Block 02
Quantity  000010
Early Warn   002
```

Batch Main Programming Display

Batching programs are entered on this page using part data entered on the following related pages. This section summarizes the programming procedures. Refer to Chapter 4 for more specific information on entry procedures and options available.

From this page, enter the Part ID number, the next block to jump to, the part quantity, and the Early Warning count for each part.

Within the page, use the right and left arrow keys to move the cursor through the data fields. The cursor will wrap from row to row within the page. Other than home position, pressing the up or down arrow keys causes the cursor to move to the first position of the next or preceding row in the display. Type over data to change. Press the STORE key to save any changes (saves all data as currently displayed) and return the cursor to home position. Press the CR key before pressing STORE to clear any changes to data (reverts to data previously saved) and return the cursor to home position.

Press the + / - keys to scroll through batch main programming pages and enter information for each part, numbers 01 to 99.

Press the CR key to toggle between the Batch Main Programming page and the **Batch Feed Programming Display** page for each part.

```
Part_01 11111111
Feed  1  Cnt 001
 Length  Rate G#
+012.345 67.8 01
```

Batch Feed Programming Display

There can be up to six Batch Feed Programming pages associated with each Batch Main Programming page. From these pages, enter data for up to six feeds per part, including feed quantity, length, rate, and gag set.

Press the + / - keys to scroll through feed programming pages (with the cursor next to "Feed" in the display) and view/enter information for each feed required for the part (feed 1 up to feed 6).

Enter data for part 01 on the main programming page. Press CR and enter data for the first feed required for part 01. Press +, enter data for the second feed for part 01, etc. Return to the main programming page. Press +, enter data for part 02. Press CR and enter data for the first feed required for part 02. Press + and enter data for each feed required for part 02. Continue this process for each part.

NOTE: *The* CLM-*Z allows using the batching feature. It is the same as the* CLM-*R except that feed length and feed rate may be entered for both the in-feed and the out-feed axes. The only display page that is different is the Batch Feed Programming page.*

The Batch Feed Programming pages for the CLM-Z are described below.

When the cursor is in the first row of the batch feed programming page of the CLM-Z, the display looks the same as on the CLM-R. The axis 1 feed length, feed rate and gag set display in row 4 of the page. When the cursor is moved down from the first row in the display page, the fourth row of information (for axis 1) moves up to the third row, and the same information for axis 2 displays in the fourth row.

```
Part_01 11111111
Feed  1  Qty 001
+012.345 67.8 01
+012.346 67.0 A2
```

Batch Feed Programming Display for CLM-Z (when cursor is in row 2, 3 or 4)

Independent feed length and feed rate entry (type-over) and micro-adjust (with cursor in first digit position after the +/- feed direction sign) is allow for both axes. If either axis is disabled, asterisks (*) display for the data.

Row H (Refer to the "Display Map" in Figure 2.2)

Press the down arrow key to see the first **GAG Output Selection Display** page. Note that the GAG/AUX pages will display only if the CLM includes the Expanded I/O option. The GAG 99, **Shear Selection Display** page will display in this row, even without the Expanded I/O option.

```
GAG_01  *(01-15)
 01 -- 03 04 05
 06 07 -- 09 10
 11 -- 13 14 15
```

GAG Output 01-15 Selection Display

Press the CR key to see the next page of GAG Output Selections.

```
GAG_01  *(16-30)
 -- 17 -- -- --
 -- -- -- -- --
 -- -- -- -- 30
```

GAG Output 16-30 Selection Display

Gagging is the use of different patterns or tools (gags) in a press, selected by outputs from the CLM. These outputs may be used for functions other than gagging, to turn ON auxiliary outputs for each feed. The selection for GAG or AUX to display is made in the batching parameter.

The outputs 01-15 and 16-30 can be turned ON or OFF for each gag set (01-99) from these pages. A gag set is selected for each feed from the Batch Feed Programming page.

Press the + or - keys (with the cursor in home position) to scroll through gag sets 01 to 99.

Press the CR key to toggle between outputs 01-15 and 16-30 for each gag set (01-99). Five gag outputs are displayed per row of the page (15 per page). Outputs that are ON are indicated by the corresponding output number showing on the display. Outputs that are OFF are indicated by a -- in the corresponding output position. An asterisk (*) indicates that gag outputs are ON in the other set of 15.

With the Expanded I/O option, shear output selection is gag set 99. Without the option, the **Shear Selection Display** page appears in the last row of the display map, in place of the other gagging display pages.

```
GAG 99
Shear Selection
Press Hold   YES
```

Shear Selection Display

To toggle Press Hold between YES and NO, press the STORE key. When YES is selected, the press is stopped momentarily, until the shear operation is complete. When NO is selected, the press continues to cycle and the shear operation occurs after the end of the feed and before the feed angle goes low.

2.2.1 Shear Selection Display

This displayis used to toggle Press Hold between Yes and No by pressing the left or right arrow keys. When Yes is selected, the press is stopped momentarily until the shear operation is complete. When No is selected, the press continues to cycle and the shear operation occurs after the end of the feed and before the feed angle goes low. The Shear Option data field will always be on if this page is enabled by the shear enable bit in Parameter B111.

For more information, refer to the SOT Supplement to this manual, Indramat publication IA74790S.

2.2.2 Two-Line Display Compatibility

Note Regarding Display Compatibility with CLM-01.2: If using the current software version on hardware version CLM-01.2, scroll to this screen and press the STORE key to toggle between two line/four line display modes. Most displays will then appear similar to the examples shown in this section. However, the third and fourth lines of information displayed with the current version will not show and cannot be edited on the earlier, two-line display version CLM.

2.3 Lower Front Panel

There are six items located on the lower part of the front panel (refer to Figure 2.3). They are:

- The CLM Ready Indicator (labeled H1) is a green LED which indicates the "amplifier ready" contact (labeled Bb on the X5 Drive Connector) is closed and the CLM is ready to operate.
- The X6, RS-232/422/485 Communications Port is located in the upper left corner below the keypad. This 25 pin, sub-miniature D connector allows communication between the CLM and a IDS, SOT, PLC or other host.
- The 1.6 Amp Fuse, labeled F1, protects the CLM from a current surge.
- The X5, Drive Connector is located at the bottom of the lower panel. These terminals connect to the power supply, the analog command outputs, and the Bb command lines.
- The Memory and Battery Module is a slide out card containing the lithium battery plus RAM and EPROM memory circuits.
- The X7, Auxiliary Drive Connector is located between the X6 and X5 connectors. This terminal is used to connect Axis 1 and Axis 2 Amplifier Enable Output to the RF terminal of the servo amplifier, and to connect a potentiometer/ switch controlled +10 volt analog override input.

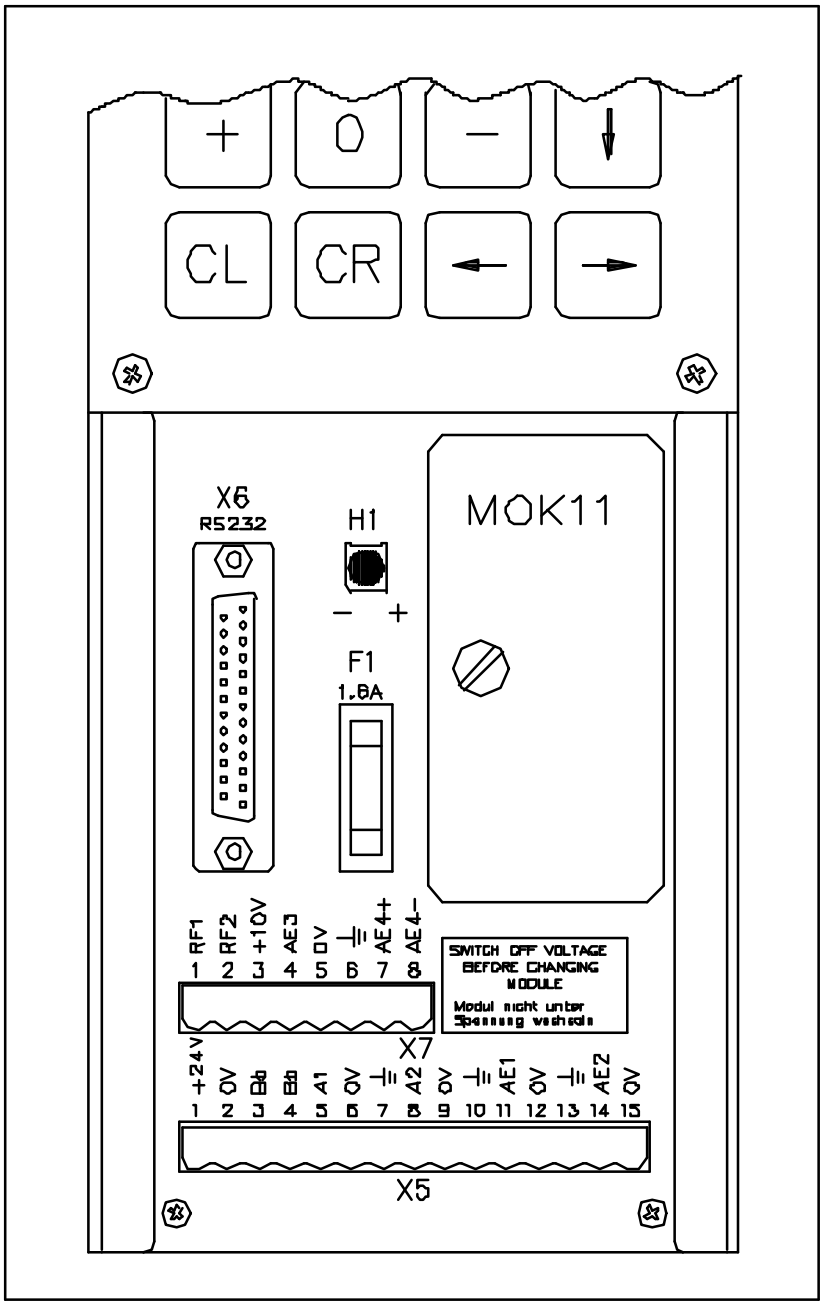


Figure 2.3 CLM Front Connector Section

CHAPTER 3. FUNCTIONAL DESCRIPTION - STANDARD FEATURES

Several input / output signals of the CLM control provide communication with the other components of the machine. This chapter describes the functional operation of the interfacing inputs and outputs of the CLM.

The first sections of this chapter describe the various interface functions in terms of the inputs / outputs involved with each. This section is followed by an individual description of each pre-defined I/O signal, including name, pin assignments, and functional description. The machine designer utilizes these signals as necessary to implement the CLM for his application, including the design of his system control panel. Also refer to the appendix for example system wiring of these and other optional signals.

3.1 Signal Definitions

The states of the input and output signals described in this manual are:

High = +24 Vdc

Low = 0 Vdc

A signal line is described as "active high" when its associated action is initiated by a high (+24 Vdc) signal level. It is described as "active low" when its function is initiated by a low signal (0 volts). This chapter describes the function with the active state of each I/O connection.

3.2 Interface Descriptions

The CLM interfaces with a feed device of some type. The CLM system is designed for control of a continuous indexing process, such as a press feeder. The CLM input and output signals provide communication to/from the machine builder's equipment, and should be considered as functional groups of signals, working in concert. These functions include:

- Operating Mode Selection
- Servo System Operation Enables
- Safety Interlocks
- Normal Operation Signals
- Handshaking, or Press (or Processing Station) Permissive Interface
- Jogging Inputs
- Setup Mode
- Fault/Diagnostic Circuitry

The following functions are further described in Chapter 4.

- Batching
- Registration
- Roll Lifting Interlock Control
- Material Loop Control (CLM-R only)

- RS-232/422/485 Multi-format Communications Interface
- Measuring Wheel

The following sections describe the basic operation theory of the CLM. They group signals by interface function, listing the I/O signals involved (and section where each signal is individually described), then describe the general function of the signals. These signal descriptions apply to both the CLM-R and CLM-Z, except where specifically noted. Later sections in this chapter describe the I/O connections/signals individually, as required by the machine builder and for troubleshooting.

Figures 3.7 and 3.9 illustrate the X3 Input and X4 Output connectors and the signal designation for each pin.

3.2.1 Operating Mode Selection

Inputs

- Parameter Mode Select (3.3.1)
- Automatic Mode Select (3.3.2)
- Setup Mode Select (3.3.13)

Outputs

- Manual Mode Indicator (3.4.1)
- Auto Mode Indicator (3.4.2)
- Parameter Mode Indicator (3.4.3)
- Setup Mode Indicator (3.4.13)

The CLM will always be in one of four operating modes:

Parameter Mode - Allows entry/verification of the parameters required to set the control for the specific requirements of the application.

Automatic Mode - Either continuous or intermittent feeding operations occur (automatically cycles).

Setup Mode - Used to set up for the automatic material feed. Especially useful in a metalforming system with progressive dies.

Manual Mode - Default mode when none of the above are selected. Used to jog the material forward or reverse through the system.

Parameter, Automatic and Setup Modes are selected by bringing the appropriate signal line high (+24 Vdc). A fault is diagnosed and an "Invalid Mode Selection" error message is issued if both Automatic and Setup Mode signal lines are high simultaneously. However, the Parameter Mode input overrides any other mode presently selected.

The suggested interface design is to wire the Parameter Mode signal to a key-switch, where a key is required to enter Parameter Mode, and/or mount the switch inside the electrical cabinet. This helps to prevent unauthorized parameter changes. Wire the Automatic and Setup Mode input signals to a three-position selector switch, where Manual Mode is selected when the switch is set to an open contact position. This method prevents selecting Automatic and Setup Mode at the same time.

The CLM has outputs to verify the currently selected mode. These are typically wired to indicator lights on the user's control panel (or to a PLC for total system control).

3.2.2 Servo System Operation Enables

Inputs

- Axis 1 Amplifier Ready (3.3.6)
- Axis 2 Amplifier Ready (3.3.7)

Outputs

- Axis 1 Amplifier Enable (3.4.4)
- Axis 2 Amplifier Enable (3.4.7)
- Axis 1 Brake Release (3.4.5)
- Axis 2 Brake Release (3.4.8)
- Feeder System Ready Indicator (3.4.9)

The CLM is designed so that various conditions must be satisfied to allow the servos to operate. If these conditions are not satisfied, the appropriate diagnostic message is displayed.

When the system is powered up, the CLM expects to receive an Axis #1 Amplifier Ready input, indicating the servo amplifier and power supply have properly powered up and the amplifier is ready for an Enable signal. Both Axis 1 and Axis 2 Amplifier Ready signals must be present when set up for two axes operation. If conditions are appropriate for operation, the CLM issues an Axis #1 Amplifier Enable output to allow the amplifier to operate and an Axis #1 Brake Release output to lift the spring-loaded servomotor brake (if using motor versions where brake is present). Similar signals are issued for axis 2. The Feeder System Ready Indicator output goes high to indicate that the feed system is ready for operation.

3.2.3 Safety Interlocks

Inputs

- EMERGENCY STOP (3.3.3)
- AXIS 1 MOTOR OVERTEMPERATURE (3.3.15)
- AXIS 2 MOTOR OVERTEMPERATURE (3.3.28)

Outputs

- NA

As described above, the CLM and its servos must perform operational checks and provide the proper signals to enable operation. There are other signals which serve as interlocks.

EMERGENCY STOP -- The Emergency Stop input must remain high for the CLM to operate. The system incorporates an Emergency Stop (E-Stop) chain, which is a circuit connected in series to both the CLM and the user's machine. Should any sensor in the E-stop chain open, all press and feed operations immediately stop. Note that the time taken to stop depends on the wiring method used, inertia of the machine, press clutch/brake retaining circuit, etc.

Elements connected in the E-stop chain commonly include the Emergency Stop switch on the user's control panel; E-stop switch(es) on the press or feeder; switches on lubrication or coolant pumps; and various die guards and safety interlock switches.

AXIS 1 MOTOR OVERTEMPERATURE / AXIS 2 MOTOR OVERTEMPERATURE -- This input is typically connected to the thermally activated switch (TAS) of an Indramat MAC servomotor. If a motor overheats, the TAS opens and drops the +24 Vdc signal. The appropriate diagnostic message is displayed and the system is halted. In Auto Mode, a current cycle will complete before the system stops (Cycle Stop issued - see next section)

3.2.4 Normal Operation Signals

Inputs

- Cycle Start (3.3.4)
- CYCLE STOP (3.3.14)
- FEED INTERRUPT (3.3.19)
- FEED INTERRUPT AXIS 2 (3.3.28)
- Minimum/Run Loop (3.3.24)
- MAXIMUM LOOP (3.3.25)
- Loop Automatic/Manual (Axis 2) (3.3.23)

Outputs

- Feed In Progress Indicator (3.4.18)
- Feed Complete Indicator (3.4.20)
- Axis #1 In Position (3.4.28)
- Axis #2 In Position (3.4.26)
- Axis #2 In Motion (3.4.26)
- Axis #2 Decelerating (3.4.16)
- Feeder In Cycle Indicator (3.4.10)
- Anticipation Point Reached (3.3.21)
- Feed Interrupt Indicator (3.4.19)
- Loop Automatic Indicator (3.4.11)

The automatic feed cycle begins when the Cycle Start line goes high (momentary) with the CLM in Automatic Mode. Once the automatic feed cycle begins, it is normally stopped by a CYCLE STOP input (line goes low, momentary). Feed will stop after completing the current cycle. The system will also stop if a fault is detected, either immediately, as an EMERGENCY STOP, or after the cycle, as a CYCLE STOP, depending on the level of the fault.

In Automatic Mode, a Single Step can be performed by activating the Cycle Stop + Cycle Start simultaneously. The CLM will step one feed and one press stroke. With batching enabled, activating Part Stop + Cycle Start simultaneously causes the CLM to perform the feeds and press strokes for one part.

Several outputs are issued by the CLM during normal system operation. They include:

- Feed in Progress Indicator - Indicates that a feed is in progress and the feed axis is not within the position threshold specified in parameter A110.
- Feed Complete Indicator - Indicates that the commanded feed is complete and the axis is within the position threshold.
- Axis In Position Indicator(s) - Indicates that the feed axis has stopped within the position threshold specified in Parameter A110.
- Feeder In Cycle Indicator - Indicates that Cycle Start has been issued and an automatic feed cycle is in progress.
- Anticipation Point Reached - Parameter A114 specifies a distance prior to the end of every feed where this output is to be issued. This output can be used to indicate when a feed is nearing completion or it can be used to initiate some external device, such as a heater or vacuum pump in thermoforming applications.

A feed interrupt can occur as a normal part of an automatic cycle. A high on the $\overline{\text{FEED INTERRUPT}}$ input indicates normal operation. If this signal goes low, the feed cycle is interrupted, the Feed Interrupt Indicator output goes high and an appropriate status message appears in the display. When the signal is restored high, the feed cycle immediately resumes.

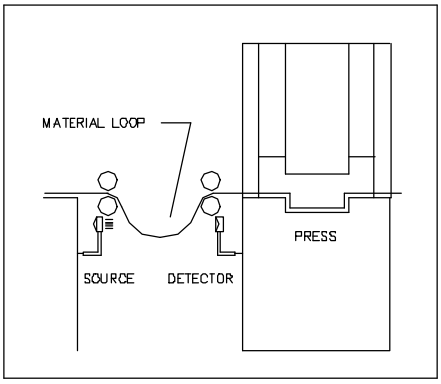


Figure 3.1 Use of $\overline{\text{FEED INTERRUPT}}$ Input

This signal is often used in conjunction with a material loop, as illustrated in Figure 3.1. Material is fed through a leveler or straightener into a looping pit, with an optical sensor in the pit tied to the feed interrupt line. If the material pulls too tight, $\overline{\text{FEED INTERRUPT}}$ goes low and the feed cycle is interrupted. As soon as an adequate amount of material is fed into the looping pit, the signal returns high and the feed cycle immediately resumes.

Warning: *If the automatic cycle is interrupted by a low on the $\overline{\text{FEED INTERRUPT}}$ line, all feed motion is suspended. Once this signal is restored high, the feed cycle will* ***immediately*** *resume. Personnel*

should use extreme caution when entering the work area if the feed has stopped as a result of this signal.

Normally a $\overline{\text{FEED INTERRUPT}}$ is of short duration, so it only stops the feed momentarily; it does not stop the press (ram) operation. Should the feed remain interrupted too long, the Feed Angle input from the press will drop (before the feed cycle is completed) and the system will be halted with a diagnostic error message displayed.

The second axis of the CLM-R can be used for loop control (controls the leveler or straightener drive). Several inputs and outputs are then used to control the depth of the loop in the pit by axis 2, as axis 1 feeds material through the press. Loop Automatic/Manual selects the mode of operation for loop control. In Loop Manual Mode, Axis 2 jogs (forward and reverse - see section 3.2.6) can be used to replenish or remove material from the loop. In Loop Automatic Mode, the CLM-R will output a velocity for axis 2 that is near the average throughput of material by axis 1. Sensors need be installed to detect the depth of the loop. A sensor, located at the normal operating depth of the loop, inputs as the Minimum/Run Loop. In Automatic Loop Correction mode, this sensor must be covered before a Cycle Start is allowed. An output will indicate when Loop Automatic Mode is selected. Axis 2 Decelerating output indicates when the axis is decelerating to zero or creep velocity. Axis 2 In Motion output indicates when motion is being commanded to the axis (analog output to A-2 is not zero volts). A sensor positioned at the maximum loop depth will cause an interrupt and a minor error to prevent excess loop condition. Jog Reverse on axis 2 is allowed to correct this condition. Loop Control for the CLM-R is further described in Chapter 4.

3.2.5 Press Permissive Interface

Note that the following description refers to the operation of a press and press feeder. These descriptions are equally valid for a feed system with other types of processing station, such as a seal-shear station or a thermoforming station.

Inputs

- Feed Angle (3.3.17)
- Press Continuous / $\overline{\text{INTERMITTENT}}$ (3.3.18)

Outputs

- $\overline{\text{PRESS IMMEDIATE STOP}}$ (3.3.12)
- Permit Press (3.3.17)

The control system is designed such that feeder operation can occur only when a series of permissive conditions are true. This is accomplished by a group of handshaking inputs/outputs between the CLM and the press interface. They are described below in the general order of occurrence.

- Press Continuous/$\overline{\text{INTERMITTENT}}$ - Input from the user's control panel which selects the press operating mode. Continuous specifies continuous press cycling, synchronized with the material feed. Intermittent specifies that the press will be cycled one time at the end of, or just previous to each feed cycle.

- Cycle Start - Momentary input signal from the user's control panel that starts the automatic feed cycle (see section 3.2.4).

- Permit Press - Output from CLM used to permit engagement of the press clutch (if all other safety logic circuitry on the press is satisfied). This output allows press operation differently when Continuous or Intermittent mode is selected, as described in the following sections.

- Feed Angle - Input, generally from a limit switch or sensor on the press or processing station, indicating that material can safely be fed. For a punch press this signal would come up shortly after the ram clears the material on its upstroke (see Figure 3.2). The signal would drop (go low) on the ram downstroke, allowing some safety margin before the ram reaches the material. The material feed must have stopped before this signal drops or the feed will stop immediately and an error will display.

- $\overline{\text{PRESS IMMEDIATE STOP}}$ - Output from the CLM, issued when a Feed Angle Lost During Feed! or other various faults are detected (see section 3.4.8 for details). This signal commands the user's circuitry to stop the press (or other machine) as soon as mechanically possible, rather than stopping after the current cycle is complete (as with a $\overline{\text{CYCLE STOP}}$).

Warning: *The $\overline{\text{PRESS IMMEDIATE STOP}}$ signal must be incorporated into the safety logic circuitry of the machine. Note that safety design of the system is the responsibility of the machine tool builder.*

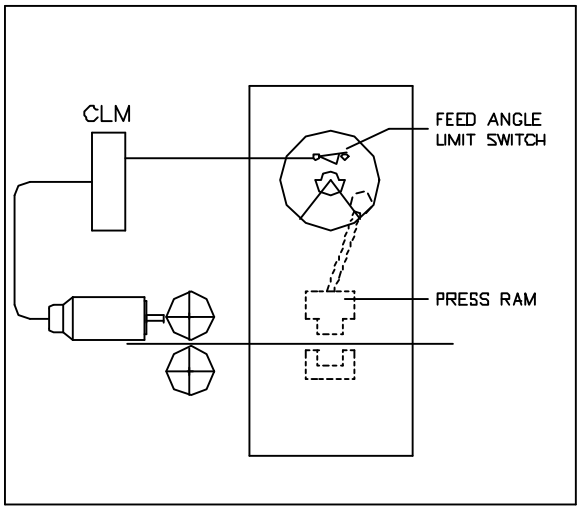


Figure 3.2 Generation of Feed Angle Signal

3.2.5.1 Press Continuous Operation

Conditions: Automatic Mode input high
Press Continuous/$\overline{\text{INTERMITTENT}}$ input high

1. Cycle Start input (momentary) goes high.

2. CLM issues the Permit Press output at the appropriate point and maintains it until the automatic cycle ends. Permit Press should be used by the press system to engage the press clutch for automatic cycling - IF all other press safety logic circuitry is satisfied.

   Parameter B109 allows selecting one of two continuous modes, Press Before Feed or Feed Before Press. Figures 3.3 and 3.4 are timing charts which illustrate these operations.

3. When the Feed Angle input from the user interface goes high, the CLM commands the servos to operate, feeding material to the length and at the feed rate specified by the operator.

   During the cycle, the CLM issues various outputs, which are normally wired to indicators on the user's control panel.

   a. Feeder In Cycle Indicator output is issued at the time Cycle Start is issued. This signal is dropped only when Cycle Stop is issued or a fault stops operations.

   b. Feed In Progress output is issued while the feed is occurring.

   c. An anticipation point prior to the end of the feed length can be selected via a parameter. The Anticipation Point Reached output is issued when appropriate.

   d. Feed Complete output is issued when the feed is complete and the axis is within the position threshold.

   e. Axis #1 In Position output is issued once the axis has arrived within the parameter-specified in-position threshold window.

If Feed Angle is lost during a feed, the CLM decelerates the feeder to a stop and issues a diagnostic message. This typically indicates that the press cycle is too fast. It does not allow sufficient time for a complete feed to occur between when the ram leaves the material on its upstroke (Feed Angle goes high - feed begins) and when the ram approaches the material on its downstroke (Feed Angle drops low - is lost).

If Feed Angle is lost, or the automatic cycle is ended, the Permit Press output is dropped. The machine builder typically employs a press clutch engagement retaining circuit that retains clutch engagement until the press ram reaches Top Dead Center and is stopped. The timing for stopping the press depends on whether Press Before Feed or Feed Before Press is selected. See Figures 3.3 and 3.4 for timing details.

The $\overline{\text{PRESS IMMEDIATE STOP}}$ output is also dropped low when Feed Angle is lost during a feed or various faults are detected. If this signal from the CLM is wired to the press, it should attempt to stop as soon as mechanically possible.

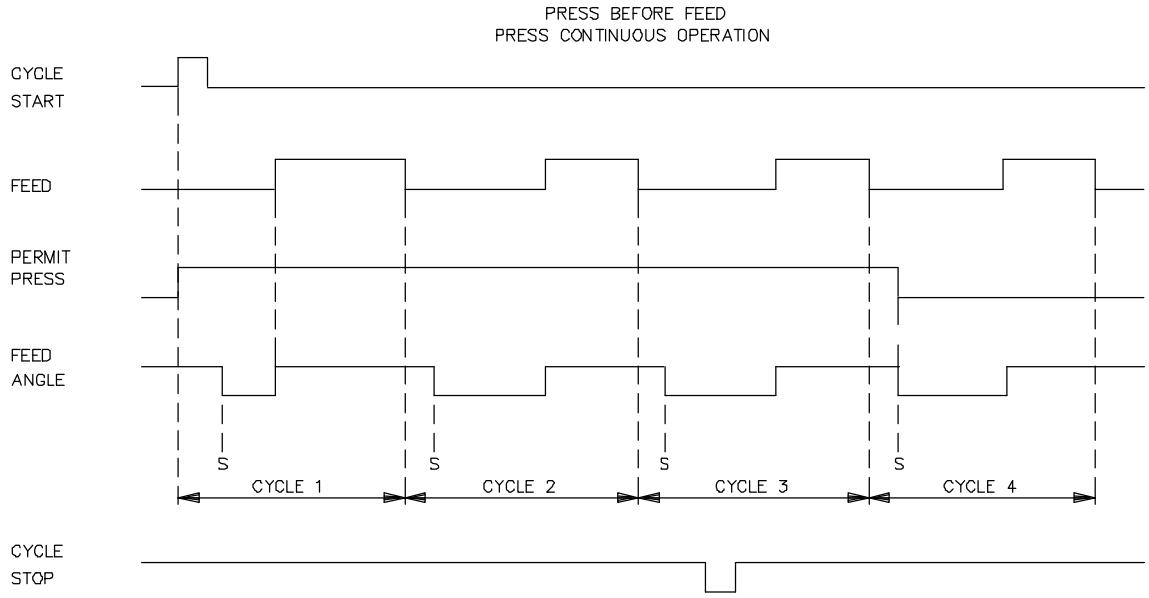


Figure 3.3 Continuous Mode - Press Before Feed

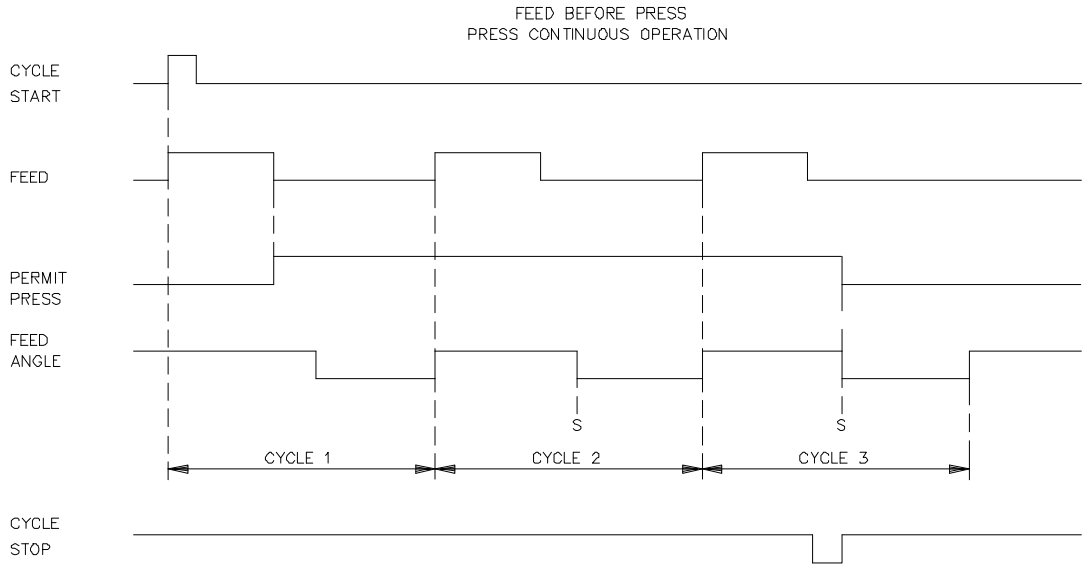


Figure 3.4 Continuous Mode - Feed Before Press

3.2.5.2 Press Intermittent Operation

Conditions: Automatic Mode input high
Press Continuous/$\overline{\text{INTERMITTENT}}$ input low

1. Cycle Start input goes high.

2. The CLM issues the Permit Press output to initiate engagement of the press clutch on a per cycle basis. The Permit Press signal is dropped when the Feed Angle goes low.

   The system typically operates as described below. Refer to Figures 3.5 and 3.6, timing charts which further explain intermittent Press Before Feed and Feed Before Press Modes.

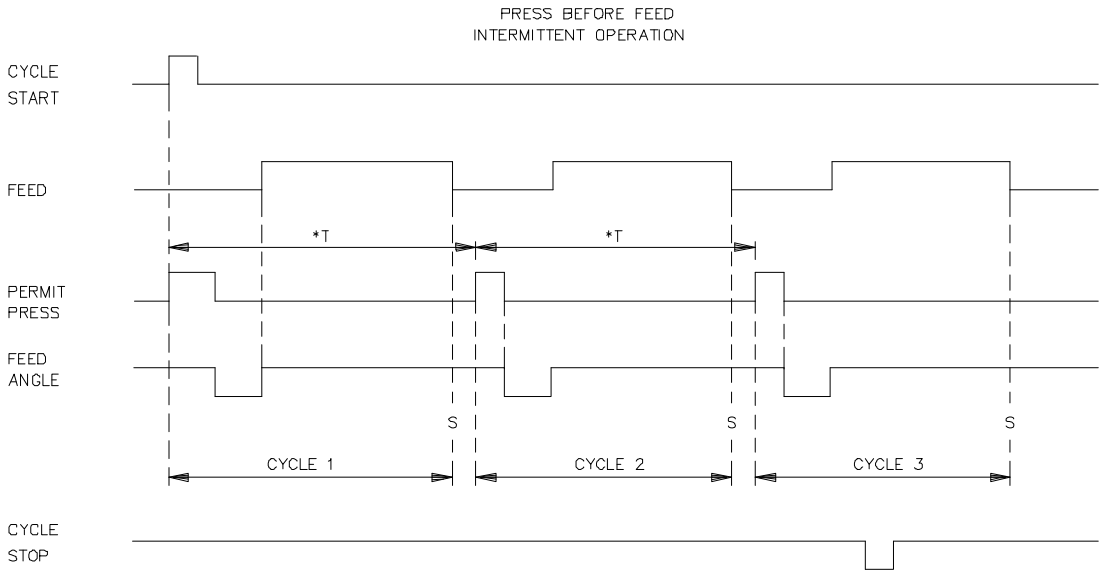
3. When the Feed Angle input from the press goes high, the next feed movement is initiated. At the completion of the feed, the Permit Press output is issued, if and only if the Minimum Cycle Time has elapsed. These actions occur at the appropriate time, depending on the selection of Press Before Feed or Feed Before Press.

During the cycle, the CLM issues various outputs, as described under continuous operation above.

When Feed Angle goes low, Permit Press output is also pulled low. Because of the press clutch retaining circuitry that most press builders employ, the press completes one cycle. The press clutch engagement retaining circuit releases the clutch and sets the brake such that the ram stops at Top Dead Center (TDC). The press then waits (dwells) until the CLM initiates the next press cycle.

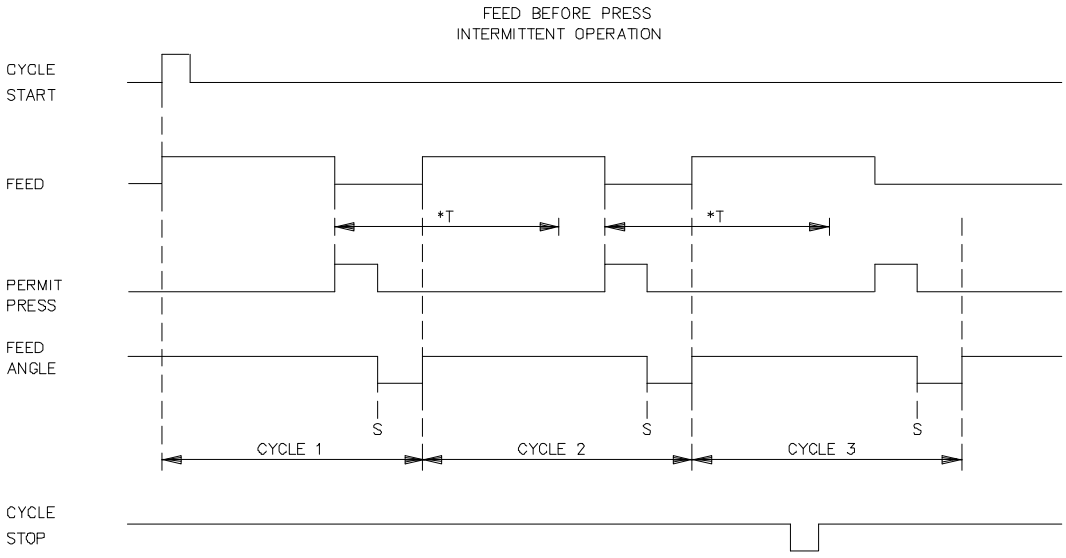
The minimum amount of dwell time at TDC is controlled by the time value entered in Parameter B109. If the minimum cycle time is less than the sum of the press cycle time plus the feed time, the Permit Press will be issued immediately (output high) at the end of the feed.

The $\overline{\text{PRESS IMMEDIATE STOP}}$ output is also pulled low when Feed Angle is lost during a feed, or other various faults occur (see section 3.4.8). If the user has wired this signal to his press, it will attempt to stop as soon as mechanically possible.



T=Minimum cycle time specified by Parameter B109 when the press is in intermittent operation. S=Stroke
***** T is longer than the cycle time needed by the press and feed sequence, therefore it limits the stroke rate.

Figure 3.5 Intermittent Mode - Press Before Feed



T=Minimum cycle time specified by Parameter B109 when the press is in intermittent operation. S=Stroke
* T is shorter than the cycle time needed by the press and feed sequence, therefore it has no effect on the stroke rate.

Figure 3.6 Intermittent Mode - Feed Before Press

3.2.6 Jogging Inputs

Inputs

- Axis 1 Jog Forward (3.3.9)
- Axis 2 Jog Forward (3.3.11)
- Jog Forward (3.3.9)
- Axis 1 Select (3.3.11)
- Axis 1 Jog Reverse (3.3.10)
- Axis 2 Jog Reverse (3.3.12)
- Jog Reverse (3.3.10)
- Axis 2 Select (3.3.12)

Outputs

- NA

The CLM's Jog inputs allow jogging the material forward and reverse. Parameter A105 specifies the jog feed rate. It usually is set to approximately 10% of the maximum feed rate. It can never be more than the maximum feed rate.

In Manual Mode, a high on the Jog Forward (Reverse) input causes the axis to feed forward (reverse) at the velocity set in Parameter A105, as long as the respective jog input is high. If Jog Step is set ON (from CLM control panel display), the CLM feeds material at the jog velocity until the jog input goes low (jog button released) or the step length (set in Parameter B108) has been reached.

On the CLM-R (when using second axis for loop control), in Loop Manual Mode, axis 1 or 2 can be jogged forward or reverse with independent inputs. On the CLM-Z, inputs select which axis will respond to a jog forward or reverse input.

The Jog inputs are not functional in Parameter or Automatic Modes. The effect of these inputs in Setup Mode is described in the following section.

3.2.7 Setup Mode

Setup Mode is normally used to jog the material through the feeder for set up in progressive die applications. A progressive die application has multiple stations. A series of feeds and press strokes, moves the material through multiple stations in a single die to produce a finished part.

It is often necessary to manually thread the leading edge of the material through the die to set up the operation. In order to avoid damaging expensive dies during set up, in most cases it is critical to cycle the press only after a full feed has been made for each progression. The press must be cycled, before the feed for the next progression can occur.

The CLM Setup Mode ensures this sequence. It allows the user to set up his feeder by running several progressive feeds (using the jog inputs) and manually cycling the press after each feed.

When Setup Mode is selected, the jog inputs function differently than in Manual Mode. As in Manual Mode, a high on the Jog Forward input causes the axis to feed forward at the parameter-specified

jog velocity. However, unlike Manual Mode, no matter how long the Jog Forward is maintained, the axis will feed only the feed length entered on the CLM control panel, then stop. If Jog Forward is released before the feed is complete, the feed will again continue (until feed length is complete) when Jog Forward is pressed again.

The CLM will allow the press to be manually cycled only when the user-selected feed length is complete (see notes below). Another feed will not be allowed until the press has cycled (CLM sees Feed Angle drop, then return). Once this occurs, the jogging process described above can be repeated (after changing the feed length entry, when required) until the material has been threaded through all stations in the die.

Note that an error will be detected if Setup Mode is exited prior to completing the feed and cycling the press. However, selecting Setup Mode again clears the error and allows completion of the set up operation.

In Setup Mode, if the Jog Reverse signal is high, the axis feeds in reverse at the parameter-specified jog velocity. However, Jog Reverse will only function if the feeder had previously been jogged forward, and the reverse jog can only be as far back as the starting point of the feed. If the feeder is already at the beginning of a feed length, reverse feed in Setup Mode is not possible.

***NOTES**:*

- *The Setup Mode is sensitive to Press Before Feed (PBF) and Feed Before Press (FBP) Interface Modes.*
- *When using FBP, the first action required is for the axis to be fed the commanded length. The sequence is completed by the press being cycled manually.*
- *When using PBF, the first action required is the press being cycled manually, followed by the axis being fed the commanded length.*
- *The Permit Press output will be turned ON at the appropriate point in the cycle, depending on the Press Interface Mode selected (PBF or FBP).*
- *If batching is enabled, Setup Mode can only use the current feed length. For multiple feed lengths, setup can be simulated by using Single Step (Cycle Stop + Cycle Start) in Automatic Mode, although this causes an automatic press cycle, not manually cycled.*

3.2.8 Fault/Diagnostic Monitoring

Inputs

- Resume Cycle (3.3.5)
- Clear (3.3.8)

Outputs

- System Fault Indicator (3.4.6)

The CLM includes extensive diagnostic monitoring circuitry, detecting normal operating status, operator errors, errors in the control itself and machine faults.

There are several categories of faults, as described in Chapter 8. In general, once a fault is detected, an error message is displayed on the CLM display and the feeder and press are halted (either immediately or after the cycle is complete - depending on the type of fault).

The fault recovery procedure is to first troubleshoot and remedy the problem. Then, press the Clear key (or external Clear input) to clear the CLM fault status and diagnostic message on the display.

For a Soft Fault or Minor Error, a momentary high on the Resume Cycle input will continue Automatic Mode cycling. For a Hard Fault, the system must be restarted.

Diagnostics and fault troubleshooting procedures are described in Chapter 8.

3.3 Input Signal Descriptions

This section describes the Inputs to the CLM control from external sources. The Input and Output signal lines of the CLM are optically isolated from the CLM's internal bus structure to minimize electrical noise interference.

The connector and pin numbers of these signals are described in the following sections and shown in Figure 3.7. For easier reference, the following section numbers coincide with the connector and pin numbers. For example, section 3.3.1=chapter 3, connector X3 (inputs) and pin 1.

Each section indicates the connector and pin number, the general function of the input signal, and the results when the signal level is in the active state, high and/or low.

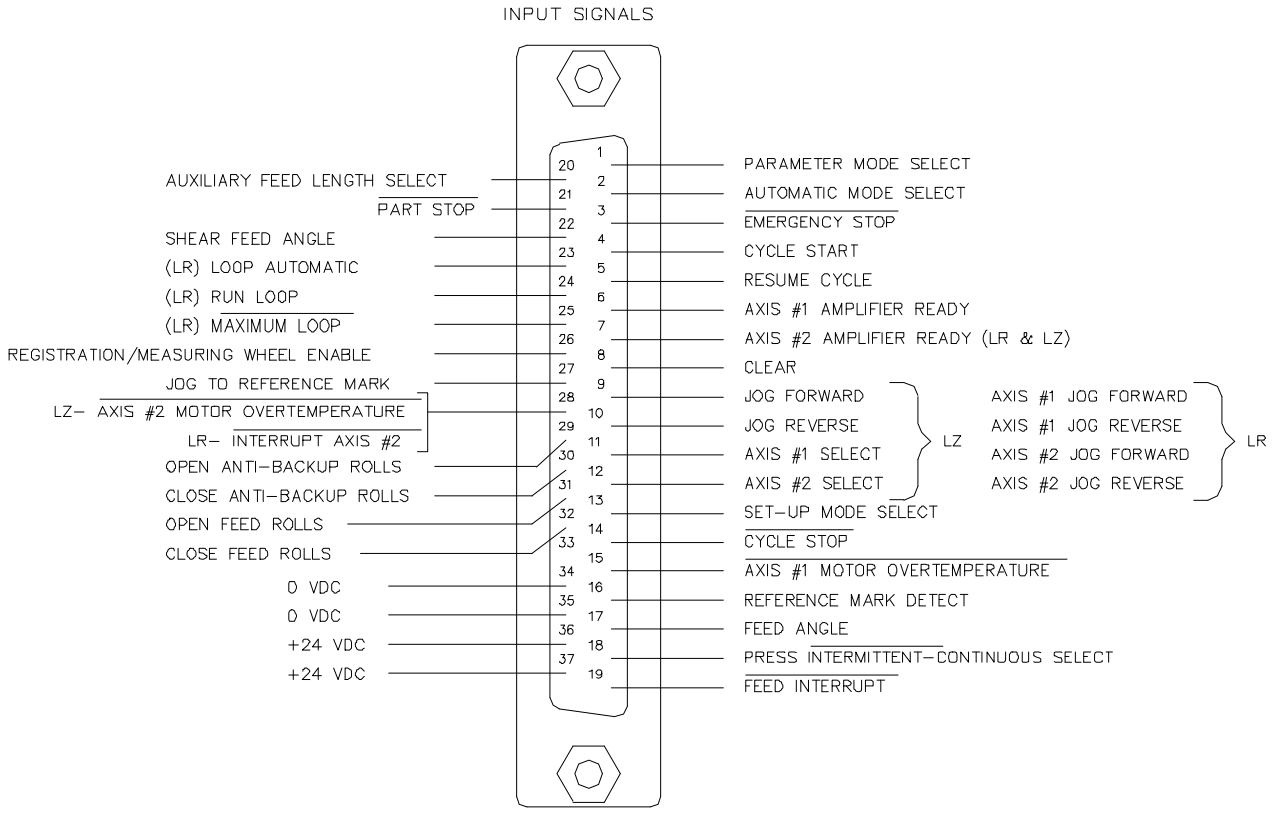


Figure 3.7 X3 Input Connector and Pin Designations

3.3.1 Parameter Mode Select

Connector - X3, pin 1

Function - (Input) Selects Parameter Mode

High = Parameter Mode selected.

The Parameter Mode Select overrides any other mode selection input. Selecting Parameter Mode while either Automatic or Setup Mode is already selected, does not cause an error. When Parameter Mode is de selected, the CLM returns to the previously selected mode - Automatic, Setup, or Manual (default when no other modes are selected).

3.3.2 Automatic Mode Select

Connector - X3, pin 2

Function - (Input) Selects Automatic Mode

High = Automatic Mode selected (Parameter Mode can override selection).

3.3.3 EMERGENCY STOP

Connector - X3, pin 3

Function - (Input) Commands Motor Drive to immediate stop

High = Allows the CLM to operate.
Low = The motor drive is commanded immediately to zero velocity. Drive reaches zero speed in the minimum time possible - given the inertia and maximum torque available. The CLM issues an "Emergency Stop" diagnostic message.

WARNING: *This signal must be used to ensure safety.*

Conditions which warrant pressing the E-Stop include:
- Any condition posing an immediate danger to personnel.
- A jam in the machinery or any other condition that poses an immediate harm to the system equipment.

3.3.4 Cycle Start

Connector - X3, pin 4

Function - (Input) Starts automatic feed cycle

High = (momentary) Starts the automatic feed cycle when the CLM is in the Automatic Mode.

This input is typically wired to a normally open push-button switch on the user control panel.

3.3.5 Resume Cycle

Connector - X3, pin 5

Function - (Input) Used to resume the automatic cycle after a soft fault or minor error is cleared (refer to section 3.3.8)
High = (momentary) Causes the automatic cycle to resume from its point of interruption.

This input is typically wired to a normally open (momentary) push-button switch on the user control panel.

3.3.6 Axis #1 Amplifier Ready

Connector - X3, pin 6

Function - (Input) Informs the CLM that the Axis #1 Amplifier is ready for operation

High = Axis #1 Amplifier has power applied and is ready to be enabled.
Low = After power-up, typically indicates either a power loss at the servo power supply or amplifier, or an internal fault in the amplifier.

This input originates at the ready (Bb) contact of the axis 1 servo amplifier. Chapter 6 describes these connections, as required for installation.

3.3.7 Axis #2 Amplifier Ready

Connector - X3, pin 7

Function - (Input) Informs the CLM that the Axis #2 Amplifier is ready for operation

High = Axis #2 Amplifier has power applied and is ready to be enabled.
Low = After power-up, typically indicates either a power loss at the servo power supply or amplifier, or an internal fault in the amplifier.

This input originates at the ready (Bb) contact of the axis 2 servo amplifier. Chapter 6 describes these connections, as required for installation.

3.3.8 Clear

Connector - X3, pin 8

Function - (Input) Clears the Hard or Soft Fault status of the CLM

High = (momentary) - Clears the Soft Fault status of the CLM, or Clears the Hard Fault status and re-initializes the CLM.

Once a fault occurs, the CLM displays a diagnostic message (refer to Chapter 8).
The operator must then physically correct the problem. Next, the operator must press the Clear button to clear the diagnostic message.

For a soft fault or minor error, press Resume to restart operation in Automatic Mode (message "Resume Req'd" on display). With a hard fault, the system must now be restarted.

This signal is typically wired to a normally open push-button switch on the user control panel.

3.3.9 Jog Forward

Connector - X3, pin 9

Function - (Input) Jogs axis 1 (or selected axis on CLM-Z) forward

High = In Manual Mode, the axis feeds forward at the velocity set in Parameter A105 (or A205 on CLM-Z). The axis will feed forward as long as the high signal is present (switch held closed). With Jog Step set ON (from CLM control panel), the axis will feed forward until reaching the feed length set in parameter B108.

High = In Setup Mode, the axis feeds forward at the velocity set in Parameter A105 (or A205 on CLM-Z). The axis will only feed forward the current commanded feed length, then stop.

This input is typically wired to a normally open push-button switch on the user control panel.

NOTE: *On the* CLM-*Z, select axis 1 and/or 2 to jog when this input is high (see sections 3.3.11 and 3.3.12).*

3.3.10 Jog Reverse

Connector - X3, pin 10

Function - (Input) Jogs axis 1 (or selected axis on CLM-Z) in the reverse direction

High = In Manual Mode, the axis feeds in the reverse direction at the velocity set in Parameter A105 (or A205 on CLM-Z). The axis will feed in reverse as long as the high signal is present (switch held closed). With Jog Step set ON (from CLM control panel), the axis will feed in reverse until reaching the feed length set in Parameter B108.

High = In Setup Mode, the axis feeds in the reverse direction (if it was jogged forward previously) at the velocity set in Parameter A105 (or A205 on CLM-Z). In Setup Mode, Jog Reverse only functions if the feeder has been jogged forward previously. The axis can be jogged back only as far as the starting point of the feed. If the feeder is already at the starting point, reverse feed is not possible.

This input is typically wired to a normally open push-button switch on the user control panel.

Note: *On the* CLM-*Z, select axis 1 and/or 2 to jog when this input is high (see sections 3.3.11 and 3.3.12).*

3.3.11 Axis 2 Jog Forward / Axis 1 Select

Connector - X3, pin 11

CLM-R Function - (Input) Jogs axis 2 forward

High = In Loop Manual Mode, the axis feeds forward at the velocity set in Parameter A201. The axis will feed forward as long as the high signal is present (switch held closed) or an interrupt or error occurs.

Low = Stops forward feed (switch released) after started with a high signal (switch was closed). Otherwise has no effect.

This input is typically wired to a normally open push-button switch on the user control panel.

CLM-Z Function - (Input) Enables axis 1 for accepting motion commands
High = Axis 1 enabled.
Low = Axis 1 disabled, but position loop is closed (if enabled in Parameter B121).

This input is typically wired to a ON/OFF selector switch on the user control panel.

3.3.12 Axis 2 Jog Reverse / Axis 2 Select

Connector - X3, pin 12

CLM-R Function - (Input) Jogs axis 2 in the reverse direction
High = In Loop Manual Mode, the axis feeds in reverse at the velocity set in Parameter A201. The axis will feed as long as the high signal is present (switch held closed) or an interrupt or error occurs.
Low = Stops reverse feed (switch released) after started with a high signal (switch was closed). Otherwise has no effect.

This input is typically wired to a normally open push-button switch on the user control panel.

CLM-Z Function - (Input) Enables axis 2 for motion commands
High = Axis 1 enabled.
Low = Axis 1 disabled, but position loop is closed (if enabled in Parameter B121).

This input is typically wired to a ON/OFF selector switch on the user control panel.

3.3.13 Setup Mode Select

Connector - X3, pin 13

Function - (Input) Selects Setup Mode

High = Setup Mode selected (Parameter Mode can override selection).

See section 3.2.7 for description of operation in this mode.

3.3.14 CYCLE STOP

Connector - X3, pin 14

Function - (Input) Used to stop the automatic cycle

High = (Continuous) Allows Automatic Mode operation.
Low = (Momentary) Stops Automatic Mode cycling at the completion of the current cycle.

The ending point of the automatic cycle depends on the selection entered in Parameter B109 (Press Before Feed or Feed Before Press - see section 3.2.5).

This input is typically wired to a normally closed push-button switch on the user control panel.

3.3.15 AXIS 1 MOTOR OVERTEMPERATURE

Connector - X3, pin 15

Function - (Input) Indicates temperature condition within the axis 1 servomotor

High = Indicates motor operation in normal temperature range.
Low = Indicates an overtemperature condition.

This input is connected to the thermally activated switch (TAS) of an Indramat MAC servomotor. When an overtemperature condition occurs, the TAS opens and removes the high signal. When in Automatic Mode, the CLM will complete the current feed cycle, issue a Cycle Stop (decelerate the feeder to a stop) and issue a hard fault diagnostic message. If this signal occurs in any other mode, it causes an immediate stop and issues a hard fault diagnostic message.

CAUTION: *This input must be used, to prevent severe motor damage which could result from its operation with an overtemperature condition.*

3.3.16 Reference Mark Detect

Connector - X3, pin 16

Function - (Input) Indicates reference mark alignment

High = Indicates reference mark on material is aligned with sensor.
Low = The sensor is not currently detecting a reference mark.

This input is used with the Registration function. The CLM will adjust the length of feeds, to compensate for material slip or stretch, if this input indicates that the length between printed marks varies from the specified feed length.

To provide this signal, use a sensor which detects a printed mark or stamp on each piece of material. A high signal must be present on this input when a reference mark is present under the sensor. The accuracy and duration of this signal is essential to the proper operation of position correction, especially if the mark needs to be detected at high speeds. See Chapter 4 for additional information and requirements when using the Registration feature.

3.3.17 Feed Angle

Connector - X3, pin 17

Function - (Input) Controls the CLM feed cycle (see 3.2.5 for more detail)

High = Indicates that material can be fed safely. When this signal goes high in Automatic Mode, it initiates the next feed cycle.

Low = Indicates that material cannot be fed. In a metal forming application, a low signal indicates the press ram is into or too close to the material to allow feeding.

In a metal forming application, after the press leaves the material on its upstroke, a switch or sensor is activated (see Figure 3.8). This switch provides a high signal to the CLM during the rotation angles that the ram is clear of the material and it is permissible to feed.

If Feed Angle goes low during a feed, the CLM issues the Press Immediate Stop output in an effort to avoid processing an incorrectly fed length. The soft fault diagnostic message "Feed Angle Lost During Feed" is issued. This fault typically indicates that the press cycle is too fast. It does not allow sufficient time for the feed cycle to complete before the ram is too close to the material to allow feeding.

If the material slips out of the position window (set in Parameter A113 as the Low FA Threshold) after/while the Feed Angle is low, the soft fault diagnostic message "Movement While FA is Low" is issued.

This input is typically wired to a limit switch or sensor on the press (see Figure 3.8).

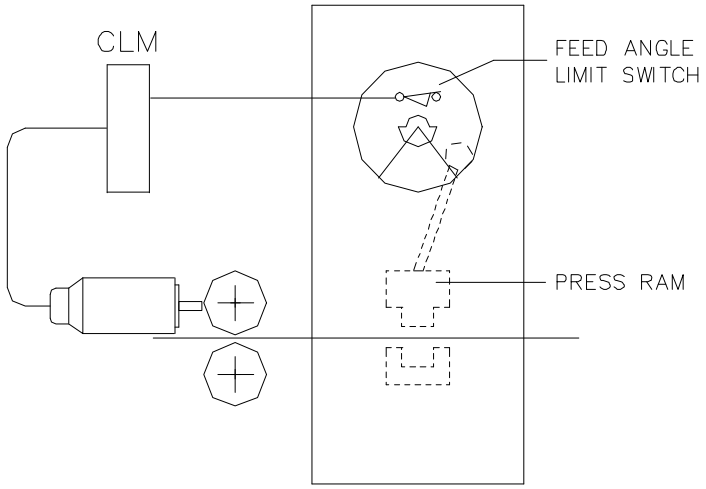


Figure 3.8 Feed Angle Switch Layout

3.3.18 Press Continuous/ $\overline{\text{INTERMITTENT}}$ Select

Connector - X3, pin 18

Function - (Input) Used to select press operating mode.

High = Selects continuous operation.
Low = Selects intermittent operation.

During Continuous Mode operation, the press stroke is continuous. When the press ram is on the upstroke, away from the material (Feed Angle goes high), the CLM feeds. The feed should finish before the press ram nears the material on its down stroke (Feed Angle goes low). This operation continues in either Press Before Feed or Feed Before Press Modes until a Cycle Stop is issued (or a fault or error occurs).

During Intermittent Mode operation, the CLM issues a Permit Press output signal, the press clutch engages and the stroke begins. When the press ram nears the material on its down stroke, the Feed Angle goes low and the CLM drops the Permit Press output. The press clutch retaining circuit (normally employed) keeps the press operating one cycle. When the press ram is on the upstroke, away from the material (Feed Angle goes high), the CLM feeds. At the end of the feed, and the end of the dwell time (need both conditions), the CLM again issues the Permit Press to start the next cycle. This operation continues in either Press Before Feed or Feed Before Press Modes until a Cycle Stop is issued (or a fault or error occurs).

The press cycle mode may be changed on-the-fly using this input, at any time during an automatic mode cycle. With batching and the expanded I/O option, it is possible to use an AUX output to change press modes.

See section 3.2.5 for a description of handshaking using this and other CLM I/O signals.

3.3.19 FEED INTERRUPT

Connector - X3, pin 19

Function - (Input) Used to interrupt the feed cycle

High = Indicates normal operation. If not using this function, this signal line must remain high for the CLM to operate.
Low = Loss of a high signal interrupts the feed cycle (feed decelerates). The CLM displays a "Stop Due to Interrupt Input" diagnostic message and turns on the Feed Interrupt indicator output (3.4.19). Once the signal is restored, the feed cycle resumes automatically in Automatic Mode. In Manual or Setup Modes, jogging is interrupted. When restored, jogging will resume if commanded.

This input is typically wired to a normally closed switch or optical sensor for material loop detection. If a feed interrupt occurs, it typically means you should slow the system so it is not tugging material (causing loss of loop/tight loop), or you should increase the speed of the uncoiler. When using the CLM-R with the loop control function, Loop Automatic and Axis 2 Jog Forward (in Loop Manual) are operational during this fault so that the loop can be filled to correct the condition.

WARNING: *If the automatic cycle is interrupted by a low (0 Vdc) on the Feed Interrupt line, all feed motion is suspended. Once this signal is restored (+24 Vdc), the feed cycle will* ***immediately*** *resume. Personnel should use extreme caution when entering the work area if the feed has stopped as a result of this signal.*

It is recommend to use the Feed Interrupt output (3.4.19) to advise operating personnel when this condition exists.

3.3.20 Auxiliary Feed Length Select

Connector - X3, pin 20

Function - (Input) Selects auxiliary feed length

High = Selects the Auxiliary Feed Length option (in Automatic Mode only). When this option is selected, the primary feed length value is ignored and the CLM operates using the feed length value entered in Parameter B103.

This option allows selection of a feed length different from that used in normal operation. It can be used to feed scrape material from the end of the roll, to easily change to a second operation that requires a different feed length, etc.

3.3.21 PART STOP

Connector - X3, pin 21

Function - (Input) Used to stop Automatic Mode cycling, after completing the current part (only functional when using the batching feature)

High = Indicates normal operation, allows continued batching operation.
Low = Loss of a high causes the CLM to stop automatically cycling, after all feeds are complete for the current part executing.

This input is typically wired to a normally closed, momentary switch. Refer to Chapter 4 for additional information on the batching function.

3.3.22 Shear Feed Angle

Connector - X3, pin 22

Function - (Input) Used to advise the CLM when the shear operation is complete

High = During the high-to-low feed angle transition, indicates the shear operation is complete and the CLM can continue feed cycling operation.
Low = Shear operation is not completed, if the shear output (3.4.15) was issued to start the shear, or this option is not selected.

The shear option allows a suspension of press operation, after an alignment feed, to perform a shear cut. It is selected in parameter B111, then set ON (yes) from the CLM display for GAG 99. Refer to Chapter 4, Batching Feature for additional information on this function.

3.3.23 Loop Automatic/Manual Mode Select

Connector - X3, pin 23

Function - (Input) Used to select mode of loop control operation (only functional on CLM-R with loop control enabled)

High = Loop Automatic Mode selected.
Low = Loop Manual Mode selected.

In Loop Automatic Mode, the CLM commands velocity of axis 2 to replenish material in the loop based on the average throughput of material fed by axis 1. In Loop Manual Mode, axis 2 jog (forward and reverse) can be used to manually add or remove material from the loop.

This input is typically wired to a two-position selector switch. An output can be used to indicate when in Loop Automatic Mode. Refer to Chapter 4 for additional information on the loop control function.

NOTE: *At power up, reset, or exit from Auto mode, loop manual is required.*

3.3.24 Minimum/Run Loop

Connector - X3, pin 24

Function - (Input) Used to advise the CLM when the material loop is at normal depth (only functional on CLM-R with loop control enabled)

High = Material loop is at sufficient depth to allow Automatic Mode operation.
Low = Material loop is **not** at sufficient depth (tight loop).

3.3.25 MAXIMUM LOOP

Connector - X3, pin 25

Function - (Input) Used to advise the CLM when the maximum material loop depth is exceeded (only functional on CLM-R with loop control enabled)

High = Material loop has **not** exceeded maximum depth (not full loop).
Low = Material loop **has** exceeded maximum depth (is at full loop).

Typically, an optical sensor is positioned at the maximum desired depth for the material loop. In Automatic Loop Correction Mode, axis 2 is immediately set to creep or zero velocity.

3.3.26 Registration or Measuring Wheel Enable

Connector - X3, pin 26

Function - (Input) Used to enable / disable registration position correction or measuring wheel operation (when either is enabled by Parameter B112 for axis 1 or 2).

High = Enables the selected option.

Low = Disables the selected option.

This input enables / disables position correction - if the function is also enabled in Parameter B112. You may use this input to override the parameter selection if you need feeds without position correction. If this input is toggled during an automatic mode cycle, position correction won't be enabled or disabled (change state) until a Cycle Stop occurs or you switch out of Automatic Mode.

This input enables / disables measuring wheel operation- if the function is also enabled in Parameter B112. When enabled, the feed length is based on the measuring wheel encoder rather than the axis position (servo encoder). If this input is toggled during an automatic mode cycle, measuring wheel length compensation won't be enabled or disabled (change state) until a Cycle Stop occurs or you switch out of Automatic Mode.

3.3.27 Jog to Reference Mark

Connector - X3, pin 27

Function - (Input) Used to jog to the reference mark in Manual Mode.

High = (momentary) Causes the material to move forward at the search velocity to the reference mark - in Manual Mode only.

This input signal is typically wired to a momentary push-button switch on the user control panel. In Automatic Mode operation, Cycle Start will not function unless the reference mark is detected (mark is under sensor or at the offset distance fed after detecting the mark, depending on option selected in Parameter B112).

3.3.28. INTERRUPT AXIS 2 / AXIS 2 MOTOR OVERTEMPERATURE

Connector - X3, pin 28

- CLM-R Function - (Input) Used to interrupt axis 2 feed (with loop control enabled)
  - High = Indicates normal operation. If not using this function, this signal line must remain high for the CLM to operate.
  - Low = Axis 2 will be commanded to zero velocity and the axis 2 drive enable output will be turned OFF. A cycle stop will be issued in Automatic Mode, followed by a soft fault "Axis 2 is Interrupted."

If axis 2 is interrupted, switch to Loop Manual Mode and jog axis 2 in reverse.

- CLM-Z Function - (Input) Indicates temperature condition within the axis 2 servomotor
  - High = Indicates motor operation in normal temperature range.
  - Low = Indicates an overtemperature condition.

This input is connected to the thermally activated switch (TAS) of an Indramat MAC servomotor. When an overtemperature condition occurs, the TAS opens and removes the high signal. When in Automatic Mode, the CLM will complete the current feed cycle, issue a Cycle Stop (decelerate the

feeder to a stop) and issue a hard fault diagnostic message. If this signal occurs in any other mode, it causes an immediate stop and issues a hard fault diagnostic message.

CAUTION: *This input must be used to prevent severe motor damage which could result from its operation with an overtemperature condition.*

3.3.29 Open Anti-Backup Rolls

Connector - X3, pin 29
Function - (Input) Used with the roll control function to open the anti-backup rolls.

High = (momentary) Causes the CLM output Open Anti-backup to go high when in Manual and Setup Modes.
Low = Normal state before or after Open Anti-backup initiated.

This input signal is typically wired to a normally-open, momentary push-button switch on the user control panel.

Two inputs for each set of rolls are provided for manual opening and closing (if the roll control function is selected in Parameter B110). These inputs will set the outputs for manual roll control. The rolls may not be raised or lowered when the axis is not in position. The manual roll control inputs are disabled in Automatic Mode. The CLM controls the anti-backup roll lifting automatically in different modes of operation. See Chapter 4 for additional information on the roll control function. Also see roll lifting outputs in sections 3.4.29 through 3.4.32.

3.3.30 Close Anti-Backup Rolls

Connector - X3, pin 30

Function - (Input) Used with the roll control function to close the anti-backup rolls

High = (momentary) Causes the output Close Anti-backup to go low when in Manual and Setup Modes.
Low = Normal state before or after Close Anti-backup initiated.

This input signal is typically wired to a normally-open, momentary push-button switch on the user control panel.

See section 3.3.29 for additional information.

3.3.31 Open Feed Rolls

Connector - X3, pin 31

Function - (Input) Used with the roll control function to open the feed rolls

High = (momentary) Causes the output Open Feed Rolls to go high when in Manual and Setup Modes.
Low = Normal state before or after Open Feed Rolls initiated.

This input signal is typically wired to a normally-open, momentary push-button switch on the user control panel.

See section 3.3.29 for additional information.

3.3.32 Close Feed Rolls

Connector - X3, pin 32
Function - (Input) Used with the roll control function to close the feed rolls

High = (momentary) Causes the output Close Feed Rolls to go low when in Manual and Setup Modes.
Low = Normal state before or after Close Feed Rolls initiated.

This input signal is typically wired to a normally-open, momentary push-button switch on the user control panel.

See section 3.3.29 for additional information.

3.4 Output Signal Descriptions

This section describes the outputs from the CLM control system to external devices. CLM input and output lines are optically isolated from the CLM's internal bus structure to minimize electrical interference.

The connector and pin numbers of these signals are described in the following sections and shown in Figure 3.9. For easier reference, the following section numbers coincide with the connector and pin numbers. For example, section 3.4.1=chapter 3, connector X4 (outputs) and pin 1.

3.4.1 Manual Mode Indicator

Connector - X4, pin 1

Function - (Output) Indicates that Manual Mode is active

High = No other modes are selected. The CLM defaults to Manual Mode.

This output signal is typically wired to an indicator light on the user control panel.

3.4.2 Automatic Mode Indicator

Connector - X4, pin 2

Function - (Output) Indicates that Automatic Mode is active

High = Automatic Mode is selected.

This output signal is typically wired to an indicator light on the user control panel.

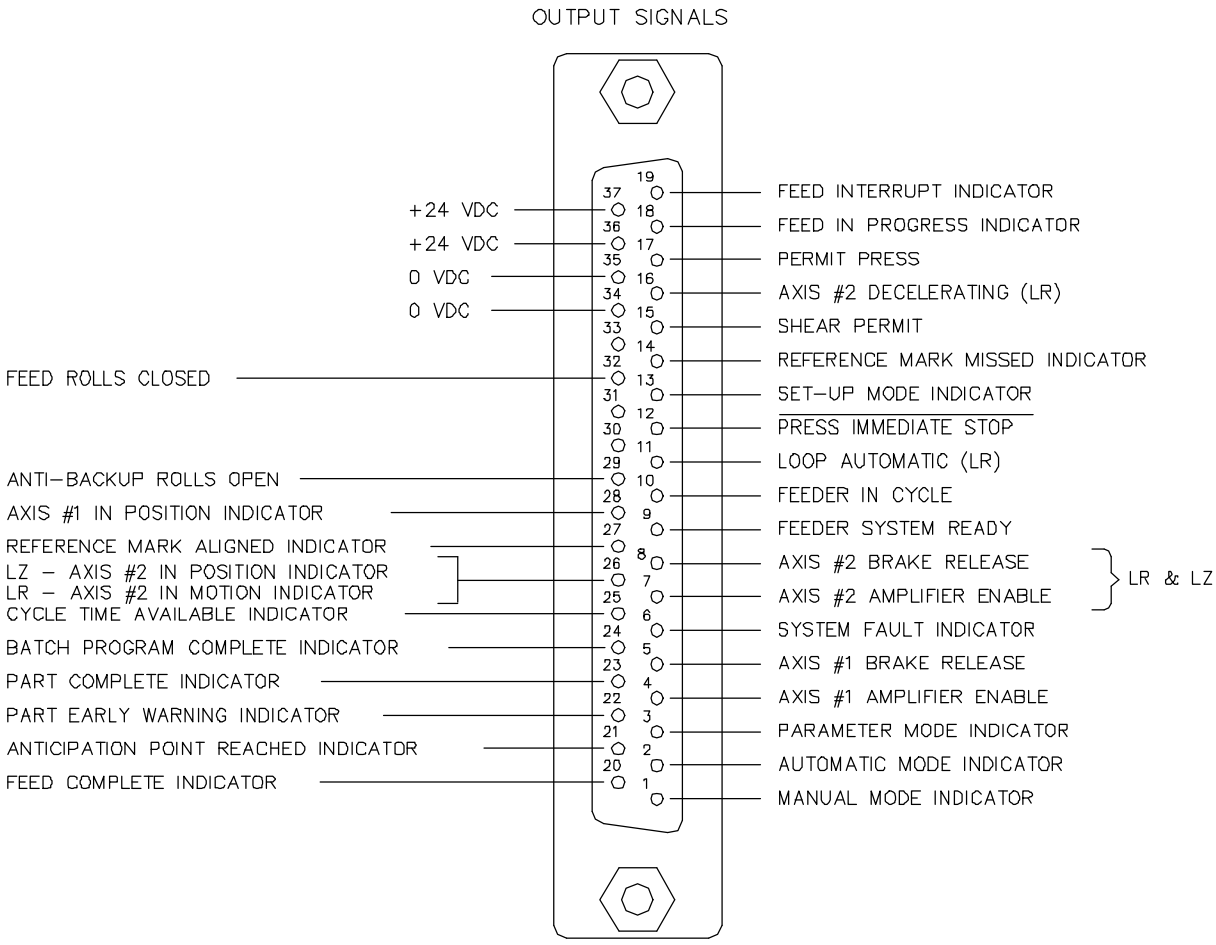


Figure 3.9 X4 Output Connector and Pin Designations

3.4.3 Parameter Mode Indicator

Connector - X4, pin 3

Function - (Output) Indicates that Parameter Mode is active

High = Parameter Mode is selected. This overrides any other mode selection.

This output signal is typically wired to an indicator light on the user control panel.

3.4.4 Axis #1 Amplifier Enable

Connector - X4, pin 4

Function - (Output) Enables Axis #1 Amplifier

High = Enables the Axis #1 Amplifier for operation.
Low = Axis #1 Amplifier is faulty (no Axis #1 Amplifier Ready input), the CLM is in the Parameter Mode, or a Hard Fault condition exists.

Wire this signal line to the RF terminal of the amplifier. Chapter 6 describes these connections as required for installation.

3.4.5 Axis #1 Brake Release

Connector - X4, pin 5

Function - (Output) Controls Axis 1 servomotor brake (when so equipped)

High = All power-up initialization and verifications are correct and the Axis #1 motor brake is electrically lifted - disengaged (unless motor brake circuit faulty).
Low = The motor brake is engaged.

The motor brake is spring loaded. When +24 Vdc is applied, the brake is electrically lifted from the motor. When the voltage is removed, the spring action of the brake engages it to the motor shaft.

3.4.6 System Fault Indicator

Connector - X4, pin 6

Function - (Output) Indicates a fault has occurred

High = The CLM has detected a fault.
Low = The system is functioning properly, or the CLM is experiencing a power loss or its microprocessor is defective.

This output is typically wired to an indicator light on the user control panel.

NOTE: *Any Hard Fault, Soft Fault or Minor Error will turn on this output. See Chapter 8 for a description of faults.*

3.4.7 Axis #2 Amplifier Enable

Connector - X4, pin 7

Function - (Output) Enables Axis #2 Amplifier

High = Enables the Axis #2 Amplifier for operation.
Low = Axis #2 Amplifier is faulty (no Axis #2 Amplifier Ready input), the CLM is in the Parameter Mode, or a Hard Fault condition exists.

Wire this signal line to the RF terminal of the amplifier. Chapter 6 describes these connections as required for installation.

3.4.8 Axis #2 Brake Release

Connector - X4, pin 8

Function - (Output) Controls axis 2 servomotor brake (when so equipped)

High = All power-up initialization and verifications are correct and the Axis #2 motor brake is electrically lifted - disengaged (unless motor brake circuit faulty).
Low = The axis 2 motor brake is engaged.

The motor brake is spring loaded. When +24 Vdc is applied, the brake is electrically lifted from the motor. When the voltage is removed, the spring action of the brake engages it to the motor shaft.

3.4.9 Feeder System Ready

Connector - X4, pin 9

Function - (Output) Used to indicate feed system is ready for operation

High = The drive system is ready, the amplifier is ready to be enabled, and no faults currently exist in the system.
Low = Either the CLM is in Parameter Mode or the system is not ready to feed and a fault may exist. Check for a diagnostic message and proper mode selection.

Typically, this output is wired to an indicator light on the user control panel.

3.4.10 Feeder In Cycle

Connector - X4, pin 10

Function - (Output) Used to indicate Automatic feed cycle operation

High = Indicates Automatic feed cycle operation is in progress.
Low = Indicates a Cycle Stop, a fault/error condition is present, or the $\overline{\text{FEED INTERRUPT}}$ signal is not present (is low).

This signal is issued (high) only in Automatic Mode, after Cycle Start. It remains in this state until the Cycle Stop is activated or a fault or error is detected.

Typically, this output is wired to an indicator light on the user control panel.

3.4.11 Loop Automatic

Connector - X4, pin 11

Function - (Output) Used to indicate Loop Control Automatic Mode selection (functional on CLM-R with loop control enabled)

High = Indicates Automatic Mode of Loop Control is selected.
Low = Manual Mode of Loop Control is selected.

Typically, this output is wired to an indicator light on the user control panel.

3.4.12 $\overline{\text{PRESS IMMEDIATE STOP}}$

Connector - X4, pin 12

Function - (Output) Used to immediately stop the press

High = The normal state during operation. Wire so this signal must be high for the press to operate.
Low = Immediately stops the press stroke.

NOTE: *Due to various factors, such as inertia and press stroke speed, the ram will not be able to stop instantaneously. However, if wired as described in this section, the CLM will attempt to stop the press ram as soon as mechanically possible if an Emergency Stop or other various faults occur.*

This signal goes low at the occurrence of the following faults (refer to Chapter 8 for fault descriptions):

All Hard Faults

Soft Faults:
Feed Angle Lost During Feed
Movement While Feed Angle Low
Press Cycle Without Feed
Zero % Feedrate Programmed
Press Timeout has Expired
Output was not Acknowledged
Correction Distance Exceeds Feedlength

Minor Error:

Feed Angle is Missing

This output signal is wired to the machine builder's press engagement clutch/brake retaining circuitry.

Upon receiving a $\overline{\text{CYCLE STOP}}$ signal, the press engagement clutch/brake retaining circuit is designed to retain clutch engagement until the press returns to the Top Dead Center position.

However, with the $\overline{\text{PRESS IMMEDIATE STOP}}$ signal wired to the clutch retaining circuit, when this signal goes low, the press attempts to stop the ram regardless of where it may be in the press stroke.

WARNING: *The* $\overline{\text{PRESS IMMEDIATE STOP}}$ *signal must be incorporated into the safety logic circuitry of the machine. Note that safety design of the system is the responsibility of the machine tool builder.*

3.4.13 Setup Mode Indicator

Connector - X4, pin 13

Function - (Output) Indicates the Setup Mode is active

High = Indicates the Setup Mode is selected.

This output signal is typically wired to an indicator light on the user control panel.

3.4.14 Reference Mark Missed Indicator

Connector - X4, pin 14

Function - (Output) Using the Registration function, indicates when a mark was missed

High = Indicates a mark was not detected in the feed cycle.
Low = Cycle is not in position where a mark should be detected or marks are being properly detected.

This output signal is typically wired to an indicator light on the user control panel. At the end of a feed cycle, a mark should be detected within a length window set in parameter. This output turns ON when a mark is missed, and remains ON until a mark is properly detected. A CLM display page shows the total number of marks missed. Depending on settings in parameters, a fault is issued if too many marks are missed. Refer to Chapter 4 for additional information on the Registration feature.

3.4.15 Shear Permit

Connector - X4, pin 15

Function - (Output) Used to enable/start a shear operation.

High = Shear operation is enabled/requested to start.

Low = Shear operation is not requested or enabled.

This output should be wired to circuitry that enables a shear. It turns ON when a shear operation is to be performed. It turns OFF at the next low feed angle after the shear operation.

3.4.16 Axis 2 Decelerating

Connector - X4, pin 16

Function - (Output) Indicates when axis 2 decelerates to zero or creep velocity. (functional on CLM-R with loop control enabled)

High = Axis 2 is decelerating to zero or creep velocity.
Low = Axis 2 velocity is normal or is being adjusted by the loop control algorithm.

This output may be used to control an uncoiler brake.

3.4.17 Permit Press

Connector - X4, pin 17

Function - (Output) Used to permit engagement of the press clutch.

High = Permits clutch engagement for press cycle operation.
Low = Disengages the clutch and press operation halts.

Permit Press is issued when the control is ready to begin cycling. In continuous Mode, it remains high during the automatic cycling. It goes low if the control sees a fault or error, or a Cycle Stop is issued. In Intermittent Mode, Permit Press is issued after the feed cycle is complete (or before the feed cycle in Press Before Feed Mode) and dropped during the actual feed cycle.

The timing of this signal stopping the press depends on the four possible mode combinations. See section 3.2.5 for a complete discussion of this signal (and other I/O's) in the Press Permissive interface. See the timing charts in Figures 3.3 through 3.6 for specific timing of this signal.

WARNING: *The machine builder should tie this signal into the other "Safety Logic Circuitry" for the press system. Do Not use this signal to fire the press without regard for other safety conditions (interlocks open, machine E-Stop, etc.).*

The following is a list of faults which will cause the Permit Press signal to go low causing the press cycle to stop:

All Hard Faults

All Soft Faults

Minor Errors:
Zero % Feedrate Entered
Zero Feed Length Entered
Change in Feedlength Exceeds Limit

Feedlength Exceeds Maximum
Feedlength Less than Minimum
Registr. Offset Exceeds Feedlength
Axis 2 Amp. is not enabled (CLM-R)

See Chapter 8 for more specific information on faults.

3.4.18 Feed In Progress Indicator

Connector - X4, pin 18

Function - (Output) Used for feed progress status

High = Indicates feeding is **in progress** or the feed axis is **not** in position as specified in Parameter A110.
Low = Indicates feeding has stopped as a result of reaching position or a fault/error exists which has stopped the feed.

This signal is operational in Automatic, Setup, or Manual Modes.

Typically, this output is wired to an indicator light on the user control panel.

3.4.19 Feed Interrupt Indicator

Connector - X4, pin 19

Function - (Output) Used to indicate an interrupted feed cycle

High = Indicates the CLM has lost the $\overline{\text{FEED INTERRUPT}}$ input signal (see section 3.3.15) and drive motion is decelerating or stopped.
Low = Indicates the CLM has not lost the $\overline{\text{FEED INTERRUPT}}$ signal.

Typically, this output is wired to an indicator light on the user control panel.

WARNING: *If the automatic cycle is interrupted by a low on the* $\overline{\text{FEED INTERRUPT}}$ *input, all feed motion is suspended. However, when the input returns high, the feed cycle will immediately resume. Use this output to alert personnel of the condition so they can use proper caution.*

3.4.20 Feed Complete Indicator

Connector - X4, pin 20

Function - (Output) Used to indicate commanded feed is complete

High = Indicates the axis is in position (within the In-Position Threshold set in Parameter A110) and the commanded feed is complete.

Low = Indicates that a feed is commanded, but is not presently complete.

Typically, this output is wired to an indicator light on the user control panel.

3.4.21 Anticipation Point Reached Indicator

Connector - X4, pin 21

Function - (Output) Used to indicate the anticipation point of a feed (set in Parameter A114) is reached.

High = Indicates the feed has reached the anticipation point.
Low = Indicates the feed is complete and the feed angle has gone low, or Parameter A112 is set to 0, which disables this output function.

This output only functions in Automatic Mode. Parameter A114 specifies the distance from the end of every feed where this output is to be issued. This output turns OFF when the feed is complete and the Feed Angle goes low.

Use this output to indicate when the feed is nearing completion, or to initiate some external device, such as a heater, vacuum pump, etc.

3.4.22 Part Early Warning Indicator

Connector - X4, pin 22

Function - (Output) Used in batching to indicate when this part run is nearing completion

High = Indicates the batch has the user specified number of this part (or less) remaining to be executed.
Low = Indicates the part count has not reached the user specified number of parts remaining, or the entry is set to 0, disabling the output.

When using the batching function, the user enters this "Early Warning" number on a page of the CLM display (see section 2.2.2). The output turns ON when the "parts remaining" count reaches this number. It remains ON as the remaining parts are completed. It turns OFF when the next part begins to execute. Refer to Chapter 4 for further information on the batching feature.

3.4.23 Part Complete Indicator

Connector - X4, pin 23

Function - (Output) Used in batching to indicate all feeds are complete for a single part

High = (Momentary) Indicates a single part just completed. Remains high about two seconds, then returns low.

When using the batching function, this output pulses momentarily as each part completes execution, whether executing a single part or several different parts in the Batching Program. It remains ON when the Batching Program Complete output turns ON, and remains ON until the next cycle start. Refer to Chapter 4 for further information on the batching feature.

3.4.24 Batch Program Complete Indicator

Connector - X4, pin 24

Function - (Output) Used in batching to indicate the batching program is completed

High = Indicates all parts in the batching program are completed.

When using the batching function, this output turns ON at the end of a batching program (when the last part is programmed with a jump to 00). It remains ON until the next cycle start. Refer to Chapter 4 for further information on the batching feature.

3.4.25 Cycle Time Available Indicator

Connector - X4, pin 25

Function - (Output) Used to indicate when the stroke rate can be safely increased

High = Indicates the time used by the feed is less than 90% of cycle time available.
Low = Indicates the time used by the feed exceeds 90%, or when not in Automatic Mode cycle or before the first cycle time measurement.

A light can be used as a visual indication to the operator that the press stroke rate can be increased without causing loss of feed angle, which would cause a fault. If the light is OFF during a cycle, the stroke rate (time for each press stroke) should be increased or the feed rate decreased to assure the feed completes before the feed angle input goes low.

3.4.26. Axis #2 in Motion / Axis #2 In Position Indicator

Connector - X4, pin 26

CLM-R Function - (Output) Indicates when motion is being commanded to axis 2.
High = Axis 2 is feeding at creep velocity or greater.
Low = Axis 2 analog output is zero volts.

This output may be used to indicate creep speed is in progress.

CLM-Z Function - (Output) Used to indicate axis 2 is in position

High = Indicates the axis is in position (within the In-Position Threshold for axis 2 set in Parameter A210).

Low = Indicates the axis is not in position (not within the In-Position Threshold).

Typically, this output is wired to an indicator light on the user control panel.

3.4.27 Reference Mark Aligned Indicator

Connector - X4, pin 27

Function - (Output) Used to indicate that the feed is aligned with the reference mark

High = Indicates alignment in Manual Mode, and a successful search in Automatic Mode during continuous position control.

Low = Indicates the cycle has started and feed motion has begun, or the reference mark function is not used.

The registration function must be enabled by both parameter and by input (see section 3.3.26). When this function is enabled, Cycle Start in the Automatic Mode is allowed only when this output is high (reference mark is aligned after using "Jog to Reference Mark" input). Refer to Chapter 4 for additional information on the registration function.

3.4.28 Axis #1 In Position Indicator

Connector - X4, pin 28

Function - (Output) Used to indicate axis 1 is in position

High = Indicates the axis is in position (within the In-Position Threshold set in Parameter A110).

Low = Indicates the axis is not in position (not within the In-Position Threshold).

Typically, this output is wired to an indicator light on the user control panel.

3.4.29 Anti-Backup Rolls Open

Connector - X4, pin 29

Function - (output) Used with the roll control function to open/close the anti-backup rolls

High = Output "open anti-backup" to system builder's circuitry.

Low = Output "close anti-backup" to system builder's circuitry.

The power-off state is the default state for roll position. Four inputs are provided for manual roll control (sections 3.3.29 through 32). Table 3-1 shows the effect that each manual input has on the state of the outputs. The CLM controls the roll lifting automatically in different modes of operation.

Table 3-2 lists the status of the rolls under different conditions and in different modes. Chapter 4 provides additional information on the roll control function.

3.4.30 Not Used Output

Connector - X4, pin 30

Function - (output) This output is not used on this version of CLM

3.4.31 Not Used Output

Connector - X4, pin 31

Function - (output) This output is not used on this version of CLM

3.4.32 Feed Rolls Closed

Connector - X4, pin 32

Function - (output) Used with the roll control function to close/open the feed rolls

High = Output "close feed rolls" to system builder's circuitry.
Low = Output "open feed rolls" to system builder's circuitry.

See section 3.4.29 for additional information.

3.5 Optional Signal Descriptions

This section describes some miscellaneous signal connections available with the CLM.

3.5.1 Analog Velocity Override

This option allows the use of a potentiometer or switch to override the programmed feed rate with a voltage input at Analog Input AE1. See figure 3.10 for a connection illustration.

This feature and options are selected in Parameter B120 for operation in Manual and Setup Modes and/or Automatic Mode. Select the modes in which the override is active, the update of the velocity, and the filtering of the voltage input.

The potentiometer or switch can be used to select the jogging velocity from 5% to 100% of the setting in Parameter A105 (Jog Feed Rate). In Manual Mode, the feed rate can be changed during a jog, allowing a creep speed for feeding to a specific point. Feed rates can also be changed during Automatic Mode cycling.

Refer to Parameter B120 in Chapter 5 for additional information and options available with this feature.

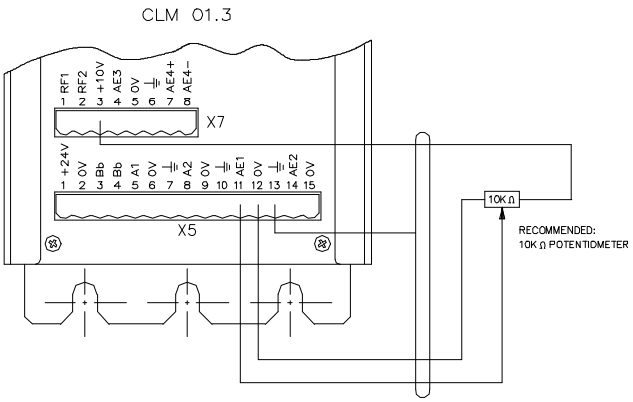


Figure 3.10 Connecting a Potentiometer for Feed Rate Override

3.5.2 Expansion Inputs and Outputs

This section describes connections provided with the optional Expansion I/O board. Note that the Expansion inputs and outputs are available only with CLM-01.3-R-E and CLM-01.3-Z-E.

Refer to Chapter 4, Batching feature for information on programming the gag or auxiliary inputs and outputs, and use of Binary or BCD inputs to select the starting part to execute in the batching program.

Expansion Input Connector X11
Pins 1-30: Gag/Aux Acknowledgments 01-30
These are acknowledgments for gag/aux outputs 01-30.

Expansion Input Connector X12

Pins 1-8: Binary/BCD Inputs

These inputs allow starting part selection by Binary or BCD input whichever is enabled in Parameter B102. When the binary option is selected, the inputs 1-7 correspond to powers of 2 from 0 to 6. When BCD is selected, the inputs 1-8 correspond to Binary Coded Decimal, where each set of four inputs is one decimal digit.

Pin 1:	Binary/BCD 0	Pin 5:	Binary/BCD 4
Pin 2:	Binary/BCD 1	Pin 6:	Binary/BCD 5
Pin 3:	Binary/BCD 2	Pin 7:	Binary/BCD 6
Pin 4:	Binary/BCD 3	Pin 8:	BCD 7

Pins 10, 11, 12: Tail Out mode inputs. See Chapter 4, Material Loop Control.

Expansion Output Connector X13
Pins 1-30: Gag/Aux Outputs 01-30
These outputs are used to control gagging or auxiliary functions.

Pin 31 - Tail Out Mode Indicator. See Chapter 4, Material Loop Control.

CHAPTER 4. FUNCTIONAL DESCRIPTION - SPECIAL FEATURES

This chapter describes special features available, and provides the general information required to use these features.

- Batching
- Registration
- Roll Lifting Interlock Control
- Material Loop Control (CLM-R only)
- RS-232/422/485 Interface
- Measuring Wheel option

4.1 Batching

If the application requires making different parts, use batching to reduce the set up time and eliminate possible entry errors by entering the required data for each part into a separate batch memory. The batching option allows multiple feed lengths and gagging outputs for each part. It allows program branching to automatically execute different parts, and a shear operation.

The CLM can store up to 99 different parts, each with unique set of feed lengths, feed rate, number of pieces to execute, and a user's part number. Up to 594 feeds can be stored in the CLM's battery-protected memory. Up to 99 sets of gagging or auxiliary outputs and acknowledgments can be programmed, if the CLM has the optional Expansion I/O board.

You can select to sequentially execute several or all different parts, or to execute any single part from the CLM control panel. You can externally select a part to execute from an SOT, a PLC or similar host device, through the communications port to the CLM. The optional Expansion I/O board provides an input connector (X12) specifically designed for Binary or BCD input.

The CLM display can show a running piece count display, user part number assignment plus outputs to indicate when the part is nearing completion, when each part is complete and when all parts in the batch run are complete. All information assigned in batching can be viewed and edited in any mode, even while the press is in operation. Automatic Mode, however, is the only mode in which parts are counted as they are made.

4.1.1 Selecting Batch Option

Parameter B102 (interface option) allows you to select the method of entering the feed length and feed rate into the CLM. With the "batching" interface option selected, you typically enter the data for each part ahead of time. Then, simply select the part or batch of different parts to execute automatically, from the CLM keypad, or from an SOT or other host (via the serial interface). Note that you cannot use the IDS option with the batching option.

4.1.2 Batch Entry and Status Displays

Section 2.2 describes the procedures for scrolling through the display screens, movement of the cursor within the display page and how to enter data into fields. The following sections further describe the entry procedures and options for batch programming.

4.1.3 Current Part Information Display

The Current Part Information Page has three functions: 1) select the starting part number, 2) micro-adjust the current part count, 3) display real-time part information. Before using this page to start the batching program, the part information must be programmed on the other batching pages, as described in the following sections.

```
INFO nn iiiiiiii
Qty   qqqqqq  G#
Count cccccc  gg
Feed  f  Cnt xxx
```

Current Part Information Page

Starting Part Selection

Before starting automatic operation, enter a starting part of the batch on this page. A batching program may start with any of the 99 parts. This allows the storage of several batching programs, each having a unique starting part and set of parts to execute automatically.

Select the starting part by either the part block number (nn) or part ID (iiiiiiii). To avoid an accidental part change, starting part entry is allowed only when the CLM is not in an Automatic Mode cycle.

With the desired part number showing on the page, press the STORE key to select it as the starting part. If the current part is entered as the starting part, the batching program will be reset to the start of the current part by pressing the STORE key.

Micro-adjustment of Current Part Count

Move the cursor into the first digit of the current part count (cccccc) for an on-line adjustment of this count. Press the '+' key to add a part to the count. Press the '-' key to subtract a part from the count.

Real-Time Part Information

This page provides a real-time display of the current part information while the CLM is cycling. The displayed part block and Part ID will change as the current part changes (begins executing the next part in the batch program).

The part quantity (qqqqqq) is displayed along with the current part count (cccccc), to show the quantity of parts to be produced and the current number of parts. The current part count will be

increased or decreased depending on the count mode selected in Parameter B111 (count up or count down). If a part is a free run (described in next section), "FREERUN" is displayed in the part quantity and the counter counts up, regardless of the count mode. A linked part is indicated with a different display, described in section 4.2.7 under Part Linking.

The current feed data is displayed in the bottom row. The current feed number (f) changes with each change in feed, as does the current gag set (gg). The current feed count (xxx) is shown, and counts up or down according to the count mode parameter. The current feed length and rate are displayed in the Feed Length Page, as described in section 2.2.

4.1.4 Batch Main Programming Display Page

Batching programs are entered in the Batch Main Programming Page. Data fields for a part may be accessed by typing either the Part Block or Part ID number.

The Batch Main Programming Page allows branching, free run, or single part operation. A part quantity is entered to set the number of times the part is executed. An Early Warning count is provided to turn ON an output when a part is near completion. If more than six feed lengths are desired, part blocks may be linked together to add up to six feeds per linked block. You can create a single part with up to 594 different feed lengths and one part quantity.

```
Main nn iiiiiiii
Jump to Block pp
Quantity  qqqqqq
Early Warn   eee
```

Batch Main Programming Page

Part Block Number (nn)

This number, from 01 through 99, is associated with feed and gagging data for a part. The display of part block and its data can be changed by typing-over with another part number. The information on the display will be updated as the keys are pressed. The part number may also be incremented or decremented using the '+' or '-' key.

Part ID Number (iiiiiiii)

The user can assign a Part ID to be associated with each Part Block number. This is any eight digit number that has meaning to the user (a part number, die number, customer number, etc.). It is stored in the CLM as a matched set with the part block number. Each part's data may be accessed by entering either the Part Block or the Part ID number. A unique Part ID must be selected for each block when using the CLM keypad. The numbers 1 to 9,'+' and '-' may be entered through the keypad. Alpha characters may be used when entered from an SOT or other host device, but are not available from the CLM keypad.

Jump to Block (pp)

Batching allows automatically executing several different parts. Enter in the Jump To Block the next part block to be executed after completion of the entered part quantity of the starting or previous part block. A jump to any of the 99 part blocks can be executed. Each part block can jump to another after it is completed. This allows executing several different parts automatically. Different batches of parts can be programmed to execute together. Enter the starting number of the batch to select the desired batch program to execute.

If a part jumps back to itself (if pp = nn), it is a free run part. The part will run continuously until a cycle stop or part stop input is activated. The part quantity display is replaced with the word "FREERUN" and the Early Warning count with all stars.

If "00" is entered here, no jump is performed, and the cycle will be stopped after the part quantity is completed. Enter "00" for the jump to block in the last part block to be executed in the batch.

Part Quantity (qqqqqq)

The part quantity is the number of times each part is repeated before jumping to the next part or stopping. If a zero is entered in every digit, the current count for the part will be cleared without affecting the part quantity.

Parts may be linked together to create a part with more than six feed lengths by entering a '+' in the part quantity. See the Part Linking section (4.2.7) for a detailed description.

Early Warning Count (eee)

The Early Warning count allows an output to be turned ON near the end of a part run. The output is turned ON when the number of parts remaining reaches this number. The output is turned OFF at the start of a new part.

4.1.5 Batch Feed Programming Display

There are six Feed Programming Pages associated with each Batch Main Programming Page. Feed lengths, rates, and gag sets may be edited for each feed, which may be executed up to 999 times.

```
Part nn iiiiiiii
Feed  f  Qty xxx
Length   Rate G#
+mll.lll rr.r gg
```

Batch Feed Programming Page

The displayed Part Block Number and Part ID are being programmed by entries on this page.

Feed Number (f)

The feeds are executed in order from 1 to 6 within each part. Data fields for feeds 1 to 6 can be accessed sequentially by pressing the '+' and '-' keys or access a feed directly by typing-over the number.

Feed Quantity (xxx)

The feed quantity is the number of times the feed will be executed before starting the next feed or the next part. If a '- ' is entered here, the part is completed after the previous feed. For example, if only two feeds are desired for a Part, a '-' must be entered in the feed quantity of Feed 3. The display will show "---" in the feed quantity for the end of the part.

A "---" in the feed quantity is not allowed in Feed 1 since each part must have at least one feed. An entry of "000" is not allowed in any feed quantity.

Feed Length (+mll.lll) and Feed Rate (rr.r)

A unique feed length, rate, and direction can be selected for each feed. The feed length can be micro-adjusted by pressing '+' or '-' while in the first digit position, indicated by 'm'.

A minor error is issued immediately if feed length limits are exceeded (set in parameter) while the CLM is not in an automatic mode cycle. The display changes to the status page (first display on the CLM display map). The current feed page is automatically displayed when you scroll to the batch main programming page. During a cycle, only the current feed is checked against the feed length limits.

In the CLM-Z, each axis can have a different feed length and rate. Refer to section 4.2.9.

Gag Output Set (gg)

If the gagging or shear options are not enabled, these digits and the "G#" or "A#" above them will not be displayed. The batching parameter allows selecting either GAG or AUX to display on the batching pages.

A Gag Output Set from 01-99 can be selected. The outputs to be turned ON and OFF for each Gag Set are entered in the Gag Output Selection Page (next section). If a 00 is entered, all gag outputs will be turned OFF.

4.1.6 GAG Output Selection Display Page

Gagging is the use of different patterns or tools in a press, selected by outputs from the CLM. The CLM allows up to 99 gag sets with up to 30 gag outputs that may be individually turned ON or OFF with each different set of feeds. These outputs may also be used for functions other than gagging to turn ON auxiliary outputs for each feed.

Gag outputs are turned ON at cycle start. There is a 200-ms delay before the first feed or press stroke to allow enough time for gag activation. During the cycle, gag outputs are turned ON when

the feed angle switches from high to low before each feed. They remain ON until the programmed gag set is changed.

To ensure that gagging is performed, the CLM provides an optional acknowledgment fault. If the acknowledgment inputs are not the same as the outputs when the feed angle switches from high to low, a soft fault "Output was not Acknowledged" is issued and the Press Immediate Stop output is activated to prevent damage to the die.

Note: *The gagging option requires the CLM to have the optional Expansion I-O board.*

```
GAG_01  *(01-15)
01 -- 03 04 05
06 07 -- 09 10
11 -- 13 14 15
```

Gag Output Selection Page

Gag Output Programming

The gag sets 01 to 99 are programmed in the Gag Output Selection page. A gag set is selected for each feed in the Feed Programming Page.

Gag sets 01-99 can be cycled through with the '+' and '-' keys, or the gag set can be entered directly. Fifteen outputs are displayed at a time. The asterisk (*) indicates that gag outputs are turned ON in the other set of 15 outputs. To toggle the display between Gag Outputs 01-15 and 16-30, press the CR key while the cursor is in the home position.

The outputs that are ON are indicated by the corresponding output number. The outputs that are OFF are indicated by a "--" in the corresponding position.

To edit the gag set, move the cursor directly to the desired output. To turn an output ON, press the '+' key in the corresponding cursor position. To turn it OFF, press the '-' key. The CR key returns the cursor to the home position and displays the current gag output set. Press the STORE key to save the currently displayed gag outputs.

4.1.7 Part Linking

The CLM normally provides up to six feeds per part. If a part requires more than six feeds, up to 99 parts may be linked together to create one part with up to 594 feeds.

To link a part to another part, enter a '+' in the part quantity in the Main Page. The '+' characters will be displayed in place of the part quantity and Early Warning, and the part will be linked with the next block.

The feeds programmed in the current block will be completed, followed by those in the "jumped to" block. The part quantity, jump to block, and early warning are defined in the last part block (the last link in the chain).

To select a linked free run part, set the part quantity to "999999".

In the example below, a linked part is entered in blocks 10 and 20. After the six feeds in block 10 are completed, the six feeds in block 20 are executed. Part block 20 is defined as the end of the part by entering a valid part quantity. The linked part in blocks 10 and 20 with 12 feeds will execute 100 times, then execution will continue at the next part in block 30.

Linked Part Programming Example (12 feeds)

```
Main 10 ******10
Jump to Block 20
Quantity  ++++++
Early Warn   +++
```

Part Block 10

```
Main 20 ******20
Jump to Block 30
Quantity  000100
Early Warn   002
```

Part Block 20

Linked Part on Information Page

The Current Part Information Page will indicate a linked part to distinguish it from a normal part. The linking process is also indicated since the CLM does not find the Part Quantity until the last link in the chain is found. There is the possibility of an infinite loop if no part quantity is found. These displays will aid the programmer in detecting this error condition.

When two or more parts are linked together, the Current Part Info Display will indicate that the part is being linked by displaying "Linking Part" in place of the part quantity. As soon as the count is found, "INFO" in the upper left corner is replaced by "LINK", and the count of the total part entered at the end of the chain is always displayed.

```
INFO 10 ******10
Qty   ++++++  G#
Count 000000  01
Feed  1  Cnt 000
```

Current Part Information Display before linked part is executed

```
INFO 10 ******10
Linking Part  G#
Count 000000  01
Feed  1  Cnt 001
```

When executing linked part but count has not been found

```
LINK 20 ******20
Qty   000100  G#
Count 000001  02
Feed  1  Cnt 000
```

After part quantity has been found for linked part

4.1.8 Shear Option

The CLM-01.3-R/Z includes a shear option. It allows a suspension of press operation, after an alignment feed, to perform a shear cut. The Expansion I/O and gagging selection are not required for the shear option. It is enabled in Parameter B111. With the Expansion I/O, the following page displays when you select Gag Set 99. Without the Expansion I/O, it appears as the last display when scrolling down (in place of the gagging displays).

```
GAG 99
Shear Selection
Press Hold   YES
```

Shear Selection Page

To toggle Press Hold from "YES" to "NO" and vice-versa, press the STORE key.

- "YES" - the press is stopped momentarily, until the shear operation is complete.
- "NO" - the press continues to cycle and the shear operation occurs after the end of the feed and before the feed angle goes low.

When the Press Hold is "YES", the Permit Press output turns OFF and remains off when the feed angle goes low after the feed prior to the shear. A shear alignment feed, programmed in the same feed page as the shear, starts when the feed angle goes high. Upon completion of the alignment feed, the Shear Permit is activated to start the shear. The shear makes a cut, then turns ON the Shear Feed Angle input when the cut is finished. When the Shear Feed Angle input is high, the CLM turns ON the Permit Press output. The Shear Permit is dropped at the next high-to-low feed angle transition, and normal feeding resumes at the next high feed angle.

While the CLM is waiting for the Shear Feed Angle Input, the status message "A: Waiting Shear" is displayed.

When Press Hold is "NO", the Permit Press remains ON and the Shear Permit is activated after the alignment feed. The shear operation must be completed in the time between the end of the feed and the low feed angle. If the Shear Feed Angle input is not active upon the high-to-low feed angle transition, the soft fault "Output was not Acknowledged" is issued.

4.1.9 Note for CLM-01.3-Z Batching

The software version LZ01.3-002.2 batching feature is the same as LR01.3-006.3, except that feed length and feed rate may be entered for both axes. The only page that is different is the Batch Feed Programming page. Micro-adjust is allowed (by pressing "+" or "-" with the cursor in the first digit position - after "+" or "-" feed length direction sign) for both axes

```
Part 01 ******01
Feed  1  Qty 001
 Length  Rate G#
+012.345 67.8 01
```

Batch Feed Programming Page for CLM-Z when the cursor is in row 1

```
Part 01 ******01
Feed  1  Qty 001
+012.345 67.8 01
+012.346 67.0 A2
```

Batch Feed Programming Page for CLM-Z when the cursor is in rows 2-4

The Axis 1 feed length, rate, and gag set are displayed in row 4. When the cursor is moved out of the first row, row 4 moves up to row 3 and Axis 2's feed length and rate are displayed in row 4. Independent feed length and feed rate entry and micro-adjust is allowed for both axes. If either axis is disabled, the respective data on the display is replaced by asterisks.

4.1.10 Batching in Automatic Mode

This section describes the operation of the CLM in Automatic Mode when using the batching option. It begins after the part information has been programmed into the batching pages.

Pressing Cycle Start

If the CLM has just been powered up or a new starting part has been entered, execution begins at the starting part entered in the Batch Part Information Page or selected through the Binary/BCD inputs.

If the cycle has been stopped during part execution (by a $\overline{\text{CYCLE STOP}}$, $\overline{\text{PART STOP}}$, or fault), the program will be continued with its current part, feed, and count values, until a "Jump to Block 00" is encountered, as programmed to end the current batching program.

Part Execution Sequence

The current feed count is incremented upon each high-to-low transition of the feed angle signal. The feed number is incremented when the target feed quantity is reached. The CLM checks if the current feed number is 6 or the new feed has a stop on feed ("---") programmed. If either condition is met,

the current part count is incremented and the feed number is reset to 1. If it is a linked part with more than six feeds, the part continues with the feeds in the next block programmed as "jump to."

If the part quantity is reached and a Jump to Block is programmed, execution starts at the part block jumped to and the feed number is reset to 1. If the part quantity is reached and a stop at end of part is programmed (by entering a "00" jump), the cycle is stopped and the status message "A: Part Stop" is displayed.

Notes on Automatic Mode Operation

The Press Before Feed/ Batch Complete parameter option causes an overlap of feeds between parts to maintain the proper tool sequence. Gagging, the shear option, and outputs used during the cycle are described in separate sections of this chapter.

Cycle Stop and Part Stop

The CLM provides a second cycle stop input for batching. The $\overline{\text{CYCLE STOP}}$ input stops the automatic cycling immediately after the current cycle completes. The added $\overline{\text{PART STOP}}$ input stops the cycle at the end of the part, after all feeds in the part have been completed. When Part Stop is used, the cycle won't be stopped in the middle of a part.

The status message "A: Cycle Stop" is displayed when the $\overline{\text{CYCLE STOP}}$ input has been activated or a fault has caused a $\overline{\text{CYCLE STOP}}$. This message indicates that the part may be incomplete. The status message "A: Part Stop" is displayed when the $\overline{\text{PART STOP}}$ input has been activated or a $\overline{\text{PART STOP}}$ has been executed in the Batching program. This message indicates that the part is complete.

4.1.11 Batching in Setup Mode

This section describes the operation of the CLM in Setup Mode when using the batching option. It begins after the part information has been programmed into the batching pages.

In setup mode, the first feed of the current part is performed. The current part can be changed through the same procedure that the starting part in Automatic Mode is selected, except BCD and Binary inputs aren't read and multiple feeds cannot be done. The BCD/binary inputs are read only when entering setup mode.

The gag outputs are turned ON as they are in Automatic Mode.

NOTE: *Setup mode is provided for single-feed applications. For setup of multiple feeds, use the single step feature with the start and stop inputs or enter a setup sequence in the Batching program. The feed and part counts are not updated in Setup Mode.*

4.1.12 Interface Options

Parameter B102 (Interface Option) allows you to select the method of entering the feed length and rate into the CLM. Refer to Chapter 5 for description of parameter entry. The batching parameter options are summarized in this section. Note that certain options (as noted) are available only if the Expansion I-O board (CLM-01.3-R-E or CLM-01.3-Z-E) is present.

Count Mode This option allows the display of the number of parts created or parts remaining (count up or down). It applies to both the current part count and the feed count.

Press Before Feed/ Batch Complete This option specifies whether the last feed in a single part or sequence of parts is performed when Press Before Feed Operation is selected in the Press Interface Parameter (end after feed or after press). It does not apply to Feed Before Press operation. See parameter description in Chapter 5 for an illustration of this function.

Gagging Option Selection To disable gagging, set this option to 0. Set the option to 1 or 2 to enable gagging operation. The displays will show "GAG" (1) or "AUX" (2). Options 1 and 2 are only available with the Expansion I/O.

Gag Acknowledgment Fault If this option is set to 1, an acknowledgment is required for each gag output at the corresponding gag input upon the next transition of the feed angle signal from low to high. The fault "Output was not Acknowledged" is issued if an acknowledgment is missing.

Shear Option To enable the shear option, set this option to 1.

Binary/BCD Starting Part Selection If this option is set to 1 or 2, the starting part is selected through inputs 1-8 on the optional expansion board input connector X12. This option is useful for interfacing to a PLC or a decade switch. In Automatic mode, the Binary/BCD inputs are read only at cycle start. In Setup mode, these inputs are read only upon entering the mode.

4.1.13 Default Batch Program Values

The CLM loads default values if data has been lost due to battery failure or at initial shipment. The soft fault "Batching Program Was Lost" is issued after CLM initialization if default values are loaded in any of the parts. The following lists the default values. Reprogram or verify data for each part and press the STORE key to save the data to CLM battery-protected memory.

Data	Default Value
Part ID Number	6 stars followed by Part Block #
Jump to Block	"00" for stop at end of part
Part Quantity	"000001"
Early Warning	"000"
Current part and feed counts	Zero
Current Feed Number	1
Feed quantity, Feed 1	"001"
Feed quantity, Feeds 2-6	"---" for end of part
Feed length and rate	Both zero
Gag Set selected for feed	"00" for gags off
Gag outputs within gag set	All off
Starting part	Block 01
Shear press hold	"NO"

4.1.14 LR01.2-005.X Compatibility and Cross Reference

This section is provided for users of previous versions of software/firmware. It describes the major differences in the batching function.

Because of the added flexibility associated with the LR01.3-006.3 batching, all batching data stored in LR01.2-005.X will be lost when the new firmware is loaded. Therefore, it should be written down on paper or downloaded to a PC. Since the serial strings emulate LR01.2-005.X as much as possible, most existing batching data can be transferred from a PC to the new system.

It is easy to emulate an LR01.2-005.X by programming only one feed with a feed quantity of 1 for each part. The addition of 83 more batches and the ability to branch and loop will be valuable even without the gagging and multiple feeds per part features.

Several terms have changed since the batching scheme that was included in LR01.2-005.X. These terms are listed here with their counterparts in the LR01.3-006.3 (LZ01.3-002.2).

Term in LR01.2-005.X	Corresponding Term in LR01.3-006.3
Batch	Part
Batch Number	Part Block Number
Part Number	Part ID Number
Batch Count	Part Quantity and Feed Quantity
Piece Count	Current Part Count and Current Feed Count

The programming differences between the two firmwares are:

1. A free run part in LR01.3-006.3 is selected by jumping back to the same part. In LR01.2-005.X, zeros were entered in the batch count.

2. In LR01.3-006.3, a '+' in the part quantity is used to link parts. In LR01.2-005.X it was used to skip parts, a feature not needed in LR01.3-006.3 because of jumping.

3. Continuous batching and single batching are not parameter options in LR01.3-006.3 but are selected through jumping to another part or entering zero as the part jump, respectively.

4.2 Registration

Registration is used to keep each feed as close as possible to a reference mark on the material. Position correction adjusts the feed for slip or stretch in the material that would cause it to move out of the predetermined position. Parameters allow customizing this function to your requirements. When enabled in parameter, the function can be disabled, when desired, by an external input. Missed marks will not affect the programmed feed length. The user can specify if or how many missed marks should cause a fault. When enabled, a registration display on the CLM will show the latest information for the function, such as average feed length, number of marks missed, etc

The software in the CLM provides three types of registration: Continuous Position Correction, Continuous with offset, and Averaging Position Correction.

- Continuous Position Correction: For each feed, as the programmed length is near the end of the feed, the CLM begins searching for the reference mark on the material. A leading and trailing distance, as specified in a parameter, determine the search window of where a mark should be detected. If a mark is not detected within this window, it is counted as a missed mark. The length, direction and search velocity of this search are selected by parameters.

  .

- Continuous with offset works the same as Continuous mode, but an offset distance may be programmed on-line. The offset distance will shift the point around which the leading and trailing distances are defined, to any point, during the feed. This mode allows changing the offset distance (length of fed after detecting the mark) on-line. This allows correction for fluctuation of the mark position without interrupting production.

- Averaging Position Correction: After a parameter specified number of feeds have been completed, the next number of feeds are adjusted to compensate for the deviation of the feed length, with respect to the position of the reference mark (average length between marks). This method will compensate for deviations while maintaining a high speed and consistent feed length.

The CLM has a high speed input for registration. This input causes a microprocessor interrupt with the detection of a mark, which causes a reset of a position counter. The accuracy of where the registration mark is detected is very high. On the CLM-Z, registration measurement is done with axis 1. Axis 2 is proportionally scaled by this measurement.

The accuracy of mark detection and duration of the input signal is essential for the proper operation of registration position correction. Signal duration needs be greater than 2.2 ms when Parameter B112 is

set for Continuous or Averaging modes of registration, and greater than 100 microseconds when B112 is set for Continuous with Offset mode.

Registration requires a special cable (#03-727). Refer to Appendix D interconnect drawings.

4.2.1 Continuous Position Correction:

Continuous Position Correction consists of a programmed feed length, and leading and trailing search distances. The feed length entered through the CLM control panel (standard) or IDS, or programmed in batching, is the expected distance between reference marks. A leading length distance (B113) and trailing length distance (B114) is entered in parameters. The leading distance is defined as the distance before the end of the programmed feed, and the trailing length is defined as the distance after the programmed feed. Measurements are based on the high feed angle transition. Refer to Chapter 5 for further description of parameters.

While the programmed feed length is being executed, the reference mark is ignored, or locked out, until the distance remaining in the feed is less than the leading distance. The CLM either stays at the same velocity or decelerates to the search velocity entered in the parameter. The length of this search is selected in Parameters B113 and B114.

The search feed velocity will decelerate to zero when the rising edge to the reference mark is sensed. The search distance is limited by the trailing length. If the search reaches this distance and the rising edge of the reference mark isn't found, the missed marks counter increments. The trailing distance will be subtracted from the next feed length and the "Missed Mark" output turns ON. A soft fault "Too Many Ref. Marks Missed" is issued if the Missed Marks counter exceeds the value set in Parameter B115.

When the mark is properly sensed during the search feed, the "Aligned" output will be turned ON, and the Registration Status display page will show an "A" until the start of the next feed. The next feed will be adjusted for the distance traveled during deceleration from the reference mark so the next programmed feed distance starts on the mark. The missed marks counter is reset and the missed mark output is turned OFF after a successful search (mark is sensed).

***NOTE**: If there is a negative feed programmed from the Auxiliary Feed length input or as part of a batch, position correction will be disabled for that feed, then continued with the next positive feed. Position correction is based in one direction only.*

4.2.2 Continuous Position Correction with Offset:

This mode works the same as Continuous mode, except an offset distance can be programmed on-line. Also, there is no filter on the high-low transition of the reference mark input as on the other two modes. In the other two modes, the reference mark is expected to be at the end of the programmed feed length. The leading and trailing lengths define the window before and after the end of the programmed feed when the CLM should search for the mark. This mode can shift the point where the mark is expected (along with the leading/trailing search window) to any point in the feed length. The offset distance is defined from the expected position of the reference mark, as illustrated in Figure 4.1.

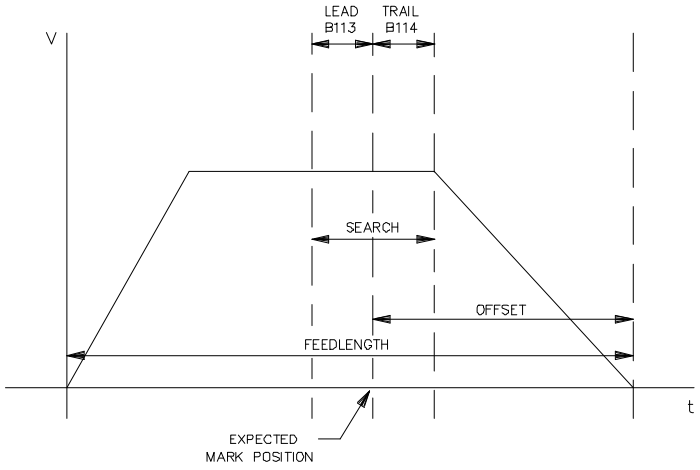


Figure 4.1 Continuous with Offset Mode of Registration

The axis will feed the offset distance from the point at which the mark is found. For example, a feed length is entered as 18 inches. The mark is expected at 10 inches, with a 2 inch leading length (start search before the mark is expected) and a 2 inch trailing length (end search if mark not found). The offset distance is 8 inches (the mark is expected after 10 inches, then feed the 8 inch offset for the full 18 inch feed length). The mark is found while feeding at the normal feed rate velocity (no deceleration to search velocity). The axis is always positioned the offset distance from where the mark is found, unless deceleration is in progress. When a mark is missed (not sensed within the leading/trailing search window), the feed will be adjusted by the offset distance minus the trailing length distance. If the offset distance is greater than the deceleration distance when the mark is found or missed, the adjustment will take place on the next feed, so that the deceleration profile will not be affected.

The offset distance appears in the bottom row. It may be edited and micro-adjusted the same as any other CLM length. If the programmed offset is greater than the programmed feed length, a minor error "Offset Exceeds Feedlength" will be issued. A zero offset distance is allowed for normal continuous mode with no registration input filter.

4.2.3 Averaging Position Correction:

After a specified number of feeds have been completed (parameter set), the next set of feeds are adjusted to compensate for the deviation of the programmed feed length compared with an average of the actual feed length found between reference marks. This method will compensate for deviations while maintaining a high speed and consistent feed length.

4.2.4 Reference Mark Alignment

In continuous and averaging modes, the reference mark must be aligned with the sensor before entering Automatic Mode. To perform alignment, use the Jog Forward or the Jog Reverse input to move the material to a point near the reference mark. Next, press and hold the Jog to Reference Mark (input) to move the material at the search velocity until the sensor detects the reference mark on the material. The Jog to Reference Mark is a separate input from the Jog (forward or reverse) inputs. The status message, "M: Ref. Search" displays during this jog. As soon as the rising edge of the mark is reached, the feed will decelerate and the status message "M: Ref. Aligned" will be displayed.

In continuous with offset mode, the procedure is the same, except the offset distance is fed after the mark is detected. Press and hold the Jog to Reference Mark to jog the material the offset distance past the reference mark. When the input is released, the axis will stop. If the offset distance has not been completed, the message 'M: Ref Search' is displayed on the CLM.

The reference mark is aligned when the rising edge of the mark is reached. The "Aligned with Reference mark" output will be turned on and an "A" will appear in the Registration Status Page display. If the Jog to Reference Mark input is activated while the mark is aligned, movement will be disabled and the status message "M: Ref. Aligned" will be displayed. The reference mark is "Not Aligned" whenever jog forward or jog reverse are active or after a Cycle Start in Automatic Mode.

If the Automatic Mode is entered when the mark is not aligned, a minor error, "Reference Mark is Not Aligned" is issued. Exiting Automatic Mode will correct this error and alignment should be performed before reentering Automatic Mode. Disabling the position correction (via input) will also clear this error. The first feed in Automatic Mode after an alignment, adjusts for the distance traveled during deceleration from the reference mark.

4.2.4.1 Programming the Feed Length for Averaging Position Correction

The feed length to be entered prior to Cycle Start may be determined by the following method:

1. Measure the distance between *n* marks (*n* = number of samples).

2. Divide the distance by *n* to obtain an average length.

3. Enter this distance into the CLM keypad feed length or batch part programming page, or through the optional SOT or IDS thumb-wheel switches, depending on the option set in the Interface Parameter B102.

Once this computed feed length is entered, the CLM will then be able to adjust this feed length for deviations caused by slip or uneven reference marks. If it is impractical to measure the total distance, an estimation based on one piece may be used. The CLM will take longer to find the average, but it will approach the correct average length if the search window and *n* samples are set properly.

The average length is displayed in the Registration Status Page. This length is checked against all feed length limits as if it were entered from the keypad or IDS. The active feed length page will show the originally entered feed length, which may be micro adjusted or reentered. If the feed length is reentered, it becomes the new average feed length.

After a Cycle Stop, the same average length may be programmed by entering the displayed average on the keypad, IDS, or as the Batch feed length.

NOTE: *It is important that the feed length entered (prior to Cycle Start) is close enough to the actual average that the averaging algorithm will be correcting for deviations. Averaging should not be used to automatically program the feed length.*

4.2.4.2 Averaging Operation

The CLM uses the distance between the end of the n^{th} feed and the nearest reference mark to compute the correction that will be added to the current feed length. The feed length will be the same for each feed in the set of n samples. The computations performed by the CLM allow it to correct for both the current deviation and the deviation of the previous set of samples.

If the computed correction length exceeds the Maximum Correction parameter (B115), the feed is adjusted using the Maximum Correction. If a reference mark is missed during the n^{th} sample, the correction length will be zero. A random missed mark will affect the average, but if it occurs rarely, the CLM should quickly find the correct average length.

4.2.5 Missed Marks and Errors

If too many marks in a row are missed, the cycle is stopped and a soft fault, "Too Many Missed Marks" is issued. If marks are being missed consistently, the original feed length may be too large or too small, the search window may be too small, the reference mark sensor or printed material may be faulty.

If the correction distance becomes larger than the current feed length, a soft fault message "Correction Distance Exceeds Feed length" (causing a cycle stop) is issued. This will occur only if there are incorrect feed length or registration parameters entered.

4.3 Roll Lifting Interlock Control

The CLM provides inputs and outputs to the machine builders circuitry to control the opening and closing of the feed rolls and the anti-backup rolls. Anti-backup rolls are controlled both manually and automatically. The feed rolls are manually controlled by the user.

Two inputs for each set of rolls are provided for the user to control the manual opening and closing of the rolls in Manual or Setup Modes. The Open Anti-Backup, Close Anti-Backup, Open Feed Roll, Close Feed Roll inputs will set the outputs for desired roll position.

The opening and closing of the feed rolls and the anti-backup rolls can be controlled by the CLM with four inputs and two outputs. To use this function, you must set the roll control flag ON in Parameter B110. If the flag is OFF, the function is disabled in all modes of operation.

This parameter also allows setting a time delay on the feed motion for any action that causes a change in the Feed or Anti-backup rolls position. The Roll Delay Time (in seconds) specifies the time delay between jog button activation and feed motion. This delay is only active when changing direction with the jog keys in Manual and Setup Modes and also before a feed when changing direction using the Auxiliary Feed Length or when Batching is selected in Automatic Mode. Refer to Chapter 5 for specific parameter entry procedures.

4.3.1 Roll Control Inputs and Outputs

The manual roll control inputs function when the CLM is in Manual or Setup Mode, but are disabled in Automatic Mode. Also, the rolls may not be raised or lowered when the axis is not in position.

The output signals have the Power OFF as the default state. The Anti-Backup output is turned ON to open the Anti-Backup Rolls. The Feed Roll output is turned ON to close the Feed Rolls. When the power is turned OFF, the Anti-Backup Rolls are closed and the Feed Rolls are opened.

The CLM controls the anti-backup roll lifting automatically in different modes of operation. For instance, in Manual Mode, the anti-backup rolls will open automatically when jogging in reverse. In Automatic Mode, the anti-backup rolls open automatically with a reverse feed. When jogging or feeding forward, the anti-backup rolls will return to the last manually selected state (open or closed, as set by the user). See Table 4-1.

Refer to section 3.3.29 for Roll Control input information, and section 3.4.29 for further information on how the outputs control the feed and anti-backup rolls with different conditions in different modes of operation.

Table 4-1 Automatic Roll Opening/Closing

Condition	Anti-Backup Rolls	Feed Rolls
Primary:		
Power-up	Close	Open (After Roll Delay)
Power off	Close	Open
Hard Fault	Close	Open (After Roll Delay)
Axis Not Ready	Close	Open (After Roll Delay)
Parameter Mode	Close	Open (After Roll Delay)
Manual and Setup Modes:		
Jog Forward	State before reverse jog	Not Affected
Jog Reverse	Open (Roll Delay if state = closed)	Not Affected
Automatic Mode:		
Forward Feed	State before reverse feed	Not Affected
Reverse Feed	Open (Roll Delay if state = closed)	Not Affected

4.4 Material Loop Control (CLM-R Only)

The second axis of the CLM-R can be used for a material loop control option, which provides control for an uncoiler, straightener or leveler. The CLM-R will output an analog voltage to an open loop motor (no encoder feed back is required), setting the velocity for axis 2 to be near the average throughput of material fed by axis 1. A sensor, mounted at the normal operating depth of the loop, inputs to the CLM as the run/minimum loop position. The CLM will try to maintain the loop near this sensor. Other sensors can input to advise of tight loop or full loop conditions and cause an interrupt for both axis to prevent material damage. Options allow for the full/maximum loop input to cause a creep velocity to prevent material damage that could result from stopping a straightener.

NOTE: *For loop control to work properly, the material loop must have a minimum of two feeds worth of material storage*

4.4.1 Selecting Loop Control

The loop control function is enabled in Parameter B121 (Loop Control Enable). Axis 2 on the CLM-R is an open-loop axis, used only for loop control to provide a ramped velocity profile through analog output A2. Since there is no encoder or drive diagnostics, the CLM-R has a special, reduced parameter set for its axis 2, as defined in Parameters A200 through A204.

Refer to Chapter 5 for specific CLM-R loop control options and parameter entry procedures.

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4.4.2 Modes of Operation

There are two modes of operation for loop control. The operating mode is selected by the Loop Automatic input. In Loop Manual, axis 2 may be jogged forward and reverse. In Loop Automatic, the CLM will automatically maintain the level of the loop based on the Run Loop input. In both loop modes, the $\overline{\text{MAXIMUM LOOP}}$ and $\overline{\text{INTERRUPT AXIS 2}}$ inputs take precedence over loop operation. When the CLM is in Parameter Mode or during a hard fault, zero velocity is commanded and the Drive Enable output is turned off.

Axis 2 may be jogged reverse during a $\overline{\text{MAXIMUM LOOP}}$ condition, but jog forward is not allowed and Automatic Loop Correction is suspended. Axis 1 operation, however, is not affected by this input, which allows this condition to be corrected when the loop is emptied.

Loop Manual

Axis 2 may be jogged both forward and reverse. When the jog inputs are not activated, the creep velocity is commanded (if it is enabled) to prevent the straightener/loop feed rollers from marking sensitive material.

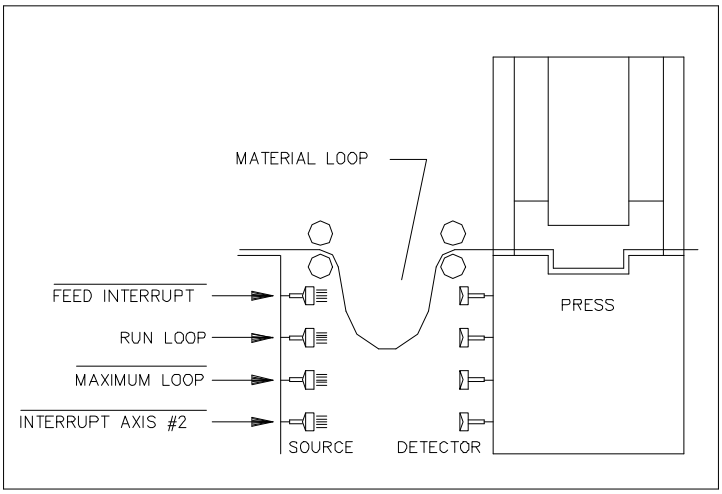


Figure 4.2 Material Loop Control

Loop Automatic

Filling the Loop Before Cycle Start
When not cycling in Automatic mode, the jog velocity will be output to axis 2 until the Run Loop sensor is covered (see Figure 4.2 for sensor position illustration). When the Run Loop input is high (sensor covered), creep velocity is commanded, if it is enabled.

Automatic Mode and Throughput Velocity
A cycle start is not accepted until Loop Automatic is selected and the Run Loop input is high. If either of these conditions is not met, a status message will be displayed on the CLM or SOT.

When cycle start is activated, the creep velocity (if enabled) is commanded to Axis 2 until the first Axis 1 feed begins. At the start of the first feed, the programmed Starting Velocity is commanded to Axis 2 until the second high-to-low Feed Angle transition.

After this point, a throughput velocity is calculated based on the distance axis 1 moved and the calculated strokes per minute. The throughput velocity is updated upon each high-to-low feed angle transition.

Automatic Loop Correction

The axis 2 velocity is adjusted based on the state of the Run Loop input and the Velocity Correction Factor. The Run Loop input is always scanned while the feeder is cycling, and the velocity adjustment is performed at the high-to-low feed angle transition after axis 1 has moved the Correction Interval.

The CLM measures the commanded loop distance since the Run Loop input was seen and adjusts the velocity using this distance and the Correction Factor. If the Run Loop input is high, the axis 2 velocity will be decreased to empty the loop faster. If Run Loop is low (sensor not covered), the axis 2 velocity will be increased to fill the loop faster.

Axis 2 Starting Velocity:

This is the initial velocity of Axis 2 at cycle start. It is entered as the ratio of material throughput to Axis 1 programmed velocity. Axis 2 is commanded this velocity for the first two feeds.

This velocity is calculated according to the formula:

$$\text{Axis 2 Velocity} = \frac{[\,(\text{Axis 2 Start Velocity \%}) * (\text{Axis 1 \%Feed Rate}) * \text{A104}\,]}{1.5}$$

The velocity commanded to axis 2 corresponds to the average throughput. In this equation, "Axis 2 Velocity" is actually the material throughput. Therefore:

$$\text{Axis 2 Start Velocity \%} = \frac{[\,(\text{Press Strokes per Minute}) * (\text{Programmed Feed Length}) * 100\% * 1.5\,]}{[\,(\text{Axis 1 \% Feed Rate}) / 100\% * \text{Parameter A104}]}$$

NOTE: *This equation is only approximate, because the acceleration will govern the effectiveness of the Start Velocity.*

Example calculations:

• Assume Axis 1 is programmed at 99.9 % of 2000 inches/min., Stroke Rate is 12 hits/min., and the Feed Length is 100.0 inches. The calculation for Axis 2 Start Velocity would be:

[(12 hits/min) * (100.0 inches) * 100 % * 1.5] / [(99.9 % / 100%) * 2000 inches/min.)] = 0.9 or 90 %

• If Axis 1 is programmed at 50.0 % of 2000 inches/min., the Stroke Rate at 50 hits/min., and the Feed length at 2.0 inches, the calculation for Axis 2 Start Velocity would be:

[(50 hits/min) * (2.0 inches) * 100 % * 1.5] / [(50.0 % /100%) * 2000 inches/min.)] = 0.15 or 15 %

Correction Interval: This is the length of material fed by Axis 1 before the Run Loop sensor is checked for Automatic Loop Correction. If it is set to zero, the Run Loop Sensor will be checked at the end of every feed.

When the correction interval is decreased, velocity correction will be done more often, to keep the material loop as close as possible to the Run Loop sensor. Increasing the correction interval results in a more stable commanded velocity, but the required loop depth will be larger.

Velocity Adjustment Factor: This factor controls the amount of Automatic Loop Correction that is performed on the throughput velocity. It is a percent of the current throughput that will be added to or subtracted from the Axis 2 velocity, depending on the states of the Run Loop input.

This factor should typically be set between 0 and 5, for the largest feed length and should then be good for all feeds. Reduce the value if a more stable loop velocity is desired. The CLM also

performs a small correction based on the distance from the Run Loop sensor, to reduce speed variations once the sensor is found.

If the application does not require correction based on loop depth, this factor can be set to zero so that the average throughput is commanded without correction.

4.4.3 Feeder Slave Mode

Parameter B121 allows selecting the feeder (axis 1) as the master. Axis 2 average velocity output for loop control is then based on the axis 1 feeder throughput. A second option is for the feeder to be a slave to the loop. Descriptions in section 4.4 assume *Feeder Master* mode. This section describes the differences for Feeder Slave Mode.

The feeder slave mode is provided to control axis 1 (the feeder) based on an analog override signal and the Run Loop input. Analog Override must be enabled in Parameter B120 for Feed Rate Correction to take place. All axis 2 inputs, outputs, and parameters are disabled. Only the Run Loop input is used.

Feed Rate Correction: The axis 1 velocity will be corrected after the override, based on the same logic for Feeder Master, but inverted. When the Run Loop input is high after the Correction Interval, the Feed Rate will be increased. The Correction Interval is the same as that described for Feeder Master mode. The Velocity Adjustment Factor uses the axis 1 velocity to calculate the correction. The starting velocity is not used, and asterisks are displayed on the CLM and the SOT.

4.4.4 Loop Control Tail Out

The Tail Out operation is intended for ease of operation during the end of coil stock condition. Three additional inputs are required to enable the function, and to provide monitoring of the loaction of the tail stock within the loop. These inputs are only supported in the expanded I/O version of the CLM. The Loop Control Tail Out Mode is selected using Parameter B121. Note that this feature operates only in the Automatic mode.

Basic Operation

Three inputs are provided by proximity sensors located strategically between the stock uncoiler and the feeder. The UNCOILER MATERIAL OUT input sensor should be located between the uncoiler and the straightener. The STRAIGHTENER MATERIAL OUT input sensor is located on the exit side of the straightener rolls. The FEEDER MATERIAL OUT input sensor is located near the entry side of the feeder rolls. These three inputs are default as normally high.

The Tail Out function is enabled as the tail stock coming off the uncoiler trips the UNCOILER MATERIAL OUT switch, causing an input low condition, which turns on the Tail Out mode indicator. The straightener (Axis 2) comes to a halt while the feeder continues to feed. During this time, material in the loop keeps depleting until the material in the loop trips the FEED INTERRUPT input. Both the feeder and the straightener stop at this moment, and a soft fault is issued: "Tail Out Stop." The Permit Press and PRESS IMMEDIATE STOP outputs are dropped.

Normally, the FEED INTERRUPT input low issues a minor error: "Stop Due to Interrupt Input." In Tail Out mode, once the UNCOILER MATERIAL OUT input goes low, the diagnostic (from seeing the FEED INTERRUPT low) changes to the soft fault "Tail Out Stop." This soft fault is issued only one time. The FEED INTERRUPT input is then ignored until the end of the Tail Out sequence.

In the "Tail Out Stop" condition, the operator will raise the cross-over table near the material loop. The cross-over table cannot touch the material, since some spacing is required for the material to advance from the straightener once the operation resumes. The spacing between the cross-over table and the material loop is important because it allows the material to advance without buckling.

Once the cross-over table is in position, the operator clears the fault and presses the "Resume" input to continue operation. At this point, the Run Loop Input requirement is ignored. An on-line screen allows the operator to select a Tail Out Restart Velocity for the straightener. Because of the differences of inertias, gain settings and accel/decel ramps between the feeder and the straightener, upon resuming operation the straightener will accelerate to speed, while the feeder remains at rest. During this time of Axis 2 acceleration, the message "A: Tail Out Resume" is displayed.

Once the straightener is at commanded speed, the feeder starts to feed material. As the tail stock somes off the straightener, the Straightener Material Out switch is tripped. This input low condition causes the straightener to decelerate to a stop. The feeder keeps on running until the Feeder Material Switch is tripped, at which time causes the feeder to stop immediately. A status message is then displayed: "End of Material." The Permit Press and PRESS IMMEDIATE STOP outputs are dropped. At this point, the only possible action to take is to exit Auto mode.

Note that the inputs are only read in the order previously described. That is, the Straightener Material Out is not read until the Uncoiler Material Out is low. Also, once each input goes low, it is not read again. Therefore, one must exit Auto mode and re-enter in order to re-arm the Tail Out sequence.

Loop Control Tail Out Diagnostics

The Tail Out inputs are scanned upon entry into Automatic mode. If they are not in the high state, a soft fault is issued: "Tail Out Inputs Low." Bringing all three inputs high corrects this error. Otherwise, pressing the clear input results in clearing the error and putting the Tail Out sequence in a state according to the inputs.

Once the Tail Out sequence begins (Uncoiler Material Out goes low), exiting from Loop Auto is required before allowing the feeder to exit Auto mode. This is diagnosed with the minor error: "Loop Auto Exit Required."

FEED INTERRUPT - When Uncoiler Material Out goes low, first occurence of Feed Interrupt issues a soft fault, "Tail Out Stop!". Once cleared, this input is ignored until the completion of the Tail Out sequence. Prior to the Uncoiler Material Out input going low, the Feed Interrupt operates as described in section 3.3.19.

4.4.4.1 Input Connector Wiring (X12)

$\overline{\text{UNCOILER MATERIAL OUT}}$ - Pin # 10, Active Low
$\overline{\text{STRAIGHTENER MATERIAL OUT}}$ - Pin # 11 Active Low
$\overline{\text{FEEDER MATERIAL OUT}}$ - Pin # 12, Active Low

Connector X12 is located on the top of the CLM with expansion I/O interface. Refer to Appendix E for connector pin numbers.

4.4.4.2 Output Connector Wiring (X13)

Tail Out Mode Indicator - Pin # 31, Active High

This output is typically wired by the machine builder, to an indicator on the user control panel.

Connector X13 is located on the top of the CLM with expansion I/O interface. Refer to Appendix E for connector pin numbers.

4.5 RS-232/422/485 Serial Interface Operation

The CLM Control includes a multi-format RS-232/422/485 port for two-way communication between the CLM and a host. The interface protocol is designed to easily transmit and receive data to and from the CLM. It can communicate with a Personal Computer, SOT, IDS, PLC or other devices at rates of 150 up to 19200 baud, using RS-232, RS-422, or RS-485 format. This chapter describes the protocol and other communication requirements.

The host device must strictly adhere to the communications format as described in this chapter to achieve proper communication, or one of several "RS Format Errors" will be returned through the port (or indicated on the control status display) indicating that the information was not properly formatted or understood.

Any parameter may be uploaded from the CLM at any time. Parameters may be downloaded to the CLM only while it is in Parameter Mode. If attempted in any other mode, the host receives a "Invalid Mode" error message through the port. Parameters can be read from the CLM in any mode.

To ensure that the correct data is being sent and received, a checksum is calculated and checked by the CLM. If the host software does not calculate a checksum, it can be disabled.

Special cabling is required for use with RS-422 and RS-485 communications, as described in the following section. The CLM and the optional Indramat SOT (Station Operator Terminal) can communicate in half-duplex to facilitate using the RS-485 interface. RS-485 uses a single twisted pair of wires to provide superior noise immunity at distances of up to 3000 feet. The CLM can also communicate with the SOT using the RS-232 interface, without any parameter changes. However, the maximum distance allowed for an RS-232 cable is 50 feet.

The optional Indramat SOT (Station Operator Terminal) is a remote mounted, operator control device for the CLM. It is used to communicate commands, status and parameter information between the CLM

and SOT. The software in the SOT includes Help screens to assist the operator in using the SOT and for entering information correctly. Refer to the supplement included with this manual for complete information on using the SOT.

The RS-485 interface is primarily used with the SOT, which provides the special hardware and software needed for proper operation. Contact Indramat Applications Engineering for assistance if you wish to use this interface format with any other device. The RS-485 interface can be used to network up to 15 CLM-R, CLM-Z, CLM-M and CLM-A units. Each unit must have a unique station number from 01 to 15, which is defined in parameter for each unit. Each CLM unit will accept and send strings that have its station number in the second set of characters in the string. For normal RS-232 and RS-422 operation, a space is used instead of the station number.

4.5.1 Connector Wiring (X6)

The serial interface connector (X6), is located on the lower front of the CLM Control Module (see Figure 2.3 in Chapter 2 for an illustration of the lower front connector area of the CLM).

Refer to Figure 4.3 for a pin-out diagram of the multi-function port (X6 connector). It shows the pin numbers and definitions of signal connections for each type of communication.

CAUTION: *Do not connect to any pin numbers, other than those shown in Figure 4.3. Some pins are used for Indramat options and factory diagnostics.*

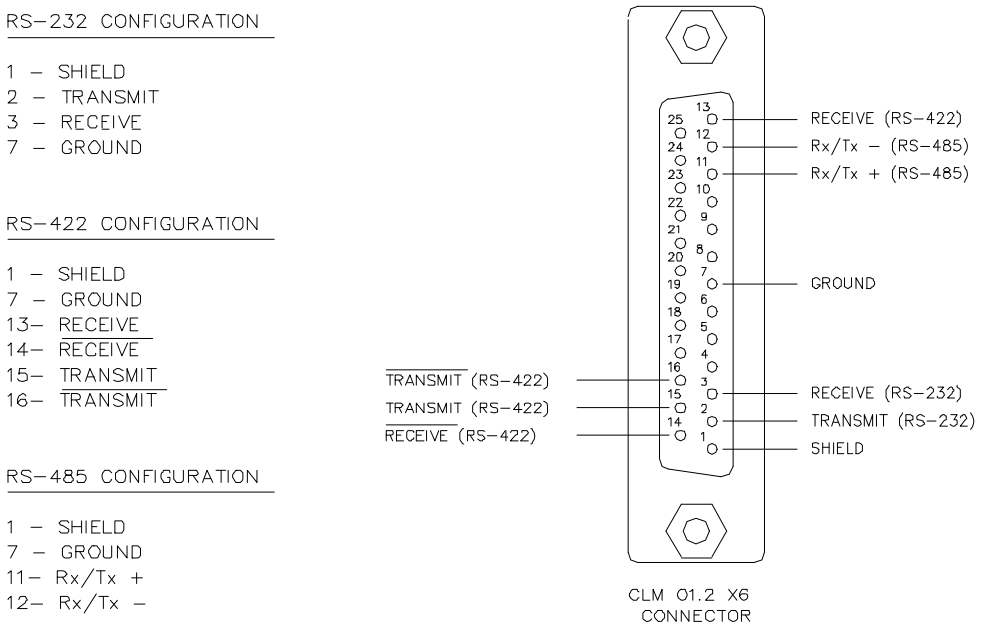


Figure 4.3 CLM X6 Connector

4.5.1.1 Signal Level Requirements

Figure 4.4 illustrates the signal level requirements for the different communication formats (RS232/422/485) for the CLM. To minimize signal degradation over long cable runs, the serial device driver should provide the following levels:

RS-232+/- 15 Vdc	(50 ft maximum run)
RS-422+/- 5 Vdc	(3000 ft maximum run)
RS-485+/- 5 Vdc	(3000 ft maximum run)

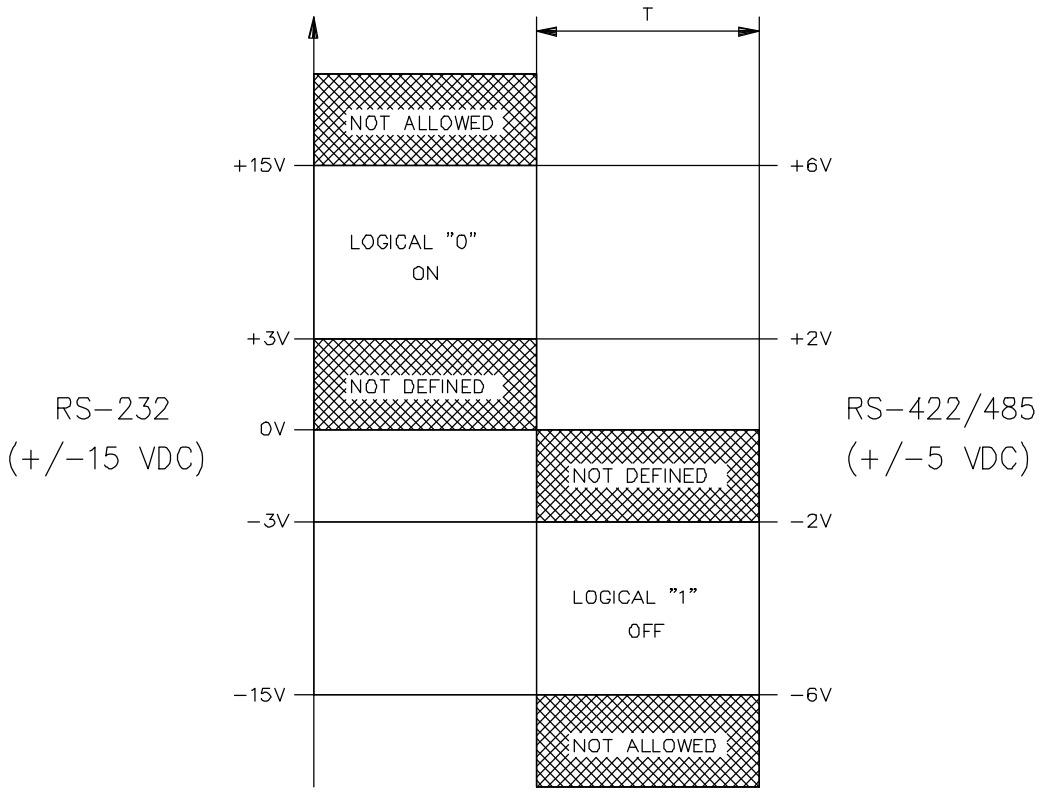


Figure 4.4 Signal Level Requirements

4.5.1.2 Serial Cable Connection to Computer

For RS-232 serial communications, you should note that the connector on the serial card in your computer can vary in configuration. Figure 4.5 illustrates two common serial connections for interfacing from the RS-232 port of a computer to the CLM.

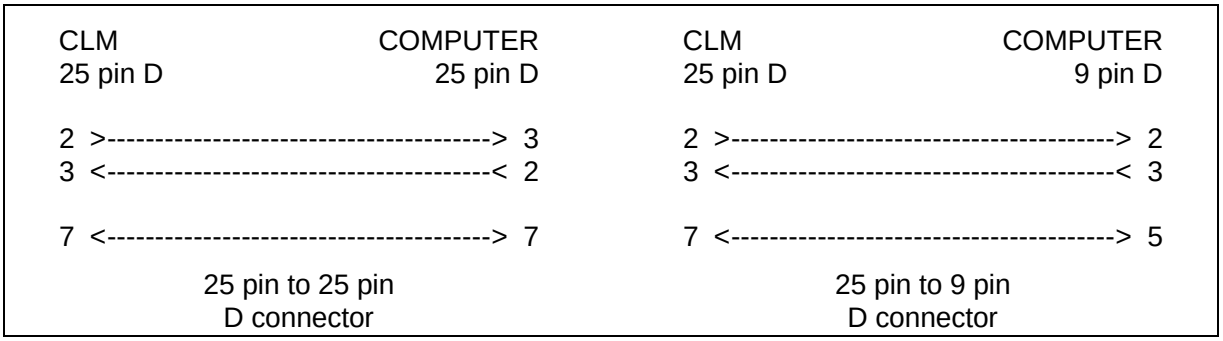


Figure 4.5 RS-232 Serial Cable Configurations

The CLM requires only three lines of the standard 25 pin connector for RS-232 communication. Pin 2 is for Transmitted Data, pin 3 for Received Data, and pin 7 is the Data Signal Ground. Typically, pin 1 connects the cable shield to ground on one end only. The transmit data connection from one device connects to the receive data of the other device, and vice versa. Signal ground connection must be common on both devices. This often requires a Null Modem cable. It connects pin 3 of one end to pin 2 on the other end. Consult the manufacturers information for the serial card in your computer for its specific pin configuration. Note that most serial cards do not provide a signal strong enough to go through a cable longer than about 50 feet. When possible, use a shielded cable no more than 25-50 feet long.

4.5.2 Data Format

To achieve proper communications, configure the communication parameters to match between your computer and the CLM. Figure 4.6 illustrates the data format.

Refer to Chapter 5 for specific parameter entry options and procedures.

Note that when you set the interface option Parameter B102 for the IDS, the port is automatically configured (2400, 8, 1, 00) to work with the IDS board. Configuration data in the Serial Port Parameters (B118/B119) are then ignored. When the Interface Option Parameter B119 is set for the SOT, the proper entry in Serial Port Operation Parameter B119 is (1920, 8, 1, 00).

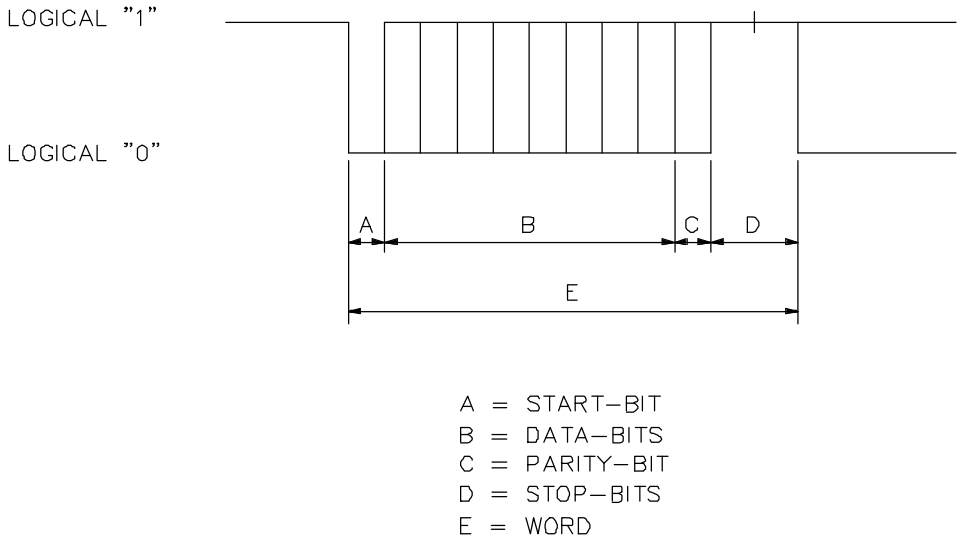


Figure 4.6 Data Format

4.5.3 Message Format

This section describes the message format required for the RS-232 Interface. A message is divided into six sections, as illustrated below and described on the next page.

```
#_  X_  _00_  01345_678  $8E  <cr><lf>
|   |   |     |          |    |
|   |   |     |          |    |
1.  2.  3...  4........  5..  6.......
```

Legend

<cr> = Carriage return
<lf> = Linefeed
_ = Space

1. The first two characters in each message are a command, which specifies the type of information requested.

   First (1) Control String Character (Transmission Type)

   All data transmissions to the CLM must start with one of the following control characters to identify what type of transmission is to follow:

Command Request

? The CLM interprets this character (received via the RxD channel) as a "Request for Information" - when followed by the proper requesting codes, the CLM will transmit the desired data via the TxD channel.

This character signifies a block of "Information to be Stored" into memory. The data that follows will be read into the proper memory location.

! This character signifies a "Control Command" is to follow.

Second (2) Control String Character (CLM Unit # Identifier)

This character is only present if communicating in the RS-485 mode. It is used to identify the CLM unit # to receive the current message. If communicating in RS-232/422 mode, this character will be a space (Hex 20).

Space (_)	=	RS-232/422 Mode
1	=	CLM#1 RS-485 Mode
2	=	CLM#2 RS-485 Mode
3	=	CLM#3 RS-485 Mode
4	=	CLM#4 RS-485 Mode
5	=	CLM#5 RS-485 Mode
6	=	CLM#6 RS-485 Mode
7	=	CLM#7 RS-485 Mode
8	=	CLM#8 RS-485 Mode
9	=	CLM#9 RS-485 Mode
A	=	CLM#10 RS-485 Mode
B	=	CLM#11 RS-485 Mode
C	=	CLM#12 RS-485 Mode
D	=	CLM#13 RS-485 Mode
E	=	CLM#14 RS-485 Mode
F	=	CLM#15 RS-485 Mode

2. These characters are format characters, which tell the CLM the information to be uploaded or downloaded (Information Type):

Format	Information
X_	Status (messages, feed length, feed rate, etc.)
B_	Batching information
K_	Parameters
S_	Action Request (jog step, etc.)
U_	Upload Request (message tables)

XD, BD, KD, UD With '?' only, will send diagnostic code at the end of the string (before the checksum).

3. These characters are identifiers, which are specific to each format. They may include decimal digits, alphabetic characters, or spaces. Identifiers are described in the section pertaining to each format.

4. This is the data to be sent. The length of this string depends upon the information requested.

5. When downloading or requesting action (#_ or !_) the data section must end with a checksum if checksum is enabled. A '$' character indicates the start of a 2-digit ASCII checksum. A checksum isn't needed with a '?' command.

6. Each transmission must end with a carriage return followed by a linefeed (CR = ASCII 0D hex, LF = 0A hex). Note that spaces aren't required or sent between the end of data and the checksum. Any characters between the end of data and the '$' are ignored by the CLM, so that longer strings may be sent for compatibility with other software.

4.5.4 Status Request (?_X_)

Information may be requested from the CLM with a status request command. Status identifiers consist of a space, a status number, and a space. The host should send the following string to request most status information:

?_X__nn_<cr><lf> Note that there must be 2 spaces between X and nn, unless '? XD' is used.

Status No. (nn)	Information
00	Position error in input units/min/.001iu
01	Diagnostic message (32 characters)
02	System Information (mode, in-cycle, step))
03	Distance moved in input units
04	Feed length resolution parameter
05	Feed length and feed rate Axis 1
06	Feed length and feed rate Axis 2 (not in CLM-R)
07	Diagnostic code (2 characters)
08	Hardware and Software version numbers (32 char.)
09	Press strokes per minute
10	Inputs 1-32 in hexadecimal (LSbit = input1)
11	Outputs 1-32 in hexadecimal (LSbit = output1)
12	Total Piececount and Total Length
13	Registration Information
14	Diagnostic Text
15	CLM Inputs in Binary (16 at a time, left to right)
16	CLM Outputs in Binary
17	Analog Inputs
18	Registration Offset
19	CLM Version Number

20	Current Accel and Decel Rates
21	System Flags
22	Throughput in Units/Minute
23	Loop Control Data
24	Loop Correction Interval and Factor
25	Current Status Message
26	Loop Control Starting Velocity
27	Loop Tail Out Restart Velocity

The CLM now allows decimal points to be sent in feed length and feed rate strings for both standard interface and batching. One decimal point for feed length and one for feed rate may be placed anywhere in the string, independent of the feed length resolution. The PC or SOT may then echo the string format sent from the CLM.

The LR01.2-005.X method of no decimal points is also supported for compatibility with current software.

Example strings, with/without decimals:

#_X__00_012.345_67.8$hh<cr><lf>
Sending feed length and rate for standard interface, decimal points included.

#_X__00_012345_678$8E<cr><lf>
Sending the same data without decimal points. Both methods are supported in LR01.3-006.0 and LZ01.3-002.0..

Data sent to the CLM-R/Z may be selectively stored within a string. When data is replaced by star (*) characters, its current value is retained. This allows the PC or SOT to change feed length without affecting feed rate, for example.

Examples:

#_X__00_012.345_.*$hh<cr><lf>**

Feed length is changed but feed rate is not.

#_B_W99_******_***_01$hh<cr><lf>**

Jump to Part is the only information that is changed.

Each status request is described in the following pages.

Position Error Request: ? X 00
If an axis is disabled, stars will be sent in place of that axis.

CLM-R Response:
X_00__-0000.1000__********$hh<cr><lf>**

CLM-Z Response:
X_00__-0000.1000__-0000.1000$hh<cr><lf>
Axis 1 Axis 2

Current Status Message Request: ? X_01 (also see ? X_25)
The CLM will send the current status message as it appears on the LCD. The 32-character message is in the current language and is centered for 16 characters.

X_01___Axis 1 Motor___Has Overheated!$hh<cr><lf>
|_____line 2 of display
|_____line 1 of display

System Information Request: ? X_02
The CLM will respond with a code that corresponds to the current mode and other operating information.

X_02_mx$hh<cr><lf>

m = Current mode:
- 0 = manual
- 1 = automatic
- 2 = parameter
- 3 = setup

x = Other information
- 0 = Step jog off, not in-cycle
- 1 = Step jog enabled in manual mode
  In-cycle in automatic mode

Distance Moved Request: ? X_03
If an axis is disabled, stars will be sent in place of that axis.

CLM-R Response:
X_03__+00123.456__********$hh<cr><lf>**

CLM-Z Response:
X_03__+00123.456__-00123.456$hh<cr><lf>
Axis 1 Axis 2

Measuring Wheel Data Request: ? X_04
If measuring wheel is not enabled by parameter, an error message will be sent.

X_04_xys_+mmm.mmm_+aaa.aaa$hh<cr><lr>

x = Selected axis for M.W. compensation (1 for CLM-R, 1 or 2 for CLM-Z)
y = Free for future use (always zero)

s = status: 0 = M.W. compensation off
1 = M.W. compensation on (in auto mode & input high)

mmm.mmm = Actual position of Measuring Wheel
aaa.aaa = Actual position of corrected Axis

Current Feed length Request for Axis 1: ? X_05
If axis 1 is disabled, stars will be sent instead of the data.

X_05_********$hh<cr><lf>**

X_05_+012.345_67.8$hh<cr><lf>

If B100 = 00, always includes a + sign

Current Feed length Request for Axis 2: ? X_06
For CLM-R or if axis is not enabled:

X_06_********$hh<cr><lf>**

X_06_+012.345_67.8$hh<cr><lf>

If B100 = 00, always includes a + sign

Diagnostic Code Request: ? X_07
The CLM will respond with the current diagnostic code (see diagnostic code section).

X_07_8B$hh<cr><lf>

Software and Hardware Version Request: ? X_08
The CLM will respond with a copy of the information that appears on the Version Number screen on the LCD.

```
X_08___CLM-01.3-R-E____LR01.3-006.0__$hh<cr><lf>
    |             |_Expansion I-O indication added to string
    |_Note one extra space than "? X  19" for LR01.2-005.1
       compatibility.
```

Strokes/Min and Time Used Request: ? X_09
The first four digits of the data string will be the current Strokes/Min. value. The next two digits following a space will be the percent of feed angle used (see Time Optimization document).

X_09_0123_45_$hh<cr><lf>

System Inputs Request in Hexadecimal: ? X_10
The CLM will respond with the hex. values of inputs 1-32. The Least significant (rightmost) bit corresponds to input #1.

X_10_00956C26$hh<cr><lf>
<---increasing input #

System Outputs Request in Hexadecimal: ? X_11
The CLM will respond with the hex values of outputs 1-32. The Least significant (rightmost) bit corresponds to output #1.

X_11_0818091A$hh<cr><lf>
<---increasing output #

Total Piece count and Total Length Request: ? X_12
The first eight digits of the data string will be the total number of pieces. The next 12 characters following a space will show the total amount of material.

X_12_00001234_+0123456.789$hh<cr><lf>

Registration Information Request: ? X_13
The CLM will respond with a compact form of the information seen on the Registration Page.

X_13_210_001_001.234_02$hh<cr><lf>
mas ccc lllllll nn

m = Registration mode:
0 = no registration
1 = continuous pos. correction
2 = averaging pos. correction

a = Alignment indicator (0=not aligned, 1=aligned)

s = Search status
0 = Lockout
1 = Reference Mark Search

ccc = Current missed mark count

lllllll = Average or Current Length

nn = Number of samples (00 for continuous)

Diagnostic Text Request: ? X_14 cc (cc = diagnostic code)
This is a request for the text message corresponding to the selected diagnostic code. The CLM will respond with a 40 character string in the parameter-selected language.

For minor errors, soft faults, and hard faults, the text is the same as the CLM LCD message, but without the spaces used for centering, unlike '? X 01'. For status messages, a more specific response than the CLM LCD will be sent. For example, instead of
'M: Wait Fd Angle', the response is 'M: Waiting for Feed Angle'.
These messages are compatible with the SOT.

Response format:
X_14_cc---40 character message---$hh<cr><lf>

Examples:
X_14_8BAxis_1_Motor_Has_Overheated!_____$hh<cr><lf>
X_14_01M:_No_Jog_Command_____$hh<cr><lf>

The CLM is also able to send all the messages in each fault table at once after an upload request (see Block Upload Requests, section 4.6.17, and section 4.6.18 for a current listing of status, error and fault messages).

CLM Inputs in Binary Request: ? X_15 n
The CLM will send the value of sixteen inputs as a '1' or a '0' (+24V or 0V) from left to right.

n = 0: Inputs 1-16
n = 1: Inputs 17-32

Example Responses:
X_15_0_0010010000100110$hh<cr><lf> - Inputs 1-16
n --->increasing input #

For CLM's with expansion I/O, the limit for n is 5 for 96 inputs.

Expansion I-O status is accessible through the serial port when expansion I/O is present.
'n' corresponds to a bank of 16 inputs or outputs.
If a bank doesn't exist, the message "E HDW OPT DISABLED" is sent from the CLM.
The limit for 'n' is 3 for outputs and 5 for inputs (see following table).

Bank Number:	Inputs:	Outputs:
0	System Inputs 1-16 (X3)	System Outputs 1-16 (X4)
1	System Inputs 17-32	System Outputs 17-32
2	GAG Inputs 1-16 (X11)	GAG Outputs 1-16 (X13)
3	GAG Inputs 17-32	GAG Outputs 17-32
4	X12 Inputs 1-16	
5	X12 Inputs 17-32	

CLM Outputs in Binary Request: ? X_16 n
The CLM will send the value of sixteen outputs as a '1' or a '0' (+24V or 0V) from left to right.

n = 0: Inputs 1-16
n = 1: Inputs 17-32

X_16_1_0001000000010000$hh<cr><lf> - Outputs 17-32
n --->increasing output #

For CLM's with expansion I/O, the limit for n is 3 for 64 outputs (see table above).

Analog Input Value Request: ? X_17

The CLM will send the values in 0.001 Volts of the analog inputs AE1 and AE2. This is to be used for verification of feed rate override or for future applications.

X_17_+05123_+05124$hh<cr><lf>

In this example, the AE1 reading is +5.123V and AE2 = +5.124V.

Registration Offset: ? X 18
The CLM will send the current registration offset value. It will be all asterisks (*) if continuous mode with offset (mode 03) is not selected. See the registration documentation for a description.

```
X_18_001.234$hh<cr><lf>
     |______Registration offset distance
```

CLM Version Number: ? X 19
The CLM will send the hardware and software version number. This is the same as CLM-R status "? X 08" except that there is not a space between the "X 19" and the start of the string. This corresponds exactly to the "? X 19" request in the latest CLM-LA firmware.

```
X_19__CLM-01.3-R-E____LR01.3-006.3__$hh<cr><lf>
      |               |____________Software version
      |____________Hardware version (-E replaced by spaces if CLM
                                     not include expansion I/O)
```

Current Accel and Decel Rates: ? X 20
This function is not supported in CLM-R/Z at this time, but is available in CLM-P bagmaking firmware.

Send to CLM: **?_X__20<cr><lf>**
Response: **X_20_aaa_ddd$hh<cr><lf>**

For CLM-R and CLM-Z, the response will always be 999 for "aaa" and "ddd" - indicating that parameter values are used for acceleration and deceleration.

System Flags: ? X 21
The CLM sends back 8 flags that are set depending on the condition they represent. Currently, only the first flag is used to indicate press cycle mode.

```
X_21_10000000$hh<cr><lf>
     |__0=press intermittent
        1=press continuous
```

The other 7 flags are set to 0, and are reserved for future use.

Throughput in Units/Min: ? X 22
The CLM will send the throughput measured in the last automatic mode cycle. Throughput=Feed length * Strokes/min. This data is always available from the CLM.

X_22__0001234$hh<cr><lf>

Loop Control Data: ? X 23
The loop control status, state of the Run Loop input, current Axis 2 commanded velocity while cycling, and current velocity correction will be sent from the CLM. This data is available from the CLM01.3-R when Loop Control is enabled; otherwise, the error "L. CTRL DISABLED" is sent.

```
X_23_31_0001200_-000034$hh<cr><lf>
     || |       |_Current velocity correction (units/min)
     || |_Axis 2 commanded velocity (units/min)
     ||_State of Run Loop Input (0=off, 1=on)
     |_Loop control status:0=Manual
                          1=Jog Forward
                          2=Jog Reverse
                          3=Automatic
                          4=Max. Loop input active
                          5=Feeder slave mode selected
```

Loop Correction Interval and Factor: ? X 24
The Loop Correction Interval and Velocity Correction Factor are sent from the CLM. This data corresponds to the input "# X 07", and is available only in CLM-R when Loop Control is enabled.

```
X_24_01234.56_02.0$hh<cr><lf>
     |        |___Correction Factor
     |_______Correction Interval
```

Current Status Message (in 40 character format): ? X 25
The CLM will send the current status in a 40 character format. This expanded format status request is a revision of ? X 01, where the status is returned with the message centered in a 16 character (32 character string) format (compatible with LR-005.1). The text is sent in the currently selected language.

Response format:
X_25_cc----------40 character message----------$hh<cr><lf>
cc = Current status code

Examples:
X_25_8BAxis 1 Motor Has Overheated $hh<cr><lf>
X_25_01M: No Jog Command $hh<cr><lf>

Loop Control Starting Velocity: ? X 26
The CLM will send the current starting velocity for loop control. If this feature is not enable, an error message will be sent. If Feeder Slave mode is selected, all asterisks will be sent.

Response format:
X_26_50.0$hh<cr><lf>

50.0 = Loop Control Starting Velocity, in % of programmed Axis 1 feedrate

Loop Tail Out Restart Velocity: ? X_27
The CLM will send the current Loop Tail Out Restart Velocity value.

4.5.5 Status Input

Status Input Requests are used to download values to the CLM or to reset counters and accumulators. Batching information may not be accessed by these requests but have their own set of identifiers (see following sections for batching information, requests and input information).

Status No. (nn)	Input Request
00	Feed length and feed rate Axis 1 when batching not enabled
01	Feed length and feed rate Axis 2 (unused for CLM-R)
02	Reset Distance Moved display
03	Reset Total Piece count
04	Reset Total Length
05	Registration Offset
06	Store Accel and Decel Rates
07	Loop Correction Interval and Factor
08	Loop Control Starting Velocity
09	Loop Tail Out Restart Velocity

Feed length/rate Input when Batching not enabled (# X_00) / (# X_01)
Feed length and feed rate may be downloaded to the CLM. The length can also be micro-adjusted by a parameter-defined value.

Axis 1 Feed length/Feed rate Entry:

```
#_X__00_0123.45_67.8$hh<cr><lf>
      | |       |    |
      | |       |    |_Checksum
 Axis 1 |       |
        |       |__% Feed rate
        |
        |__Feed length
```

Feed length Micro-Adjust:
If an "M+" is sent to the CLM, the feed length will be increased by the value stored in Parameter B107.

```
#_X__00_M+$hh<cr><lf>
```

If an "M-" is sent to the CLM, the feed length will be decreased by the value stored in Parameter B107.

```
#_X__00_M-$hh<cr><lf>
```

Axis 2 Feed length/Feed rate Entry:

```
#_X__01_0123.45_67.8$hh<cr><lf>
      | |       |    |
      | |       |    |_Checksum
 Axis 2 |       |
        |       |__% Feed rate
        |
        |__Feed length
```

Feed length Micro-Adjust, Axis 2:
The Axis 2 feed length may also be micro-adjusted.

#_X__01_M+$hh<cr><lf>

Reset Distance Moved: (# X_02)
The Distance Moved Display for both axes will be cleared when this string is received.

#_X__02$hh<cr><lf>

Reset Total Piece count: (# X_03)
The Total Piece count accumulator is cleared when this string is received.

#_X__03$hh<cr><lf>

Reset Total Length: (# X_04)
The Total Length accumulator is cleared when this string is received.

#_X__04$hh<cr><lf>

Registration Offset: # X_05
The registration offset length may be sent to the CLM if registration is enabled.

```
#_X__05_001.000$hh<cr><lf>
        |______Registration offset length
```

Store Accel and Decel Rates: # X_06
The message **"E NO CHNGE ALLOWED$hh<cr><lf>"** will be sent by CLM-R and CLM-Z until this feature is implemented (not available at this time).

Loop Correction Interval and Factor: # X_07
The Loop Correction Interval and Velocity Correction Factor may be sent to the CLM-R if Loop Control and editing of these values are selected. If editing is disabled or in CLM-Z firmware, the error message **"NO CHNGE ALLOWED"**is sent.

```
#_X__07_001234.56_02.0$hh<cr><lf>
        |          |__Correction Factor
```

```
        |________Correction Interval
```

Loop Control Starting Velocity: # X 08

The Loop Start Velocity may be sent to the CLM.

```
#_X__08_12.3$hh<cr><lf>
        |______Loop Start Velocity
```

Loop Tail Out Restart Velocity: # X 09

The Loop Tail Out Restart Velocity may be sent to the CLM.

```
#_X__09_43.5$hh<cr><lf>

        |______Restart Velocity
```

4.5.6 Batching Information

All batching information may be uploaded from the CLM and downloaded to the CLM. Each identifier includes a letter to indicate the type of information and a part block number. Feed data also includes a feed number.

```
#_B_F011
    || |_Feed 1
    ||_Part block 01
    |_Feed data
```

The part block numbers 01 to 99 will send the information to the corresponding part. If a 00 is in the string, the information will be entered into the current part. If '**' is sent, the working part is accessed (see Batching Input - Working Part and Wild Card, section 4.6.9).

The feed number is only needed when feed data is accessed (?_B_F and ?_B_Z). If a space is sent instead of the feed number, the data from feed 1 will be accessed. If a zero is sent as the feed number, information from the current feed will be sent.

Unless otherwise noted, the strings correspond to the CLM keypad and display. Refer to the batching section in this chapter for additional information.

4.5.7 Batching Requests

The requested information corresponds to that displayed on the CLM. Data may be echoed back to the CLM in the same format by adding a "#_" and a checksum.

Part ID, Early Warning, and Jump to Part

?_B_W02<cr><lf>

The alphanumeric part ID number, early warning count, and jump to part will be sent.

```
B_W02_1234ABCD_012_03$hh<cr><lf>
      |        |   |_Jump to Part
      |        |_Early Warning
      |_Part ID number
```

Part Quantity, Current Part Count, Current Feed Number and Count

?_B_C01<cr><lf>

The part quantity and current count for this part are sent back by the CLM. The current feed number and feed count are also sent in this string. The feed number and count will be the same regardless of which part is selected. If a B_C00 is requested and the part is a linked part, the counts defined in the end block will be sent.

```
B_C01_000123_000012_2_012$hh<cr><lf>
      |      |      | |_Current feed count
      |      |      |_Current feed number
      |      |_Current part count
      |_Part quantity
```

Axis 1 feed length, feed rate, gag set, and feed quantity

?_B_F031<cr><lf> (e.g. for Part 03, Feed 1)

The feed number must be sent after the part identifier, and the CLM sends the sign of the feed length after the feed number without a space between them. The feed length and feed rate are sent from the CLM with the decimal points in the proper positions. The gag set and target count for the selected feed are sent after the length and rate.

```
B_F031+001.234_56.7_01_012$hh<cr><lf>
      ||       |    |  |_Feed quantity
      ||       |    |_Gag set for this feed
      ||       |_Axis 1 Feed rate
      ||_Axis 1 Feed length
      |_Axis 1 Feed direction
```

Axis 2 feed length and feed rate

?_B_Z042<cr><lf> (e.g. for Part 04, Feed 2)

The CLM sends the feed length and feed rate for Axis 2. In LR firmware or if Axis 2 is disabled by parameter in CLM-Z, stars will be sent in place of the feed data.

```
B_Z042+001.234_56.7$hh<cr><lf>
      ||       |_Axis 2 Feed rate
      ||_Axis 2 Feed length
```

```
      |_Axis 2 feed direction
```

Current Part Block and Program Status:
?_B_A<cr><lf>

When part linking is performed, program status is also included in the string sent from the CLM. If a linked part is being executed, the starting block of the linked part is sent. When the end of the part is found, its corresponding part block is sent. The status "Linking Program" and "Link" on the CLM display can be decoded from this string, as well as the location of the current part counter.

CLM Response when part is not linked (Normal response):

```
B_A__12_**_**$hh<cr><lf>
     |_Current part block
```

At start of a linked part, no count found:

```
B_A__13_12_**$hh<cr><lf>
     |  |_Start of linked part
     |_Current part block
```

During a linked part:

```
B_A__14_12_15$hh<cr><lf>
     |  |  |_End of linked part (where count and jump are found)
     |  |_Start of linked part
     |_Current Part block
```

Look Up Part Block - Given Part ID

```
?_B_N0123ABCD<cr><lf>
     |_Part ID
```

The CLM will look up the part ID it receives and send back the corresponding block number. If a block number that matches the ID is not found, the CLM will send back stars (**) in place of the part number. Note that the active part, working part, and jump to part downloads may also be accessed by part ID.

```
B_N0123ABCD_01$hh<cr><lf>
   |        |_Part block number
   |_Part ID requested
```

Gag Set in Binary - 15 at a time

```
?_B_G011
     | |_Bank 0 or 1
     |_Gag set 01 to 99 (If 0, current state, if wild card,
                       working part number used)
```

The selected state of the gag outputs 1-15 are sent when the 0 bank is requested. Outputs 16-30 are sent when the bank number is 1. The outputs are printed in binary from left to right.

For gag 99, if shear press hold is YES, the leftmost bit will be set to 1, and if it is selected as NO, the bit is zero.

```
B_G011_010111000000110$hh<cr><lf>
        -->increasing output #
```

Working Part Number

```
?_B_P
```

The CLM sends the current working part number used for wild card part access. When wild card characters are used, the information from this part is sent or received.

```
B_P__01$hh<cr><lf>
     |_Current working part block number
```

Current Part Number by Part ID

```
?_B_AN<cr><lf>
```

CLM Response:

```
B_A_N01234567$hh<cr><lf>
     |_______Current part number
```

The CLM will respond with the current part number. Note that the ?_B_A request is used for current part block and linking information.

Working Part Number by Part ID

```
?_B_PN<cr><lf>
```

CLM Response:

```
B_P_N01234567$hh<cr><lf>
     |_______Working part number
```

The CLM will respond with the working part number. See section 4.6.9 (working part and wild card) for a description.

4.5.8 Batching Input

The input requests correspond wherever possible to the output from the CLM. Extraneous information is discarded so that the strings received from the CLM may be sent back to the CLM without causing any errors. Data may be also be accessed by part block in some cases. Selective storage of any of the information in the string may also be done by sending stars in place of the data.

Part ID, Early Warning, Jump to Part

```
#_B_W02_1234ABCD_012_90$hh<cr><lf>
       |        |   |_Jump to Part Block
       |        |__Early Warning
       |_______Part ID number
```

The Jump to Part may also be entered as a Part ID number. The CLM looks up the number, and if a matching part block isn't found it sends back the error "E Part # Not Found".

```
#_B_W02_1234ABCD_012_N0090-000$hh<cr><lf>
                      |___Jump to Part ID (N + Part ID number)
```

A free run part may be selected either by jumping to the same part or by sending an 'F' in place of the Jump to Part.

```
#_B_W02_1234ABCD_012_F$hh<cr><lf>
                     |_alternate way of selecting Free Run
```

Part Quantity, Current Part Count micro-adjust

```
#_B_C01_012345_M+$hh<cr><lf>
        |       |_Current Part count micro-adj. flag
        |_____Part Quantity
```

Sending a zero in the part quantity will zero the current part count. Sending a plus in the first digit of the quantity will select a linked part, as it does on the display.

If "M+" or "M-" are sent in the part count micro-adjust flag, the count will be increased or decreased by 1. If the flag is any other character or is omitted, the count will stay the same. An echo of information received from the CLM will not affect the current count. For LR01.2-005.1 compatibility, the '+' or '-' may be sent alone, without the 'M'.

Axis 1 feed length, feed rate, gag set, and feed quantity

```
#_B_F021+012.345_67.8_02_010$hh<cr><lf>
       | |       |    |  |__Feed quantity("---" = end of part)
       | |       |    |_Gag set
       | |       |___Axis 1 feed rate
       | |_____Axis 1 feed length (with +/- feed direction sign)
       |_Selected feed number (1-6)
```

Data may be sent with or without decimal points.
The feed length may also be micro-adjusted up or down using the flags "M+" and "M-".

```
#_B_F021M+$hh<cr><lf>
```
Positive feed length micro-adjust

```
#_B_F021M-$hh<cr><lf>
```
Negative feed length micro-adjust

Axis 2 feed length and feed rate (CLM-Z only)

```
#_B_Z021+012.345_67.8$hh<cr><lf>
       | |       |___Axis 2 feed rate
       | |_____Axis 2 feed length (with sign)
       |_Selected feed number
```

The axis 2 feed length can also be micro-adjusted by sending "M+" or "M-" as with axis 1 above.

Gag Set in Binary 15 at a time

```
#_B_G011
     | |_Bank 0 or 1
     |_Gag set 01 to 99  (If 0, current state, if wild card,
                         working part number used)
```

The selected state of the gag outputs 1-15 are stored when the 0 bank is requested. Outputs 16-30 are stored when the bank number is 1. The outputs are selected in binary from left to right.

When GAG 99 is a shear, to select shear press hold YES, the leftmost bit should be set to 1; otherwise it should be set to 0.

```
#_B_G011_010111000000110$hh<cr><lf>
         -->increasing output #
```

Send:	Action:
'0' or '-'	Turn output OFF
'1' or '+'	Turn output ON
'2' or '*'	Don't change stored output state
'3'	Toggle output on/off or off/on

Change Starting Part Number

```
#_B_A01
     |_Change by part block number

#_B_AN111-1111
      |_______Change by part ID number (send "N" and Part ID)

#_B_AM+
#_B_AM-
     |_Micro-adjust starting part block number

#_B_A00
     |_When not cycling, reset program to the start of the
        current part.
```

The starting part can be selected by block number, part ID, or micro-adjust as shown above. A change of the starting part is done only at cycle start. If there is no block number found when selecting by Part ID, the message "E: Part # Not Found" is sent from the CLM.

Change Working Part Number

```
#_B_P01
     |_Change by part block number

#_B_PN111-1111
      |_______Change by part ID number (send "N" and Part ID)
```

```
#_B_PM+
#_B_PM-
     |_Micro-adjust working part block number
```

The working part can be selected by block number, part ID, or micro-adjust as shown above.

When wild card characters are used, the information from this part is sent or received.

Current Feed Length / Feed Rate Input

```
#_X__00+001.234_56.7$hh<cr><lf>
       |_If sign isn't included, positive value is stored.
```

The feed length can be input using the #_X__00 and #_X__01 commands when batching is enabled. These commands can be used to download the current feed length and feed rate for Axis 1 (X 00) and Axis 2 (X 01).

4.5.9 Batching Input - Working Part and Wild Card

A batching string may be sent with a wild card part number designated by two stars (**). When two stars are sent, the data is stored or received from the working part.

To change the working part, the string "#_B_P" is used. The working part may be changed by part block number, part ID, or micro-adjust (see string descriptions in this document).

Accessing Working Part with Wild Card Characters
Any batching data may be sent or received to or from the working part by using wild card characters.

Examples:

```
?_B_F**1<cr><lf>  requests Feed 1 data for the working part.

#_B_C**_001234$hh<cr><lf>  sends a part quantity of 1234 to
                           the working part.
```

Using Working Part and Wild Card
The working part and wild card are useful for reducing communication program logic, since only one set of strings needs to be sent for all information. It is also useful when accessing data by Part ID rather than Part block number.

Example: Access data by Part ID without knowing Part Block

```
#_B_P_NPart#001$hh<cr><lf>      ;Change working part to
                                  ID "Part#001"
?_B_C**<cr><lf>                 ;Request part info for Part#001
B_C01_001234_000001_1_001$hh<cr><lf>;CLM response

?_B_F**1<cr><lf>                ;Request Feed 1 info for
```

```
                                        Part#001
B_F011+012.345_67.8_02_001$hh<cr><lf>;CLM response

#_B_W**_********_***_N222-2222$hh<cr><lf>;Store a jump to Part
                                          ID 222-2222 from
                                          Part#001
```

4.5.10 LR01.2-005.X Batching Compatibility

This section is for users of previous versions of the CLM-R. It advises of the changes in procedures and information on how to adapt your current program.

For many strings, the format for the LR01.2-005.X is the same as the current LR01.3-006.3, but with new information added. The features changed (skip batch, free run batch, etc.) require a change in the strings. Also, the Part Quantity is now first in the "?_B_C" request to allow the same string to be sent to the CLM as is received from the CLM. The "#_B_F" and "#_B_W" strings may be used to emulate LR01.2-005.X batching by sending a LR01.2-005.X string.

```
#_B_F01_+001234_567$hh<cr><lf>
       |           |_No data after feed rate
       |_No feed number
```

The string above will send the length and rate to Feed 1. A target count of 001 in feed 1, a target count of "---" in feed 2, and a gag of 00 (no gag) will be stored automatically to emulate LR01.2-005.X.

```
#_B_W01_1234ABCD_012$hh<cr><lf>
                    |_No data after early warning
```

The string above will set the Jump to Part to 00 for a "single batch".

Current Feed Length / Feed Rate Input - with Batching
In previous CLM-R/Z versions, the feed length could not be input using the #_X__00 and #_X__01 commands when batching was enabled. Now, these commands can be used to download the current feed length and feed rate for Axis 1 (X 00) and Axis 2 (X 01).

```
#_X__00+001.234_56.7$hh<cr><lf>
       |_Optional sign (? X  00) sends sign back in data.
```

4.5.11 Parameter Request

There are now two types of parameter requests and responses. The condensed parameter format is fully compatible with LR01.2-005.X and is accessed with the request "?_K_". The new extended parameter format string includes the digits exactly as they appear on the CLM display with parameter text, and is requested from the CLM with "?_KF". The "#_K_" input string allows either format, so that strings sent from the CLM can be echoed back.

```
Request to CLM for Condensed format: ?_K_A101<cr><lf>
Response from CLM: K_A101_00012345____$hh<cr><lf>
                          |___________12 digit unformatted string

Request to CLM for Extended format: ?_KFA101<cr><lf>

Response from CLM:
K_A101___0001.2345____Feed Constant___$hh<cr><lf>
      ¦<------------>¦<------------>¦
      ¦  Formatted    ¦Parameter Text ¦
         Parameter     in current language
         (16 char.)     (16 char.)

Send to CLM:#_K_A101_00012345$hh<cr><lf>
         or #_K_A101___001.2345____Feed Constant___$hh<cr><lf>
                                |___Remaining characters
                                       discarded by CLM

            #_K_B111_101101$hh<cr><lf>
         or #_K_B111_1_0_G=110_1____Batching Option_$hh<cr><lf>
```

Dimensional Units Parameter

The CLM will send both the code and the text for Parameter B101, Dimensional Units, but uses the code to select the dimensional unit. These codes are listed below.

```
     K_B1010020_____ft_______Dimensional Unit$hh<cr><lf>
           |___4-digit Unit Code

     #_K_B1010020_____ft_______Dimensional Unit$hh<cr><lf>
 or  #_K_B101_0010$hh<cr><lf>
```

Dimensional Unit Legend

Text	Code
in.	**0000**
ft.	**0010**
mm	**0020**
cm	**0030**
m	**0040**
rad.	**0050**
deg.	**0060**
rev.	**0070**

4.5.12 Parameter Input

Parameters may be downloaded to the CLM only while the CLM is in Parameter Mode. The strings to send the CLM correspond to those sent from the CLM after a (? K) command. If a parameter is detected as invalid after it is input, the CLM will send back an error message (**E_K_nnnn_INVALID**).

#_K_nnn_xxxxxxxx$hh<cr><lf> variable data length

Store:	String sent to CLM:
Feed Constant	**#_K_A101_00012345$CD<cr><lf>**
Batching Option	**#_K_B110_01110$69<cr><lf>**
Interface Option	**#_K_B102_02$F9<cr><lf>**
Dimensional Unit	**#_K_B101_0030$99<cr><lf>**

Note that extra digits may be added to the end of the string, which may make the sending software easier to write. For example, all 8 digits may be sent for feed length resolution, although it is a 2-digit parameter. They may also be echoed back formatted (see section 4.6.11)

4.5.13 Action Requests

Action requests to the CLM include Step Mode ON and Step Mode OFF commands. All action requests must include a checksum if enabled.

Step Mode On Request
!_S__01$hh<cr><lf>

This string will put the CLM into Step Jog Mode for manual mode jogging.

Step Mode Off Request
!_S__00$hh<cr><lf>

This string will turn off the Step mode and cause the CLM to jog normally (i.e. as long as the jog inputs are high).

Step Mode Toggle Request
!_S__02$hh<cr><lf>

This string will toggle the CLM from jog step ON to jog step OFF and vice-versa.

Operating Mode Requests
The operating mode of the CLM may be changed through the serial port if the setup and automatic mode inputs are low. Otherwise, the CLM will issue a serial port error. The parallel system inputs take precedence over the serial input strings once they are toggled from high to low. Parameter mode can only be selected by CLM input.

Select Manual Mode:
!_S__03$hh<cr><lf>

Select Automatic Mode:
!_S__04$hh<cr><lf>

Select Setup Mode:
!_S__05$hh<cr><lf>

Registration Toggle Request
!_S__06$hh<cr><lf>

Registration can be turned ON and OFF when the corresponding CLM input is low. The notes for the mode inputs above also apply to this request. This string is now used by the roll feed SOT to provide an alternate method of enabling registration.

Press Cycle Mode Toggle Request
!_S__07$hh<cr><lf>

The Press Cycle Mode is toggled between Press Intermittent and Press Continuous if the corresponding CLM input is low. The notes for the mode inputs above also apply to this request.

Clear Fault Request
!_CLEAR$hh<cr><lf>

This string functions the same as the CL key or the Clear input and clears a soft fault or hard fault.

Cycle Stop and Part Stop Requests
Note that for safety reasons, an operator Cycle Stop or Part Stop push-button should always be wired to the CLM connector X3. These strings can provide a secondary method of stopping the cycle from a remote site.

!_STOP$hh<cr><lf>
This string functions the same as the $\overline{\text{CYCLE STOP}}$ input.

!_STPT$hh<cr><lf>
This string functions the same as the $\overline{\text{PART STOP}}$ input.

4.5.14 Polling Request

A polling request may be used to see if the CLM is on-line. The SOT on the RS-485 bus periodically sends this request to ensure the integrity of bus communications. This response is compatible with CLM-A, CLM-R, CLM-M and CLM-Z, and consists of a colon, a station number, diagnostic code, a carriage return, and a linefeed (no checksum).

Polling Request
:1<cr><lf>

1 = Request to station number 1.

Polling Response :snn (s=station, nn = diag. code)
:101<cr><lf>

The CLM Responds to the SOT with the station number and the current status diagnostic code. In this example the station number is 1 and the diagnostic code is 01.

4.5.15 Checksum

To ensure that the correct data is being sent and received, a checksum is calculated and checked by the CLM. It is recommended that the checksum be enabled. However, if the host software doesn't calculate a checksum, checksum can be disabled in the Interface parameter. To compute the checksum, add together the hexadecimal ASCII values of all of the characters before the '$'. Then add the most significant digit of the checksum to the two least significant digits. Then, negate ('+/-' on a calculator) this value to form the two's complement. Take the last 2 digits of this number. The result is a 2-digit checksum to be transmitted to the CLM.

Example:

#_B_A03$B6<cr><lf>

Checksum on #_B_A03:

```
                    23  hex
                    20
                    42
                    20
                    41
                    30
                +   33
                   ----
                   149

                    49
                   + 1
                   ----
                    4A
```

Checksum = -(4A) = B6

4.5.16 RS-232 and RS-422 Flow Control

The CLM supports both hardware and software flow control (handshake). The device communicating with the CLM must have either or both types of handshake, or characters may be missed during high-speed transmission. The method of flow control is selected in the Serial Port Operation parameter (B119). The options are described below.

Software handshake uses the XON (ASCII $11) and XOFF (ASCII $13) characters to provide flow control. When an XOFF is sent to the CLM transmission is interrupted until an XON is sent. The CLM will send an XOFF when an interruption in transmission is necessary because of buffer overflow, due to a high transmission rate. Software handshake is always enabled.

Hardware handshake uses the RTS (Request To Send) and CTS (Clear To Send) lines on the RS-232 cable to provide flow control. When the host lowers the CTS line, transmission from the CLM will be interrupted until the CTS is raised. The CLM will lower the RTS when an interruption in transmission from the host is necessary. If the host does not support hardware handshake, the RTS/CTS lines are not connected, or the use of RTS/CTS is inconsistent with the CLM, select software handshaking only (no hardware handshake).

XON/XOFF and RTS/CTS are provided to keep the CLM's buffers from overflowing and should be used the same way by the host software. The communicating device should employ some other type of internal flow control (e.g. sending one message at a time) to prevent the ports from reaching a handshake state.

4.5.17 Block Uploads

When a Block Upload is requested, the CLM will send a block consisting of a header and several messages. The header will contain the identifier and the number of messages that will be sent. Currently, the Block Upload feature allows each of the Status, Minor, Soft, and Hard tables in the current language to be uploaded. A table listing the current status, error and fault messages is included as the next section (4.6.18). A checksum is not required in the request string.

Status Message Block Upload
?_U__00<cr><lf>

Minor Error Block Upload
?_U__40<cr><lf>

Soft Fault Block Upload
?_U__60<cr><lf>

Hard Fault Block Upload
?_U__80<cr><lf>

The CLM will respond with a header block that has the identifier and the length of the block: **U \60.23$EF** indicates that the soft fault table is being sent and that there are 23 (decimal) messages. Each message in the block will start with a 'U' and the message number and end with **<cr><lf>**. The text string is 40 characters long and corresponds to the CLM's LCD but with spaces removed. If the status table is requested, the CLM will send a 40-character message that is more descriptive than that of the LCD. The following is an abbreviated example of a response from the CLM when the hard fault table is requested:

```
U \80.10$EA
U 80CLM SYSTEM ERROR Code #HRD00            $CD
U 81Parameters Lost! Clear to Cont.         $ED
U 82Axis 1 Drive Runaway!                   $6A
U 84CLM SYSTEM ERROR Code #PL001            $DA
U 85CLM SYSTEM ERROR Code #FXPM0001         $6A
U 86Parameters Lost! Select P - Mode!       $57
U 87CLM SYSTEM ERROR Code #UPRG01           $85
U 88EMERGENCY STOP! EMERGENCY STOP!         $60
U 89Axis 1 Amplifier Hardware Fault!        $BE
U 8BAxis 1 Motor Has Overheated!            $C5
```

4.5.18 Serial Diagnostic Codes

This section lists the current status messages, minor errors, soft faults and hard faults that will be issued by the CLM. The maximum message length is 40 characters. When these same messages appear as the status page on the CLM control panel display, they are abbreviated to fit within two lines of 16 characters each.

Serial Diagnostic	Serial Port Message (? X 14 xx/ ? U xx)

Code	Status Messages	
	Minor Errors	
00	**System Is Ready**	**$**
01	**M: No Jog Command**	**$**
02	**M: Feeding Forward**	**$**
03	**A: No Cycle Start**	**$**
04	**A: Cycle Stop**	**$**
05	**A: Feeding**	**$**
06	**A: Waiting for Feed Angle**	**$**
07	**A: Cycle Delay**	**$**
08	**M: Roll Delay**	**$**
09	**S: Feeding Forward**	**$**
0A	**S: Feed Incomplete**	**$**
0B	**S: Waiting for Feed Angle**	**$**
0C	**S: Waiting for Press**	**$**
0D	**S: Start of Feed**	**$**
0E	**CLM PARAMETER MODE**	**$**
0F	**Roll Open & Close On**	**$**
10	**S: Roll Delay**	**$**
11	**A: Roll Delay**	**$**
12	**S: Release Jog**	**$**
13	**Both Jogs High**	**$**
14	**M: Waiting for Feed Angle**	**$**
15	**A: Resume Required**	**$**
16	**S: Feeding Reverse**	**$**
17	**M: Feeding Reverse**	**$**
18	**Initializing System**	**$**
19	**A: Waiting for Press**	**$**
1A	**A: Cycle Stop Input Active**	**$**
1B	**A: Cycle Start Input Active**	**$**
1C	**A: Resume Input Active**	**$**
1D	**M: Reference Mark Aligned**	**$**
1E	**M: Reference Mark Search**	**$**
1F	**No Axis Selected**	**$**
20	**Jog Input Active**	**$**
21	**Roll Input Active**	**$**
22	**A: Part Stop Input Active**	**$**
23	**A: Part Stop**	**$**
24	**A: Waiting for Shear**	**$**
25	**A: No Run Loop Input**	**$**
26	**A: Loop Automatic Not Selected**	**$**
27	**End of Material**	**$**
28	**A: Tail Out Resume**	**$**

Serial Diagnostic Code	Serial Port Message (? X 14 xx/ ? U xx)
	Minor Errors
40	**CLM SYSTEM ERROR Code #MNR00** **$**
41	**Zero Feedlength Entered** **$**
42	**Registr. Offset Exceeds Fdlength** **$**

43	Zero % Feedrate Entered	$
44	Axis 1 Amplifier Is Not Ready!	$
45	Axis 2 Amplifier Is Not Ready!	$
46	Axis 1 Has Not Reached Position	$
47	Axis 2 Has Not Reached Position	$
48	Stop Due To Interrupt Input!	$
49	Feed Angle Is Missing!	$
4A	Invalid Part Selected	$
4B	Reference Mark Is Not Aligned	$
4C	Change in Fdlgth Exceeds Limit	$
4D	Feedlength Exceeds Maximum	$
4E	Feedlength Less Than Minimum	$
4F	Invalid Axis Selected	$
50	Axis Has Changed During Jg	$
51	Axis 1 Required for Registration	$
52	Loop Auto Exit Required	$

Soft Faults

60	CLM SYSTEM ERROR Code #SFT00	$
61	Serial Com Port Disconnection!	$
62	Serial Com Port Overrun Error!	$
63	Serial Com Port Framing Error!	$
64	Serial Com Port Parity Error!	$
65	Serial Com Port IDS Format Error!	$
66	Feed Angle Lost During Feed!	$
67	Serial Com Port RS485 Bus Error!	$
68	Movement While Feed Angle Low	$
69	Press Timeout Has Expired	$
6A	Invalid Mode Selection!	$
6B	Press Cycle Without Feed!	$
6C	Correction Dist. Exceeds Fdlen.	$
6D	Zero % Feedrate Programmed!	$
6E	Set Up Mode Cycle Incomplete	$
6F	Too Many Ref. Marks Missed	$
70	CLM SYSTEM ERROR Code #UPRG02	$
71	CLM SYSTEM ERROR Code #FLPM0001	$
72	CLM SYSTEM ERROR Code #FLPM0002	$
73	Aux. Feedlength Is Zero!	$
74	Count Exceeds Part Quantity	$
75	Axis has Changed During Cycle!	$
76	Battery is Low! Replace it Soon	$
77	Para. Invalid! Select P-mode!	$
78	Batching Program was Lost!	$
79	Output was not Acknowledged	$
7A	Axis 2 Is Interrupted	$
7B	Tail Out Stop	$
7C	Tail Out Inputs Missing	$

Serial Diagnostic Code	Serial Port Message (? X 14 xx/ ? U xx)
	Hard Faults
80	CLM SYSTEM ERROR Code #HRD00 $
81	Parameters Lost! Clear to Cont. $
82	Axis 1 Drive Runaway! $
83	Axis 2 Drive Runaway! $
84	CLM SYSTEM ERROR Code #PL001 $
85	CLM SYSTEM ERROR Code #FXPM0001 $
86	Parameters Lost! Select P - Mode! $
87	CLM SYSTEM ERROR Code #UPRG01 $
88	EMERGENCY STOP! EMERGENCY STOP! $
89	Axis 1 Amplifier Hardware Fault! $
8A	Axis 2 Amplifier Hardware Fault! $
8B	Axis 1 Motor Has Overheated! $
8C	Axis 1 Drive Stalled! $
8D	Axis 2 Drive Stalled! $
8E	CLM SYSTEM ERROR Code #FLPM0003 $
8F	Axis 2 Motor Has Overheated! $
90	Measuring Wheel Encoder Fault! $
91	CLM System Power Loss! $

4.5.19 Serial Interface Errors

There are two types of interface errors: transmission errors and format errors.

Transmission Errors:

Transmission errors are cycle stop soft faults since they indicate that the serial cable or port is faulty.

code #: 62

```
Serial Com Port
 Overrun Error!
```

Overrun occurs when the baud rate of the host is greater than the baud rate of the CLM. It is also issued when the CLM has missed data due to a faulty cable or port.

code #: 63

```
Serial Com Port
 Framing Error!
```

This error occurs when the baud rate of the CLM is greater than the baud rate of the host, or if the start and stop bit parameters are not the same at both ends of the communication line. It is also issued when the CLM has missed data due to a faulty cable or port.

code #: 64

```
Serial Com Port
 Parity Error!
```

This error occurs when the parity type of the CLM doesn't match that of the host. It also is issued during transmission if the parity check fails, indicating a faulty serial cable.

code#: 67

```
Serial Com Port
RS485 Bus Error!
```

This error is issued when data is being sent and received at the same time when SOT operation is selected in Parameter B118. If the device communicating with the CLM is not an LR01.3-006.0 (or 005.1) compatible SOT, the Interface mode in B118 should be set to 1. If the CLM is talking to an SOT, this error indicates a faulty cable or port.

code#: 61

```
Serial Com Port
Disconnection!
```

This error is issued when the IDS decade switch is not communicating with the CLM when Parameter B102 is set to 01. The time for disconnect detection is automatically set to 2 seconds when IDS is enabled.

```
Serial Com Port
IDS Format Error
```

This error is issued only when the IDS interface option is selected and indicates a faulty serial port or cable.

Format Errors:

Every format error sent from the CLM includes a code number. It is also sent in the currently selected language and in both upper and lower case. Otherwise, the text for the existing errors have not been changed since LR01.2-005.1. The format error string has the following format:

```
E_nn_16-char. message$hh<cr><lf>
  :_Format error code
```

Format errors are issued only over the serial interface and do not cause a CLM fault. An 'E' followed by a two digit error code, followed by a 16-character string is sent from the CLM. Each message starts with a different error code number for error detection by the host, as shown in the following list.

List of Format Errors With Codes

```
E_00_Format_Error____
E_01_Identifier Error
```

```
E_02_#_Out_Of_Bounds_
E_03_Checksum_Error__
E_04_String_Invalid__
E_05_Batch_Disabled__
E_06_K_Xnnn_Invalid__  (xnnn replaced by para number)
E_07_Para_Not_Allowed
E_08_Axis_Disabled___
E_09_Regis._Disabled_
E_0A_M.W._Disabled___
E_0B_Hdw_Opt_Disabled
E_0C_Gag/Aux_Disabled
E_0D_No_Chnge_Allowed
E_0E_!!Flp_Err_0001!!
E_0F_Part # Not Found
E_10_L. Ctrl Disabled
E_11_Not Implemented_
E_12_Clm Input High__
```

Each format error is individually described on the following pages.

E_00_Format_Error____$hh<Cr><Lf>

This error is sent when the format characters (chars 3 and 4) are invalid. It is also a generic error that is issued when a message isn't being received properly due to improper handshaking or no carriage return or linefeed.

E_01_Identifier_Error$hh<Cr><Lf>

This error is issued when an identifier character (e.g. the lowercase c in ?_B_c01) is invalid.

E_02_#_Out_Of_Bounds_$hh<Cr><Lf>

This error is sent when the number in the identifier is greater than the maximum number of batches, status messages, or parameters.

E_03_Checksum_Error__$hh<Cr><Lf>

This error occurs when the checksum computed by the CLM doesn't match the one transmitted, which could result from a faulty serial cable or port. It also is issued when the checksum is invalid or missing.

E_04_String_Invalid__$hh<Cr><Lf>

This message is sent when the received data is invalid. (e.g. if the feed length data is not decimal characters)

E_05_Batch_Disabled__$hh<Cr><Lf>
E_09_Regis._Disabled_$hh<Cr><Lf>
E_0A_M.W._Disabled___$hh<Cr><Lf>
E_0B_Hdw_Opt_Disabled$hh<Cr><Lf>

These 4 messages are sent by the CLM if one of the corresponding functions is not enabled by parameter or in hardware: Batching, Registration, Measure Wheel, and Expansion I-O.

E_06_K_A100_Invalid_$hh<Cr><Lf> 'a100'=Parameter Downloaded To Clm

This message is sent when a downloaded parameter exceeds its limits. It corresponds to the 'is invalid' message on the CLM display.

E_07_Para_Not_Allowed$hh<Cr><Lf>

This message is sent when a parameter download is attempted when the CLM is not in parameter mode.

NOTE: *If an error is detected when exiting parameter mode, the status code (X_07 or at end of string if ? XD) from the CLM will be a generic 'Parameter is Invalid'. The CLM will send the message "Knnn Invalid" the next time a parameter is requested.*

E_0C_Gag/Aux_Disabled$hh<Cr><Lf>

This error is sent when gagging/aux. information is requested when gagging is disabled by parameter.

E_0D_No_Chnge_Allowed$hh<Cr><Lf>

This error is issued when editing of certain values (loop correction, accel/decel) has been disabled by parameter in the CLM.

E_0E_!!Flp_Err_0001!!$hh<cr><lf>

This is an internal CLM system error. Call the Indramat service department if this error is received from the CLM.

E_0F_Part_#_Not_Found$hh<cr><lf>

This error is sent when no match is found for the part ID received by the CLM for starting part, working part, or Jump to Part.

Message Acknowledgment:

Y_<cr><lf> if B118 mode is 1 (RS-232/422)
Yn<cr><lf> n=station number, if B118= 2 or 3 (single SOT or SOT on RS-485 bus)

This message is an acknowledgment of correctly stored data when the Serial Interface Mode (Parameter B118) is 2 or 3 (or 1 or if acknowledgment is enabled).

4.5.20 SOT ScreenManager™ Notes

The SOT is preprogrammed using Indramat ScreenManager™. This software package runs on any PC computer using MS-DOS. This program was used to write the information and prompt lines that appear on the SOT display. The command lines are downloaded to the SOT. From the SOT keyboard, data can be entered in response to these command line prompts.

The SOT for the CLM-R/Z is preprogrammed with prompts for its general application. Use this program if desired to further customize the screen for a specific application.

This section provides a short note about an easy access to the batching data over the serial port. The working part can be used for easy access to all Batching data while conserving SOT memory. Alternately, the Part Blocks may be treated as program blocks. For example, instead of Part Block 10, the Block in the Screen manager can be set up in the command file as Block 100. To facilitate this, the CLM ignores the character after the Part block. Also, each feed can be accessed as a program block. Part 10, feed 1 can be called Block 101.

Example

```
#_B_C100001234_001000_1_001$hh<cr><lf>
     bbbqqqqqq
```

bbb=Block number (Part Block 10), qqqqqq=part quantity

Most data can now be echoed as is from the CLM and back, including the parameters, which are always 12 characters long when unformatted, and 32 characters (including text) when formatted. All data that isn't needed in the send string is discarded by the CLM.

4.6 Measuring Wheel

This feature can be used when slippage of the feed rolls or stretch of material causes inaccurate feed lengths. A measuring wheel, which rides on the surface of the material, can be used with the CLM to correct any deviation in length that may occur between the feed rolls and the point at which the material is measured.

The CLM-R/Z offers three different methods for position correction using a measuring wheel. When Measuring Wheel is selected by input, every feed in automatic and setup mode will be length-compensated. The dynamic position correction mode continuously measures the difference between the motor encoder and MW encoder. Correction to the feed length is made throughout the entire feed. Position is maintained by the motor encoder. The second method uses the MW encoder to measure the feed, but when the feed angle transitions to a low signal, position is maintained by the motor encoder. The third method is for the MW encoder to measure the feed and maintain position continuously. All three methods still provide safety by monitoring the deviation between the motor encoder and MW encoder.

If the Measuring Wheel Enable is turned ON or OFF during a cycle, none of the feed lengths (positive, negative, auxiliary, batching) will be affected. Operation in or out of the Length Compensation mode continues until a Cycle Stop is issued (or a fault or error occurs).

4.7 Single Step Using Start and Stop Inputs

A single step may be performed by activating the $\overline{\text{CYCLE START}}$ input and the $\overline{\text{PART STOP}}$ or $\overline{\text{CYCLE STOP}}$ input simultaneously. The $\overline{\text{PART STOP}}$ input can be used for single step only when batching is enabled.

If the $\overline{\text{CYCLE STOP}}$ + Cycle Start are activated, the CLM will step one feed and press stroke at a time. The status message "A: C.Stop Active" will be displayed by default indicating that the cycle stop input is active. A single feed will take place when the cycle start input is activated. If the $\overline{\text{PART STOP}}$ + Cycle Start are activated in batch mode, the CLM will step one part at a time and the status message "A: P.Stop Active" will be displayed.

CHAPTER 5. PARAMETERS

This chapter describes the user entered parameters required for the CLM to perform the motion control operation. The user adapts the CLM to his machine and the mechanical characteristics of the application by entering values for various parameters. This permits a standard control system to conform to different but similar applications.

NOTE: *The CLM requires that all parameters be correctly entered before operation is possible.*

5.1 Parameter Set Description

The CLM includes the following sets of parameters.

Parameter Set A1/2:
This parameter set includes the axis operating values for Automatic, Manual and Setup Mode operation. These parameters allow the user to configure the CLM for the motor and drive package that the CLM is controlling. They also allow the user to set the various factors of the motion profile, as required for the material and application. These include the resolution of the feed, acceleration and deceleration rates, feed rates in different modes, etc.

With the CLM-01.3-R, use the A1/B1 parameter sets to configure axis 1. Axis 2 on the CLM-R is enabled only when the Material Loop Control feature is enabled by parameter. Use the A2 parameter set to define function for axis 2.

With the CLM-01.3-Z, Infeed/Outfeed control, axis 1 and axis 2 have separate but identical parameter sets. Parameter sets A1 and/or A2 are enabled based on the entry in B121. Enter parameter values separately for each enabled axis using the A1 and/or A2 parameter sets.

Parameter Set B1:
This parameter set establishes the operating arrangement of the CLM. It allows the user to configure the CLM for various options such as the language that shows on the display (English, German, Spanish or French); selecting control interface options, such as the IDS or SOT; selecting and configuring other optional features like Batching, Roll Control, Registration, etc.

5.2 Parameter List

The following table lists all of the parameters for the CLM with software version LR01.3-006.3 and LZ01.3-002.2. Only the parameters available for your type of control will show on your CLM display for entry. The A2xx parameters for axis 2 of the CLM-Z (shown in table as "LZ") have the same entry requirements as the A1xx parameters for axis 1 of the CLM-R or CLM-Z. The A2xx parameters for CLM-R axis 2 (shown in table as "LR") are enabled only when the Material Loop Control feature is enabled in Parameter B121.

Table 5-1 Parameter List

Parameter Set A1/2			Parameter Set B1	
Axis 1	**Axis 2 (LZ)**	**Description**		**Description**
A100	A200	Feed Length Resolution	B100	Language
A101	A201	Feed Constant	B101	Dimensional Unit
A102	A202	Drive Input Sensitivity	B102	Interface Option
A103	A203	Encoder Line/Revolution	B103	Auxiliary Feed Length
A104	A204	Maximum Feed Rate	B104	Feed Length Maximum Limit
A105	A205	Jog Feed Rate	B105	Feed Length Minimum Limit
A106	A206	Maximum Acceleration Rate	B106	Fd Lngth Max. Change in Cycle
A107	A207	Maximum Deceleration Rate	B107	Fd Lngth Micro-Adjust Increment
A108	A208	Maximum Allowable Jerk	B108	Jog Step
A109	A209	Position Gain	B109	Press Interface Mode
A110	A210	In-Position Threshold	B110	Roll Control
A111	A211	Direction of Operation	B111	Batching Option
A112	A212	Monitoring Window for Drive Diagnostics	B112	Registration/Measuring Wheel
			B113	Registration Leading Length
A113	A213	Low Feed Angle Threshold	B114	Registration Trailing Length
A114	A214	Anticipation Output	B115	Miss Marks Limit/Max. Position Correction
	Axis 2 LR	**(with Loop Control enabled)**	B116	Measuring Wheel Feed Constant
			B117	Measuring Wheel Encoder
	A200	Max. Velocity and Direction	B118	Serial Interface Mode
	A201	Jog Velocity	B119	Serial Port Operation
	A202	Creep Velocity	B120	Analog Override
	A203	Acceleration	B121	Loop Control Enable - CLM-R or Axis Enable - CLM-Z
	A204	Deceleration		
			B122	Slug Width

5.3 Entering the Parameters

The CLM must be in Parameter Mode to enter or edit parameters. The Parameter Mode is normally selected via a switch on the user control panel. This selector switch will typically require a key to enter this mode to prevent unauthorized changes to the parameter values. Parameters are entered or changed by writing over any previous data stored. These changes are made through the CLM keypad (or via a serial interfaced host). After you correctly enter the desired value of each parameter, press the STORE key to save the new value in memory. A Lithium backup battery assures this memory is retained when the CLM is powered down or if the system experiences a power loss.

In Parameter Mode, the CLM display shows the parameter name, number and data value of the parameter selected, as illustrated below.

```
Feed Length Res.
A100     02
```

When selecting Parameter Mode, the display shows the first parameter of the **A1** set of parameters (A100), unless a fault exists, as described below.

NOTE: *Should the displayed message appear in a language other than the language desired by the user, enter the **B1** Parameter Set as described in section 5.6.1. Set Parameter B100 to change the display to the desired language, as explained in section 5.6.2.*

Two conditions exist which can result in a parameter "Is Invalid" fault message.

1. The CLM software checks the parameter input value limits when you press the STORE key. If you have entered a value higher or lower than the limits of the parameter, a diagnostic message appears in the display after you press the STORE key. The parameter description and number remain on the display. In place of the data, the message "Is Invalid" appears.

   ```
   Feed Length Res.
   A100 Is Invalid!
   ```

   Press the CL key to clear the fault status message. The display returns to the normal parameter entry display. Enter correct values for the parameter (within limits) and press STORE.

2. The CLM checks the parameters each time power is applied to the unit. It also does secondary calculations, based on entered parameter data, when you switch out of Parameter Mode. In either case, if required parameter's data is missing or incorrectly entered, the CLM detects the error and displays the "Parameter Is Invalid" diagnostic message.

   ```
   Parameter A105
     Is Invalid!
   ```

   Switch back into Parameter Mode. The first "invalid" parameter automatically displays. Enter the data correctly and press STORE for each parameter that appears as invalid.

To advance or scroll forward through the parameter set, press the up arrow key on the CLM keypad. Each time you press the key, the parameters on the display advance from the first to last, as shown in Table 5.1. Use the down arrow key to scroll backwards through the parameter set. Press the CR key to toggle between the A1, A2 and B1 sets of parameters. Press the left or right arrow key to move the cursor left or right within the display. Each parameter can be accessed directly without scrolling. Press the "Hot" (blank) key on the keypad to move the cursor to the parameter number. Type over the number to directly select the desired parameter to display.

The parameter displays are visible in the CLM's control panel display and on the optional SOT or other host, via the RS-232/422/485 serial interface, when used.

NOTE: *The optional remote florescent tube display, available with the IDS option, will only display the message **Parameter Mode** while the CLM is in this mode. The two digit display on the IDS shows code number 17 when this mode is selected.*

Perform the following steps to change or edit the value of a parameter (from the CLM control panel; see Chapter 4 for procedures to download from a PC or SOT via the serial interface):
1. Move the cursor (arrow keys) over the digit you want to change.

2. Enter the desired number from the CLM keypad (type over existing entry).
3. Verify data changes are correct in the display.
4. Press the STORE key to save the new parameter values (displayed data) into memory.
5. Maintain a current list of parameter entries. Appendix C provides work sheets which show the organization of each parameter and provide spaces to list each entry.

5.4 Unit of Measurement/Input Unit

The Unit of Measurement, also referred to as Input Unit (IU), is the type of measurement category selected that best suits the application. Categories include: inches, feet, millimeters, degrees, etc.

Parameter B101 displays the dimensional (input) unit category currently selected. This parameter is designed only as a memory aid for the user. The settings in this parameter will in no way affect the computation or operation of the CLM. All calculations are based on the feed length resolution (A100). The unit of measurement is typically determined by the number of decimal places of resolution required for the application, as described in section 5.5.1.

5.5 Parameter Set A1/2

The following sections describe the parameters in set A1/2, required for the CLM to command motion. Each parameter description includes an illustration of the CLM display and the formula required to obtain the parameter value, where applicable. For easy reference, this section describes each parameter in numerical order (A1 set, the special A2 set for CLM-R, then the B1 set).

NOTE: *For CLM-Z, use the A1xx parameter descriptions to also set A2xx parameters for axis 2. Since the parameters for each axis are identical, this section lists them only once, as A1xx.*

5.5.1 Parameter A100: Feed Length Resolution

```
Feed Length Res.
A100     02
```

Input value limits: between 01 and 04

This parameter controls the decimal point placement for most of the parameters shown in the CLM display. The number of decimal places determines the level of resolution or exactness of a parameter value.

The level of resolution is relative to the input unit or dimensional unit. Typically, the number of decimal places indicates the category of the unit of measurement. Table 5-2 shows the typical relationship of decimal placement (resolution) to unit of measurement commonly used.

Table 5-2 Typical Decimal Placement

Decimal Placement	Unit of Measurement
.X	Angular Measurement (e.g., Degrees, Radians)
.XX	International System (Metric) (e.g., Millimeters, Centimeters)
.XXX	US Customary System (e.g., Inches, Feet)
.XXXX	High Resolution Usually Used With US Customary System

NOTE: *The decimal placement relationship to unit of measurement, as shown in Table 5-2, is* ***typically*** *used in the Motion Control industry. However, this relationship is not restricted to the categories shown. Any of the four levels of decimal placement can be used with any unit of measurement desired. The final selection is dependent on the level of resolution required.*

Although Parameter A100 affects most of the other parameters, not all the parameters are affected in the same way. All velocity and acceleration parameter displays have one less decimal place than the feed length parameters. The Feed Constant and Position Tolerance parameter displays have one more decimal place than the feed length parameters (refer to Table 5-3).

For example, if 02 is entered as a value in Parameter A100:

The Feed Length Limit = 2 decimal places.

The Acceleration Rate = 1 decimal place.

The Feed Constant = 3 decimal places.

The following table summarizes the decimal places that result from the four possible values of Parameter A100.

Table 5-3 Decimal Placement

A100 Parameter Entry Value	Feed Length Parameters	Max. Jerk Accel/Velocity	Feed Constant and In-Pos. Threshold
01	1	0	2
02	2	1	3
03	3	2	4
04	4	3	5

The remainder of the parameters either do not use number values or have fixed decimal places.

The parameters that have fixed decimal places are:

A102 - Drive Input Sensitivity
A202 - CLM-R only, Creep Velocity
A109 - Position Gain
A112 - Monitor Window
B109 - Press Interface, Minimum Cycle Time
B110 - Roll Control - Delay Time
B112 - Registration - Search Velocity/Measuring Wheel Deviation

NOTE: *When A100 is changed, the numerical digits in other parameters remain in place but the decimal point shifts. As an example, with A100 set to 03, and the value entered in A101 = 1.2345, if A100 is changed to 02, then A101 data becomes 12.345. If you change parameter A100, you then need to verify and change other parameters, as required.*

NOTE: *For simplicity and consistency, all parameter display illustrations in this manual reflect the decimal placement when A100 is set to 02.*

5.5.2 Parameter A101: Feed Constant

```
Feed Constant
A101   01234.567
```

Units: Input units per motor revolution

Input Value Limits: from 00000100 to 10000000 (regardless of decimal pos.)

Decimal Places: A100 + 1 (figure shown A100=02)

The Feed Constant is the ratio of material movement per motor revolution. The feed roll diameter and the gear ratio are two of the values needed to determine the Feed Constant value. The CLM uses this constant value in several mathematical computations in order to command axis motion. This parameter defines the Input Units (IU) used in other parameters. Use the formula below to obtain the feed constant value required for your application. Enter the feed roll diameter in the Input Unit value that you want to use (inches, millimeters, etc.).

$$\text{Feed Constant} = \frac{\text{feed roll diameter} \times \pi}{\text{gear ratio}}$$

5.5.3 Parameter A102: Drive Input Sensitivity

```
Drive Input Sens
A102 01500/10.0V
```

Input Value Limits: from 100 RPM/10.0V to 10,000 RPM/10.0V
(or 10 RPM/1.0V to 1,000 RPM/1.0V)

This parameter defines the sensitivity of the drive/motor physical relationship.

(1) Maximum motor RPM (revolutions per minute)

(2) Servo voltage (volts) at maximum motor RPM

NOTE: *The maximum RPM at maximum volts is found on the Drive Personality Module.*

This parameter defines the sensitivity of the motor (RPM) to the drive voltage. The voltage range in Parameter A102 can vary from 1.0V to 10.0V. Note that 100 RPM/10.0V has the same relationship as 10 RPM/1.0V. The result of the calculations in the CLM are the same with either entry.

Typically, the drive personality module lists the maximum RPM at 10 volts. Your entry in A102 should be the same as shown on the personality module. In rare cases, you may need to modify the entry so the personality module information fits in the parameter entry limits. For example, assume the servo data plate lists 1500 RPM/8.333V. Parameter A102 does not allow for three decimal places in the voltage entry. Rounding off to one place loses the true relationship. If you multiply both sides of the equation by three (4500 RPM/25.0V), then divide both sides by five (900 RPM/5.0V), you derive a number that maintains the original relationship and is valid as an entry in the parameter.

5.5.4 Parameter A103: Encoder Lines/Revolution

```
Enc Lines/Rev
A103     1250
```

Units: Encoder Lines / Motor Revolution

Input Value Limits: from 0100 to 5000

This parameter specifies the number of line counts from the incremental encoder per motor revolution. This number is located on the nameplate of the incremental encoder which is mounted at the rear of the servomotor.

The CLM counts the encoder lines as the motor rotates to determine position. In the sample display above, the CLM counts the revolutions based on the line count of 1250 lines per revolution. The CLM uses this data in several different computations that affect positioning.

The encoder frequency is limited to 1 MHz. Calculate the frequency by taking the number of encoder lines per revolution times the maximum number of motor revolutions required for the application (measured in revolutions per second).

Example of a maximum frequency calculation:

Encoder = 1250 lines / revolution
Maximum motor speed = 1500 revolutions / minute

Convert motor speed to seconds [1500 / 60 seconds = 25 rev / sec]

Per formula:

1250 (lines / rev) x 25 (rev / sec) =
31,250 lines or signal cycles per second (hertz [Hz]) = 31.25 KHz
Times 4 increments / line (Quadrature circuitry of encoders) = 125 KHz
125 KHz = 0.125 MHz

5.5.5 Parameter A104: Maximum Feed Rate

```
Max Feedrate
A104   0123456.7
```

Input Unit: Input Units (IU [Unit of Measurement]) per minute

Input Value Minimum: 00000100 (regardless of decimal point)

Input Value Maximum: Max. RPM (A102) x Feed Constant (A101), or 1 MHz (see 5.5.4)

Decimal Places: A100 - 1 (figure shown A100=02)

This parameter defines the maximum feed rate at which material can be fed and is expressed in units per minute. The feed rate in Automatic Mode is expressed as a percentage of the Maximum Feed Rate entered in this parameter. This percentage is entered through the CLM keypad, or

through the thumb-wheel switches of the optional IDS assembly, optional SOT keyboard or other host via the serial port.

Use the following formula to calculate the maximum feed rate.

Maximum Feed Rate	=	Maximum Motor RPM (from A102)	x	Feed Constant (from A101)

The entry in A104 should reflect the maximum feed rate desired for the application. This is not necessarily the same as the maximum the system is capable of performing.

NOTE: *Maximum Feed Rate is specified in units of measurement per minute. Convert seconds to minutes when required.*

CAUTION: *If the motor employed with this system is overrated for the application, feeding at the maximum feed rate may damage the feed rollers or its associated hardware. Adjust the entry in A104 to reflect the maximum feed rate desired for the application.*

5.5.6 Parameter A105: Jog Feed Rate

```
Jog Feedrate
A105   0123456.7
```

Input Unit: Input Units per minute

Input Value Minimum: 00000100 (regardless of decimal point)

Input Value Maximum: less than or equal to maximum feed rate entered in parameter A104.

Decimal Places: A100 - 1 (figure shown A100=02)

This parameter specifies the maximum jog feed rate in Manual and Setup Modes. The jog feed rate is typically a much slower speed than the maximum feed rate.

It is recommended to start with a Jog Feed Rate at 10% of the Maximum Feed Rate (A104). Adjust higher or lower as desired for the application.

Example:

Jog Feed Rate = Maximum Feed Rate (A104) x 10%

5.5.7 Parameter A106: Maximum Acceleration Rate

```
Accel Rate
A106  0123456.7
```

Input Unit: Input Units per second^2

Input Value Minimum: 00000100 (regardless of decimal point)

Input Value Maximum: 99999999 (regardless of decimal point)

Decimal Places: A100 - 1 (figure shown A100=02)

When Constant Acceleration is selected (A108=0), this parameter specifies the constant acceleration rate used to reach peak velocity.

When Jerk Limiting (trapezoidal) Acceleration is selected (A108 not =0), acceleration is ramped up to the value specified in A106, and then ramped down to zero until peak velocity is reached.

You select the shape of the acceleration profile in Parameter A108 (refer to section 5.5.9).

NOTE: *It is absolutely necessary to balance the Position Gain and the Maximum Acceleration Rate in order to avoid position overshoot.*

5.5.8 Parameter A107: Maximum Deceleration Rate

```
Max Decel Rate
A107   0000012.3
```

Input Units: Input Units per second^2

Input Value Limits: If A108=0, Limits are the same as A106

If A108 not =0, A107 must be equal to A106

If A107=0, Default is A107=A106

Decimal Places: A100 - 1 (figure shown A100=02)

When Constant Acceleration is selected, this parameter specifies the constant deceleration rate used to ramp down from peak velocity to zero velocity. The deceleration rate is not required to equal the acceleration rate.

When Jerk Limiting (trapezoidal) Acceleration is selected, the value stored in Parameter A106 or zero must be stored in this parameter (so A107=A106). The deceleration rate is required to equal the acceleration rate.

You select the shape of the acceleration profile in Parameter A108 (refer to section 5.5.9).

NOTE: *It is absolutely necessary to balance the Position Gain and the Maximum Deceleration Rate in order to avoid position overshoot.*

5.5.9 Parameter A108: Maximum Allowable Jerk

```
Maximum Jerk
A108  0000123.4
```

If A108 = 0, constant acceleration rate is selected.

If A108 is not = 0:

Units: Input units per second^3

Decimal places: A100 - 1 (figure shown A100=02)

Low Limit: (60 x A106^2) / A104

High Limit: 99999999

This parameter selects the shape of the acceleration profile. If A108 is set to zero, Constant Acceleration Rate is selected. If A108 is not set to zero, the jerk rate is selected. Jerk is defined as the rate of acceleration change. The value stored in this parameter is used to ramp up the acceleration to the value stored in Parameter A106 (Maximum Acceleration Rate).

When this value is set to the lowest level, a triangular acceleration profile will result. This profile produces the smoothest starts and stops but increases the time required to reach maximum acceleration. To decrease acceleration time and maintain the smoothest profile, the jerk should be increased. By increasing jerk, the acceleration profile will approach trapezoidal and acceleration time approaches that of constant acceleration. Due to the earlier mechanical method of Jerk Limiting (primarily cams), some users may refer to Jerk Limiting as a Modified "S" Curve.

In applications where stretch or slip are a problem, Jerk Limiting will improve performance. The profiles shown in Figures 5.1 and 5.2 illustrate the effect of Jerk Limiting. The Velocity Profile in Figure 5.2 has much smoother "S" shaped ramps than the ones in Figure 5.1. The Acceleration Profile in Figure 5.1 is a near square, while the profile in Figure 5.2 is a trapezoid shape. The Jerk profile in Figure 5.2 is far less severe than the one in Figure 5.1.

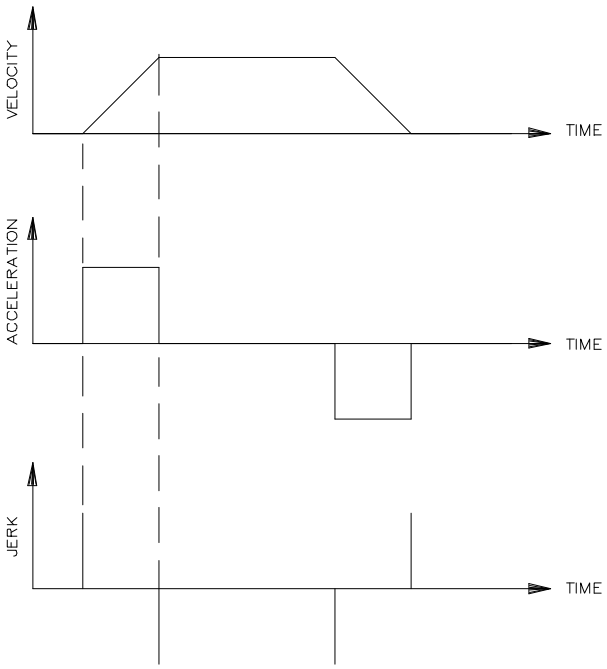


Figure 5.1 Profile without Jerk Limiting

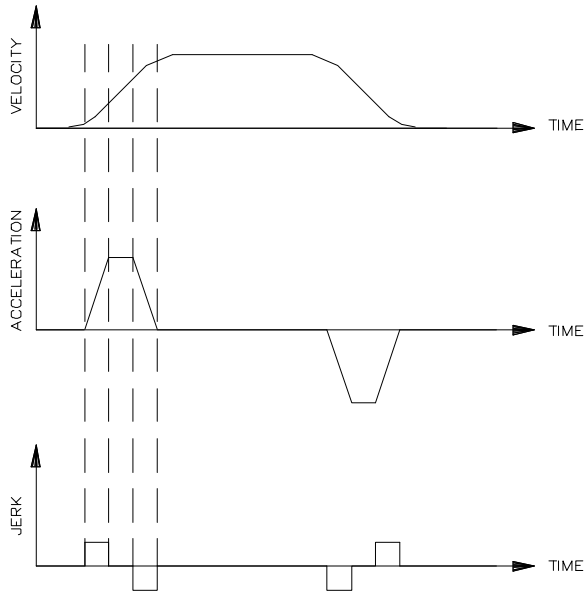


Figure 5.2 Profile with Jerk Limiting

5.5.10 Parameter A109: Position Gain

```
Position Gain
A109    01.23
```

Input Units: Input Units per minute per 0.001 input units

[IU in inches] inches per minute per mil (.001 inch)

[IU in meters] meters per minute per millimeter (.001 m)

Decimal Places: 2, not affected by A100 setting

Input Value Limits: 00.01 to 10.00

This parameter specifies the position gain of the closed loop positioning control. The proper setting of position loop gain is essential for optimum performance of the drive system.

Position Gain is expressed in terms of commanded velocity per .001 units of position (or following) error. The position control commands a given velocity (units/minute) per each thousandth (unit) of position error detected by the control.

Position Gain is represented by the expression Kv. Use the formulas below to determine Kv.

US Customary	International (Metric)
$Kv = \frac{\text{in/min}}{0.001\ \text{in}}$	$Kv = \frac{\text{m/min}}{0.001\ \text{m}}$

The higher the gain the smaller the position error. Position Gain is tuned to achieve the desired performance of the system. Gain should not be so high as to cause system overshoot or oscillation.

NOTE: *A position loop gain set too low will result in sluggish operation. Too high a setting causes the system to be too sensitive. This results in motor oscillation. A by-product of motor oscillation is an audible buzz or ringing noise.*

Load inertia, friction, motor dynamics, and velocity, are just some of the elements which affect gain. Because of the many variables that influence the proper gain, there is no established setting for this parameter. However, it is recommended that the user begin with a small number (such as 00.50) and increase the numeric entry until optimum performance is achieved.

NOTE: *The Position Gain (A109), the Acceleration Rate (A106), the Deceleration Rate (A107) and Maximum Jerk (A108) directly interact with one another. Before operating, after setting the position gain, insure the acceleration rate is set correctly for the application.*

WARNING: *If the gain is set too high, the motor could begin oscillating the moment power is applied. This condition could result in damage to the machine and/or personal injury. Disconnect the motor from the machine for initial testing.*

5.5.11 Parameter A110: In-Position Threshold

```
In-Pos Threshold
A110    000.123
```

Units: Input Units

Decimal Places: A100 + 1 (figure shown A100=02)

Input Value Limits: from 000.000 to 999.999

This parameter sets the in-position threshold window for Axis 1. This is the defined window or area in which the CLM will consider the axis in position. A close or tight threshold requires more time for the axis to reach position (within threshold window).

Enter the value in the unit of measurement common to the rest of the parameters (inches to inches or millimeter to millimeter).

The CLM should always make the exact feed (within feed length resolution) as shown in Figure 5.3. This parameter is used to determine when the axis is not feeding and, if set small enough, will not affect the accuracy of the feed. This parameter should not be misinterpreted as "feed accuracy."

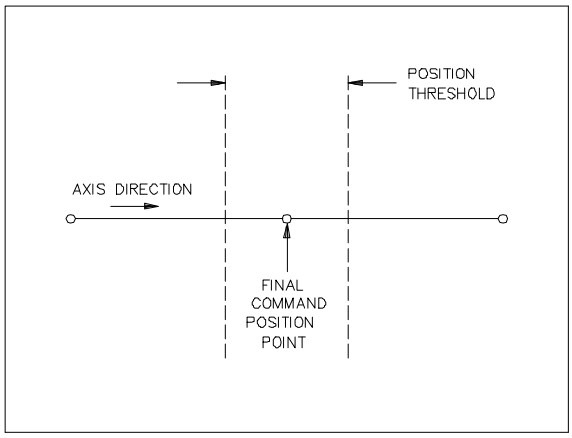


Figure 5.3 In-Position Threshold

5.5.12 Parameter A111: Direction of Operation

```
Direction
A111 Enc=0 Cmd=0
```

Input Value Limit: 0 or 1

This parameter allows changing the axis direction (+/-) by software in the CLM. Direction and polarity changes are provided by this parameter without the need for wiring changes.

Enc = 0 - Direction of operation remains unchanged (as wired)

= 1 - Reverse direction of operation (inverts operating polarity of the motor encoder)

Cmd = 0 - Direction of operation remains unchanged (as wired)

= 1 - Reverse direction of operation
(inverts the polarity of the CLM velocity command output)

WARNING: *Runaway conditions can occur if this parameter is changed so that the phase relationship between feedback and command is incorrect. Incorrectly defined velocity command/encoder polarity will result in unexpected motor direction movement. This condition could result in machine damage and/or personal injury. It is recommended to disconnect the load from the motor when altering this parameter. Once operation and direction are verified, the load can be reconnected.*

5.5.13 Parameter A112: Monitoring Window for Drive Diagnostics

```
Monitor Window
A112     10.0%
```

Units: Input Units

Decimal Places: 1, unaffected by A100

Input Value Limits: 00.1%-20.0%

This parameter selects an error detection monitoring window for "Drive Stalled" and "Drive Runaway" hard faults. The CLM uses a mathematical model of the system to calculate the expected position error (lag). Drive Runaway occurs when the motor is moving too far ahead of the expected lag. Drive Stalled occurs when the motor is moving too far behind the expected lag. Parameter A112 defines the amount of input units the drive can deviate from its expected position error.

- If the position read from the encoder is greater than the expected position, plus the amount of the monitoring window, the CLM detects a "Drive Runaway" condition.
- If the position read from the encoder is less than the expected position, plus the amount of the monitoring window, the CLM detects a "Drive Stalled" condition.

The suggested value for this parameter is 10%.

The allowed deviation of the motor's Lag is computed as follows:

Lag = Velocity / (KV x 1000)

MAX_LAG = A102 (max RPM) / (1000 x A109)

Allowed Deviation from computed Lag = A112 % x MAX_LAG

NOTES:

1. *If A112 is too small, a normal feed will cause "Drive Runaway" or "Drive Stalled."*

2. *For quicker error detection, A112 may be entered as less than 10%, as long as the condition noted above does not occur.*

3. *A112 may be made larger than the suggested value if desired. An upper limit of 20% is placed on the parameter.*

4. *If the position tolerance is set to a high value (larger than allowed deviation from max lag), the CLM may not be able to distinguish stalled from runaway, although a hard fault will still be issued. See Chapter 8 for description of fault diagnostics.*

5.5.14 Parameter A113: Low Feed Angle Threshold

```
Low FA Threshold
A113     00.0100
```

The CLM can use this parameter while the feed angle is low to determine if the material is in position. It uses Parameter A110 (In-Position Threshold) when the feed angle is high.

If the position error is greater than this value (material slipped out of position) while the feed angle is low, the soft fault "Movement While Feed Angle Low" is issued.

Typically, the machine builder will cause the feed rolls to open during the actual press operation, then close to feed material. If the rolls are closed, and the press low feed angle causes the material to pull (turning the feed rolls, causing feedback to the CLM), the CLM will issue a fault. This parameter allows setting a tolerance that will allow the feed rolls to move some amount before causing the CLM to issue a fault.

This parameter should not affect the accuracy of the feed because it is used only after the feed is complete. The in-position, feeding, and feed complete signals all depend on the value in this parameter.

If all zeros are entered in this parameter, the CLM uses the Position Tolerance (A110).

5.5.15 Parameter A114: Anticipation Output

```
Anticipation
A114   012.345
```

Units: Input Units

Decimal Places: A100 + 1 (figure shown A100=02)

Input Value Limits: None

This parameter selects the distance from the end of every feed in Automatic Mode, when the Anticipation Output is turned ON.

NOTES:

1. *If the value of Parameter A114 is set to zero, the output will never turn ON.*

2. *If the value of Parameter A114 is a larger value than the feed length, this output turns ON at the start of the feed.*

The output turns OFF when the feed is complete and the feed angle goes low.

This output is typically used to minimize the lag of an external device used in part of the process, such as a heater in thermal-forming applications.

5.6 Parameter Set A2 for CLM-R Loop Axis

The axis 2 parameter set (A2xx) for the CLM-Z is exactly the same as described for axis 1 (A1xx).

This section describes the special axis 2 parameter set for use with the CLM-R. Its axis 2 is only enabled when the Material Loop Control feature is enabled in Parameter B121. Refer to Chapter 4 for additional information on this feature.

Axis 2 on the CLM-R is an open-loop axis which provides a ramped velocity profile through analog output A2. Since there is no encoder or drive diagnostics, axis 2 has a reduced parameter set (A200 through A204), as described in the following sections.

5.6.1 Parameter A200: Maximum Velocity and Direction

```
Maximum Velocity
A200 0 0030000.0
     A) B)
```

A) Direction of command voltage (1=reverse direction)

B) Max Velocity at 10.0V (in Axis 1 units/minute)

Units: Input Units

Decimal Places: A100 - 1 (figure shown A100=02)

Input Value Limits: Same as A104

Axis 2 has an implied feed constant, since there is no encoder on which to base units/revolution. The units and decimal point resolution are the same as Axis 1.

The Maximum Velocity entered here corresponds to an output voltage of 10.0V. The Feed Constant, Drive Sensitivity, Max. Feed Rate, and Direction parameters are all combined into a single parameter.

A negative velocity is never commanded in Loop Automatic Mode.

5.6.2 Parameter A201: Jog Velocity

```
Jog Velocity
A201   0003000.0
```

Input Unit: Input Units per minute

Input Value Minimum: 00000100 (regardless of decimal point)

Input Value Maximum: Less than or equal to maximum feed rate entered in Parameter A200.

Decimal Places: A100 - 1 (figure shown A100=02)

This velocity is used when jogging axis 2, automatically filling the loop, and at the start of an auto mode cycle.

5.6.3 Parameter A202: Creep Velocity

```
Creep Velocity
A202   1  0.10%
       A) B)
```

A) 0= disable creep velocity (always come to a stop)
1= creep in Loop Auto only
2= creep in both Loop Auto and Loop Manual

B) Creep Velocity in percent of Max. Velocity (A200)

Limits: 0.00 - 9.99 %

Decimal Places: Fixed at 2

Creep velocity is normally set to a very low value to keep the straightener rollers moving at all times. This is desirable in many cases to prevent damage to the material.

This velocity is output to Axis 2 when an Automatic Mode cycle is not in progress. It is also used when the $\overline{\text{MAXIMUM LOOP}}$ input is low, indicating full loop condition.

5.6.4 Parameter A203: Acceleration

```
Acceleration
A203   0001000.0
```

The acceleration rate for CLM-R axis 2 is specified in units/second^2.

Decimal Places: A100 - 1 (figure shown A100=02)

5.6.5 Parameter A204: Deceleration

```
Deceleration
A204   0002000.0
```

The deceleration rate for CLM-R axis 2 is specified in units/second^2.

Decimal Places: A100 - 1 (figure shown A100=02)

5.7 Parameter Set B1

The following section describes the B1 set of parameters. They are used to configure or structure the CLM to a particular environment or application. Some of these parameters determine the language the display will use, the units of measurement employed, and options selected, if any.

5.7.1 Entering the B1 Parameter Set

To enter the B1 Parameter Set, the CLM must first be in the Parameter Mode. Upon selecting the Parameter Mode, the CLM normally displays A100, the first parameter in the A1 set (refer to section 5.5.1).

Once in the Parameter Mode, press the CR key on the CLM keypad to change between the A1, A2, and B1 set of parameters, from any parameter within any set. Section 5.7.2 illustrates the first B1 parameter that appears in the CLM display (B100).

NOTE: *The user may exit the Parameter Mode from any parameter set at any time. The CLM returns to the selected operating mode (Manual, Automatic or Setup).*

The following sections describe each of the **B1** parameters in detail.

5.7.2 Parameter B100: Language

```
Language
B100          01
```

Input Value Limit: 00, 01, 02 or 03

All displayed text messages appear in the language selected.

The language choices are as follows:

00 = German

01 = English

02 = French

03 = Spanish

5.7.3 Parameter B101: Dimensional Units

```
Dimensional Unit
B101          in.
```

Use this parameter only as a memory aid (electronic note pad) for the user. The operator's selection of input units has no effect on the computation or operation of the CLM. The selected dimensional unit displays with data on the SOT display.

Use the left or right arrow keys to scroll through the selection of dimensional units available. Press the STORE key when the desired selection displays. The following is a list of abbreviations which will display for available dimensional units:

in. = inches
ft. = feet

mm = millimeters
cm = centimeters
m = meters

deg. = degrees
rad. = radians
rev. = motor revolutions

5.7.4 Parameter B102: Interface Option

```
Interface Option
B102    02
```

Input Value Limit: 00, 01 or 02

This parameter selects the method of entering the Feed Length and Feed Rate in the CLM.

The following possible input values for B102 are further explained below.

00 - Standard CLM
01 - Standard CLM with IDS (option)
02 - Enable Batching Operation

- If B102 is set to 00, the standard CLM is selected. Feed Rate and Feed Length are entered directly through the CLM keypad or through a host terminal via the serial interface port.
- If B102 is set to 01, the IDS option is selected. Feed Length and Feed Rate are entered through the IDS thumb-wheel switches. The serial interface port is automatically configured for the IDS and is not available for a separate host terminal input.

- If B102 is set to 02, the Batching option is selected. The Feed Length and Feed Rate are entered for different parts in the batching program. The part or parts to execute (with preprogrammed feed lengths, feed rate, etc.) are selected through the CLM keypad or through a host terminal via the serial interface port. This is the only selection that allows using the batching function. Refer to the Batching operational description in Chapter 4 for further information.

Viewing of the CLM Feed Length / Feed Rate display is performed differently with each option selected. They are described in section 2.2.

5.7.5 Parameter B103: Auxiliary Feed Length

```
Aux. Feed Length
B103    +1234.56
```

Units: Input Units (with +/- feed direction sign)

Decimal Places: See Parameter A100 (figure shown A100=02)

Input Value Limit: none

This parameter specifies an auxiliary (secondary) feed length. The Auxiliary Feed Length is triggered by an external signal from a device such as a PLC, a counter/buffer, selector switch, or another type of control device (see Chapter 3). Upon energizing this external signal, the feed length originally stored in the CLM, by the CLM keypad, the IDS or from a host via the serial interface port, is ignored and the value stored in this parameter is used. For example the Auxiliary Feed Length could be used with a Feed to Shear operation or to feed damaged material off the end of the roll, or any other operation which requires a secondary feed length.

If auxiliary lengths are requested during Batching, they will be produced but not counted in the batch.

NOTE: *The value stored in this parameter is usable only in Automatic Mode.*

5.7.6 Parameter B104: Feed Length Maximum Limit

```
Feed Length Max.
B104     1234.56
```

Units: Input Units

Decimal Places: See Parameter A100 (figure shown A100=02)

Input Value Limit: none

This parameter sets the maximum limits for feed length that the CLM will accept from the CLM keypad (or the IDS, SOT or other RS-232/422/485 host option, if so equipped).

If this parameter is set to all zeros (0000.00) there is no software limit on feed length.

CAUTION: *When you set this parameter to 0000.00, exercise caution to insure that you always enter the correct desired feed length. An accidental or incorrectly entered feed length could result in damage to the machine or material.*

Should the feed length entered be larger than the maximum limit set in this parameter, the diagnostic message "Feed Length Limit Exceeded!" will appear in the display.

5.7.7 Parameter B105: Feed Length Minimum Limit

```
Feed Length Min.
B105     1234.56
```

Units: Input Units

Decimal Places: See Parameter A100 (figure shown A100=02)

Upper Limit: Value stored in Parameter B104 (maximum limit)

This parameter sets the minimum feed length limit that the CLM will accept from the CLM keypad (or the optional IDS, SOT, or a host terminal, via the RS-232/422/485 port).

If this parameter is set to all zeros (0000.00) there is no software minimum limit on feed length.

If the value entered in Parameter B105 is greater than the maximum feed length value stored in Parameter B104, the CLM issues an invalid parameter entry message "B105 Is Invalid!" when the Store key is pressed. Reenter the parameter data for B105.

If the value entered in Parameter B105 is equal to the value stored in Parameter B104, only one programmed feed length is permitted in each direction.

Should the feed length entered be less than the minimum limit set in this parameter, the diagnostic message "Feedlength Less Than minimum!" will appear in the display. Reenter a feed length within value limits.

5.7.8 Parameter B106: Feed Length Maximum Change During Cycle

```
Feed Max. Change
B106     1234.56
```

Units: Input Units

Decimal Places: See Parameter A100 (figure shown A100=02)

Limits: None

This parameter limits the amount the programmed feed length can change during an Automatic Mode cycle.

Should the difference in the old and the newly entered feed length be greater than the maximum limit set in this parameter, the diagnostic message "Change in Fdlgth Exceeds Limit!" will appear in the display. Reenter the new feed length correctly.

If this parameter is set to all zeros (0000.00) there is no software maximum change limit on a feed length entry.

5.7.9 Parameter B107: Feed Length Micro-Adjust Increment

```
Feed Increment
B107     0123.45
```

Units: Input Units

Decimal Places: See Parameter A100 (figure shown A100=02)

Upper Limit: B104 (feed length maximum limit)

This parameter specifies a length that will be added or subtracted from the feed length each time the **+** or **-** key is pressed - while the current feed length is displayed and the cursor is in home position. This parameter is designed to allow fine tuning of the feed length in both the standard feed length operation or when the Batching option is selected.

The micro-adjustment can be entered from the CLM keypad or from an SOT or other host option via the RS-232/422/485 serial interface port.

Refer to section 2.2 for procedures to perform the micro-adjust from the CLM control panel for axis 1 (and for axis 2 on the CLM-Z).

As an example, if the current feed length is 4.050 inches and Parameter B107 is set to the value of 0.005 inches, the feed length will increase by 0.005 each time the + key is pressed. Each change in the micro-adjustment is reflected in the CLM display. The "adjusted" feed length is automatically stored as the new feed length value.

The micro-adjustment feature is disabled when 0000.00 is entered and stored in this parameter.

5.7.10 Parameter B108: Jog Step Parameter

```
Jog Step
B108     0000.50
```

Unit: Input units

Decimal Places: See Parameter A100 (figure shown A100=02)

Limits: None

Use this parameter to set the incremental distance that will be fed with a jog forward or reverse input, when Jog Step Mode is set ON from the CLM control panel (or from SOT or other host via the serial interface port). If this parameter is set to zero, jog step operation is not allowed.

5.7.11 Parameter B109: Press Interface Mode

```
Press Interface
B109  01 1.0s 02
      A) B)   C)
```

A) Press interface mode:
00 = Press before feed
01 = Feed before press

B) Minimum cycle time in press intermittent mode
0.0 - 9.9 = time in seconds

C) Permit Press Timeout in Automatic Mode
00 = disable timeout fault
01 - 99 = timeout in minutes

Select one of the feed/press modes:

Input Value Limit: 00 or 01

Press Before Feed - At Cycle Start the CLM allows the press to complete a press cycle. At the end of that cycle, the CLM feeds the material into position. Once in position, the press cycle repeats. At Cycle Stop, the cycle will end at the completion of the feed.

Feed Before Press - At Cycle Start the CLM feeds the material until it is in position. Once the material is in position, the press begins the press cycle. At Cycle Stop, the cycle will end at the completion of the press cycle.

NOTES:

1. *Once the CLM detects a Cycle Stop, it must detect the high to low transition of the Feed Angle input before the final cycle is complete.*

2. *For more specific information, refer to section 3.2.5.1 and see the Cycle Timing Charts in Figures 3.4 through 3.7.*

Minimum cycle time:

Input Unit: seconds

Decimal Places: 1 (fixed), not affected by A100

Input Value Limit: 0.0 to 9.9

Set the minimum delay time from the start of a press cycle to the start of the next press cycle during Intermittent Mode operation. This setting is used primarily for press brake/clutch

protection. The user sets the minimum cycle time to minimize the duty cycle of the press brake/clutch assembly. This reduces brake/clutch overheating and premature failure.

Example Operating Conditions:
- Press cycle time and feed cycle time are equal to eight (8) seconds.
- Parameter B108 is set to nine (9) seconds.
- The press would delay for one second (at top of its stroke) before starting a new cycle.

NOTE: *Setting Minimum cycle time for 0.0 indicates no delay time is required.*

Permit Press Timeout:

Permit Press Timeout is set from 1 to 99 minutes.

The CLM issues a soft fault "Press Timeout Has Expired" if the press hasn't cycled (high-to-low Feed Angle transition) in the specified time period during an automatic mode cycle. After this fault is cleared, a resume input is required to continue the cycle.

If this fault is not desired, set the digits to 00.

5.7.12 Parameter B110: Roll Control

```
Roll Control
B110  01  1.2s
      A)  B)
```

This parameter selects the options for anti-backup and feed roll opening and closing.

A) Roll Control flag:

00 = Roll control is disabled. The CLM will never turn ON the roll control outputs and manual roll control is disabled.

01 = Roll control is enabled. Anti-backup rolls will be both automatically and manually controlled. Feed rolls may only be controlled manually. The CLM controls the roll lifting automatically in different modes of operation.

See Chapter 3, section 3.3.29-32 for information on manual control inputs, and section 3.4.29-32 for results of the manual and automatic control of the outputs.

B) Roll Delay Time:
Units: Seconds
Decimal Places: 1 (fixed), (not affected by Parameter A100)
Limits: 0.0 to 9.9

Specifies the delay between jog button activation (input high) and feed motion when changing direction in Manual and Setup Modes, the delay before a feed when changing direction using the Auxiliary Feed Length or Batching in Automatic Mode.

Refer to Chapter 4 for additional information on the roll control function.

5.7.13 Parameter B111: Batching Option

```
Batching Option
B111 1 1 G=111 0
     A B   CDE F
```

A) Count Mode
- 0 = Up
- 1 = Down

B) PBF Batch Complete
- 0 = Do not end on feed
- 1 = End on feed

C) Gagging Option Selection
- 0 = Gagging disabled
- *1 = Gagging enabled, display "GAG"
- *2 = Gagging enabled, display "AUX"

D) Gag Acknowledgment fault
- 0 = No fault
- *1 = Fault issued if gag not acknowledged

E) Shear Option
- 0 = Disabled
- 1 = Enabled

F) Binary/ BCD Starting Part Selection
- 0 = Disabled
- *1 = Binary Part selection
- *2 = BCD Part selection

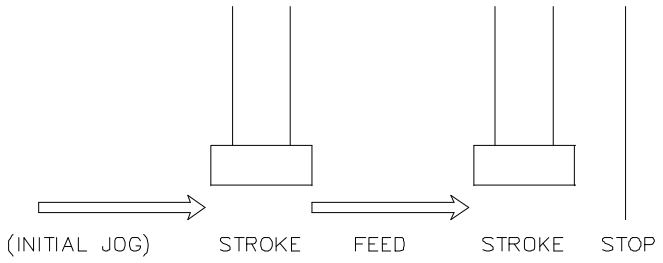
The selections marked with an asterisk (*) are available only if the expansion I-O board (CLM-01.3-R-E, CLM-01.3-Z-E) is present; otherwise a zero must be entered in these digits for the CLM to accept this parameter.

If using this batching option, the Interface Option Parameter B102 must be set for 02 (Batching). Otherwise, the values in this parameter are ignored.

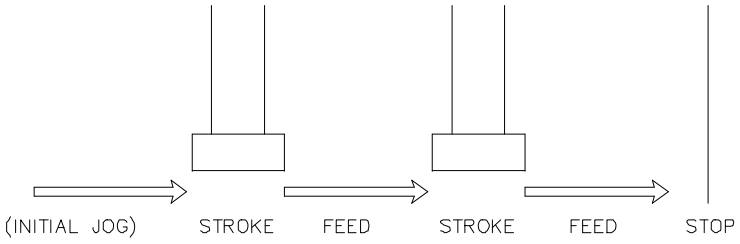
NOTE: *The following pages describe the entry options and procedures for this parameter. Refer to Chapter 4 for detailed information on the batching function.*

B111-A: Count Mode
This option allows the display of the number of parts created or parts remaining. It applies to both the current part count and the feed count. To count up from 1 to the selected quantity, enter a 0 in this digit. To count down from the quantity to 0, enter a 1.

B111-B: Press Before Feed/ Batch Complete
This digit specifies whether the last feed in a single part or sequence of parts is performed when Press Before Feed Operation is selected in the Press Interface Parameter. It does not apply to Feed Before Press operation. The following shows examples of press/feed cycle conditions.



PBF Batch Complete = 0 (end with press cycle)



PBF Batch Complete = 1 (end with feed cycle)

If PBF Batch Complete is set to 0, the batching program will end with a press cycle. The end of a program is indicated on the CLM display with the "A: Part Stop" status message. This option assumes that the first feed of the part executed at cycle start has been jogged into the machine. The feed count is incremented with each press stroke, resulting in the jogged-in material being counted as one feed. The press operator is responsible for jogging the material over the die to avoid a double hit of the press. The CLM will not inhibit a cycle start if the material is not jogged in.

If PBF Batch Complete is set to 1, the part program will end with a feed. The feed it ends with at a Part Stop state is the next feed to be executed. For example, if another part is jumped to and the part stop input is activated, the first feed of the next part will be performed at the end of the cycle. The machine is then ready for operation at the next cycle start without the danger of a double hit of the press.

B111-C: Gagging Option Selection *(Expansion I/O Required)*
To disable gagging, set this digit to 0. The gag program page and all gagging displays will disappear. Set the digit to 1 or 2 to enable gagging operation. Gag programming and displays are enabled. When '1' is entered, the displays will show "GAG" and "G#" to indicate that gagging is used. For other applications, a 2 may be entered in this digit to display "AUX" and "A#" for auxiliary outputs.

B111-D: Gag Acknowledgment Fault
If this digit is set to 1, an acknowledgment is required for each gag output at the corresponding gag input upon the next transition of the feed angle signal from low to high. The fault "Output was not Acknowledged" is issued if an acknowledgment is missing.

B111-E: Shear Option
To enable the shear option, set this digit to 1. GAG/AUX 99 selects a shear function with an optional press hold feature. Press hold can be toggled ON/OFF from the CLM control panel (section 2.2).

B111-F: Binary/BCD Starting Part Selection *(Expansion I/O Required)*
If this digit is set to 1 or 2, the starting part is selected through inputs 1-8 on the expansion input connector X12. A change in these inputs causes a new starting part to be selected. This option is useful for interfacing to a PLC or a decade switch.

To select binary operation, set the digit to 1. The inputs 1-7 on connector X12 correspond to powers of 2 from 0 to 6. To select BCD operation, set the digit to 2. The inputs 1-8 correspond to Binary Coded Decimal, where each set of 4 inputs is one decimal digit.

The Binary/BCD inputs are read when the cycle start is activated. If the part block number selected is greater than 99, the Minor Error "Invalid Part Selected" is issued. To clear this error, select a valid part and then press cycle start.

If the selection on the BCD/binary inputs has not changed since the last cycle start activation, the program will continue where it left off after the last cycle stop. If a zero is entered on these inputs, the program will reset to the last selected starting part number at feed 1.

5.7.14 Parameter B112: Registration / Measuring Wheel Selection

```
Registration/MW
B112 11 00 25.0%
     A) B) C)
```

A) 00 = Disable Measuring Wheel and Registration
01 = Registration: Continuous Position Correction Mode
02 = Registration: Averaging Position Correction
03 = Registration: Continuous Position Correction Mode, with Offset
10 = Measuring wheel is used to dynamically correct feed length variations during the feed
20 = (LZ) Same as 10, except that the correction is based on Axis 2 encoder
11 = Position loop closed on MW encoder when Feed Angle is high; closed on motor encoder when Feed Angle is low.
12 = Position loop is continuously closed on Meas. Wheel encoder.
21 = (LZ) same as 11, except that the position loop is closed on Axis 2
22 = (LZ) same as 12, except that the position loop is closed on Axis 2.

B) If A) = 01 or 03: Search velocity flag for continuous.
= 02: The number of samples for averaging.
= 10, 11, 12, 20, 21, or 22: Not used

C) If A) = 01 or 02: Reference mark search velocity
= 10,11,12, 20,21 or 22: Allowed deviation between measuring wheel and motor encoders (defined in percent of one motor revolution) before encoder fault occurs.

The Measuring Wheel function is active only in Auto and Setup modes; displays are active in all modes. The Axis Position and Total Length displays are updated with data from which ever encoder closes the position loop.

NOTE: *Position correction or measuring wheel (whichever one is selected in this parameter) must also be enabled (and can be disabled) with the Enable input (see Chapter 3, section 3.3.26).*

To enable measuring wheel operation, this parameter must be set for Axis 1 (or Axis 2 is an option for CLM-Z only). The Measuring Wheel Select input (see note above) must be high to enable Length Compensation in Automatic Mode.

Refer to Chapter 4 for information on the Registration function and the Measuring Wheel option.

The following provides a general description of the options.

- 00 = Disable Measuring Wheel and Registration - All related inputs, outputs and displays are disabled.

- 01 = Continuous Position Correction Mode - As a programmed length is being fed, the reference mark is ignored or locked out until the distance remaining in the feed is less than the leading distance set in Parameter B113. The CLM then searches for the mark at the search velocity specified in this parameter (B112) or at the current velocity. The search window is defined by the leading distance (B113) and the trailing distance (length after the expected position of the mark, the entered feed length target) set in Parameter B114.

- 02 = Averaging - After a specified number (*n*) of feeds (set in this parameter) have been completed, the next *n* feeds are adjusted to compensate for the deviation of the n^{th} feed from the n^{th} reference mark (the average difference found between the length between marks and the entered feed length).

- 03 = Continuous Position Correction with Offset Mode - This mode works the same as continuous, except an offset distance can be programmed on-line. This mode can shift the point where the mark is expected (along with the leading/trailing search window) to any point in the feed length. The axis will feed the offset distance from where the mark is found. Change the offset distance on-line to compensate for variations in the mark position, without interrupting production.

- 10 = Measuring Wheel, Axis 1 - When enabled by this parameter and an input, the axis 1 feed length is continuously corrected during the feed, based on the difference between axis 1 and the MW encoder. A measuring wheel riding on the material can provide a more accurate position of the material fed if material slips in rollers, system has loose gear lash, etc.

- 11 = Measuring Wheel, Axis 1 - When the Feed Angle is high, the feed length is measured from the MW encoder. When the Feed Angle is low, the motor encoder is used to hold position.

- 12 = Measuring Wheel, Axis 1 - The MW encoder is used continuously to measure feed length and hold position.

  Measuring wheel also requires entry in Parameters B116 and B117.

- 20 = Measuring Wheel, Axis 2 - Same as mode 10, except the Axis 2 feed length correction is based on the Measuring Wheel encoder.

- 21 = Measuring Wheel, Axis 2 - (LZ) Same as mode 11, except that the position loop is closed on Axis 2

- 22 = Measuring Wheel, Axis 2 - (LZ) Same as mode 12, except that the position loop is closed on Axis 2

NOTE: *In all Measuring Wheel modes, deviation between motor encoder and MW encoder is always monitored in setup and automatic mode.*

Reference Mark Search Velocity/Flag:
This is the velocity at which the jog to reference mark moves during alignment in Manual Mode.

For Continuous Position Correction, this velocity is also used for the reference mark search (within the search window set in parameters B113/114) in Automatic Mode. The search feed velocity will decelerate to zero when the rising edge of the reference mark is seen.

If the search velocity flag is set to "00" - the axis will remain at the programmed feed rate. If the search velocity flag is set to other than "00" - the axis will decelerate to the search velocity entered in this parameter. The Search Velocity is entered as a percentage of the Maximum Feed Rate (Parameter A104). Select a value small enough to accurately detect the reference mark; typically this entry is no greater than 10.0%.

Number of Samples for Averaging:
This number is used only for Averaging Position Correction. This setting determines the number of feeds that will be used to compute the average feed length. Each feed will be corrected based on the deviation of the n^{th} feed from the nearest reference mark.

5.7.15 Parameter B113: Leading Length of Search Window for Registration

```
Leading Length
B113   0001.23
```

Units: Input Units

Decimal Places: See Parameter A100 (figure shown A100=02)

Input Value Limits: None

This parameter selects the first part of the reference mark search for Averaging or Continuous Position Correction (see Parameter B112). This is called the "Leading" distance because it is the distance before the expected position of the reference mark (before the end of the feed).

The Leading distance is the distance from the end of each feed where the reference mark search begins. If it is set to zero, the search begins at the start of the next feed. If the Leading and Trailing (B114) distances overlap, the Trailing distance takes priority.

The leading and trailing distances are used to select a search window. The search window is set to insure the CLM does not mistake other printing for the reference mark. When the feed position is not in this window, the reference mark is Locked Out or not scanned for. The Lockout distance varies with the feed length, while the leading and trailing distances remain the same.

Refer to Chapter 4 for additional information on the Registration function.

5.7.16 Parameter B114: Trailing Length of Search Window for Registration

```
Trailing Length
B114    0001.23
```

Units: Input Units

Decimal Places: See Parameter A100 (figure shown A100=02)

Input Value Limits: None

This parameter selects the second part of the reference mark search window for Averaging and Continuous Position Correction (see Parameter B112). This is called the "Trailing" distance as this is the distance after the expected position of the reference mark (after the end of the feed cycle). The Search window is described in Parameter B113.

For Averaging Position Correction, the Trailing distance is defined from the start of the current feed. After this distance is fed, the Lockout distance begins. The mark is locked out at the beginning of the first feed after Cycle Stop and remains in this condition until the first leading distance begins. The Missed Mark counter increments if a mark is not detected during the entire search window.

Refer to Chapter 4 for additional information on the Registration function.

5.7.17 Parameter B115: Missed Marks Limit/Max. Correction per Feed

```
Miss Lmt/Max Cor
B115 010 000.500
     A)  B)
```

A) Limit for Consecutive Missed Marks

Missed Marks Allowed:

001-999=Number of marks

000=Disable fault

Whenever a reference mark is missed, the Missed Mark counter increments. The current value of the missed mark counter is displayed in the Registration Display (see section 2.2). The counter is cleared to zero when a mark is found.

This part of this parameter sets the limit of consecutive missed marks allowed before a soft fault "Too Many Ref. Marks Missed" is issued. If this parameter is set to zero, this fault will never be issued, however the counter will continue to increment to 999. It remains at 999 until the mark is found or reinitialized.

B) Maximum Position Correction per Feed Averaging

Units: Input Units

Decimal Places: See Parameter A100 (figure shown A100=02)

Limits: None
If zero, Maximum Position Correction is disabled

This parameter is used to limit the amount of correction per feed during Averaging Position Correction (see Parameter B112). This maximum correction value is added to or subtracted from each feed as long as the correction needed for the measured deviation is greater than this parameter.

5.7.18 Parameter B116: Measuring Wheel Feed Constant

```
M.W. Feed Const.
B116   0012.3456
```

Units: Input units per measure wheel revolution

Input Value Limits: from 00000100 to 10000000 (regardless of decimal pos.)

Decimal Places: A100 + 1 (figure shown A100=02)

This parameter scales input units to measure wheel revolutions. Refer to Parameters B112 and B117 for additional entries required for use of the measuring wheel.

5.7.19 Parameter B117: Measuring Wheel Encoder

```
M.W. Encoder
B117 L=1250 D=0
```

L = Measuring wheel encoder lines/revolution (from data plate on encoder)

Units: Encoder Lines per Revolution

Input Value Limits: from 0100 to 5000

D = Measuring wheel encoder direction
0 = Direction as wired
1 = Reverse direction - as a convenience, in place of reversing the wiring for direction

5.7.20 Parameter B118: Serial Interface

```
Serial Interface
B118 M=1 S=00 00
       A)  B) C)
```

A) Serial Interface Mode
0 = Serial port off
1 = RS-232/RS-422 (full duplex) communication with PC or other external host device
2 = Communication with a single SOT via RS-232/485 (half duplex)
3 = Operation with Indramat SOT via RS-485 Bus (half duplex), station 01 through 15

B) Station number
If M = 1: All stored data is acknowledged with "Y <cr><lf>" if S = 10
If M = 2: S values are ignored
If M = 3: Enter the Station number of the CLM on the RS-485 bus; assign a different number for each CLM on the bus (01 through 15)

C) Not used

Select the mode of communication required to interface the CLM control to a host device. Also select the communication requirements from the operation parameter (B119).

Refer to Chapter 4 for additional information on the RS-232/422/485 Interface operation and communication requirements.

5.7.21 Parameter B119: Serial Port Operation

```
Serial Operation
B119 1920 8 1 00
     A    B C DE
```

A) Baud Rate: 19200 [enter 1920], 9600, 4800, 2400, 1200, 0600, or 0300
B) # of Data Bits: 8, 7
C) # of Stop Bits: 1, 1.5 [enter 3], or 2
D) Parity
   0=none
   1=odd
   2=even
E) Flow Control / Checksum
   0=Software (XON/XOFF) Handshake with Checksum
   1=Software and Hardware (RTS/CTS) Handshake with Checksum
   2=Software Handshaking with no Checksum
   3=Software and Hardware Handshake with no Checksum

Enter the data required for proper transmission between the CLM and a host device. Select the mode of communication in Parameter B118. Refer to Chapter 4 for additional information on the RS-232/422/485 Interface operation and communication requirements.

When interfaced to the SOT, the values required for this parameter are: 1920, 8, 1, 0 0. When the interface option Parameter B102 is set for the IDS, the port is automatically configured to work with the IDS board. This serial interface parameter is then ignored.

5.7.22 Parameter B120: Analog Override

```
Analog Override
B120 M=1 2 0 #2
       A B C  D
```

A) Override Mode:
   0 = Override off
   1 = Override by analog input
B) Override Active in Modes:
   0 = Manual and Setup only
   1 = Automatic only
   2 = Auto, Manual and Setup
C) Override Update in Automatic and Setup modes:

0 = Continuously update velocity every 4 ms
1 = Update velocity only before each feed

D) Analog input filter constant

If override is set OFF (M=0), the analog input AE1 has no effect on the programmed or jog feed rate.

Override in Manual and Setup Modes - the feed rate override is based on the jog feed rate (Parameter A105).

Override in Manual and Setup Modes only or in all three modes (set to 0 or 2) - use a potentiometer, switch, or feedback device to select the jogging velocity from 5% to 100% of Parameter A105. In Manual Mode, the feed rate may be changed during a jog, which allows "creeping up" to a point by reducing the velocity on AE1. The search velocity for registration is not affected by the override. In Setup Mode the velocity is continuously updated if the 3rd digit is set to 0. Otherwise, the velocity is updated at the start of each feed.

Override in Automatic Mode (set to 1 or 2) - the programmed (via IDS, batching, or standard entry) feed rate is used as the upper limit for override. For example, if the feed rate entered from the CLM keypad is 80.0% of the maximum feed rate and 2.5V is applied to AE1, the programmed velocity will be 20.0%. The velocity is continuously updated if the Update digit is set to zero. Otherwise, the velocity is overridden only at the start of each feed.

Override Operation - in any mode, the feed rate is multiplied by a percent of 10V that is read from analog input AE1 (Pins 11 and 12 on connector X5). A potentiometer may be connected as shown in Figure 5.4 to override the velocity from 5% (0V to +0.5V) to 100% (10.0V). A switch may be used to select fixed feed rates. Other applications that require control of feed time based on an external process may use a feedback device to control the velocity.

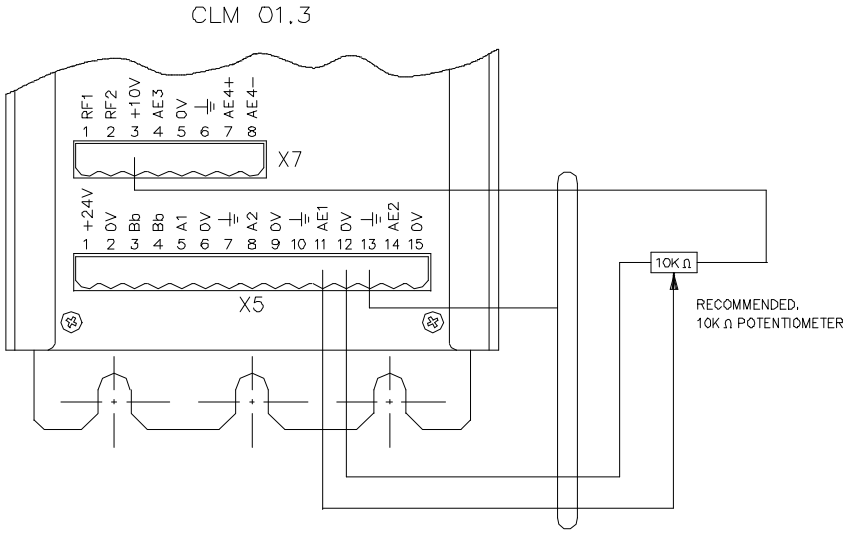


Figure 5.4 Connecting a Potentiometer for Feed Rate Override

Analog Input Filter

To reduce the effects that electrical noise and voltage switching have on the programmed feed rate, the fourth digit in Parameter B120 can be used to filter the analog input values. A value is selected to average up to 2048 analog input readings. The update time for the analog inputs is shown in the following table.

Table 5-4 Analog input filter values

Digit Value	Update time	Values for Average
0	4 ms	1
1	32 ms	8
2	64 ms	16
3	128 ms	32
4	256 ms	64
5	512 ms	128
6	1.02 s	256
7	2.05 s	512
8	4.10 s	1024
9	8.19 s	2048

If the digit is set to zero, the current analog input value will always be used. For a more consistent feed rate, but slower update time, a higher value should be entered in this parameter. A value between 2 and 7 is usually sufficient for a smooth velocity transition when using a potentiometer or a switch. When using the analog input for feedback from an external device, the digit value should be lower for quicker response.

NOTE: *The override for the CLM-Z version works the same as it does for CLM-R, except that AE1 will override the programmed velocity for both axes. If the keypad-programmed velocities for each axis are different, they will be overridden by the same override factor.*

5.7.23 Parameter B121: Loop Control Enable on CLM-R

```
Loop Control
B121 M=1 E=1 T=1
      A)  B) C)
```

A) Loop Control Mode
- 0 = Disable loop control. The Axis 2 Parameter set is disabled.
- 1 = Loop Control with feeder as master and Axis 2 average velocity output based on feeder throughput. Axis 2 Parameters are enabled; enter data into Parameters A200 through A204.
- 2 = The feeder is a slave to the loop, using the Run Loop input. Analog override must be enabled in Parameter B120.

B) Loop Data Edit Enable
- 0 = Disable editing of Loop Correction data.
- 1 = Enable editing of Loop Correction data.

C) Tail Out Enable (Requires Expansion I/O Hardware Option)

0 = Disabled
1 = Enabled (Requires M = 1)

Refer to Chapter 4 for additional information on using axis 2 of the CLM-R for the Material Loop Control function. This option is not available for the CLM-Z.

5.7.24 Parameter B121: Axis Enable on CLM-Z

```
Axis Enable
B121    01
```

00 = Both axis 1 and axis 2 are enabled
01 = Axis 1 enabled
02 = Axis 2 enabled

Enter parameter data for the enabled axis or axes. Also select an enabled axis by input to accept motion commands (see sections 3.3.11 and 3.3.12).

5.7.25 Parameter B122: Slug Width Compensation

```
Slug Width Cmp
B122   000.050
```

A)

A) 000.000 = No Slug Width Compensation will be added to feed.
000.050 = Every feed in Automatic and Setup mode will have 000.050 (inches, mm, etc.) added. For example, if the commanded feed length is 10.000 inches, the actual length fed will be 10.050 inches. This will be shown on the Axis Position Dist display, as well as the Total Length and MW display.

NOTE: *(LZ software): Slug width can be enabled only on Axis 1. If only Axis 2 is enabled, slug width compensation cannot be used.*

CHAPTER 6. INSTALLATION

This Chapter covers the installation of the CLM control system. The system consists of the following components:

The CLM Control Module

The Servo Amplifier(s)

The Power Supply

The Servomotor(s)

The installation instructions in this chapter are directed primarily at the CLM Control Module. The installation particulars of the other components are explained in detail in their respective manuals. Appendix B list relevant publications which you may require.

Tools required:

- A small 1/8" blade, standard screwdriver
- A multi-meter (VOM meter)
- An appropriate wrench for 1/4" machine type bolts (use for mounting module[s] to cabinet).

6.1 Unpacking / Parts Inventory

The CLM system is shipped in reinforced cardboard cartons and is sufficiently packed to withstand normal shipping activity. Upon receiving equipment, inspect shipping carton for any evidence of external damage (i.e., ripped or punctured carton, water marks, etc.). Should carton show any signs of damage, immediately inspect contents and contact carrier for damage claim if necessary.

Open cartons and remove the Styrofoam and bubble packing material from around the equipment. Remove the equipment and place on a firm level surface.

The CLM carton contains the following items:

G The CLM module

G CLM cable set which contains:
  - 1 Input cable
  - 1 Output cable
  - 1 Encoder cable

G CLM Electrical Accessory Kit (E-5 CLM) which contains:
  - 15 pin Phoenix connector (X5)
  - Wire tie wraps

- 7 pin Phoenix connector (X7)

CLM optional equipment includes:

G Remote Keypad - accessories include:
  - Remote keypad extension cable (typically 2 meters)
  - 2 dual side adhesive foam gaskets for keypad
  - A dummy CLM face plate

G Station Operator Terminal (SOT) - accessories include:
  - A communications cable
  - A parallel outputs cable

G IDS Assembly - with Electrical accessory kit that contains:
  - A 5 pin Phoenix connector
  - A serial interface cable with a RS-232 connector at one end and Ferrule connectors on the other.
  - Refer to Appendix E for electrical connector information.

G Remote Vacuum Florescent Tube Display - (available with IDS only) accessories include:
  - Gasket and clip assembly
  - Refer to Appendix E for electrical connector information.

G CLM Expansion Input/Output - (hardware version includes a -E, CLM-01.3-R-E or CLM-01.3-Z-E) accessories include:
  - I/O cables

6.2 Mounting Cabinet

The CLM and its associated modules are designed for cabinet mounting. It is recommended the CLM be mounted in a cabinet, side by side with the Amplifier and Power Supply modules (see Figure 6.1). The enclosure should be sufficient to protect the equipment from contaminants, such as water, oil, etc. Indramat recommends a NEMA 4 or 12 enclosure or equivalent.

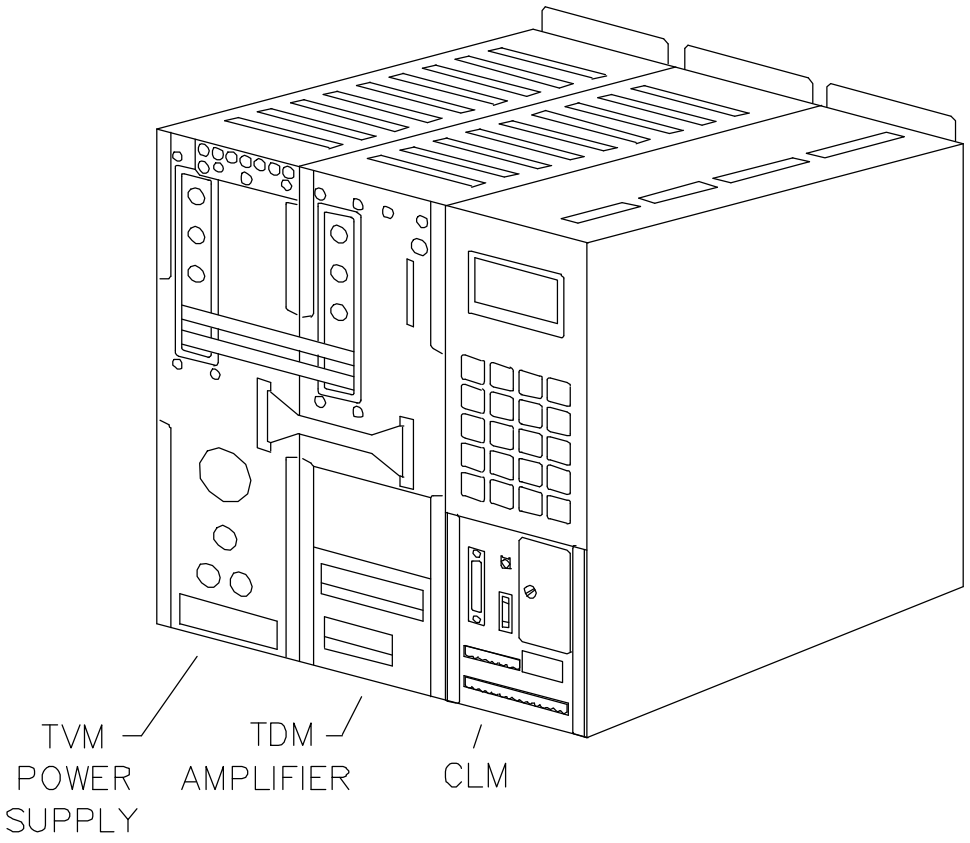


Figure 6.1 CLM System

6.3 Power

The CLM requires 24 Vdc to operate. This voltage is supplied from the TVM (KDV) or from an external 24 Vdc supply. Refer to section 1.6.2 for power specifications for the CLM and its options. Refer to separate manuals (listed in Appendix B) for power requirements of the other modules (power supply, servo amplifier, etc.).

6.4 Cable Routing

For higher reliability, the feedback cables must be shielded and routed away from high voltage power sources to reduce electrical noise.

Do not route the CLM cables near high amperage type machines, like welding equipment, which produce strong magnetic field interference.

Suppress inductive loads (such as solenoids and motors) that are switched ON and OFF during CLM operation, with R-C networks (AC) or diodes (DC).

Correct grounding is essential for trouble-free operation. Make the ground connection, strictly observing the branching conditions shown in the wiring diagram.

6.5 Transformer - Heat Dissipation

The incoming 3-phase power must be ground reference. Use an isolation transformer with a "Y" secondary if this cannot be confirmed. Refer to the TVM/KDM (or appropriate) manual for additional information.

If a transformer is needed for operation, exercise caution on its location. Do not install the transformer in the same cabinet as the CLM modules unless a sufficient method of cooling is applied.

6.6 Hardware Installation

The CLM and its supporting modules mount to the back wall of the equipment enclosure (cabinet). The mounting brackets of the modules are per-drilled to accept a 1/4" machine bolt.

See Appendix E for mounting hole dimensions and location of the CLM module, the cut-out dimensions for the remote keypad, keypad gasket, and keypad replacement panel (dummy face plate) and mounting holes and cut-out dimensions for the optional IDS and remote display.

The mounting dimensions and cabinet cut-out data for the TVM (KDV), TDM (KDS) and the SOT are located in the units respective support manuals.

The method of mounting the MAC servomotor is dependent upon the application. Additional information and a drawing package for the MAC servomotor is available on request from Indramat.

6.7 Electrical Installation

There are many variations of wiring techniques used to connect the CLM to the machine builder's equipment. The Interconnect Drawings supplied with this manual (see Appendix D) show an example of the CLM connections to a typical metalforming machine.

6.8 CLM Connectors

This section describes all the connectors on the CLM module. Refer to Figure 1.5 and Figure 1.6 in Chapter 1, or Appendix E for an illustration of the CLM module and its connector locations.

X1: Encoder Input Axis 1

Female, Db 25 connector is located on the top of the CLM and used for inputs from the respective encoder assembly for axis 1 (from servo or measuring wheel encoder).

X2: Encoder Input Axis 2

Connector is not used with the CLM-01.3-R.

With the CLM-01.3-Z only - Female, Db 25 connector is located on the top of the CLM and used for inputs from the respective encoder assembly for axis 2.

X3: System Input

Male, Db37 connector is located on the top of the CLM and used for inputs from various locations of the system (see Section 3.3, Input Signal Descriptions).

X4: System Output

Female, Db37 connector is located on the top of the CLM and used for various outputs (see Section 3.4, Output Signal Descriptions).

X5: Drive Connector

A 15 pin Phoenix connector is located on the lower front panel of the CLM. This is a multi-functional connector.

The various contacts of X5 are:

24 Vdc Power Supply	-	pins 1 & 2	
Bb motor Contacts	-	pins 3 & 4	
Analog Command Axis #1	-	pins 5 & 6	
Analog Command Axis #2	-	pins 8 & 9	(optional for CLM-Z, or -R Loop Control)
Ground	-	pins 7 & 10	(not used, see following note)
Analog Input	-	pins 11 & 12	(optional)

NOTE: *To prevent a ground loop condition, connect the ground to the servo amplifier only.*

X6: RS-232/422/485 Communications Port (Interface)

Female, Db 25 connector is located on the lower front panel of the CLM. It is used for serial communication between the CLM and a host terminal, SOT or the IDS option. Refer to Chapter 4 for description of this multi-functional, two-way communications port.

X7: Auxiliary Drive Connector

An 8 pin Phoenix connector is located above the X5 connector on the lower front panel of the CLM. See Figure 2.3 for an illustration and description of the lower front connector panel.

The various contacts of X7 are:

pin 1	RF1	Enables Axis 1 Amplifier for operation (same as X4, pin 4, use either)
pin 2	RF2	Enables Axis 2 Amplifier for operation (same as X4, pin 7, use either)
pin 3	+10 Vdc	Potentiometer or switch supply for Analog Override
pin 4	AE3	Pins 4-8 are Not used on this version CLM
pin 5	0 Vdc	
pin 6	Com	
pin 7	AE4 (+)	
pin 8	AE4 (-)	

6.9 Pre-Operation Test

This section covers the power - up and manual test of the CLM.

NOTE: *It is recommended not to mechanically connect the servomotor to the load until after this initial testing and verification of system operation.*

1. Verify all wires and connectors are correct, as illustrated in Appendix D or as modified for your specific application.

2. Power up the CLM.

3. Disconnect the X5 connector. Verify +24 Vdc is present at pin 1 and 0 Vdc at pin 2 of the cable from the Power Supply (TVM).

4. If voltage and polarity are correct, power down and reconnect the cable to X5. Power up the CLM again.

5. Enter the Parameters into the CLM as required for your application (see Chapter 5). Note that the minimum required parameters, as entered for factory testing, will allow the unit to function in this test.

6. Select the Manual Mode and press the forward or reverse jog button. If jog motion occurs, installation is complete.

7. If jog motion fails to occur, re-check all connections and parameter settings. Run test with procedures outlined in Chapter 7 for a typical start-up.

6.10 IDS Assembly

The Input Decade Switch (IDS) assembly is described in Chapter 1, section 1.3. The IDS is typically mounted to the user's cabinet or control console. Refer to Appendix E for the IDS specifications.

6.11 Remote Display

Systems with the IDS unit, may employ a second additional device; the remote florescent display. This display is only available when the IDS option is selected. It is described in Chapter 1, section 1.3. The Remote Display is typically mounted to the user's cabinet or control console. Refer to Appendix E for mounting specifications and wiring connections.

Inside the Remote Display are various switches used to properly match the display communication to the user's system. These switches are properly set at the factory to communicate with the CLM with the IDS option. If use of this display makes it necessary to change these switches, the procedure is as follows:

1. Remove the 4 screws (2 per side) from the display case and remove cover.
2. Place display face down so that switches (one 10 position dip switch for protocol, and 2 select switches for addressing) are accessible.
3. Make desired switch changes and test display. If correct, replace cover and 4 screws.

Refer to Appendix E for additional information on switch settings.

6.12 Station Operator Terminal (SOT)

The SOT is described in Chapter 1, section 1.3. Refer to the SOT Supplement User's Guide included with this manual for further information on operation and installation procedures. Refer to Chapter 4 for specific information on the serial interface communications requirements.

CHAPTER 7. START-UP

This chapter provides an example of procedures required for a CLM-01.3-R Start-up. This example is for a single axis (feed to length) application. Similar procedures are used for the CLM-01.3-Z, for its axis 1 and 2.

WARNING: *The information given in this chapter may not be suitable for a specific application. If you use this example for testing, do not mechanically connect the servomotor to the actual load.*

This chapter refers to the drawings in the Appendixes. Appendix D illustrates typical interconnect wiring between the CLM and external devices. Appendix E illustrates the CLM connector layout and connection information for optional devices (IDS, Remote Display, etc.).

7.1 Connections

NOTE: *Do NOT apply power until all connections have been made.*

1. Install the TVM (or KDV) power supply and the TDM (or KDS) amplifier per their respective support manuals.
2. Make connection to the CLM Drive Connectors X5 and X7.
3. Make the motor connections per drawings in Appendix D, and the TDM and motor support manuals.
4. Connect the encoder to X1 (and X2 for CLM-Z) from servomotor or measuring wheel.
5. If applicable, connect the SOT or the IDS and Remote Display (see Appendix) to the serial interface port.

7.2 Inputs

The connections in this example are minimized for the sake of simplicity (see Figure 7.1). Refer to the interconnect drawings in Appendix D for any additional details. Connect the incoming side of each switch to a +24 Vdc signal.

1. Connect a 3-position selector switch to provide a +24 Vdc signal to Pin 2 (Automatic Mode input) and Pin 13 (Setup Mode input). The third position is not wired (0 Vdc), and is used for Manual Mode (default mode). Connect a key switch to provide +24 Vdc to Pin 1 (Parameter Mode input).

2. Connect a Normally Closed pushbutton switch to Pin 3 ($\overline{\text{EMERGENCY STOP}}$) of the System Input Connector X3.

3. Connect a Normally Open momentary switch to Pin 4 (Cycle Start) of connector X3.

4. Connect the Bb Contact of the drive amplifier to Pin 6 (Axis #1 Amplifier Ready) of connector X3.

5. Connect a Normally Open momentary switch to Pin 9 (Jog Forward) of connector X3..

6. Connect a Normally Open momentary switch to Pin 10 (Jog Reverse) of connector X3.

7. Connect a Normally Closed momentary switch to Pin 14 ($\overline{\text{CYCLE STOP}}$) of connector X3.

8. Connect a Normally Open momentary switch to Pin 17 (Feed Angle) of connector X3.

9. Connect Pin 18 of connector X3 (for Press Continuous mode) to a +24 Vdc power source.

10. Connect a Normally Open momentary switch to Pin 5 (Resume Cycle) of connector X3.

11. Connect Pin 15 ($\overline{\text{MOTOR OVERTEMPERATURE}}$) to a +24 Vdc power source. For final wiring, note that this circuit normally passes through the TAS of an Indramat MAC motor.

12. Connect Pin 19 of connector X3 ($\overline{\text{FEED INTERRUPT}}$) to a +24 Vdc power source.

7.3 Outputs

The output for Axis #1 Amplifier Enable (Systems Output Connector X4 - Pin 4, or Auxiliary Drive Connector X7 - Pin 1) must be connected to the Drive (see the interconnect drawings in Appendix D).

7.4 Power-up

The system can now be powered up. All voltages should be checked by a qualified electrician to ensure proper signals and connections.

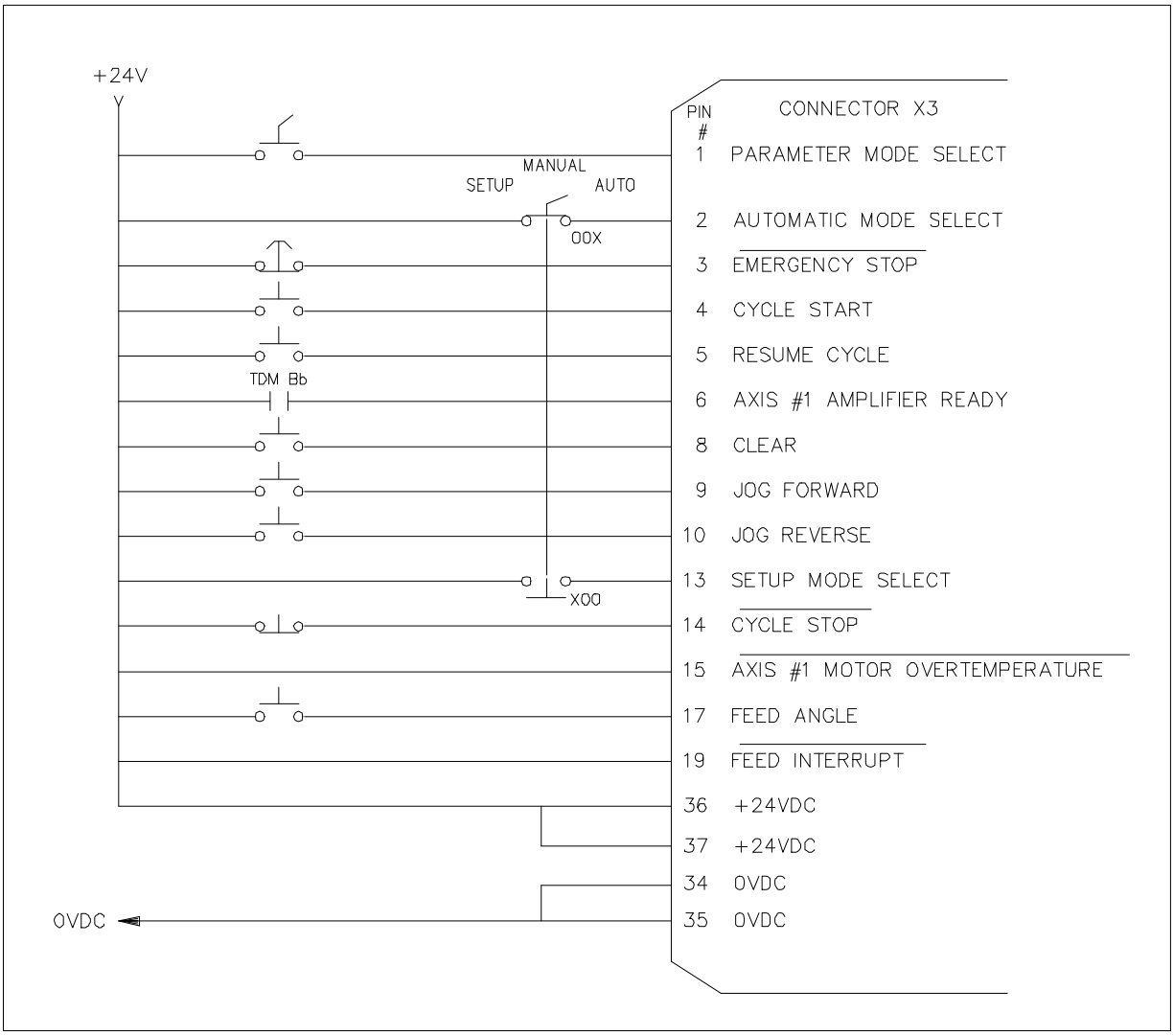


Figure 7.1 Example Input Diagram

7.5 Parameter Entry

The parameters given here are the minimum required to operate the CLM for this example. Turn the key switch to the Parameter Mode and enter the following parameters (see Chapter 5 for procedures):

A100	Feed Length Resolution	03
A101	Feed Constant	0001.0000
A102	Drive Input Sensitivity (use drive personality module value)	03000/10.0V
A103	Encoder Lines (use value shown on servomotor name plate)	1250
A104	Maximum Feed Rate	001500.00
A105	Jog Feed Rate	000300.00
A106	Maximum Acceleration Rate	000100.00
A107	Maximum Deceleration Rate	000000.00
A108	Maximum Allowable Jerk	000000.00
A109	Position Gain (KV)	03.00
A110	In-Position Threshold	00.0100
A111	Direction of Operation	Enc=0 Cmd=0
A112	Monitor Window for Drive Diagnostics	10%
B102	Interface Option	00 (or 01 for IDS)
B104	Feed Length Max Limit	000.000
B109	Press Interface Mode	01

7.6 Axis Jogging In Manual Mode

NOTE: *Verify Drive is ON.*

To verify proper motor hook-up, and control of the motor, jog the axis in Manual Mode. Turn the selector switches to the OFF position so that Automatic, Setup and Parameter Mode inputs are not high (selects Manual Mode).

1. Press the Forward Jog pushbutton (connected to X3, Pin 9). The axis should jog in the forward direction.

2. Press the Reverse Jog pushbutton (connected to X3, Pin 10). The axis should jog in the reverse direction.

3. Should either the forward or reverse motor movement fail to react, check all cable connections and verify the CLM is in Manual Mode.

7.7 Automatic Operation

To check Automatic Mode operation:

1. Turn the selector switch to Automatic Mode (wired to connector X3, Pin 2).

2. Press the Cycle Start pushbutton (connected to X3, Pin 4)

NOTE: *The CLM should follow the feed length and velocity settings entered from CLM keypad (with Parameter B102 set to 00) or the decade switches on the IDS (if connected, and Parameter B102 set to 01).*

3. Manually activate the Feed Angle switch (pushbutton connected to X3, Pin 17) each cycle, to simulate the ram movement and allow the next feed cycle.

4. Press the Cycle Stop pushbutton to stop operation. The cycle stops after a feed in "Press Before Feed Mode" or after the feed angle signal input in "Feed Before Press Mode" (the latter was selected for Parameter B109 in section 7.5).

CHAPTER 8. DIAGNOSTICS AND TROUBLESHOOTING

This chapter describes the diagnostic messages that are issued and displayed by the CLM, and suggests troubleshooting procedures or recommended actions for each display. These messages provide the user with information on faults, hardware status, and operational status of the system. When needed, request assistance from Indramat (section 1.1.2).

8.1 Status / Diagnostic Display Alphabetical Index

This section is an alphabetical index listing of the CLM diagnostic message displays. It provides a quick reference for locating and identifying displays in question. Following sections describe the meaning and recommended action for each display.

Note that when using the SOT or other host, the diagnostics may be requested through the serial interface port in full text format or as a corresponding diagnostic number. The following index lists the displays in alphabetical order. A similar index in section 8.7 of this chapter correlates the displays in order of the numeric, diagnostic code equivalents.

When using the IDS, its two digit display will show numeric codes for diagnostic messages. The code list index for the IDS is in section 8.8 of this chapter.

CLM Display ..... Page

A: C.Stop Active 8-25

A: Cycle Delay 8-24

A: Cycle Stop 8-23

A: Feeding 8-24

A: No Cycle Start 8-23

A: No Loop Auto 8-26

A: No Run Loop Input 8-26

A: P.Stop Active 8-25

A: Part Stop 8-26

A: Resume Active 8-25

A: Resume Req'd 8-24

CLM Display ..... Page

A: Roll Delay 8-24

A: Start Active 8-25

A: Tail Out Resume 8-27

A: Wait Fd Angle 8-24

A: Waiting for Shear 8-26

A: Waiting Press 8-24

Aux Feedlength is Zero! 8-14

Axis 1 Drive Runaway! 8-8

CLM Display ..... Page

Axis 1
Drive Stalled! 8-8

Axis 1 Amplifier
Hardware Fault! 8-9

Axis 1 Amplifier
Is Not Ready! 8-18

Axis 1 Has Not
Reached Position 8-18

Axis 1 Motor
Has Overheated 8-9

Axis 1 Required
for Registration 8-21

Axis 2
Drive Runaway! 8-8

Axis 2
Drive Stalled! 8-8

Axis 2 Amplifier
Hardware Fault! 8-9

Axis 2 Amplifier
Is Not Ready! 8-18

Axis 2 Has Not
Reached Position 8-18

Axis 2 is Interrupted! ...8-15

Axis 2 Motor
Has Overheated! 8-9

Axis has Changed
During Jog 8-20

Axis has Changed
During Cycle! 8-14

Batching Program
was Lost! 8-15

CLM Display..... Page

Battery is Low!
Replace it Soon 8-14

Both Jogs High 8-22

Change in Fdlgth
Exceeds Limit 8-19

CLM PARAMETER MODE 8-21

CLM System
Power Loss! 8-10

CLM SYSTEM ERROR
Code #HRD00 8-6

CLM SYSTEM ERROR
Code #MNR00 8-16

CLM SYSTEM ERROR
Code #SFT00 8-10

CLM SYSTEM ERROR
Code #UPRG02 8-10

CLM SYSTEM ERROR
Code #FLPM0001 8-10

CLM SYSTEM ERROR
Code #FLPM0002 8-10

CLM SYSTEM ERROR
Code #FLPM0003 8-6

CLM SYSTEM ERROR
Code #FXPM0001 8-6

CLM SYSTEM ERROR
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CLM SYSTEM ERROR
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8.2 Diagnostic Display Categories

The faults, errors and diagnostic status messages are separated into four (4) categories:

1. Hard Fault
2. Soft Fault
3. Minor Errors
4. Status Messages

8.2.1 Hard Fault

A hard fault is the indication of a condition that could result in damage to equipment or harm to personnel. It halts all machine operation by dropping the 3-phase power to the motor (single phase on some motors).

The motor is generally stopped as soon as possible, by regenerative braking. At the occurrence of a Hard Fault, the system zeroes out all reference to position. Material in the machine is typically scrapped. The CLM system must be restarted after the fault is corrected.

Upon the detection of a hard fault, or the loss of the EMERGENCY STOPinput (causing a hard fault), the following occurs:

- The E-Stop chain is broken
- The 3-phase power is dropped (drive stops)
- All outputs are switched off (except "System Fault" indicator)
- A diagnostic fault message is issued (displays)

To clear a hard fault:

1. Determine and correct the fault causing condition.
2. Initiate the Clear input (from the user control panel), or the CL key (on the CLM keypad), to initialize the control (the CLM will verify inputs, parameter data, etc. and will clear the fault status and diagnostic message).
3. Restart the CLM control system.

8.2.2 Soft Fault

A soft fault is an indication of a condition that is inhibiting normal operation of the system.

At the occurrence of a soft fault, the following occurs:

- If feeding, the axis decelerates to a stop (the CLM commands zero velocity, axis decelerates at the rate set in parameter for deceleration)
- Outputs remain in the last state they were in (high or low) at the moment of fault detection
- Position value of the axis is maintained by the CLM (remembers position within feed)
- The appropriate fault diagnostic message is issued (displays)

To clear a soft fault:

1. Determine and correct the fault causing condition.
2. Initiate the Clear input, or the CL key, to clear the fault status and diagnostic message.
3. If in Auto Mode and "A: Resume Req'd" is displayed, press Resume Cycle to continue automatic operation. Some faults are issued after the CLM stops the cycle.

8.2.3 Minor Errors

Minor Errors are messages which indicate that a condition required to continue has not been met.

Upon the detection of a Minor Error the following occurs:

- If feeding, the axis decelerates to a stop (the CLM commands zero velocity, axis decelerates at the rate set in parameter for deceleration)
- Outputs remain in the last state they were in (high or low) at moment of error detection
- Position value of the axis is maintained by the CLM (remembers position within feed)
- The appropriate error diagnostic message is issued (displays)

A Minor Error is automatically cleared when the error condition is corrected.

WARNING: *Once the Minor Error condition* FEED INTERRUPT *is corrected, the CLM immediately returns to operation. A Minor Error condition does not require a Clear input signal to continue operation. See description in section 8.4 for further information.*

8.2.4 Status Messages

These information messages indicate the current status of the CLM system, such as: "System Is Ready" or "A: Feeding". A fault or error message will override a status message on the display.

Status messages, as well as fault and error messages, are each described in the following sections.

8.3 Hard Fault Messages

This section provides a complete list of hard fault diagnostic messages, and an explanation of the potential cause(s).

```
CLM System Error
Code #HRD00
```

An internal system fault has occurred in the CLM. The following hard fault system errors can occur: code #HRD00, #PL001, #FXPM0001, #UPRG01, #FLPM0003.

NOTE: *For any CLM system error display, call Indramat home office. Advise them of the error code number displayed.*

```
Parameters Lost!
Clear to Cont.
```

This message indicates the parameters were lost when the CLM was powered up in the Parameter Mode. It is also displayed after installing new firmware. Press the Clear push-button on the user control panel to continue with parameter entry. Check the memory backup battery if parameters were previously entered.

All parameter entries must be reentered and/or Stored again, regardless of the parameter values shown in the CLM display. If/when the data on the display is correct for the parameter, press the STORE key to store/save the data to memory. Repeat this process for each parameter.

NOTE: *Maintain a current log of parameter settings for your system (see Appendix C for an entry form).*

```
Parameters Lost!
Select P - Mode
```

Indicates the parameters were lost when the CLM was powered up in the Automatic, Manual or Setup Mode. It is also displayed after installing new firmware. Select Parameter Mode and re-enter parameter values. Check the memory back-up battery condition if parameters were previously entered. Note that after the "Battery is Low" fault first displays, the battery needs to be replaced within two weeks.

All parameter entries must be reentered and/or stored again, regardless of the parameter values shown in the CLM display. If/when the data on the display is correct for the parameter, press the STORE key to store the data to memory. Repeat this process for each parameter.

NOTE: *Maintain a current log of parameter settings for your system (see Appendix C for an entry form).*

```
EMERGENCY STOP!
EMERGENCY STOP!
```

This indicates the E - Stop chain is broken (X3 - Pin 3). Check the E - Stop chain to determine the reason for the EMERGENCY STOP condition.

```
    Axis 1
Drive Stalled!
```

```
    Axis 2
Drive Stalled!
```

Indicates the position feedback is not being controlled within the tolerance of the position command. The CLM uses a mathematical model of the system to calculate the expected position error (lag). Drive Stalled occurs when the motor is moving too far behind the expected lag. The Monitoring Window Parameter (A112) must be set to a value that is greater than the deviation in position error caused by

normal mechanical and electrical characteristics (see Chapter 5 for parameter description). Axis 2 display is on the CLM-Z only, and requires parameter entry in A212.

The following items should be checked:

1. There is a velocity command but no axis motion - check for a disconnected encoder cable and for a faulty encoder feedback cable.

2. Parameter A103 entry doesn't match lines/rev on the servomotor (too large) - correct the parameter entry to match the data plate information.

3. Max. RPM in Parameter A102 (Drive Input Sensitivity) is greater than that on the Personality module - correct entry.

4. Acceleration rate is too high - correct in Parameter A106.

5. Position Gain is too high for system inertia - correct in Parameter A109.

6. Drive Enable (RF) signal from CLM is not reaching the drive - check cable connections.

```
    Axis 1
Drive Runaway!
```

```
    Axis 2
Drive Runaway!
```

Indicates the position feedback is not being controlled within the tolerance of the position command. The CLM uses a mathematical model of the system to calculate the expected position error (lag). Drive Runaway occurs when the motor is moving too far ahead of the expected lag. The Monitoring Window Parameter (A112) must be set to a value that is greater than the deviation in position error caused by normal mechanical and electrical characteristics (see Chapter 5 for parameter description). Axis 2 display is on the CLM-Z only, and requires parameter entry in A212.

The following items should be checked:

1. Axis motion is detected without a velocity command - ensure that signal feedback and command cables are properly installed.

2. Parameter A111: Direction of Operation is inconsistent with wired polarity - verify the settings correspond to the feedback and polarity of the drive / motor.

3. Parameter A103 entry doesn't match lines/rev on the servomotor (too small) - correct the parameter entry to match the data plate information.

4. Max. RPM in Parameter A102 (Drive Input Sensitivity) is less than that on the Personality module - correct entry.

5. Deceleration rate is too high when Acceleration is okay - correct in Parameter A107.

6. Monitoring Window is too small for calculated Max. lag - correct entry in Parameter A112.

Axis 1 Amplifier Hardware Fault!

Axis 2 Amplifier Hardware Fault!

Issued when the Amplifier Ready inputs (X3 pin 6, axis 1; X3 pin 7, axis 2) have gone low in Auto Mode or when motion is commanded. Check the wiring from the amplifier to the CLM, and verify proper amplifier operation. Consult the amplifier manual for additional information.

Axis 1 Motor Has Overheated

Axis 2 Motor Has Overheated

The $\overline{\text{MOTOR OVERTEMPERATURE}}$ switch input, X3 - Pin 15 (or X3-28 on CLM-Z axis 2) has gone low.

1. Check for correct input connection to the motor. Trace the +24 Vdc signal from the CLM, through the TAS in the motor, back to the CLM.

2. Check the motor application and mechanical load conditions to determine the reason for the overtemperature condition.

Measuring Wheel Encoder Fault

With measuring wheel selected by input, every feed in Automatic Mode will be adjusted for the deviation between the axis (servo encoder) and the measuring wheel encoder. A percent of deviation allowed is set in Parameter B112. This fault occurs when the deviation exceeds that setting. Check cable connections and tracking on material.

CLM System Power Loss!

The CLM has detected a low supply voltage (less than 20 Vdc) and has shut-down. Correct cause of power fluctuation and power-up system.

8.4 Soft Fault Messages

This section provides a list of soft fault diagnostic messages and an explanation of the potential cause(s).

```
CLM System Error
Code #SFT00
```

An internal system fault has occurred in the CLM. The following soft fault system errors can occur: code #SFT00, #UPRG02, #FLPM0001, #FLPM0002.

NOTE: *For any CLM system error display, call Indramat home office. Advise them of the error code number displayed.*

```
Serial Com Port
Disconnection!
```

This indicates the IDS is not properly connected to the RS-232 port of the CLM when the IDS is selected for the Interface Option in Parameter B102. Check the cable connection of the IDS to the CLM front panel connector. The time for disconnect detection is automatically set to 2 seconds when IDS is enabled.

```
Serial Com Port
Overrun Error
```

This indicates the baud rate of the host is greater than the baud rate of the CLM via the RS-232/422/485 communications port. Check and verify settings are same. Also issued if CLM has missed data due to a faulty cable or port. Chapter 4 describes the serial port communication settings and error diagnostics.

```
Serial Com Port
Framing Error!
```

This occurs when the baud rate of the CLM is greater than the baud rate of the host, or if the start/stop bit parameters are not the same for both. Check and verify settings are same. Also issued if CLM has missed data due to a faulty cable or port. Chapter 4 describes the serial port communication settings and error diagnostics.

```
Serial Com Port
Parity Error!
```

This indicates the parity type of the CLM does not match that of the host. It is also issued during RS-232/422/485 communication if the parity check fails, indicating a faulty serial cable. Chapter 4 describes the serial port communication settings and error diagnostics.

```
Serial Com Port
IDS FormatError!
```

This indicates the serial communication is not functioning properly for the IDS. Check the cable and connections between the IDS and the RS-232 port of the CLM.

```
Serial Com Port
RS485 Bus Error!
```

This error is issued when data is being sent and received at the same time when SOT operation is selected in Parameter B118. If the device communicating with the CLM is not a CLM-01.3-R or CLM-01.3-Z compatible SOT, or is communicating in full duplex, the Interface mode in B118 should be set to 1. If the CLM is talking to an SOT, this error indicates a faulty cable or port.

```
Feed Angle Lost
  During Feed!
```

This indicates the feed angle input (X3 - Pin 17) went low before the CLM had completed the current feed.

- Check the input connection from the feed angle switch.
- Ensure the mechanical functions and timing are sequenced properly.
- Decrease the feed length or increase the feed rate.
- Increase speed/decrease cycle time of the press (external to CLM).
- If Parameter A113=0, then the material was tugged out of position due to press contact.

```
Movement While
Feed Angle Low
```

Displayed when the axis (material) slips out of the position window after (while) the Feed Angle is low. The setting in Parameter A113 (Low Feed Angle Threshold) is used to determine if the material is tugged out of position due to press contact. To correct this fault condition, raise the Low Feed Angle Threshold, check for other parameters that may be causing instability, check cables or system mechanics for cause of axis movement.

Press Timeout Has Expired

Occurs when the press has not cycled (high-to-low feed angle transition) in Automatic Mode, for a period defined in Parameter B109. Set the time in the parameter, as required for the application. The limits are from 1 to 99 minutes. Set time to 00 to disable. After this fault is cleared, a resume input is required to continue the cycle.

Invalid Mode Selection!

This indicates that the Auto and Setup modes are both selected (both inputs high). Check the following inputs:

X 3 Pin 2	Automatic Mode
X 3 Pin 13	Setup Mode

NOTE: *The Parameter Mode can override any other mode when selected. When de-selected, the CLM returns to the previously selected mode: Auto, Setup or Manual (defaults to Manual Mode when other modes de-selected).*

Press Cycle Without Feed!

Indicates a double hit of the press. Fault occurs if there is more than one press cycle when in the "Roll Delay" state (using Roll Control function) or the FEED INTERRUPT input is active.

Correction Dist. Exceeds Fdlen.

Indicates the Registration Correction distance is larger than the current feed length. This will occur only if there are erroneous feed length or registration parameter entries. Verify the feed length entry, or correct the "Maximum Position Correction per Feed" for Averaging setting in Parameter B115.

Zero % Feedrate Programmed

The feed rate programmed for the part selected to execute in batching (or value downloaded through the serial port from a host) is set to zero. Scroll to the feed programming display page and correct the feed rate (or correct in host device).

```
  Set Up Mode
Cycle Incomplete
```

This indicates the user has tried to exit the Setup Mode without completing the cycle.

Verify the Press Interface Mode ("Press Before Feed" or "Feed Before Press") setting is selected as desired (Parameter B109).

The user has the following two (2) options:

1. Reenter Setup Mode and complete the cycle (press jog key until the entered feed length is complete, and/or cycle the press, if required, to complete the cycle).

2. Press the Clear push-button on the user's control panel or press the CL key on the CLM keypad. This will clear the diagnostic message, and recognize any mode change selection.

```
  Too Many Ref.
  Marks Missed
```

Indicates number of consecutive missed marks (in Registration function) exceeds the "Missed Marks Allowed" limit entered in Parameter B115. Check the reference mark sensor connections, sensitivity or position adjustment, etc. Refer to Chapter 4 for additional information on this function.

```
Aux. Feedlength
   is Zero!
```

Indicates the Auxiliary Feed Length option was selected but Parameter B103 is set at zero. To correct:

1. Turn OFF the Auxiliary Feed Length selection (input).

2. Press Clear and enter the Parameter mode.

3. Enter the desired "Auxiliary Feed Length" in Parameter B103.

```
Count Exceeds
Part Quantity
```

This cycle stop, soft fault is issued if the part quantity entered is less than the current part count. To correct this error, clear the current count by entering a zero in the part quantity, then press the clear key or input.

Axis has Changed During Cycle

On the CLM-Z only, the state of the selected axis enable input (X3, pin 11 for axis 1, pin 12 for axis 2) was changed while cycling in Automatic Mode. Re-enable the axis. If not disabled, check switch function and wiring.

Battery is Low Replace it Soon

Indicates the RAM Backup Battery is low. Fault will not be issued if an Automatic Mode cycle is in progress or if an axis is feeding. After clearing the fault, it will be issued every 60 minutes as a reminder.

To prevent loss of parameters and batch programming, replace the battery within two weeks of when the fault is first issued. Turn power OFF to the CLM, remove the Memory and Battery Module and replace the 3.5 volt Lithium battery. Before disconnecting the old battery, connect the new battery to the second connector (other side of battery).

NOTE: *If the battery voltage gets too low, all RAM data (parameters, feed length and rate, batch programming) will be lost and needs to be re-entered after replacing the battery.*

Para Invalid! Select P-mode

Fault is displayed when power is applied to the CLM or when you switch out of Parameter Mode. In either case, this fault indicates that required parameter's data is missing or incorrectly entered. Switch to Parameter Mode. The display shows the first sequential number of the parameter requiring correction. Enter the data correctly and press STORE for each parameter that appears as invalid. Refer to section 5.3 for added information on this and related "Parameter Is Invalid" fault conditions.

Batching Program was Lost!

This fault is issued if batching data is invalid upon power-up (lost due to battery failure or at initial installation). Default values (see section 4.2.13) are loaded for any part in which data is invalid.

Output was not Acknowledged

This fault is issued if a gag or auxiliary output is not acknowledged (by input) when the feed angle goes from high to low (i.e. Shear complete input needs go high after executes to acknowledge output request

for shear operation). The press immediate stop is activated during this fault. This function can be enabled/disabled in Parameter B111 (see Chapter 5).

```
    Axis 2
is Interrupted!
```

On the CLM-R only, this error is issued when the $\overline{\text{INTERRUPT AXIS 2}}$ input is low. Unlike other errors, the Axis 2 Drive Enable output is turned OFF after axis 2 has ramped down to zero velocity. Jog reverse for axis 2 is allowed so this error can be corrected (by removing material from the loop to correct full loop condition).

```
    Tail Out
     Stop
```

Displayed when Tail Out enabled and first occurrence of Feed Interrupt after Tail Out sequence begins.

```
 Tail Out Inputs
     Missing
```

Displayed when Tail Out enabled and entry in automatic mode without all three inputs high.

8.5 Minor Error Messages

This section provides a complete list of Minor Error diagnostic messages, and an explanation of the potential cause(s).

```
CLM System Error
  Code #MNR00
```

An internal system fault has occurred in the CLM.

NOTE: *For <u>any</u> CLM system error display, call Indramat home office. Advise them of the error code number displayed.*

```
Zero Feedlength
    Entered
```

This indicates the feed length is set to zero (0) on the CLM (or from the IDS, etc.). If in the Automatic Mode, enter the desired feed length and press the Resume Cycle button to continue the automatic cycle operation.

If in Setup Mode, select the desired feed length and the diagnostic message will clear.

```
Registr. Offset
Exceeds Fdlength
```

The programmed offset is greater than the programmed feed length. The offset can be micro-adjusted from the registration display screen (section 2.2.2). See Chapter 4 for additional information on the registration feature.

```
Zero % Feedrate
   Entered
```

The feed rate entered is set to 0% on the CLM (from the IDS, etc.). If in Automatic Mode, select the desired feed rate % and press the resume button to continue the cycle.

NOTE: *This message does not apply when in Setup Mode, as the feed rate used is the predetermined jog velocity (set in parameter).*

```
Axis 1 Amplifier
 Is Not Ready!
```

```
Axis 2 Amplifier
 Is Not Ready!
```

The input from the respective amplifier (Amplifier Ready) is low (X3 pin 6, axis 1; X3 pin 7, axis 2). On the CLM-R, this error for axis 2 is issued when attempting to jog axis 2 or selecting Loop Automatic while the Drive Ready input is low.

Check/perform the following to correct:

1. Apply Power to the amplifier.
2. Check the amplifier connection.
3. Check the amplifier for a fault.

Axis 1 Has Not Reached Position

Axis 2 Has Not Reached Position

This indicates the input to select Automatic Mode or Setup Mode is high, but the axis is not stopped within the position threshold. Axis 2 error occurs on the CLM-Z only. To correct:

1. Check the "In-Position Threshold" setting in Parameter A110/210. Setting may be too tight.
2. Check for amplifier failure.
3. Verify Encoder (and cable) is functioning properly.

Stop Due To Interrupt Input!

The $\overline{\text{FEED INTERRUPT}}$ input (X3 - Pin 19) has gone low, causing the axis motion to halt.

WARNING: *In Automatic Mode, the feed will resume automatically when this signal returns. Use the Feed Interrupt output to advise operating personnel of this condition.*

Feed Angle Is Missing!

This error is issued in three different situations:

1. Appears upon entry into Automatic or Setup Mode, if the CLM detects the Feed Angle input is low.
2. After either soft fault "Feed Angle Lost During Feed" or "Movement While Feed Angle Low" is cleared and the Feed Angle input is low.
3. If a Cycle Start is actuated while the Feed Angle input is low.

Check the feed angle switch or sensor and its connections. This error will clear when the Feed Angle input goes high.

Invalid Part Selected

This error is issued if the Binary or BCD input for part selection exceeds maximum limit (99).

Reference Mark Is Not Aligned

Error is displayed when entering Automatic Mode and the mark is not aligned. Exit Automatic Mode to correct this error. Perform alignment before reentering Automatic Mode (manual jog to near reference mark, then press Jog to Reference Mark). Disabling Position Correction by input will also clear this error.

Change in Fdlgth Exceeds Limit

The "limit" is set in Parameter B106 (Feed length Maximum Change). It is the maximum amount that the programmed feed length can change during a cycle. This limit is checked only during an Automatic Mode cycle. The maximum change window is based upon the first programmed feed length after a Cycle Start or Resume. A new Maximum Change limit will be accepted on the next cycle after it is changed and STORED. The limit may be disabled by entering a zero (0) in the parameter.

Feedlength Exceeds Maximum

The feed length "Maximum Limit" is set in Parameter B104. This error is immediately displayed if the programmed feed length exceeds this limit while not in an Automatic Mode cycle. While an Automatic Mode cycle is in progress, the programmed feed length is checked only when a feed is about to begin (change not recognized until start of next cycle). This prevents a feed from being interrupted by an erroneous feed length entry (during the current cycle). An erroneous entry will cause the error to display and turn off the Permit Press output. Change length to within limits and press Resume Cycle to continue.

Feedlength Less Than Minimum

The feed length "Minimum Limit" is set in Parameter B105. This error is immediately displayed if the programmed feed length is less than this limit while not in an Automatic Mode cycle. While an Automatic Mode cycle is in progress, the programmed feed length is checked only when a feed is about to begin (change not recognized until start of next cycle). This prevents a feed from being interrupted by an erroneous feed length entry (during the current cycle). An erroneous entry will cause the error to display and turn off the Permit Press output. Change length to within limits and press Resume Cycle to continue.

```
Invalid Axis
  Selected
```

On the CLM-Z only, axis 1 or axis 2 or both can be enabled by parameter and by input. This error indicates that an axis enabled by input is not also enabled by parameter. Disable the axis that is not enabled in parameter.

```
Axis has Changed
  During Jog
```

On the CLM-Z only, the state of the selected axis enable input (X3, pin 11 for axis 1, pin 12 for axis 2) was changed while the jog input was high (jogging). Re-enable the axis. If not disabled, check the switch function and wiring.

```
Axis 1 Required
for Registration
```

On the CLM-Z only, axis 1 is required for the registration function. This display indicates that axis 1 is not enabled by input (must also be enabled by parameter) while the registration function is enabled by input (and by parameter). Enable axis 1 or disable registration function.

```
 Loop Auto Exit
  Required
```

Displayed upon power up/reset when Loop Automatic input is high. Also displays when exiting from Feeder Auto mode, once Tail Out Mode is entered.

8.6 System Status Messages

This section provides a complete list of status messages provided by the CLM. Certain messages are dependent on the selected mode of operation. These are described separately in this section.

8.6.1 General Messages

The following messages are not exclusive to a particular operating mode.

```
Initializing Sys
```

This message indicates the CLM is performing the system self test following a power up. It performs computations based on the parameter values. If all conditions are correct, a mode specific

status report message will display. Should any condition not be met, the CLM will display the appropriate diagnostic message.

CLM PARAMETER MODE

This indicates the CLM is in Parameter Mode and appears only in the optional vacuum florescent tube remote display. The CLM control panel display shows the actual parameter and its data (A100, etc.).

NOTE: *If Parameter B102 (Interface Option) is changed from the IDS option to the standard CLM configuration, the remote display will retain the message "PARAMETER MODE" regardless of the CLM mode or operation.*

NOTE: *The SOT can display "CLM PARAMETER MODE" as acknowledgment of the CLM mode of operation.*

Open & Close On

This indicates both of these manual roll control inputs are high. This condition must be corrected before normal operation can continue. The four (4) manual roll control inputs should be wired to momentary, push-button switches (open-close feed rolls, X3 - pins 31 & 32; open-close anti-backup rolls, X3 - pins 29 & 30).

1. Check switches for proper operation.

2. Check switch wiring.

Both Jogs High

This indicates both the Jog Forward and the Jog Reverse inputs (X3 - pins 9 & 10 or using CLM-R pins 11 & 12) are high when entering the Manual or Setup Mode. As a result, with the forward and reverse jogs being equal, the signals cancel each other and the motor remains in a hold state. This condition must be corrected before normal operation can continue. Inputs should be wired into normally-open, momentary, push-button switches (input signal drops when button released).

1. Check both Jog buttons for proper operation.

2. Check Jog switch wiring.

Jog Input Active

This indicates the Jog Forward or the Jog Reverse input (X3 - pins 9 & 10 or using CLM-R pins 11 & 12) is high when entering the Manual or Setup Mode. Inputs should be wired into normally-open, momentary, push-button switches (input signal drops when button released). Also, if toggled between Step Mode and Jog Mode while the motors are in motion, the motors will ramp down and this message will be displayed.

1. Check both Jog buttons for proper operation.

2. Check Jog switch wiring.

Roll Inpt Active

This indicates a manual roll control input is high when entering the Manual or Setup Mode (X3 - pins 29 - 32).

1. Check input switch buttons for proper operation.

2. Check switch wiring.

No Axis Selected

On the CLM-Z only, an axis must be enabled by input (X3, pin 11 for axis 1, pin 12 for axis 2) before executing a command. Either one or both axis may be enabled by input if also enabled by parameter.

8.6.2 Automatic Mode Messages

The following status messages are displayed in Automatic Mode.

A: No Cycle Start

This message indicates the system is ready and waiting for a momentary Cycle Start input. This message appears only after the CLM is powered up and initialized or upon entry into Automatic Mode.

A: Cycle Stop

This indicates the CYCLE STOP button was pressed to cause the CLM to stop automatic cycling at the completion of the current cycle.

A: Feeding

Indicates the axis is feeding. This may display if the Position Threshold parameter setting is too small.

A: Wait Fd Angle

Indicates the CLM is waiting for the Feed Angle input to go high. This signal indicates when the press ram is away from the material and the CLM can safely feed.

A: Cycle Delay

Indicates the cycle is complete, and the CLM is currently waiting for the "Minimum Cycle Time" delay (set in Parameter B109 for Press Intermittent mode of operation) to expire before starting the next automatic feed cycle.

A: Roll Delay

Indicates the CLM is waiting for the roll delay time to expire before executing the feed cycle. In the Roll Control Parameter (B110), the "Roll Delay Time" entry specifies the delay time before a feed, when changing direction, using Aux. Feed Length or Batching in Automatic Mode.

A: Resume Req'd

Displayed after clearing a fault to indicate a "Resume Cycle" input is required. Pressing the Resume button causes the CLM to continue the automatic feeding cycle from where the axis stopped.

```
A: Waiting Press
```

Indicates the CLM is waiting for the press to continue its stroke cycle until the Feed Angle (input) is available, indicating it is safe to feed material.

```
A: C.Stop Active
```

Displayed if the $\overline{\text{CYCLE STOP}}$ input is low (active) while in Automatic Mode, but not cycling. This message also displays when single-stepping during batching (pressing Cycle Stop and Cycle Start together causes the CLM to step one feed and press stroke at a time).

If the Cycle Stop button was not pressed as described for either case above, check the push-button switch, connectors and wiring for an electrical open.

```
A: Start Active
```

Displayed if the Cycle Start input was high upon entering Automatic Mode.

This message could indicate the Cycle Start input is wired incorrectly, or the Normally Open push-button is not functioning properly.

```
A: Resume Active
```

Displayed if the Resume Cycle input was high upon entering Automatic Mode.

If the button was not pressed, check for a malfunction of the normally open push-button or a wiring error to the input.

```
A: P.Stop Active
```

Displayed if the Part Stop input is low (active) at cycle start when batching is enabled. It is also displayed when single-stepping in batching (pressing Part Stop and Cycle Start together will cause the CLM to step one complete part at a time).

```
A: Part Stop
```

Displayed when the Part Stop input has gone high and the CLM stopped the cycle after the current part was complete or when the Batching program (last part executes) is complete.

```
A: Waiting Shear
```

Displayed when the Press Hold is active and the CLM is waiting for the Shear Feed Angle input (acknowledgment) before resuming normal cycling.

```
A: No Run Loop
```

Displayed when the Run Loop input is false (Cycle Start is inhibited) when not cycling in Automatic Mode and Loop Control is enabled in Parameter B121.

```
A: No Loop Auto
```

Displayed when Loop Auto Mode is not selected when not cycling in Automatic Mode and Loop Control is enabled in Parameter B121.

```
A:Tail Out Resume
```

Displayed after "Tail Out Stop" condition and automatic cycle is resumed

```
End of Material
```

Displayed when the Tail Out sequence is complete.

.

8.6.3 Manual Mode Messages

The following status messages are displayed in Manual Mode.

```
M: No Jog Cmd
```

Indicates that neither the Jog Forward nor the Jog Reverse inputs are high (in Manual Mode).

```
M: Feed Forward
```

Indicates the axis is feeding in the forward direction (Jog Forward active in Manual Mode).

```
M: Feed Reverse
```

Indicates the axis is feeding in the reverse direction (Jog Reverse active in Manual Mode).

```
M: Roll Delay
```

Indicates the CLM is waiting for the roll delay time to expire before executing the feed. In the Roll Control Parameter (B110), the "Roll Delay Time" entry specifies the delay time between jog button activation and feed motion when changing direction in Manual Mode.

```
M: Wait Fd Angle
```

Indicates that the Feed Angle input (X 3 - Pin 17) is low. The CLM will not allow the axis to jog until the feed angle is available, indicating that the press ram is clear of the material.

```
M: Ref. Search
```

```
M: Ref. Aligned
```

With the Registration function, the reference mark must be aligned before entering Automatic Mode. To perform the alignment, use the Jog Forward and Jog Reverse inputs to move to a point near the reference mark. Then, activate the Jog to Reference Mark input. The material will feed while the input is active, until reaching the reference mark. The display shows "M: Ref. Search" during the jog feed movement.

As soon as the rising edge of the mark is reached (input transitions from 0 volts to 24 volts) and the offset distance (if enabled) is fed, the feed will decelerate to a stop, and the status message "M: Ref. Aligned" will be displayed. The Aligned with Reference Mark output will be turned ON.

If the Jog to Reference Mark input is activated while the mark is aligned, movement is disabled and the status message "M: Ref. Aligned" is displayed.

8.6.4 Setup Mode Messages

The following messages are displayed in Setup Mode.

```
S: Feed Forward
```

Indicates the axis is feeding in the forward direction (Jog Forward input active in Setup Mode causes the CLM to feed the entered feed length, then stop).

```
S: Feed Reverse
```

Indicates that the axis is feeding in the reverse direction.

```
S: Fd Incomplete
```

Indicates that the jog button has been released before the end of the feed (entered feed length) for setup. Press and hold the jog button until setup feed is complete.

```
S: Wait Fd Angle
```

Indicates that the Feed Angle input is low, (X 3 - Pin 17). The CLM will not allow the axis to jog until the feed angle is available, indicating that the press ram is clear of the material.

```
S: Waiting Press
```

Indicates the CLM is waiting for the press to complete its stroke cycle before allowing the next feed cycle to start (after completing the jog feed length, manually initiate a press cycle, then initiate the next jog feed).

S: Start of Feed

Indicates that the axis is at the start of the feed position.

S: Roll Delay

Indicates the CLM is waiting for the roll delay time to expire before executing the feed. In the Roll Control Parameter (B110), the "Roll Delay Time" entry specifies the delay time between jog button activation and feed motion when changing direction in Setup Mode.

S: Release Jog

Indicates the CLM is ready to start the next feed, but the jog button has not been released since the previous feed.

If the Jog button is not pressed, check push-button switch operation and wiring.

8.7 SOT Status / Diagnostic Codes Index

When using the SOT or other host, the diagnostics may be requested through the RS-232/422/485 serial port in expanded text format or as a corresponding diagnostic code number (refer to Serial Interface in Chapter 4). The index at the beginning of this chapter lists the CLM displays in alphabetical order. The following index correlates the CLM displays in order of the numeric, diagnostic code equivalents. Diagnostic codes on the IDS are listed in the next section.

SOT Code Display	Page
System Messages	
01 M: No Jog Command	**8-26**
02 M: Feed Forward	**8-26**
03 A: No Cycle Start	**8-23**
04 A: Cycle Stop	**8-23**
05 A: Feeding	**8-24**
06 A: Wait Fd Angle	**8-24**
07 A: Cycle Delay	**8-24**
08 M: Roll Delay	**8-27**
09 S: Feed Forward	**8-28**
0A S: Fd Incomplete	**8-28**
0B S: Wait Fd Angle	**8-28**
0C S: Waiting Press	**8-28**
0D S: Start of Feed	**8-28**
0E CLM PARAMETER MODE	**8-21**
0F Open & Close On	**8-22**
10 S: Roll Delay	**8-29**
11 A: Roll Delay	**8-24**
12 S: Release Jog	**8-29**
13 Both Jogs High	**8-22**
14 M: Wait Fd Angle	**8-27**
15 A: Resume Req'd	**8-24**
16 S: Feed Reverse	**8-28**
17 M: Feed Reverse	**8-27**
18 Initializing Sys	**8-21**
19 A: Waiting Press	**8-24**
1A A: C.Stop Active	**8-25**
1B A: Start Active	**8-25**
1C A: Resume Active	**8-25**
1D M: Ref. Aligned	**8-27**
1E M: Ref. Search	**8-27**
1F No Axis Selected	**8-23**
20 Jog Input Active	**8-22**
21 Roll Inpt Active	**8-23**
22 A: P.Stop Active	**8-25**
23 A: Part Stop	**8-26**
24 A: Waiting for Shear	**8-26**

SOT Code Display.....Page

25 A: No Run Loop Input .8-26

26 A: No Loop Auto 8-26

27 End Of Material 8-26

28 A: Tail Out Resume ..8-26

Minor Errors

40 CLM SYSTEM ERROR Code #MNR00 8-16

41 Zero Feedlength Entered 8-16

42 Registr. Offset Exceeds Fdlength 8-17

43 Zero % Feedrate Entered 8-13

44 Axis 1 Amplifier Is Not Ready! 8-18

45 Axis 2 Amplifier Is Not Ready! 8-18

46 Axis 1 Has Not Reached Position 8-18

47 Axis 2 Has Not Reached Position 8-18

48 Stop Due To Interrupt Input! 8-18

49 Feed Angle Is Missing! 8-19

4A Invalid Part Selected 8-19

4B Reference Mark Is Not Aligned ..8-19

SOT Code Display ..... Page

4C Change in Fdlgth Exceeds Limit 8-19

4D Feedlength Exceeds Maximum 8-20

4E Feedlength Less Than Minimum 8-20

4F Invalid Axis Selected 8-20

50 Axis has Changed During Jog 8-20

51 Axis 1 Required for Registration 8-21

52 Loop Auto Exit Required 8-15

Soft Faults

60 CLM SYSTEM ERROR Code #SFT00 ...8-10

61 Serial Com Port Disconnection! 8-10

62 Serial Com Port Overrun Error 8-11

63 Serial Com Port Framing Error! 8-11

64 Serial Com Port Parity Error! 8-11

65 Serial Com Port IDS Format Error! ..8-11

66 Feed Angle Lost During Feed! 8-12

67 Serial Com Port RS485 Bus Error! ... 8-11

SOT Code Display.....Page

68 Movement While Feed Angle Low 8-12

69 Press Timeout Has Expired 8-12

6A Invalid Mode Selection! 8-12

6B Press Cycle Without Feed! 8-13

6C Correction Dist. Exceeds Fdlen. 8-13

6D Zero % Feedrate Programmed! 8-13

6E Set Up Mode Cycle Incomplete ... 8-13

6F Too Many Ref. Marks Missed 8-14

70 CLM SYSTEM ERROR Code #UPRG02 ... 8-10

71 CLM SYSTEM ERROR Code #FLPM0001 8-10

72 CLM SYSTEM ERROR Code #FLPM0002 8-10

73 Aux Feedlength is Zero! 8-14

74 Count Exceeds Part Quantity 8-14

75 Axis has Changed During Cycle! 8-14

76 Battery is Low! Replace it Soon 8-14

SOT Code Display..... Page

77 Para. Invalid! Select P-mode! 8-15

78 Batching Program was Lost! 8-15

79 Output was not Acknowledged 8-15

7A Axis 2 Is Interrupted! 8-25

7B Tail Out Stop 8-27

7C Tail Out Inputs Missing 8-27

Hard Faults

80 CLM SYSTEM ERROR Code #HRD00 8-6

81 Parameters Lost! Clear to Cont. 8-7

82 Axis 1 Drive Runaway! 8-8

83 Axis 2 Drive Runaway! 8-8

84 CLM SYSTEM ERROR Code #PL001 8-6

85 CLM SYSTEM ERROR
Code #FXPM0001 8-6

86 Parameters Lost!
Select P - Mode 8-7

87 CLM SYSTEM ERROR
Code #UPRG01 8-6

88 EMERGENCY STOP!
EMERGENCY STOP!.....8-7

89 Axis 1 Amplifier
Hardware Fault! 8-9

SOT Code Display.....Page

8A Axis 2 Amplifier
Hardware Fault! 8-9

8B Axis 1 Motor
Has Overheated 8-9

8C Axis 1
Drive Stalled! 8-8

8D Axis 2
Drive Stalled! 8-8

8E CLM SYSTEM ERROR
Code #FLPM0003 8-6

8F Axis 2 Motor
Has Overheated! 8-9

90 Measuring Wheel
Encoder Fault! 8-10

91 CLM System
Power Loss! 8-10

8.8 IDS Status / Diagnostic Codes Index

When using the IDS, the diagnostics appear on the two digit display in a corresponding diagnostic code number. The index at the beginning of this chapter lists the displays in alphabetical order. The following index correlates the CLM displays in order of the numeric, diagnostic code equivalent display on the IDS.

IDS Code Display ..... Page

System Messages

00 Initializing Sys ... 8-21

01 M: No Jog Command 8-27

02 M: Feed (Jog) Forward 8-26

S: Feed Forward 8-28

03 M: Feed (Jog) Reverse 8-27

S: Feed Reverse 8-28

04 A: No Cycle Start .. 8-23

05 S: Waiting Press (Waiting for Press) 8-28

A: Waiting Press ... 8-24

06 M: Wait Fd Angle (Waiting Feed Angle) 8-27

S: Wait Fd Angle ... 8-28

A: Wait Fd Angle 8-24

07 A: Feeding 8-24

08 A: Cycle Delay 8-24

09 A: Cycle Stop 8-22

10 A: Resume Required . 8-23

11 M: Roll Delay (see display for type) .. 8-26

IDS Code Display ..... Page

S: Roll Delay 8-29

A: Roll Delay 8-24

12 M: Ref. Search 8-27

13 M: Ref. Aligned 8-27

14 S: Start of Feed (Setup Mode Feed) .. 8-29

15 S: Fd Incomplete (Setup Mode feed inc) 8-28

16 S: Release Jog (Setup Mode feed done) 8-29

17 CLM PARAMETER MODE . 8-21

18 CLM Input Active (see display for type)

19 A: No Run Loop Input 8-26

20 A: No Loop Auto (mode not selected) 8-26

21 End Of Material 8-26

22 A: Tail Out Resume .. 8-26

Minor Errors

40 Zero Feedlength Entered 8-16

41 Zero % Feedrate Entered 8-13

IDS Code Display .....Page

42 Feedlength Less Than Minimum 8-20

43 Feedlength Exceeds Maximum 8-20

44 Change in Fdlgth Exceeds Limit 8-19

45 Axis 1 Amplifier Is Not Ready! 8-18

46 Axis 2 Amplifier Is Not Ready! 8-18

47 Axis 1 Has Not Reached Position 8-18

48 Axis 2 Has Not Reached Position 8-18

49 Stop Due To Interrupt Input! 8-18

50 Feed Angle Is Missing! 8-19

51 Reference Mark Is Not Aligned ...8-19

52 Registr. Offset Exceeds Fdlength 8-17

53 Axis 1 Required for Registration 8-21

54 Invalid Axis Selected 8-20

55 Axis has Changed During Jog 8-20

56 Loop Auto Exit Required 8-15

IDS Code Display..... Page

Soft Faults

60 Feed Angle Lost During Feed! 8-12

61 Movement While Feed Angle Low 8-12

62 Press Cycle Without Feed! 8-13

63 Press Timeout Has Expired 8-12

64 Invalid Mode Selection! 8-12

65 Aux Feedlength is Zero! 8-14

66 Set Up Mode Cycle Incomplete ...8-13

67 Axis has Changed During Cycle! 8-14

68 Too Many Reference Marks Missed 8-14

69 Correction Distance Exceeds Feedlength ...8-13

70 Para. Invalid! Select P-mode! 8-15

71 Battery is Low! Replace it Soon 8-14

72 Axis 2 Is Interrupted! 8-15

73 Tail Out Stop 8-17

74 Tail Out Inputs Missing 8-15

IDS Code Display.....Page

Hard Faults

80 EMERGENCY STOP!..... 8-7

81 Axis 1 Drive Runaway!. 8-8

82 Axis 2 Drive Runaway!. 8-8

83 Axis 1 Drive Stalled!. 8-8

84 Axis 2 Drive Stalled!. 8-8

85 Axis 1 Amplifier Hardware Fault! 8-9

86 Axis 2 Amplifier Hardware Fault! 8-9

87 Axis 1 Motor Has Overheated 8-9

88 Axis 2 Motor Has Overheated! 8-9

89 Measuring Wheel Encoder Fault! 8-10

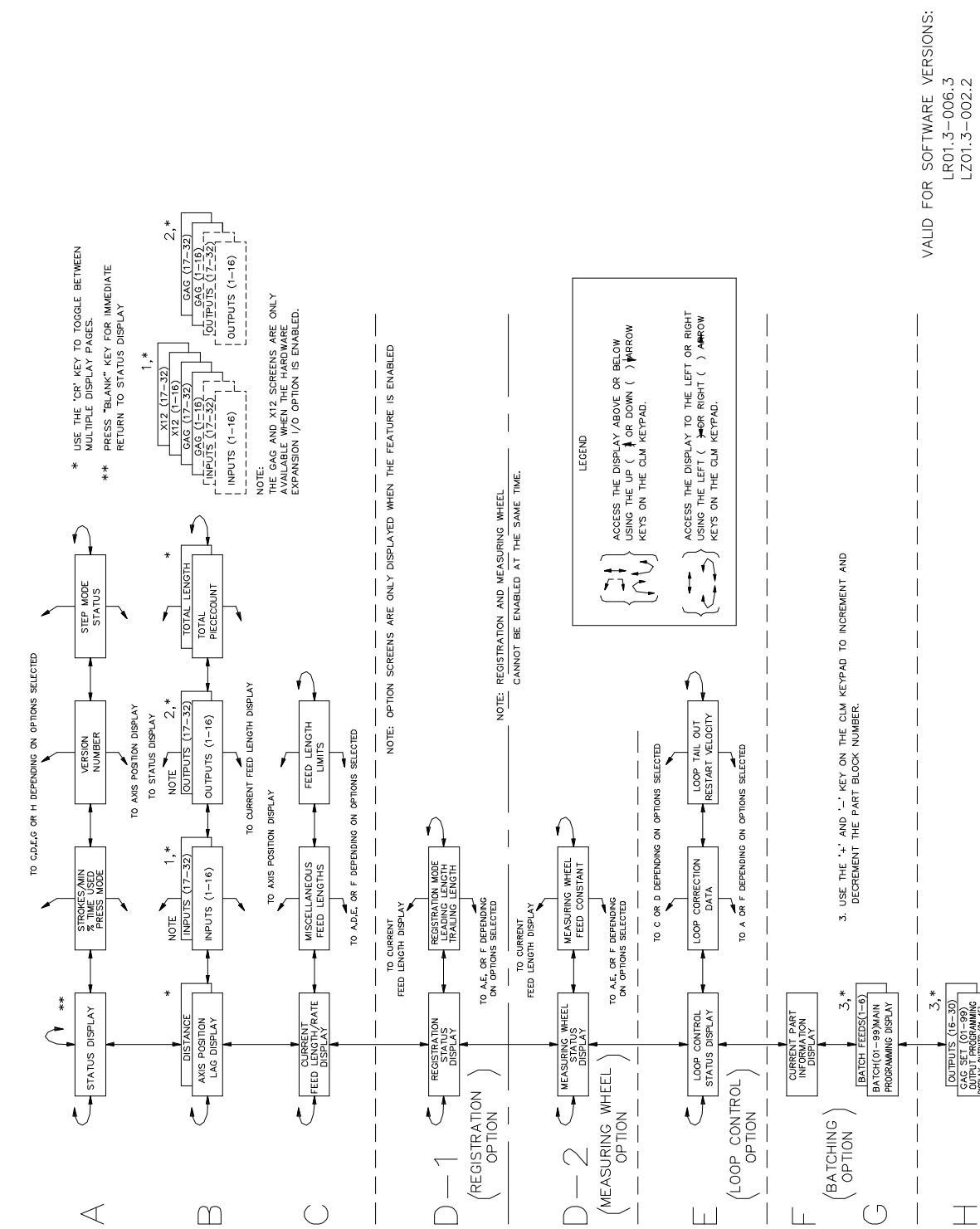
90 Parameters Lost! Select P - Mode 8-7

91 CLM System Power Loss! 8-10

99 Communications or System Error: See CLM Display

APPENDIX A: DISPLAY MAP

Refer to Chapter 2, section 2.2 for a description of how to use this map to scroll through the display screens on the CLM control panel display.


A
B
C
D—1
REGISTRATION OPTION
D—2
MEASURING WHEEL OPTION
E
LOOP CONTROL OPTION
F
BATCHING OPTION
G
H
BATCHING WITH GAGGING OPTION
STATUS DISPLAY
DISTANCE
AXIS POSITION LAG DISPLAY
CURRENT FEED LENGTH/RATE DISPLAY
REGISTRATION STATUS DISPLAY
MEASURING WHEEL STATUS DISPLAY
LOOP CONTROL STATUS DISPLAY
CURRENT PART INFORMATION DISPLAY
BATCH FEEDS(1-6)
BATCH(01-99)MAIN PROGRAMMING DISPLAY
OUTPUTS (16-30)
GAG SET (01-99)
OUTPUT PROGRAMMING DISPLAY, OUTPUTS (01-15)
STROKES/MIN
% TIME USED
PRESS MODE
VERSION NUMBER
STEP MODE STATUS
INPUTS (17-32)
INPUTS (1-16)
OUTPUTS (17-32)
OUTPUTS (1-16)
TOTAL PIECECOUNT
TOTAL LENGTH
MISCELLANEOUS FEED LENGTHS
FEED LENGTH LIMITS
REGISTRATION MODE
LEADING LENGTH
TRAILING LENGTH
MEASURING WHEEL FEED CONSTANT
LOOP CORRECTION DATA
LOOP TAIL OUT
RESTART VELOCITY
X12 (17-32)
X12 (1-16)
GAG (17-32)
GAG (1-16)
INPUTS (17-32)
INPUTS (1-16)
OUTPUTS (17-32)
OUTPUTS (1-16)
NOTE
1,*
2,*
3,*
TO C,D,E,G OR H DEPENDING ON OPTIONS SELECTED
TO AXIS POSITION DISPLAY
TO STATUS DISPLAY
TO CURRENT FEED LENGTH DISPLAY
TO A,D,E, OR F DEPENDING ON OPTIONS SELECTED
TO CURRENT FEED LENGTH DISPLAY
TO A,E, OR F DEPENDING ON OPTIONS SELECTED
TO C OR D DEPENDING ON OPTIONS SELECTED
TO A OR F DEPENDING ON OPTIONS SELECTED
NOTE: OPTION SCREENS ARE ONLY DISPLAYED WHEN THE FEATURE IS ENABLED
NOTE: REGISTRATION AND MEASURING WHEEL CANNOT BE ENABLED AT THE SAME TIME.
3. USE THE '+' AND '-' KEY ON THE CLM KEYPAD TO INCREMENT AND DECREMENT THE PART BLOCK NUMBER.
* USE THE 'CR' KEY TO TOGGLE BETWEEN MULTIPLE DISPLAY PAGES.
** PRESS "BLANK" KEY FOR IMMEDIATE RETURN TO STATUS DISPLAY
NOTE:
THE GAG AND X12 SCREENS ARE ONLY AVAILABLE WHEN THE HARDWARE EXPANSION I/O OPTION IS ENABLED.
LEGEND
ACCESS THE DISPLAY ABOVE OR BELOW USING THE UP (↑) OR DOWN (↓) ARROW KEYS ON THE CLM KEYPAD.
ACCESS THE DISPLAY TO THE LEFT OR RIGHT USING THE LEFT (←) OR RIGHT (→) ARROW KEYS ON THE CLM KEYPAD.
VALID FOR SOFTWARE VERSIONS:
LR01.3-006.3
LZ01.3-002.2

APPENDIX B: REFERENCES TO INDRAMAT DOCUMENTATION

Documentation Reference List

The CLM-01.3-R and CLM-01.3-Z controls are used as part of a system, operating with one or more servo amplifiers, servomotors, and a power supply.

For detailed information and specifications on these devices, refer to the Indramat technical publications listed below.

TVM/TDV AC Power Supplies	Publication No. IA 74156
TDM/KDS AC Servo Amplifiers	Publication No. IA 74145
TDM Amplifier Drive Selection List	Publication No. IA 74122
KDS Amplifier Drive Selection List	Publication No. IA 74142
TDM/KDS User Manual	Publication No. IA 74725
TVM/KDV User Manual	Publication No. IA 74727

The CLM can also be used in conjunction with Indramat's intelligent AC spindle drives. Contact Indramat if you require technical documentation on the KDA or RAC.

When using the SOT option, refer to the supplement manual included with this CLM manual. If using ScreenManager Ô to modify the prompt lines on the SOT, refer to the following publication.

ScreenManagerÔ User's Manual	Publication No. IA 74784

APPENDIX C: BLANK PARAMETER WORKSHEETS

The following pages include blank Indramat parameter worksheets. Make copies of the sheets that are applicable to your system. Use these sheets to record the parameter settings entered for your application.

CLM-01.3-R, A1 Parameter Set

LR01.3-006.3 "A1" Parameter Set for Axis 1

FEEDLENGTH RES.	**A100**	**_ _ (0-4)**
FEED CONSTANT (INPUT UNITS/REV)	**A101**	**_ _ _ _ _ _ _ _**
DRIVE INPUT SENS	**A102**	**_ _ _ _ _/_ _. _**
ENC LINES/REV	**A103**	**_ _ _ _**
MAX FEEDRATE (INPUT UNITS/MINUTE)	**A104**	**_ _ _ _ _ _ _ _**
MAX FEEDRATE = (MAX RPM [A102] X FEED CONSTANT [A101])		
JOG FEEDRATE (INPUT UNITS/MINUTE)	**A105**	**_ _ _ _ _ _ _ _**
MAX ACCEL RATE (INPUT UNITS/SEC^2)	**A106**	**_ _ _ _ _ _ _ _**
MAX DECEL RATE (INPUT UNITS/SEC^2)	**A107**	**_ _ _ _ _ _ _ _**
MAXIMUM JERK	**A108**	**_ _ _ _ _ _ _ _**
MAX JERK lower limit = (60 X A106^2/A104)		
POSITION GAIN	**A109**	**_ _. _ _**
IN-POS THRESHOLD	**A110**	**_ _ _ _ _ _**
DIRECTION	**A111**	**ENC= _ COM= _**
MONITOR WINDOW	**A112**	**_ _. _ %**
The recommended percentage for the Monitor Window is 10.0%		
LOW FA THRESHOLD	**A113**	**_ _ _ _ _ _**
ANTICIPATION	**A114**	**_ _ _ _ _ _**

CLM-01.3-R, B1 Parameter Set

LR01.3-006.3

LANGUAGE	B100	_ 00 GERMAN _ 01 ENGLISH _ 02 FRENCH _ 03 SPANISH
DIMENSIONAL UNIT	B101	_IN _FT _MM _CM _M _RAD _DEG _REV
INTERFACE OPTION	B102	_ 00 STANDARD CLM _ 01 IDS BOARD _ 02 BATCH OPTION
AUX FEEDLENGTH	B103	(+/-)_ _ _ _ _ _ _
FEEDLENGTH MAX	B104	_ _ _ _ _ _
FEEDLENGTH MIN	B105	_ _ _ _ _ _
FEED MAX CHANGE	B106	_ _ _ _ _ _
FEED INCREMENT	B107	_ _ _ _ _ _
JOG STEP	B108	_ _ _ _ _ _
PRESS INTERFACE	B109	_ _ _. _SEC _ _
ROLL CONTROL (00=DISABLED, 01=ENABLED)	B110	_ _ _ . _SEC
BATCHING OPTION	B111	_ _ G= _ _ _ _
REGISTRATION/MW	B112	_ _ _ _ _ _. _ %
LEADING LENGTH	B113	_ _ _ _ _ _
TRAILING LENGTH	B114	_ _ _ _ _ _
MISS LMT/MAX COR	B115	_ _ _ /_ _ _ _ _ _
M. WHEEL FD CONSTANT	B116	_ _ _ _ _ _ _
M. WHEEL ENCODER	B117	L= _ _ _ _ D= _
SERIAL INTERFACE	B118	M= _ S= _ _ _ _
SERIAL OPERATION	B119	_ _ _ _ _ _ _ _
ANALOG OVERRIDE	B120	M= _ _ _ #_
LOOP CONTROL	B121	M= _ E= _ T= _
SLUG WIDTH COMPENSATION	B122	_ _ _ _ _ _

CLM-01.3-R, A2 Parameter Set

LR01.3-006.3 "A2" Parameter Set for Axis 2 (with Loop Control enabled)

MAXIMUM VELOCITY	**A200**	_ _ _ _ _ _ _ _ _ _
JOG VELOCITY	**A201**	_ _ _ _ _ _ _ _
CREEP VELOCITY	**A202**	_ _. _ _ %
MAX ACCEL RATE	**A203**	_ _ _ _ _ _ _ _
MAX DECEL RATE	**A204**	_ _ _ _ _ _ _ _

CLM-01.3-Z, A1 Parameter Set

LZ01.3-002.2 "A1" Parameter Set for Axis 1

FEEDLENGTH RES.	**A100**	**_ _ (0-4)**
FEED CONSTANT (INPUT UNITS/REV)	**A101**	**_ _ _ _ _ _ _ _**
DRIVE INPUT SENS	**A102**	**_ _ _ _ _/_ _. _**
ENC LINES/REV	**A103**	**_ _ _ _**
MAX FEEDRATE (INPUT UNITS/MINUTE)	**A104**	**_ _ _ _ _ _ _ _**
MAX FEEDRATE = (MAX RPM [A102] X FEED CONSTANT [A101])		
JOG FEEDRATE (INPUT UNITS/MINUTE)	**A105**	**_ _ _ _ _ _ _ _**
MAX ACCEL RATE (INPUT UNITS/SEC^2)	**A106**	**_ _ _ _ _ _ _ _**
MAX DECEL RATE (INPUT UNITS/SEC^2)	**A107**	**_ _ _ _ _ _ _ _**
MAXIMUM JERK	**A108**	**_ _ _ _ _ _ _ _**
MAX JERK lower limit = (60X A106^2/A104)		
POSITION GAIN	**A109**	**_ _. _ _**
IN-POS THRESHOLD	**A110**	**_ _ _ _ _ _**
DIRECTION	**A111**	**ENC= _ COM= _**
MONITOR WINDOW	**A112**	**_ _. _ %**
The recommended percentage for the Monitor Window is 10.0%		
LOW FA THRESHOLD	**A113**	**_ _ _ _ _ _**
ANTICIPATION	**A114**	**_ _ _ _ _ _**

CLM-01.3-Z, A2 Parameter Set

LZ01.3-002.2 "A2" Parameter Set for Axis 2

FEEDLENGTH RES.	**A200**	**_ _ (0-4)**
FEED CONSTANT (INPUT UNITS/REV)	**A201**	**_ _ _ _ _ _ _ _**
DRIVE INPUT SENS	**A202**	**_ _ _ _ _/_ _. _**
ENC LINES/REV	**A203**	**_ _ _ _**
MAX FEEDRATE (INPUT UNITS/MINUTE)	**A204**	**_ _ _ _ _ _ _ _**
MAX FEEDRATE = (MAX RPM [A202] X FEED CONSTANT [A201])		
JOG FEEDRATE (INPUT UNITS/MINUTE)	**A205**	**_ _ _ _ _ _ _ _**
MAX ACCEL RATE (INPUT UNITS/SEC^2)	**A206**	**_ _ _ _ _ _ _ _**
MAX DECEL RATE (INPUT UNITS/SEC^2)	**A207**	**_ _ _ _ _ _ _ _**
MAXIMUM JERK	**A208**	**_ _ _ _ _ _ _ _**
MAX JERK lower limit = (60 X A206^2/A204)		
POSITION GAIN	**A209**	**_ _. _ _**
IN-POS THRESHOLD	**A210**	**_ _ _ _ _ _**
DIRECTION	**A211**	**ENC= _ COM= _**
MONITOR WINDOW	**A212**	**_ _. _ %**
The recommended percentage for the Monitor Window is 10.0%		
LOW FA THRESHOLD	**A213**	**_ _ _ _ _ _**
ANTICIPATION	**A214**	**_ _ _ _ _ _**

CLM-01.3-Z, B1 Parameter Set

LZ01.3-002.2

LANGUAGE	B100	_ 00 GERMAN _ 01 ENGLISH _ 02 FRENCH _ 03 SPANISH
DIMENSIONAL UNIT	B101	_IN _FT _MM _CM _M _RAD _DEG _REV
INTERFACE OPTION	B102	_ 00 STANDARD CLM _ 01 IDS BOARD _ 02 BATCH OPTION
AUX FEEDLENGTH	B103	(+/-)_ _ _ _ _ _ _
FEEDLENGTH MAX	B104	_ _ _ _ _ _
FEEDLENGTH MIN	B105	_ _ _ _ _ _
FEED MAX CHANGE	B106	_ _ _ _ _ _
FEED INCREMENT	B107	_ _ _ _ _ _
JOG STEP	B108	_ _ _ _ _ _
PRESS INTERFACE	B109	_ _ _. _SEC _ _
ROLL CONTROL (00=DISABLED, 01=ENABLED)	B110	_ _ _ . _SEC
BATCHING OPTION	B111	_ _ G= _ _ _ _
REGISTRATION/MW	B112	_ _ _ _ _ _. _ %
LEADING LENGTH	B113	_ _ _ _ _ _
TRAILING LENGTH	B114	_ _ _ _ _ _
MISS LMT/MAX COR	B115	_ _ _ /_ _ _ _ _ _
M. WHEEL FD CONSTANT	B116	_ _ _ _ _ _ _
M. WHEEL ENCODER	B117	L= _ _ _ _ D= _
SERIAL INTERFACE	B118	M= _ S= _ _ _ _
SERIAL OPERATION	B119	_ _ _ _ _ _ _ _
ANALOG OVERRIDE	B120	M= _ _ _ #_
AXIS ENABLE	B121	_ _
SLUG WIDTH COMPENSATION	B122	_ _ _ _ _ _

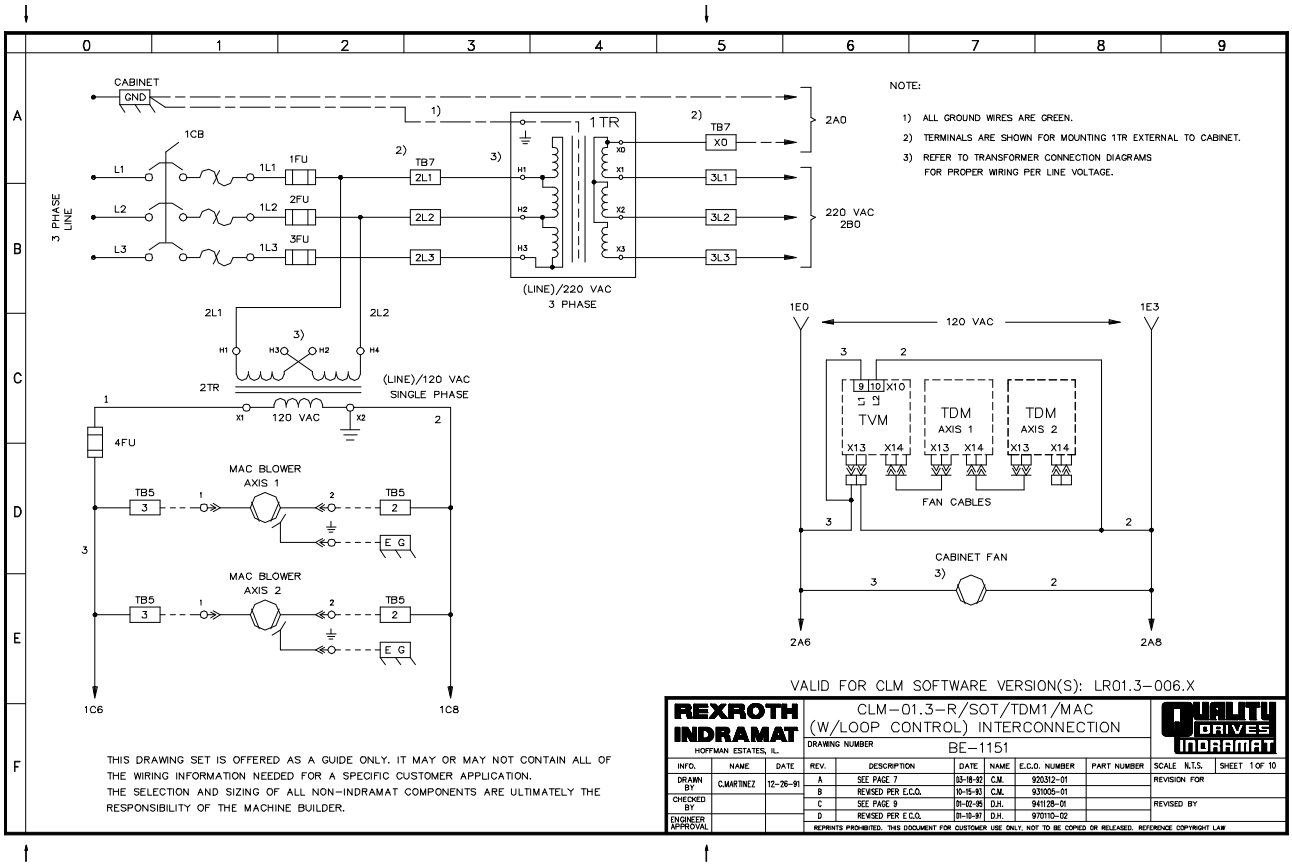
APPENDIX D: DRAWINGS AND SCHEMATICS

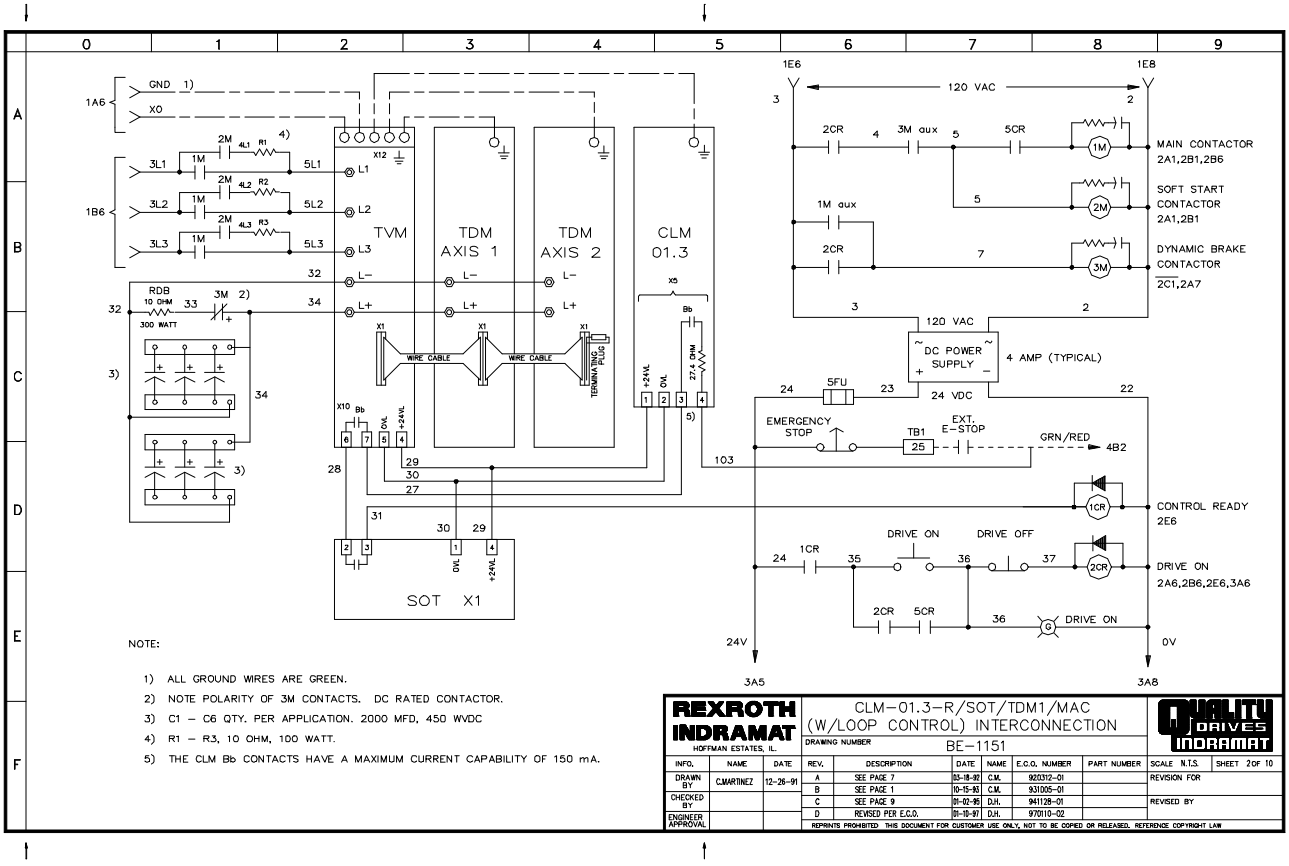
CAUTION: *Drawings in this appendix are included for illustrative purposes only and are subject to change without notice. Check with Indramat to be sure you are working with the latest drawings, prior to installing, wiring and powering equipment.*

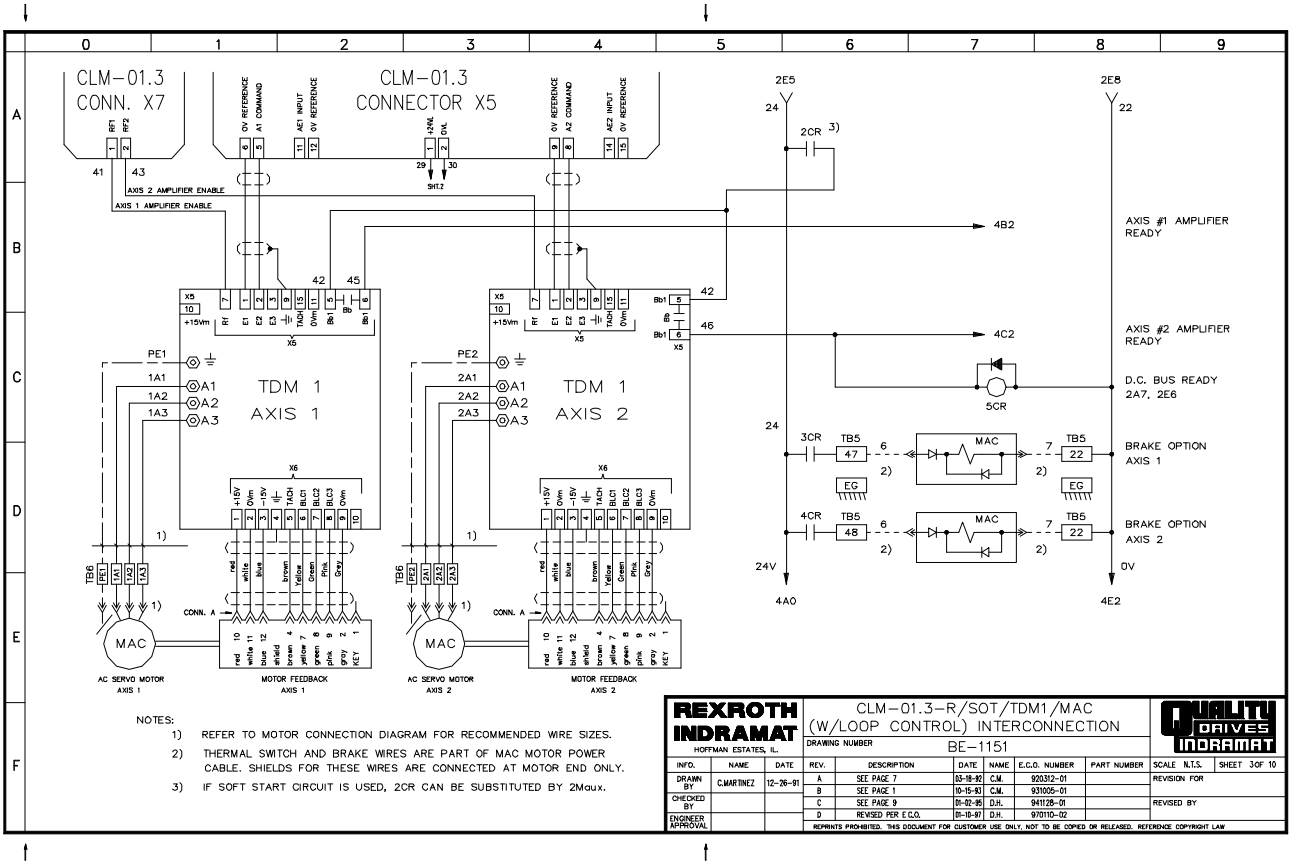
NOTE: *This appendix includes a separate set of interconnect drawings for:*

CLM-01.3-R	*LR01.3-006.3*	*Drawing #BE1151*	*Pages D1 through D10*
CLM-01.3-Z	*LZ01.3-002.2*	*Drawing #BE1143*	*Pages D11 through D22*

CLM-01.3-Z Interconnect Drawings



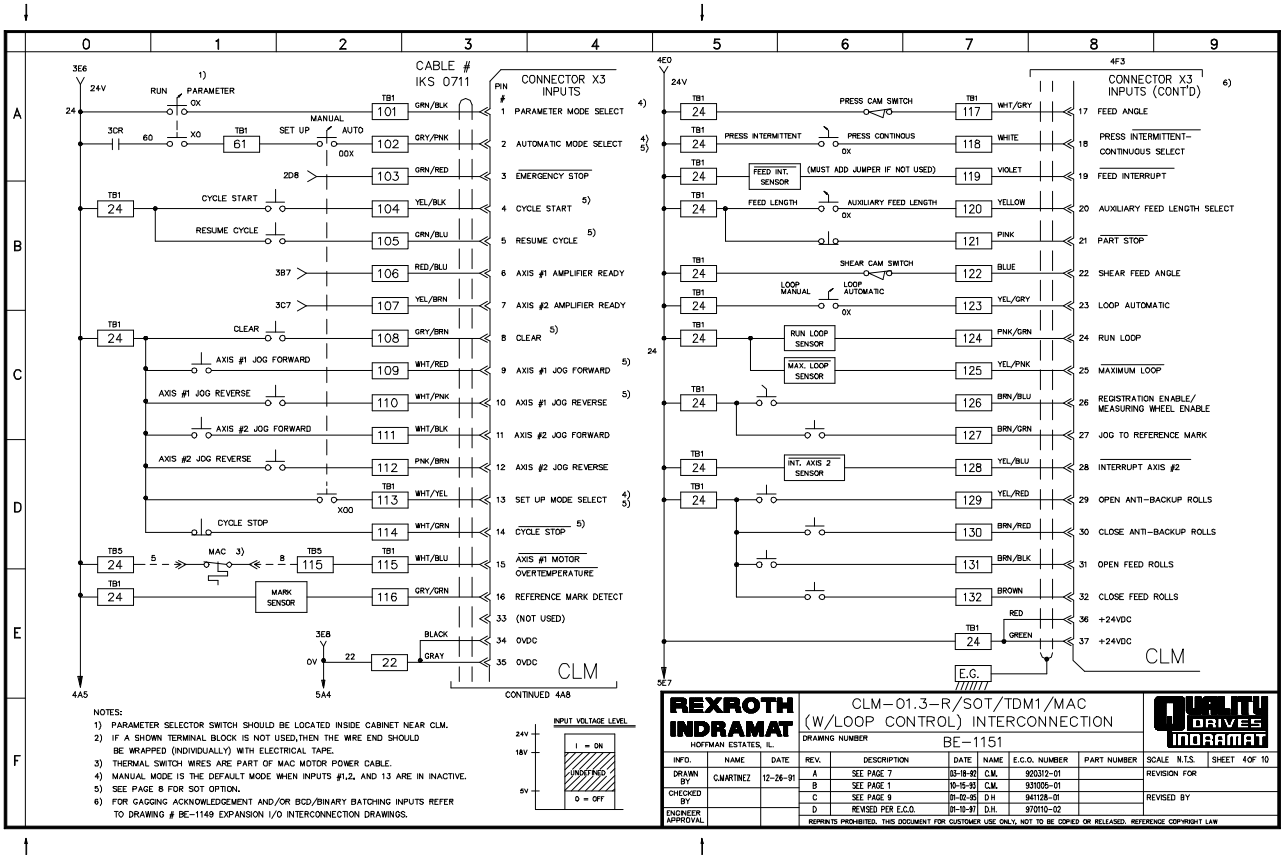

TVM
TDM AXIS 1
TDM AXIS 2
CLM 01.3
120 VAC
DC POWER SUPPLY
4 AMP (TYPICAL)
24 VDC
MAIN CONTACTOR 2A1,2B1,2B6
SOFT START CONTACTOR 2A1,2B1
DYNAMIC BRAKE CONTACTOR 2C1,2A7
CONTROL READY 2E6
DRIVE ON 2A6,2B6,2E6,3A6
EMERGENCY STOP
EXT. E-STOP
DRIVE ON
DRIVE OFF
SOT X1
WIRE CABLE
TERMINATING PLUG
NOTE:
1) ALL GROUND WIRES ARE GREEN.
2) NOTE POLARITY OF 3M CONTACTS. DC RATED CONTACTOR.
3) C1 – C6 QTY. PER APPLICATION. 2000 MFD, 450 WVDC
4) R1 – R3, 10 OHM, 100 WATT.
5) THE CLM Bb CONTACTS HAVE A MAXIMUM CURRENT CAPABILITY OF 150 mA.
REXROTH INDRAMAT
HOFFMAN ESTATES, IL.
CLM–01.3–R/SOT/TDM1/MAC (W/LOOP CONTROL) INTERCONNECTION
DRAWING NUMBER BE–1151
QUALITY DRIVES INDRAMAT
REVISION FOR
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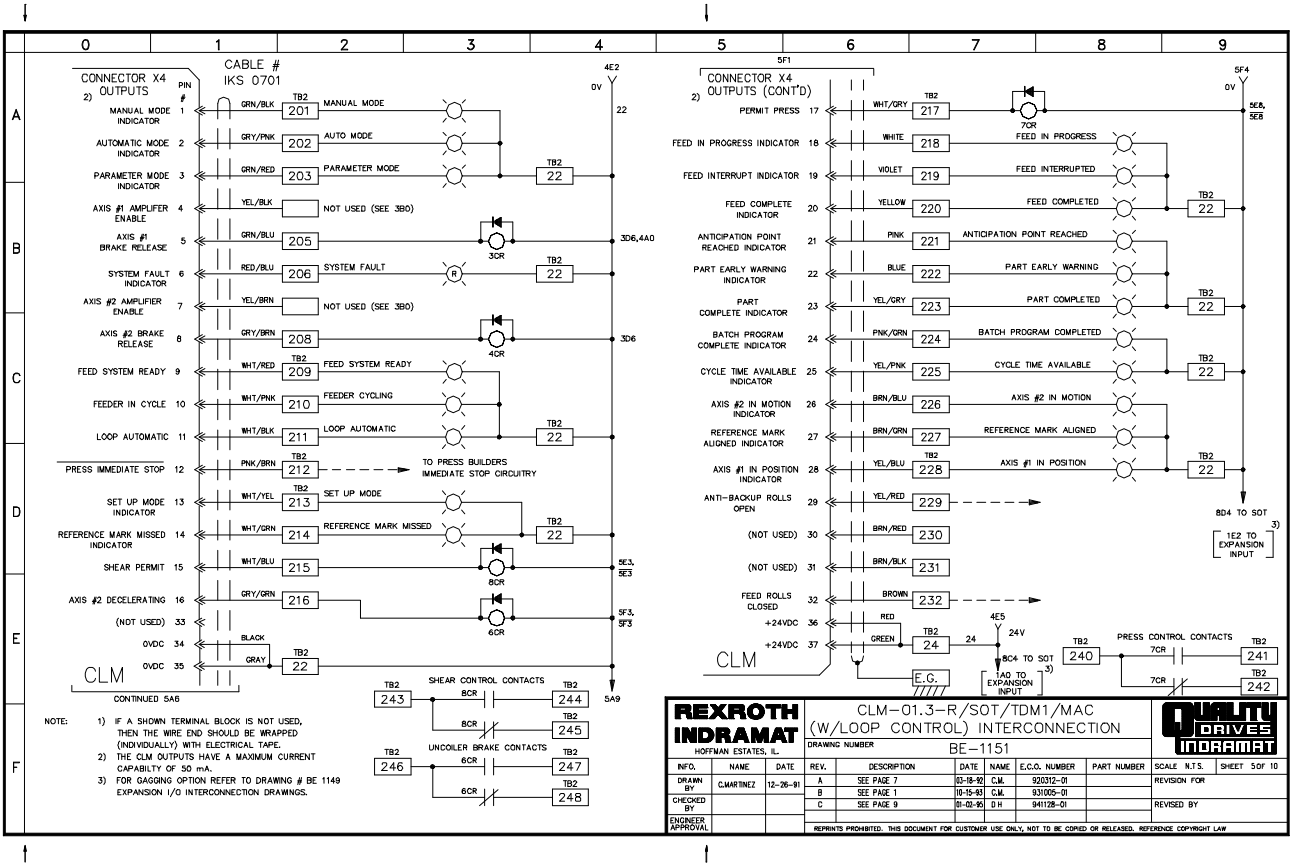


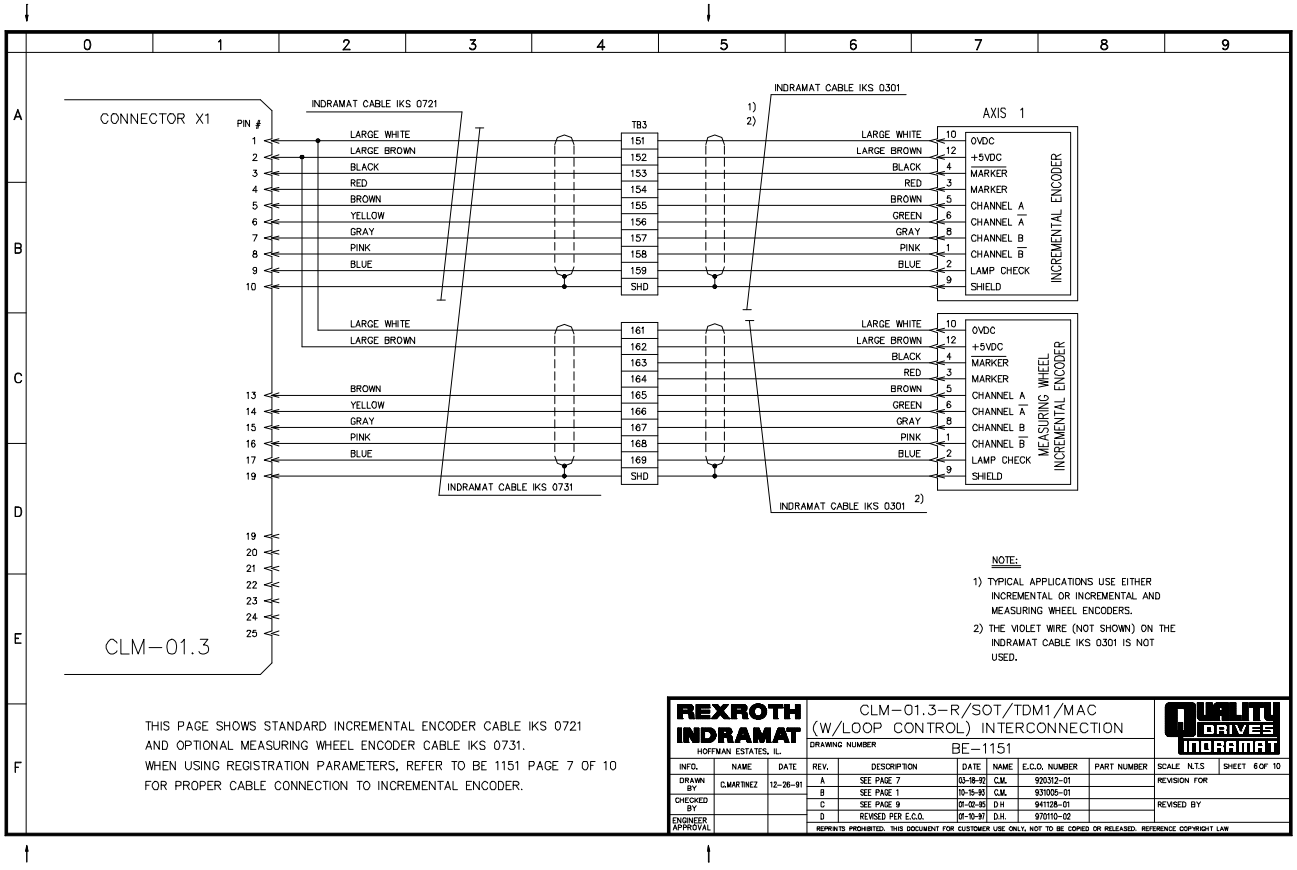
INFO.	NAME	DATE
DRAWN BY	C.MARTINEZ	12-26-91
CHECKED BY		
ENGINEER APPROVAL		

REV.	DESCRIPTION	DATE	NAME	E.C.O. NUMBER	PART NUMBER
A	SEE PAGE 7	03-18-92	C.M.	920312-01	
B	SEE PAGE 1	10-15-93	C.M.	931005-01	
C	SEE PAGE 9	01-02-96	D.H.	941128-01	
D	REVISED PER E.C.O.	01-10-97	D.H.	970110-02	

SCALE N.T.S. SHEET 3OF 10
REVISION FOR
REVISED BY


CABLE # IKS 0711
CONNECTOR X3 INPUTS
CONNECTOR X3 INPUTS (CONT'D)
PIN #
1 PARAMETER MODE SELECT
2 AUTOMATIC MODE SELECT
3 EMERGENCY STOP
4 CYCLE START
5 RESUME CYCLE
6 AXIS #1 AMPLIFIER READY
7 AXIS #2 AMPLIFIER READY
8 CLEAR
9 AXIS #1 JOG FORWARD
10 AXIS #1 JOG REVERSE
11 AXIS #2 JOG FORWARD
12 AXIS #2 JOG REVERSE
13 SET UP MODE SELECT
14 CYCLE STOP
15 AXIS #1 MOTOR OVERTEMPERATURE
16 REFERENCE MARK DETECT
33 (NOT USED)
34 0VDC
35 0VDC
17 FEED ANGLE
18 PRESS INTERMITTENT-CONTINUOUS SELECT
19 FEED INTERRUPT
20 AUXILIARY FEED LENGTH SELECT
21 PART STOP
22 SHEAR FEED ANGLE
23 LOOP AUTOMATIC
24 RUN LOOP
25 MAXIMUM LOOP
26 REGISTRATION ENABLE/ MEASURING WHEEL ENABLE
27 JOG TO REFERENCE MARK
28 INTERRUPT AXIS #2
29 OPEN ANTI-BACKUP ROLLS
30 CLOSE ANTI-BACKUP ROLLS
31 OPEN FEED ROLLS
32 CLOSE FEED ROLLS
36 +24VDC
37 +24VDC
CLM
CONTINUED 4A8
INPUT VOLTAGE LEVEL
NOTES:
1) PARAMETER SELECTOR SWITCH SHOULD BE LOCATED INSIDE CABINET NEAR CLM.
2) IF A SHOWN TERMINAL BLOCK IS NOT USED,THEN THE WIRE END SHOULD BE WRAPPED (INDIVIDUALLY) WITH ELECTRICAL TAPE.
3) THERMAL SWITCH WIRES ARE PART OF MAC MOTOR POWER CABLE.
4) MANUAL MODE IS THE DEFAULT MODE WHEN INPUTS #1,2, AND 13 ARE IN INACTIVE.
5) SEE PAGE 8 FOR SOT OPTION.
6) FOR GAGGING ACKNOWLEDGEMENT AND/OR BCD/BINARY BATCHING INPUTS REFER TO DRAWING # BE-1149 EXPANSION I/O INTERCONNECTION DRAWINGS.
REXROTH INDRAMAT
HOFFMAN ESTATES, IL
CLM-01.3-R/SOT/TDM1/MAC (W/LOOP CONTROL) INTERCONNECTION
DRAWING NUMBER BE-1151
DRAWN BY C.MARTINEZ 12-26-91
CHECKED BY
ENGINEER APPROVAL
REV. A SEE PAGE 7 03-18-92 C.M. 920312-01
REV. B SEE PAGE 1 10-15-93 C.M. 931005-01
REV. C SEE PAGE 9 01-02-95 D.H. 941128-01
REV. D REVISED PER E.C.O. 01-10-97 D.H. 970110-02
SCALE N.T.S. SHEET 4OF 10
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CONNECTOR X4
OUTPUTS
CABLE #
IKS 0701
MANUAL MODE INDICATOR
AUTOMATIC MODE INDICATOR
PARAMETER MODE INDICATOR
AXIS #1 AMPLIFIER ENABLE
AXIS #1 BRAKE RELEASE
SYSTEM FAULT INDICATOR
AXIS #2 AMPLIFIER ENABLE
AXIS #2 BRAKE RELEASE
FEED SYSTEM READY
FEEDER IN CYCLE
LOOP AUTOMATIC
PRESS IMMEDIATE STOP
SET UP MODE INDICATOR
REFERENCE MARK MISSED INDICATOR
SHEAR PERMIT
AXIS #2 DECELERATING
(NOT USED)
0VDC
0VDC
CLM
CONTINUED SA6
TO PRESS BUILDERS IMMEDIATE STOP CIRCUITRY
SHEAR CONTROL CONTACTS
UNCOILER BRAKE CONTACTS
CONNECTOR X4
OUTPUTS (CONT'D)
PERMIT PRESS
FEED IN PROGRESS INDICATOR
FEED INTERRUPT INDICATOR
FEED COMPLETE INDICATOR
ANTICIPATION POINT REACHED INDICATOR
PART EARLY WARNING INDICATOR
PART COMPLETE INDICATOR
BATCH PROGRAM COMPLETE INDICATOR
CYCLE TIME AVAILABLE INDICATOR
AXIS #2 IN MOTION INDICATOR
REFERENCE MARK ALIGNED INDICATOR
AXIS #1 IN POSITION INDICATOR
ANTI-BACKUP ROLLS OPEN
(NOT USED)
(NOT USED)
FEED ROLLS CLOSED
+24VDC
+24VDC
CLM
E.G.
8D4 TO SOT
1E2 TO EXPANSION INPUT
8A0 TO EXPANSION INPUT
PRESS CONTROL CONTACTS
NOTE: 1) IF A SHOWN TERMINAL BLOCK IS NOT USED, THEN THE WIRE END SHOULD BE WRAPPED (INDIVIDUALLY) WITH ELECTRICAL TAPE.
2) THE CLM OUTPUTS HAVE A MAXIMUM CURRENT CAPABILITY OF 50 mA.
3) FOR GAGGING OPTION REFER TO DRAWING # BE 1149 EXPANSION I/O INTERCONNECTION DRAWINGS.
REXROTH INDRAMAT
HOFFMAN ESTATES, IL.
CLM-01.3-R/SOT/TDM1/MAC
(W/LOOP CONTROL) INTERCONNECTION
DRAWING NUMBER
BE-1151
QUALITY DRIVES INDRAMAT
DRAWN BY C.MARTINEZ 12-26-91
CHECKED BY
ENGINEER APPROVAL
A SEE PAGE 7 03-18-92 C.M. 920312-01
B SEE PAGE 1 10-15-93 C.M. 931005-01
C SEE PAGE 9 01-02-95 D H 941128-01
SCALE N.T.S.
SHEET 5OF 10
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THIS PAGE SHOWS STANDARD INCREMENTAL ENCODER CABLE IKS 0721 AND OPTIONAL MEASURING WHEEL ENCODER CABLE IKS 0731. WHEN USING REGISTRATION PARAMETERS, REFER TO BE 1151 PAGE 7 OF 10 FOR PROPER CABLE CONNECTION TO INCREMENTAL ENCODER.

REXROTH INDRAMAT
HOFFMAN ESTATES, IL.

CLM-01.3-R/SOT/TDM1/MAC (W/LOOP CONTROL) INTERCONNECTION

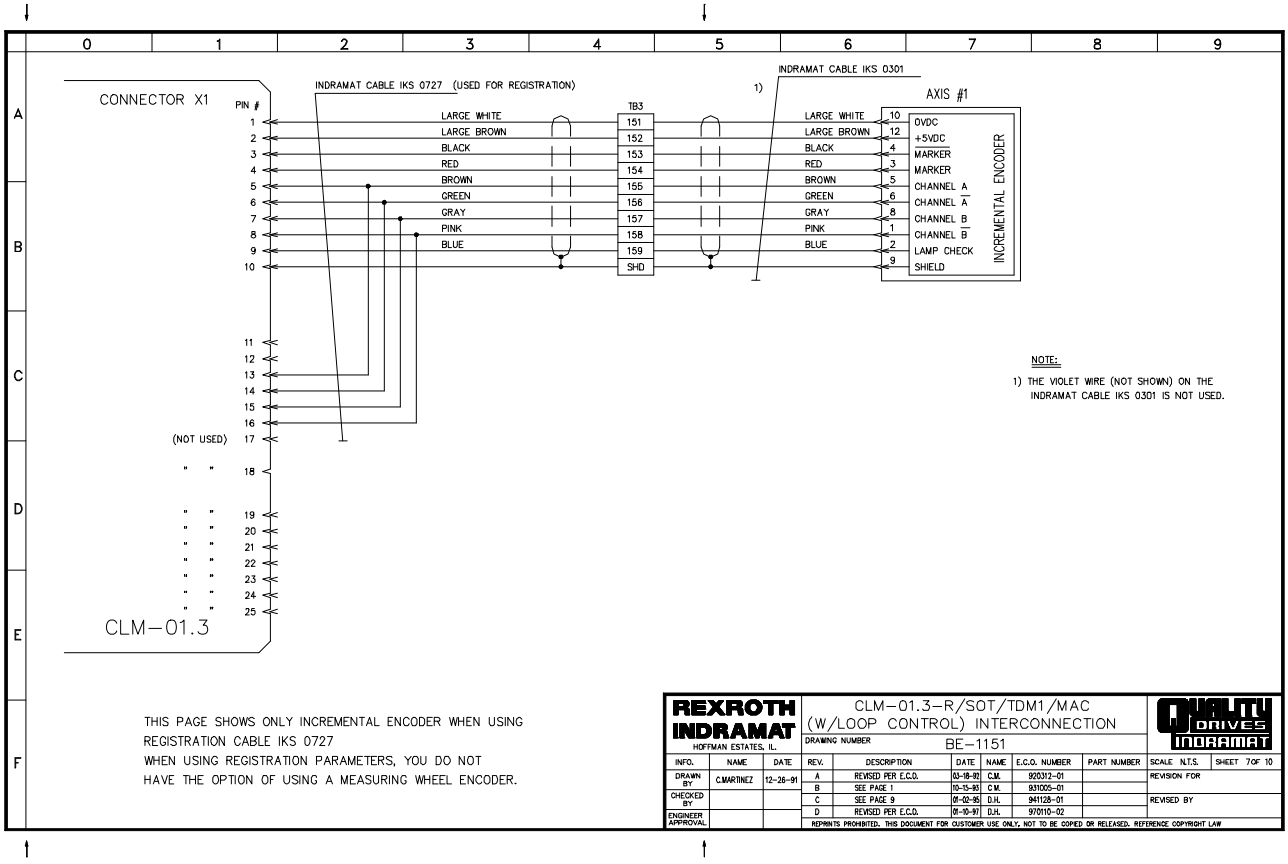
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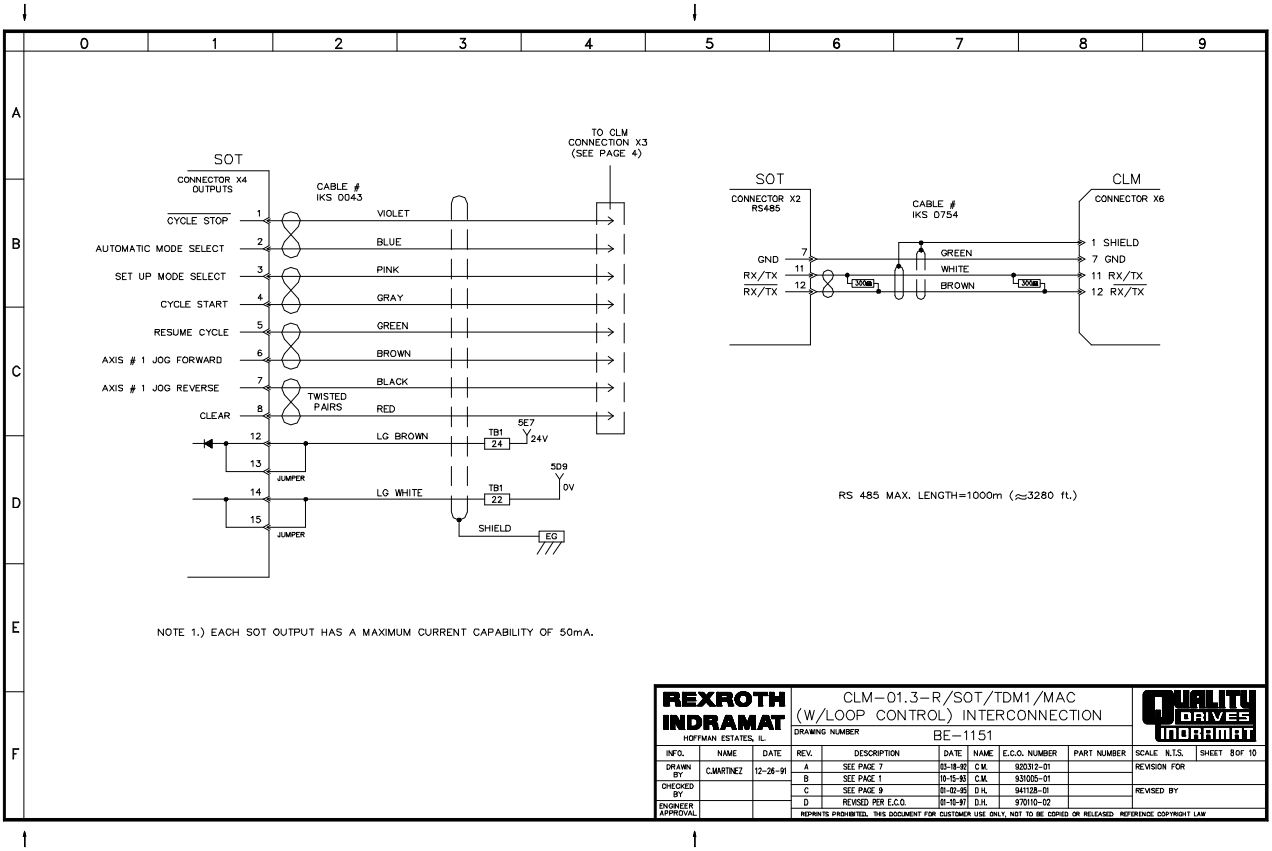
INFO.	NAME	DATE
DRAWN BY	C.MARTINEZ	12-26-91
CHECKED BY		
ENGINEER APPROVAL		

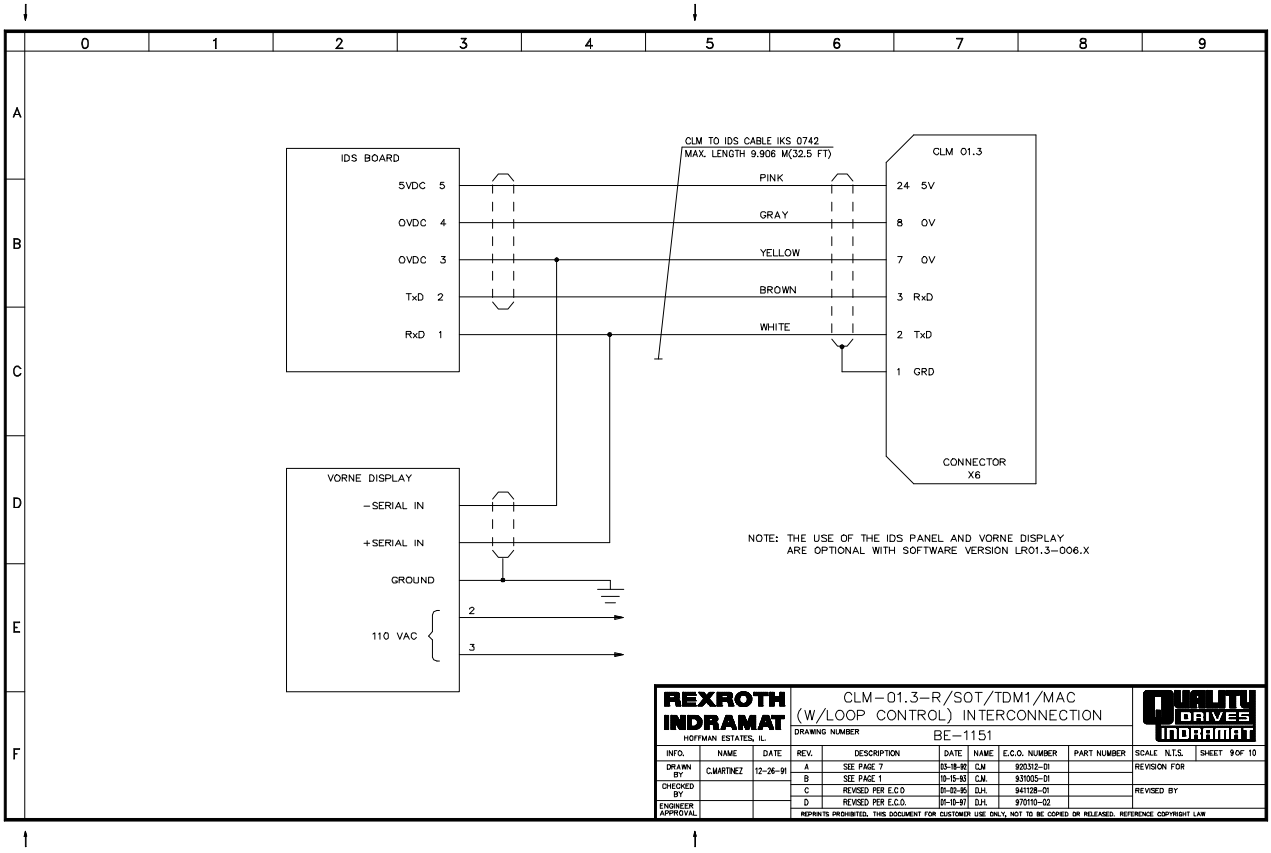
REV.	DESCRIPTION	DATE	NAME	E.C.O. NUMBER	PART NUMBER
A	SEE PAGE 7	03-18-92	C.M.	920312-01	
B	SEE PAGE 1	10-15-93	C.M.	931005-01	
C	SEE PAGE 9	01-02-95	D.H	941128-01	
D	REVISED PER E.C.O.	07-10-97	D.H.	970110-02	

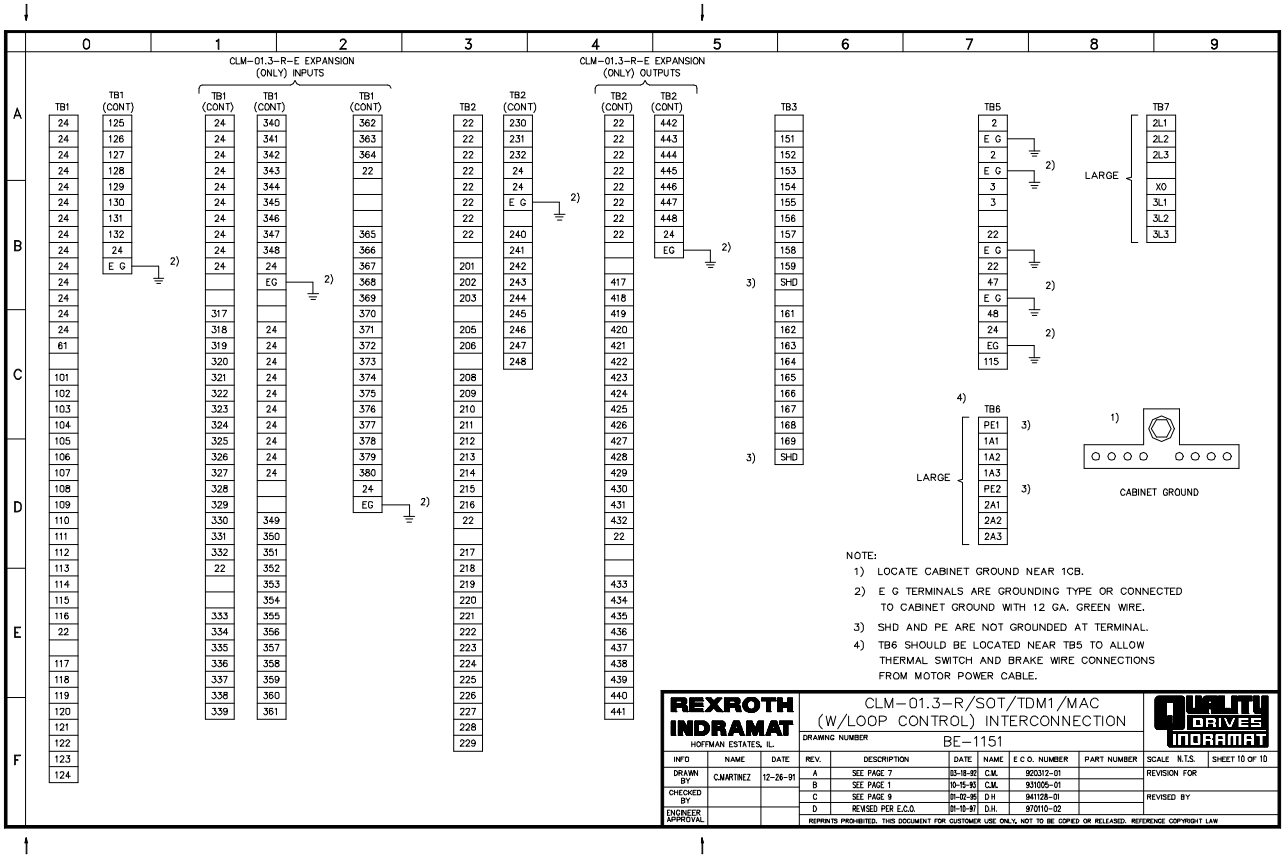
SCALE N.T.S SHEET 6 OF 10
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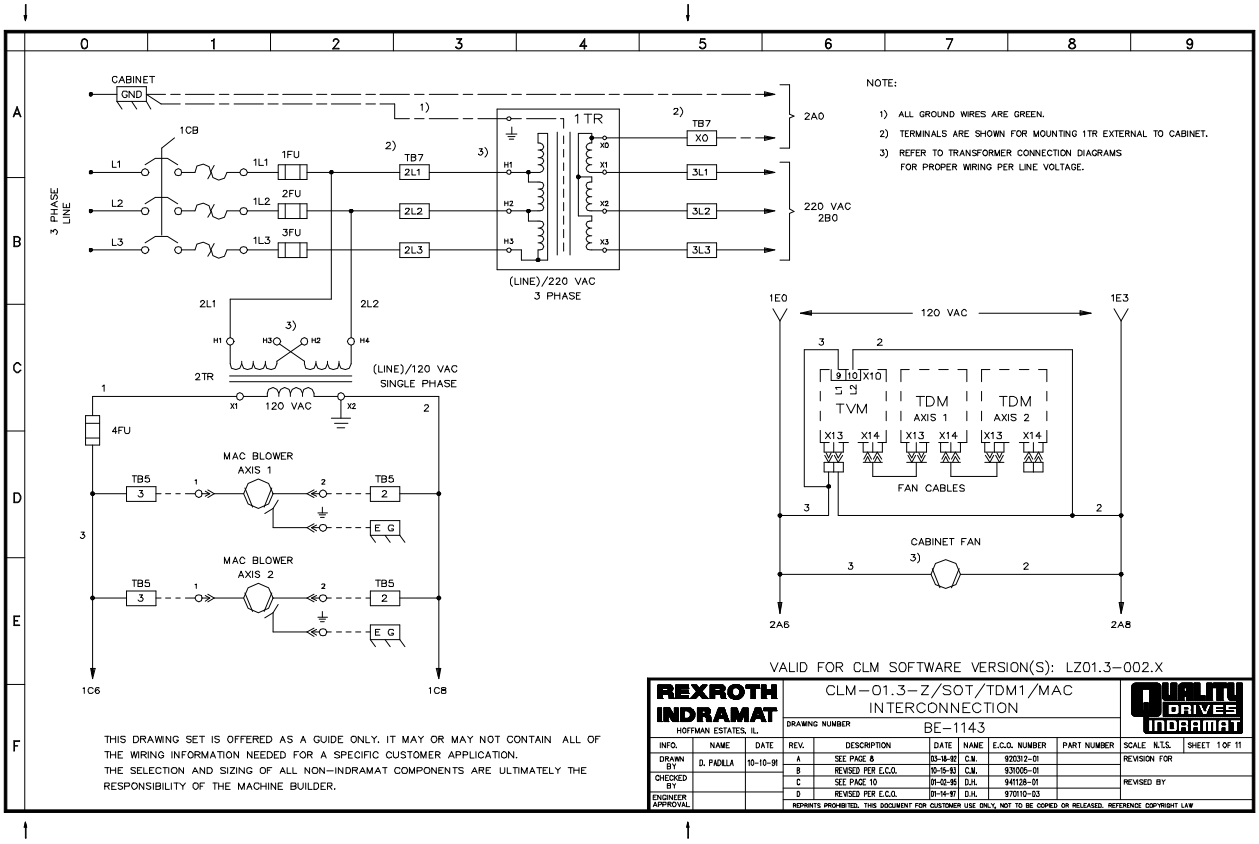
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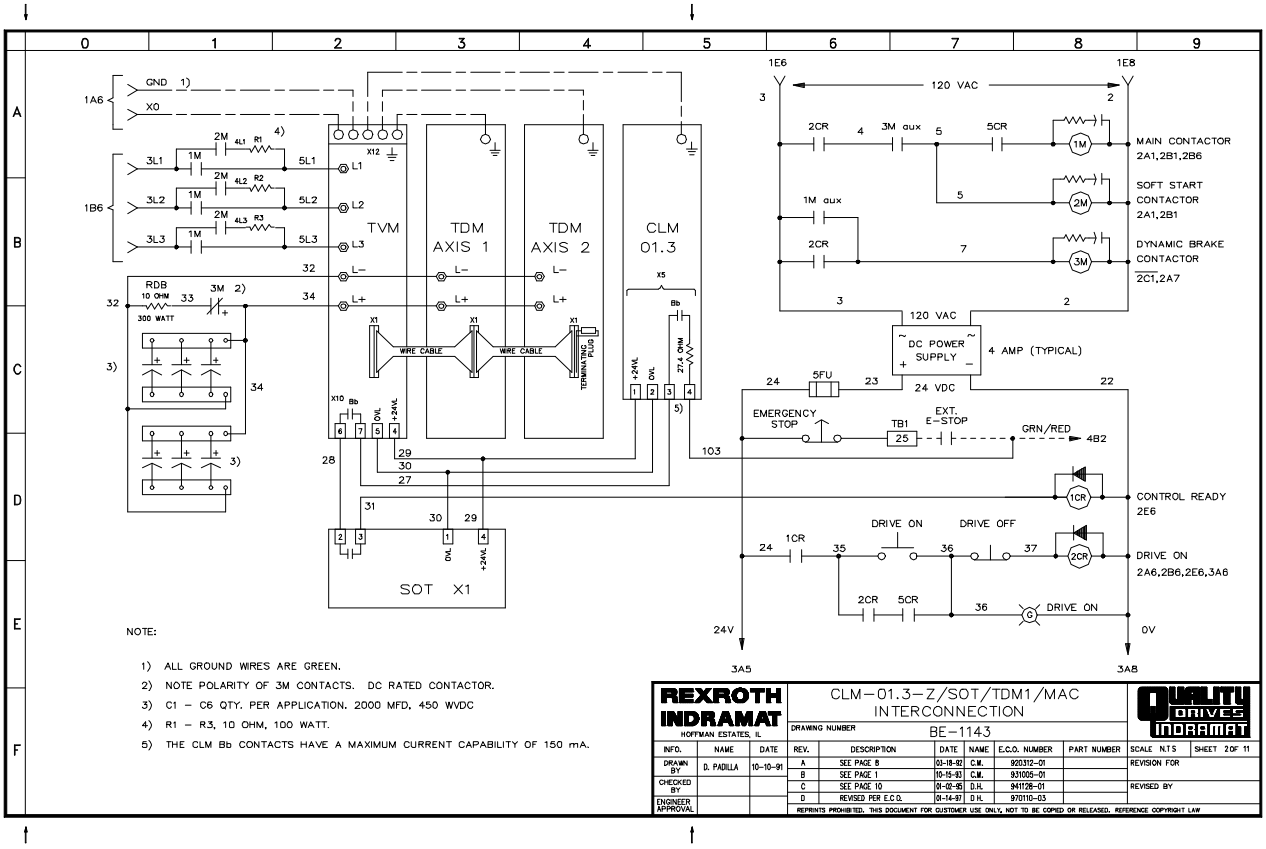

CONNECTOR X1
PIN #
INDRAMAT CABLE IKS 0727 (USED FOR REGISTRATION)
INDRAMAT CABLE IKS 0301
1)
AXIS #1
TB3
LARGE WHITE
LARGE BROWN
BLACK
RED
BROWN
GREEN
GRAY
PINK
BLUE
SHD
0VDC
+5VDC
MARKER
MARKER
CHANNEL A
CHANNEL A
CHANNEL B
CHANNEL B
LAMP CHECK
SHIELD
INCREMENTAL ENCODER
(NOT USED)
CLM-01.3
NOTE:
1) THE VIOLET WIRE (NOT SHOWN) ON THE INDRAMAT CABLE IKS 0301 IS NOT USED.
THIS PAGE SHOWS ONLY INCREMENTAL ENCODER WHEN USING REGISTRATION CABLE IKS 0727
WHEN USING REGISTRATION PARAMETERS, YOU DO NOT HAVE THE OPTION OF USING A MEASURING WHEEL ENCODER.
REXROTH INDRAMAT
HOFFMAN ESTATES, IL.
CLM-01.3-R/SOT/TDM1/MAC (W/LOOP CONTROL) INTERCONNECTION
DRAWING NUMBER BE-1151
INFO. NAME DATE
DRAWN BY C.MARTINEZ 12-26-91
CHECKED BY
ENGINEER APPROVAL
REV. DESCRIPTION DATE NAME E.C.O. NUMBER PART NUMBER
A REVISED PER E.C.O. 03-18-92 C.M. 920312-01
B SEE PAGE 1 10-15-93 C.M. 931005-01
C SEE PAGE 9 01-02-96 D.H. 941128-01
D REVISED PER E.C.O. 01-10-97 D.H. 970110-02
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SCALE N.T.S.
SHEET 7OF 10
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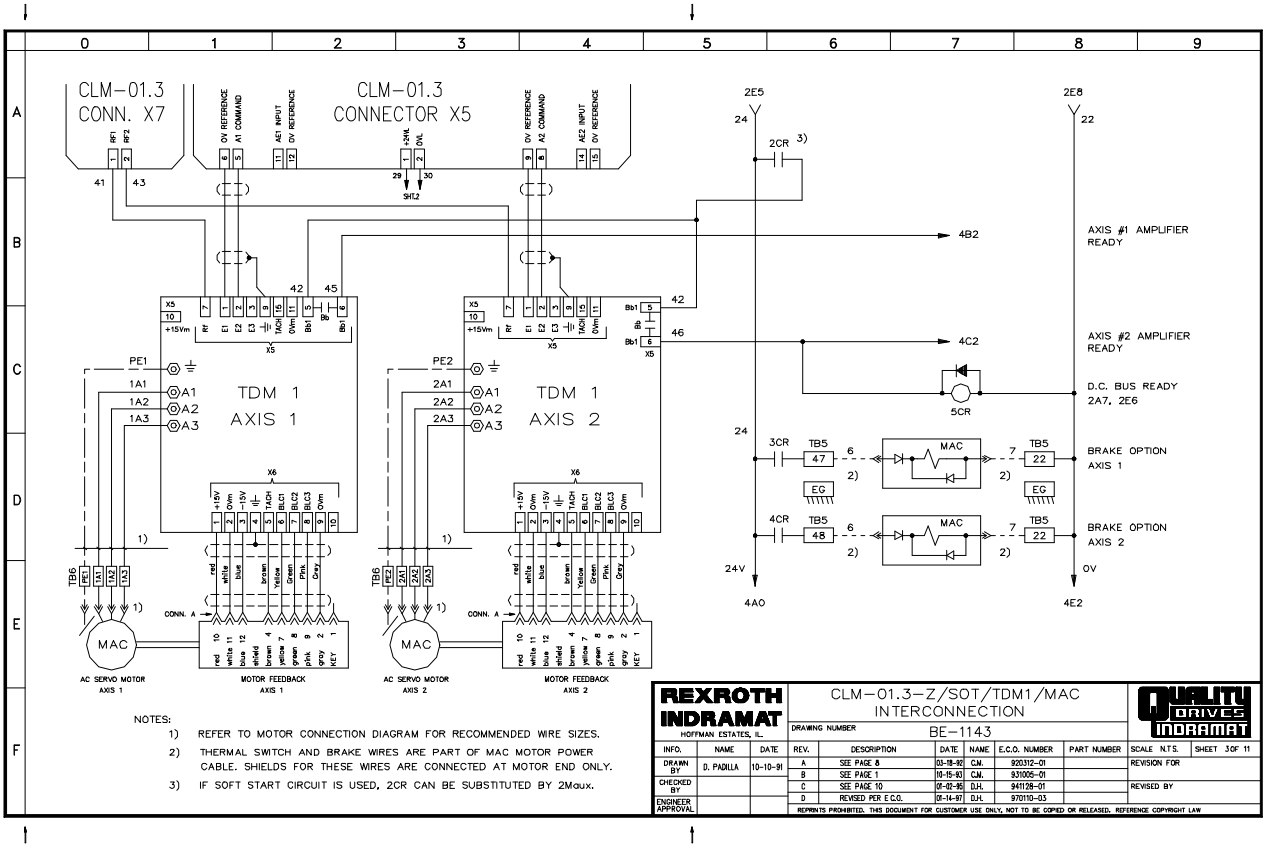

SOT
CONNECTOR X4 OUTPUTS
CABLE # IKS 0043
TO CLM CONNECTION X3 (SEE PAGE 4)
CYCLE STOP 1 VIOLET
AUTOMATIC MODE SELECT 2 BLUE
SET UP MODE SELECT 3 PINK
CYCLE START 4 GRAY
RESUME CYCLE 5 GREEN
AXIS # 1 JOG FORWARD 6 BROWN
AXIS # 1 JOG REVERSE 7 BLACK
CLEAR 8 RED
TWISTED PAIRS
12 LG BROWN
13 JUMPER
14 LG WHITE
15 JUMPER
TB1 24
TB1 22
5E7 24V
5D9 0V
SHIELD
EG
NOTE 1.) EACH SOT OUTPUT HAS A MAXIMUM CURRENT CAPABILITY OF 50mA.
SOT
CONNECTOR X2 RS485
CABLE # IKS 0754
CLM
CONNECTOR X6
GND 7
RX/TX 11
RX/TX 12
GREEN
WHITE
BROWN
1 SHIELD
7 GND
11 RX/TX
12 RX/TX
RS 485 MAX. LENGTH=1000m (≈3280 ft.)
REXROTH INDRAMAT
HOFFMAN ESTATES, IL
CLM-01.3-R/SOT/TDM1/MAC (W/LOOP CONTROL) INTERCONNECTION
DRAWING NUMBER BE-1151
QUALITY DRIVES INDRAMAT
INFO. NAME DATE
DRAWN BY C.MARTINEZ 12-26-91
CHECKED BY
ENGINEER APPROVAL
REV. DESCRIPTION DATE NAME E.C.O. NUMBER PART NUMBER
A SEE PAGE 7 03-18-92 C.M. 920312-01
B SEE PAGE 1 10-15-93 C.M. 931005-01
C SEE PAGE 9 01-02-95 D.H. 941128-01
D REVISED PER E.C.O. 01-16-97 D.H. 970110-02
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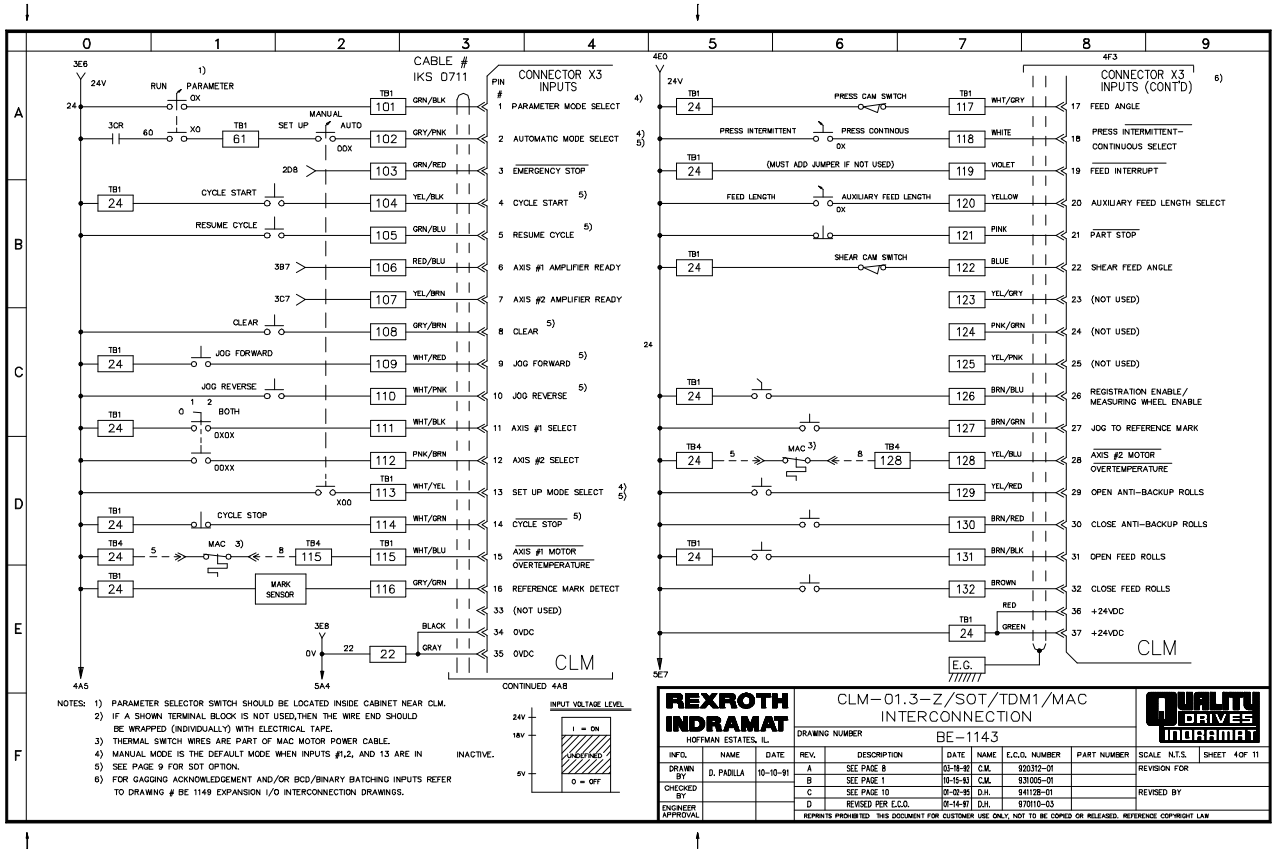

IDS BOARD
5VDC 5
OVDC 4
OVDC 3
TxD 2
RxD 1
CLM TO IDS CABLE IKS 0742
MAX. LENGTH 9.906 M(32.5 FT)
PINK
GRAY
YELLOW
BROWN
WHITE
CLM 01.3
24 5V
8 0V
7 0V
3 RxD
2 TxD
1 GRD
CONNECTOR
X6
VORNE DISPLAY
-SERIAL IN
+SERIAL IN
GROUND
110 VAC
2
3
NOTE: THE USE OF THE IDS PANEL AND VORNE DISPLAY
ARE OPTIONAL WITH SOFTWARE VERSION LR01.3-006.X
REXROTH
INDRAMAT
HOFFMAN ESTATES, IL.
CLM-01.3-R/SOT/TDM1/MAC
(W/LOOP CONTROL) INTERCONNECTION
DRAWING NUMBER
BE-1151
QUALITY DRIVES INDRAMAT
INFO. NAME DATE
DRAWN BY C.MARTINEZ 12-26-91
CHECKED BY
ENGINEER APPROVAL
REV. DESCRIPTION DATE NAME E.C.O. NUMBER PART NUMBER
A SEE PAGE 7 03-18-92 CJM 920312-01
B SEE PAGE 1 10-15-93 CJM 931005-01
C REVISED PER E.C.O 01-02-96 DJH 941128-01
D REVISED PER E.C.O. 01-10-97 DJH 970110-02
SCALE N.T.S. SHEET 9OF 10
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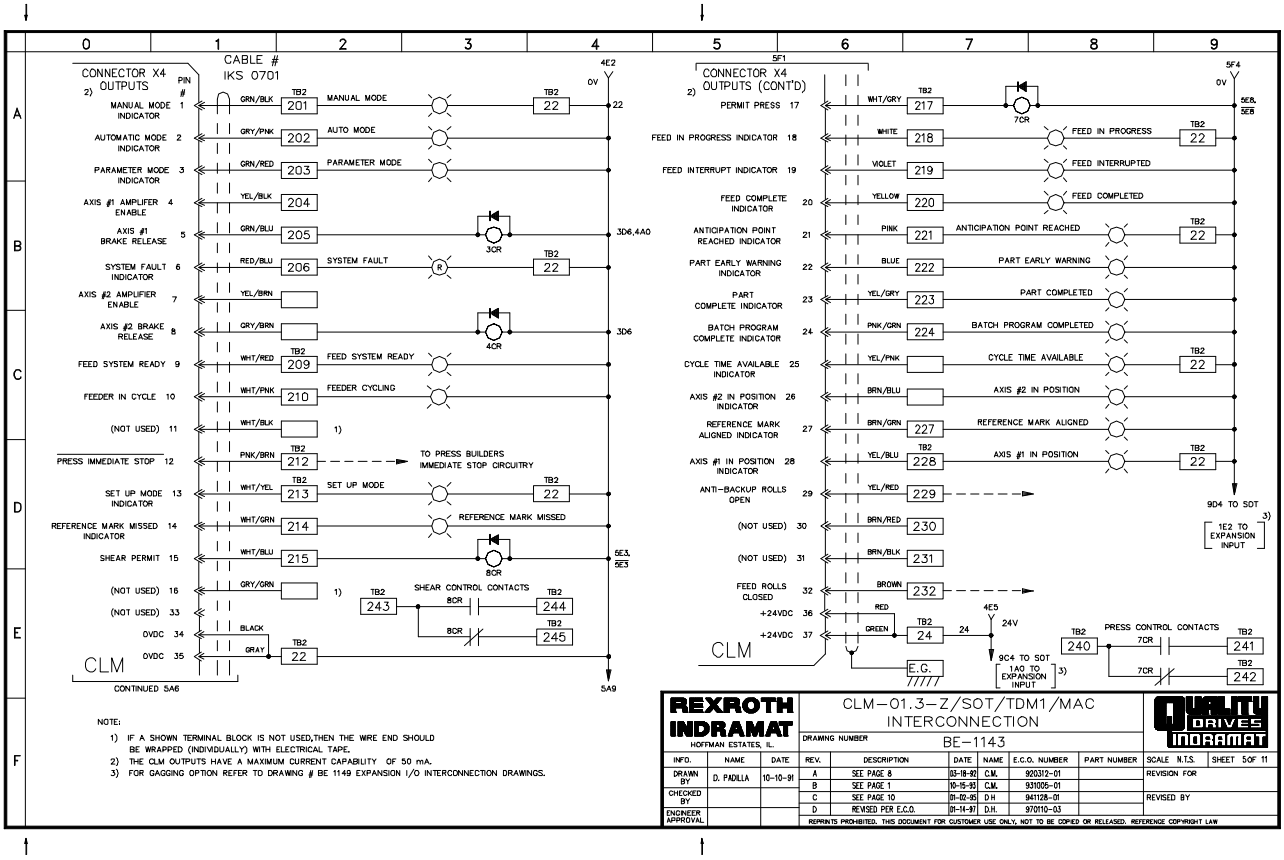

CLM-01.3-R-E EXPANSION (ONLY) INPUTS
CLM-01.3-R-E EXPANSION (ONLY) OUTPUTS
TB1
TB1 (CONT)
TB2
TB2 (CONT)
TB3
TB5
TB6
TB7
LARGE
CABINET GROUND
NOTE:
1) LOCATE CABINET GROUND NEAR 1CB.
2) E G TERMINALS ARE GROUNDING TYPE OR CONNECTED TO CABINET GROUND WITH 12 GA. GREEN WIRE.
3) SHD AND PE ARE NOT GROUNDED AT TERMINAL.
4) TB6 SHOULD BE LOCATED NEAR TB5 TO ALLOW THERMAL SWITCH AND BRAKE WIRE CONNECTIONS FROM MOTOR POWER CABLE.
REXROTH INDRAMAT
HOFFMAN ESTATES, IL.
CLM-01.3-R/SOT/TDM1/MAC (W/LOOP CONTROL) INTERCONNECTION
DRAWING NUMBER BE-1151
QUALITY DRIVES INDRAMAT
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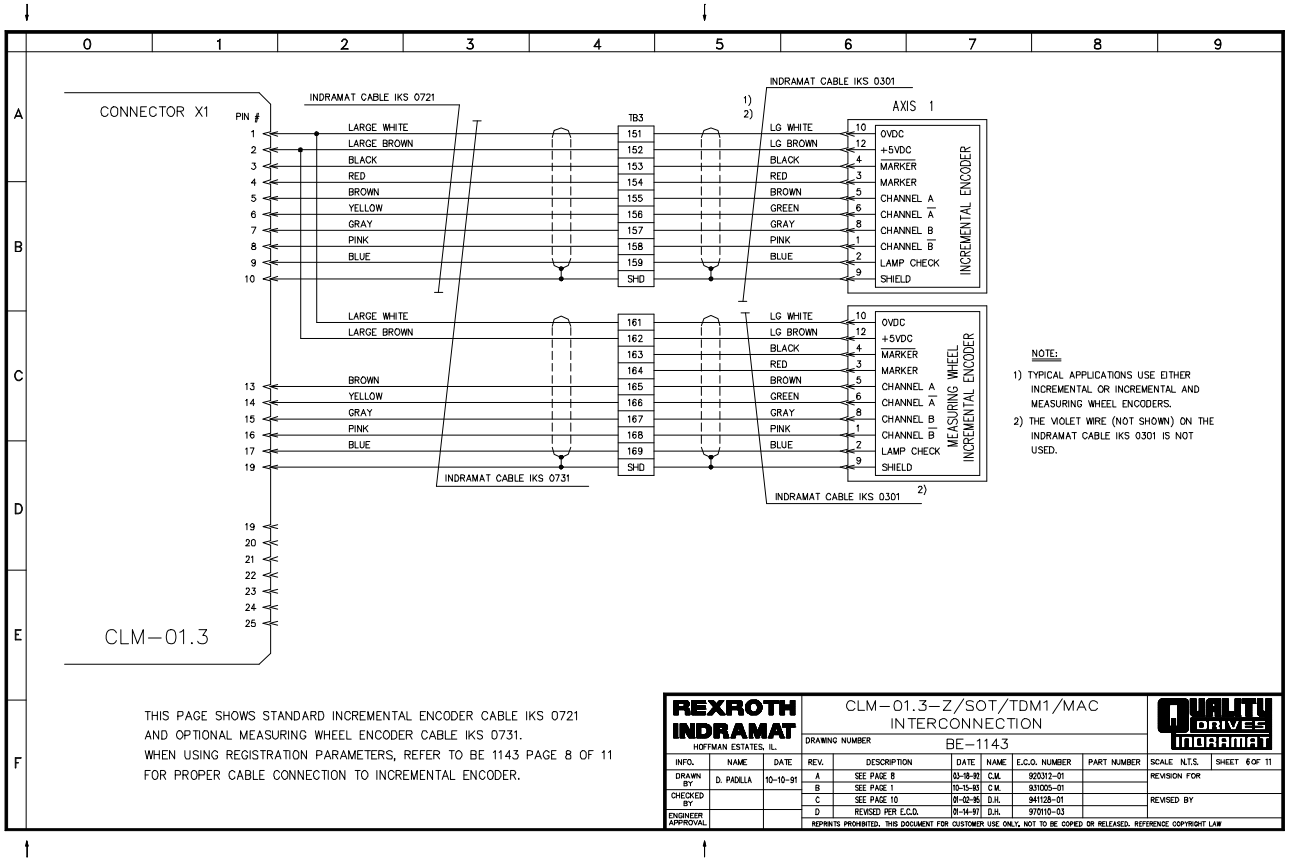

CABINET
GND
1CB
L1
L2
L3
3 PHASE LINE
1L1
1L2
1L3
1FU
2FU
3FU
1TR
TB7
2L1
2L2
2L3
XO
3L1
3L2
3L3
2A0
220 VAC
2B0
(LINE)/220 VAC
3 PHASE
2TR
(LINE)/120 VAC
SINGLE PHASE
120 VAC
4FU
MAC BLOWER
AXIS 1
MAC BLOWER
AXIS 2
TB5
E G
1C6
1C8
NOTE:
1) ALL GROUND WIRES ARE GREEN.
2) TERMINALS ARE SHOWN FOR MOUNTING 1TR EXTERNAL TO CABINET.
3) REFER TO TRANSFORMER CONNECTION DIAGRAMS FOR PROPER WIRING PER LINE VOLTAGE.
1E0
120 VAC
1E3
TVM
TDM
AXIS 1
TDM
AXIS 2
FAN CABLES
CABINET FAN
2A6
2A8
VALID FOR CLM SOFTWARE VERSION(S): LZ01.3-002.X
REXROTH INDRAMAT
HOFFMAN ESTATES, IL
CLM-01.3-Z/SOT/TDM1/MAC
INTERCONNECTION
DRAWING NUMBER
BE-1143
QUALITY DRIVES INDRAMAT
INFO. NAME DATE
DRAWN BY D. PADILLA 10-10-91
CHECKED BY
ENGINEER APPROVAL
REV. DESCRIPTION DATE NAME E.C.O. NUMBER PART NUMBER
A SEE PAGE 8 03-16-92 C.M. 920312-01
B REVISED PER E.C.O. 10-15-93 C.M. 931005-01
C SEE PAGE 10 01-02-95 D.H. 941128-01
D REVISED PER E.C.O. 01-14-97 D.H. 970110-03
SCALE N.T.S. SHEET 1 OF 11
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THIS DRAWING SET IS OFFERED AS A GUIDE ONLY. IT MAY OR MAY NOT CONTAIN ALL OF THE WIRING INFORMATION NEEDED FOR A SPECIFIC CUSTOMER APPLICATION.
THE SELECTION AND SIZING OF ALL NON-INDRAMAT COMPONENTS ARE ULTIMATELY THE RESPONSIBILITY OF THE MACHINE BUILDER.


TVM
TDM AXIS 1
TDM AXIS 2
CLM 01.3
SOT X1
120 VAC
DC POWER SUPPLY
4 AMP (TYPICAL)
24 VDC
MAIN CONTACTOR 2A1,2B1,2B6
SOFT START CONTACTOR 2A1,2B1
DYNAMIC BRAKE CONTACTOR 2C1,2A7
CONTROL READY 2E6
DRIVE ON 2A6,2B6,2E6,3A6
EMERGENCY STOP
EXT. E-STOP
DRIVE ON
DRIVE OFF
WIRE CABLE
RDB 10 OHM 300 WATT
NOTE:
1) ALL GROUND WIRES ARE GREEN.
2) NOTE POLARITY OF 3M CONTACTS. DC RATED CONTACTOR.
3) C1 – C6 QTY. PER APPLICATION. 2000 MFD, 450 WVDC
4) R1 – R3, 10 OHM, 100 WATT.
5) THE CLM Bb CONTACTS HAVE A MAXIMUM CURRENT CAPABILITY OF 150 mA.
REXROTH INDRAMAT
HOFFMAN ESTATES, IL
CLM–01.3–Z/SOT/TDM1/MAC INTERCONNECTION
DRAWING NUMBER BE–1143
DRAWN BY D. PADILLA 10–10–91
CHECKED BY
ENGINEER APPROVAL
A SEE PAGE 8 03–18–92 C.M. 920312–01
B SEE PAGE 1 10–15–93 C.M. 931005–01
C SEE PAGE 10 01–02–95 D.H. 941128–01
D REVISED PER E.C.O. 01–14–97 D.H. 970110–03
SCALE N.T.S SHEET 20F 11
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CLM-01.3
CONN. X7
CLM-01.3
CONNECTOR X5
TDM 1
AXIS 1
TDM 1
AXIS 2
MAC
AC SERVO MOTOR
AXIS 1
MOTOR FEEDBACK
AXIS 1
AC SERVO MOTOR
AXIS 2
MOTOR FEEDBACK
AXIS 2
AXIS #1 AMPLIFIER
READY
AXIS #2 AMPLIFIER
READY
D.C. BUS READY
2A7, 2E6
BRAKE OPTION
AXIS 1
BRAKE OPTION
AXIS 2
24V
0V
NOTES:
1) REFER TO MOTOR CONNECTION DIAGRAM FOR RECOMMENDED WIRE SIZES.
2) THERMAL SWITCH AND BRAKE WIRES ARE PART OF MAC MOTOR POWER CABLE. SHIELDS FOR THESE WIRES ARE CONNECTED AT MOTOR END ONLY.
3) IF SOFT START CIRCUIT IS USED, 2CR CAN BE SUBSTITUTED BY 2Maux.
REXROTH INDRAMAT
HOFFMAN ESTATES, IL.
CLM-01.3-Z/SOT/TDM1/MAC
INTERCONNECTION
DRAWING NUMBER
BE-1143
QUALITY DRIVES INDRAMAT
INFO. NAME DATE
DRAWN BY D. PADILLA 10-10-91
CHECKED BY
ENGINEER APPROVAL
REV. DESCRIPTION DATE NAME E.C.O. NUMBER PART NUMBER
A SEE PAGE 8 03-18-92 C.M. 920312-01
B SEE PAGE 1 10-15-93 C.M. 931005-01
C SEE PAGE 10 01-02-95 D.H. 941128-01
D REVISED PER E.C.O. 05-14-97 D.H. 970110-03
SCALE N.T.S. SHEET 3OF 11
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CABLE # IKS 0711
CONNECTOR X3 INPUTS
CONNECTOR X3 INPUTS (CONT'D)
CLM
CONTINUED 4A8
INPUT VOLTAGE LEVEL
24V
18V
5V
1 = ON
UNDEFINED
0 = OFF
NOTES: 1) PARAMETER SELECTOR SWITCH SHOULD BE LOCATED INSIDE CABINET NEAR CLM.
2) IF A SHOWN TERMINAL BLOCK IS NOT USED,THEN THE WIRE END SHOULD BE WRAPPED (INDIVIDUALLY) WITH ELECTRICAL TAPE.
3) THERMAL SWITCH WIRES ARE PART OF MAC MOTOR POWER CABLE.
4) MANUAL MODE IS THE DEFAULT MODE WHEN INPUTS #1,2, AND 13 ARE IN INACTIVE.
5) SEE PAGE 9 FOR SDT OPTION.
6) FOR GAGGING ACKNOWLEDGEMENT AND/OR BCD/BINARY BATCHING INPUTS REFER TO DRAWING # BE 1149 EXPANSION I/O INTERCONNECTION DRAWINGS.
REXROTH INDRAMAT
HOFFMAN ESTATES, IL.
CLM-01.3-Z/SOT/TDM1/MAC INTERCONNECTION
DRAWING NUMBER BE-1143
QUALITY DRIVES INDRAMAT
INFO. NAME DATE
DRAWN BY D. PADILLA 10-10-91
CHECKED BY
ENGINEER APPROVAL
REV. DESCRIPTION DATE NAME E.C.O. NUMBER PART NUMBER
A SEE PAGE 8 03-18-92 C.M. 920312-01
B SEE PAGE 1 10-15-93 C.M. 931005-01
C SEE PAGE 10 09-01-95 D.H. 941128-01
D REVISED PER E.C.O. 09-14-97 D.H. 970110-03
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CONNECTOR X4
2) OUTPUTS
PIN #
CABLE # IKS 0701
MANUAL MODE INDICATOR 1
AUTOMATIC MODE INDICATOR 2
PARAMETER MODE INDICATOR 3
AXIS #1 AMPLIFIER ENABLE 4
AXIS #1 BRAKE RELEASE 5
SYSTEM FAULT INDICATOR 6
AXIS #2 AMPLIFIER ENABLE 7
AXIS #2 BRAKE RELEASE 8
FEED SYSTEM READY 9
FEEDER IN CYCLE 10
(NOT USED) 11
PRESS IMMEDIATE STOP 12
SET UP MODE INDICATOR 13
REFERENCE MARK MISSED INDICATOR 14
SHEAR PERMIT 15
(NOT USED) 16
(NOT USED) 33
0VDC 34
0VDC 35
GRN/BLK
GRY/PNK
GRN/RED
YEL/BLK
GRN/BLU
RED/BLU
YEL/BRN
GRY/BRN
WHT/RED
WHT/PNK
WHT/BLK
PNK/BRN
WHT/YEL
WHT/GRN
WHT/BLU
GRY/GRN
BLACK
GRAY
MANUAL MODE
AUTO MODE
PARAMETER MODE
SYSTEM FAULT
FEED SYSTEM READY
FEEDER CYCLING
TO PRESS BUILDERS IMMEDIATE STOP CIRCUITRY
SET UP MODE
REFERENCE MARK MISSED
SHEAR CONTROL CONTACTS
3CR
4CR
8CR
CLM
CONTINUED 5A6
4E2
0V
3D6,4A0
3D6
5E3
5A9
CONNECTOR X4
2) OUTPUTS (CONT'D)
5F1
PERMIT PRESS 17
FEED IN PROGRESS INDICATOR 18
FEED INTERRUPT INDICATOR 19
FEED COMPLETE INDICATOR 20
ANTICIPATION POINT REACHED INDICATOR 21
PART EARLY WARNING INDICATOR 22
PART COMPLETE INDICATOR 23
BATCH PROGRAM COMPLETE INDICATOR 24
CYCLE TIME AVAILABLE INDICATOR 25
AXIS #2 IN POSITION INDICATOR 26
REFERENCE MARK ALIGNED INDICATOR 27
AXIS #1 IN POSITION INDICATOR 28
ANTI-BACKUP ROLLS OPEN 29
(NOT USED) 30
(NOT USED) 31
FEED ROLLS CLOSED 32
+24VDC 36
+24VDC 37
WHT/GRY
WHITE
VIOLET
YELLOW
PINK
BLUE
YEL/GRY
PNK/GRN
YEL/PNK
BRN/BLU
BRN/GRN
YEL/BLU
YEL/RED
BRN/RED
BRN/BLK
BROWN
RED
GREEN
7CR
FEED IN PROGRESS
FEED INTERRUPTED
FEED COMPLETED
ANTICIPATION POINT REACHED
PART EARLY WARNING
PART COMPLETED
BATCH PROGRAM COMPLETED
CYCLE TIME AVAILABLE
AXIS #2 IN POSITION
REFERENCE MARK ALIGNED
AXIS #1 IN POSITION
9D4 TO SOT
1E2 TO EXPANSION INPUT
9C4 TO SOT
1A0 TO EXPANSION INPUT
4E5
24V
E.G.
PRESS CONTROL CONTACTS
NOTE:
1) IF A SHOWN TERMINAL BLOCK IS NOT USED,THEN THE WIRE END SHOULD BE WRAPPED (INDIVIDUALLY) WITH ELECTRICAL TAPE.
2) THE CLM OUTPUTS HAVE A MAXIMUM CURRENT CAPABILITY OF 50 mA.
3) FOR GAGGING OPTION REFER TO DRAWING # BE 1149 EXPANSION I/O INTERCONNECTION DRAWINGS.
REXROTH INDRAMAT
HOFFMAN ESTATES, IL.
CLM-01.3-Z/SOT/TDM1/MAC INTERCONNECTION
DRAWING NUMBER BE-1143
INFO. NAME DATE
DRAWN BY D. PADILLA 10-10-91
CHECKED BY
ENGINEER APPROVAL
REV. DESCRIPTION DATE NAME E.C.O. NUMBER PART NUMBER
A SEE PAGE 8 03-18-92 C.M. 920312-01
B SEE PAGE 1 10-15-93 C.M. 931005-01
C SEE PAGE 10 01-02-95 D.H. 941128-01
D REVISED PER E.C.O. 01-14-97 D.H. 970110-03
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THIS PAGE SHOWS STANDARD INCREMENTAL ENCODER CABLE IKS 0721
AND OPTIONAL MEASURING WHEEL ENCODER CABLE IKS 0731.
WHEN USING REGISTRATION PARAMETERS, REFER TO BE 1143 PAGE 8 OF 11
FOR PROPER CABLE CONNECTION TO INCREMENTAL ENCODER.

REXROTH INDRAMAT
HOFFMAN ESTATES, IL.

CLM–01.3–Z/SOT/TDM1/MAC
INTERCONNECTION

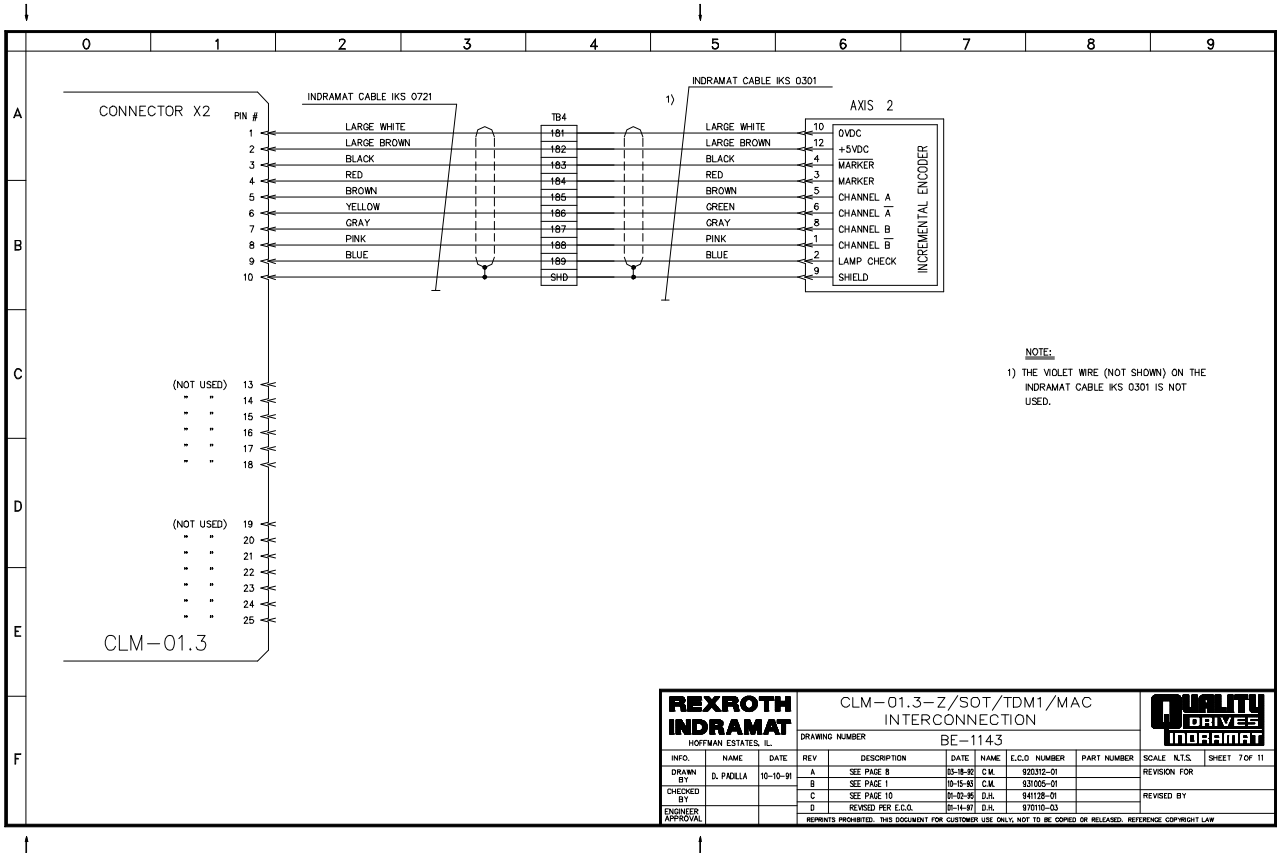
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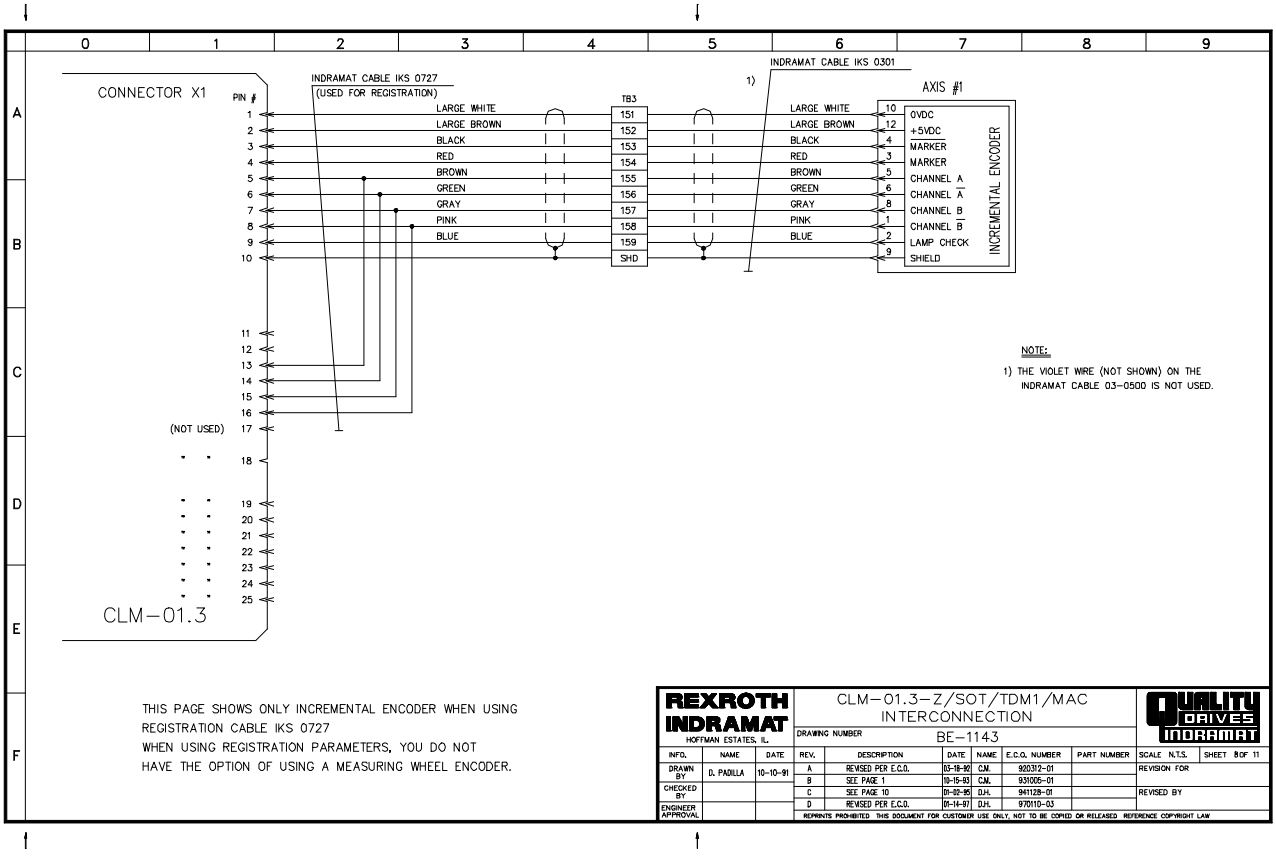
INFO.	NAME	DATE
DRAWN BY	D. PADILLA	10-10-91
CHECKED BY		
ENGINEER APPROVAL		

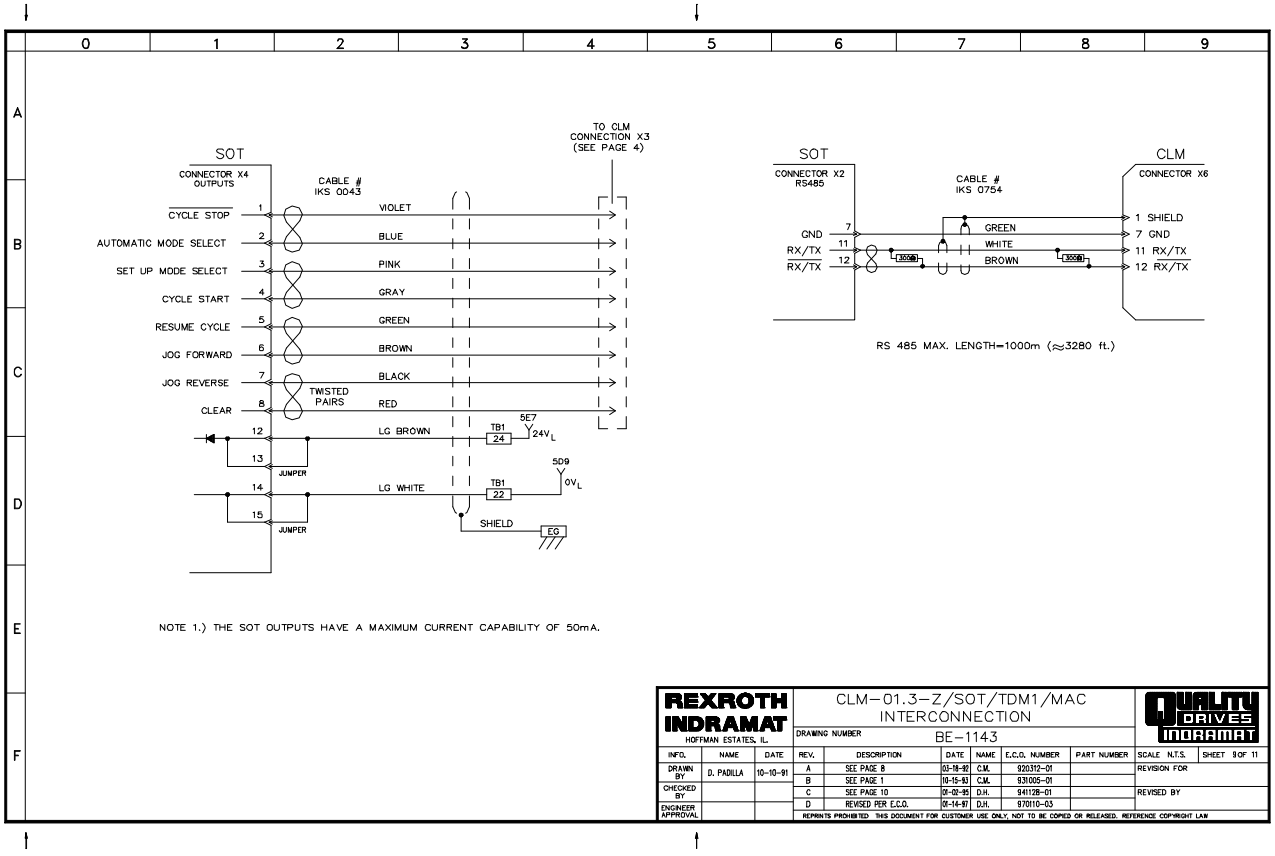
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A	SEE PAGE 8	03-18-92	C.M.	920312-01	
B	SEE PAGE 1	10-15-93	C.M.	931005-01	
C	SEE PAGE 10	01-02-96	D.H.	941128-01	
D	REVISED PER E.C.O.	01-14-97	D.H.	970110-03	

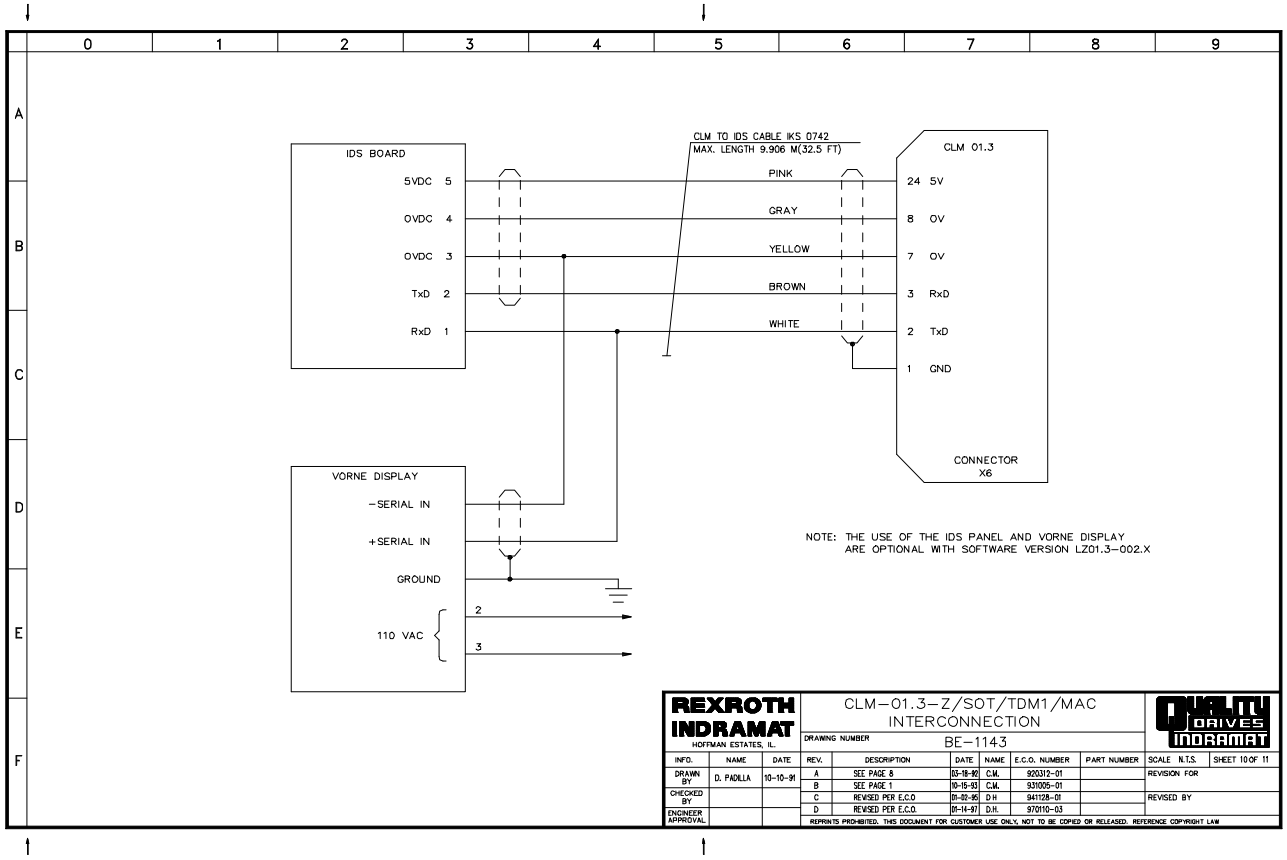
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REVISION FOR
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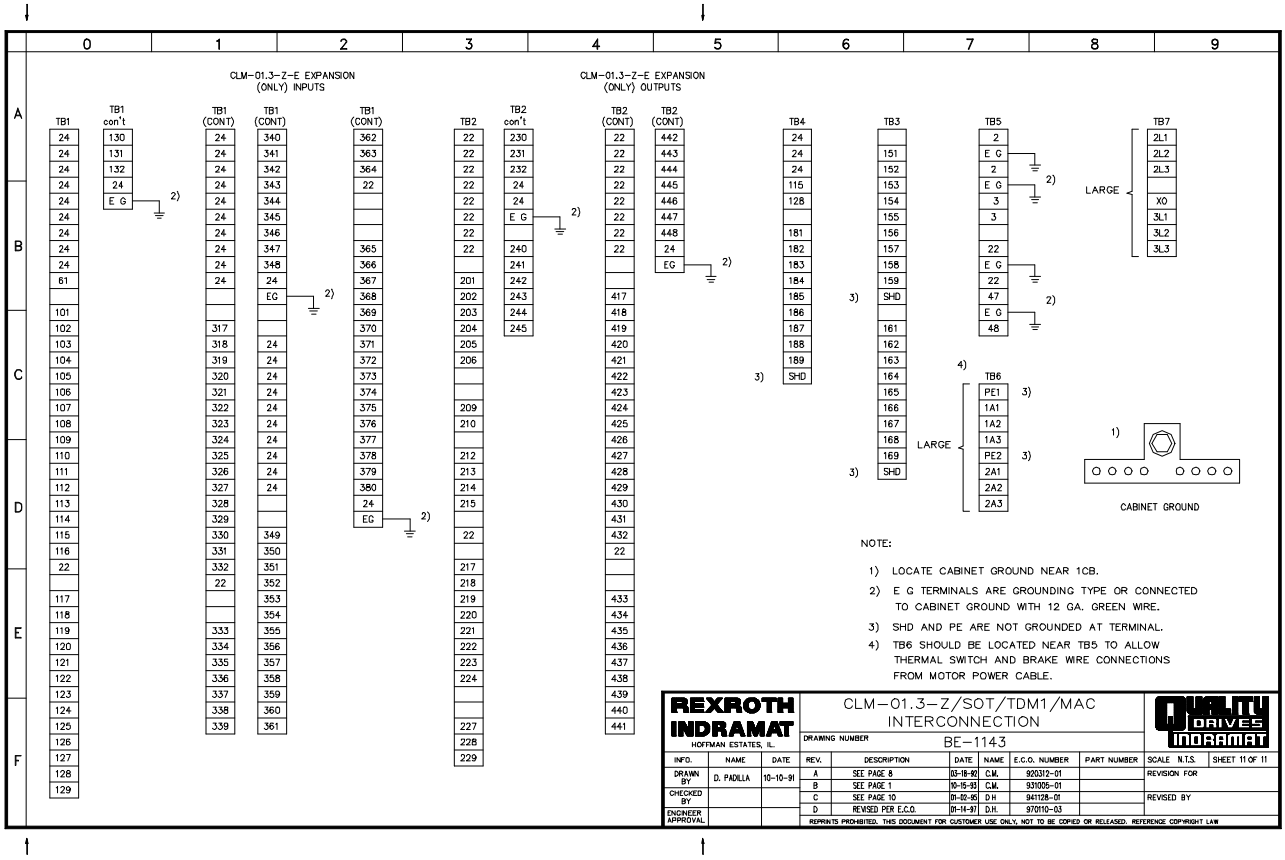
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CONNECTOR X2
PIN #
INDRAMAT CABLE IKS 0721
INDRAMAT CABLE IKS 0301
1)
TB4
AXIS 2
LARGE WHITE
LARGE BROWN
BLACK
RED
BROWN
YELLOW
GRAY
PINK
BLUE
GREEN
SHD
0VDC
+5VDC
MARKER
CHANNEL A
CHANNEL B
LAMP CHECK
SHIELD
INCREMENTAL ENCODER
(NOT USED)
CLM-01.3
NOTE:
1) THE VIOLET WIRE (NOT SHOWN) ON THE INDRAMAT CABLE IKS 0301 IS NOT USED.
REXROTH INDRAMAT
HOFFMAN ESTATES, IL.
CLM-01.3-Z/SOT/TDM1/MAC
INTERCONNECTION
DRAWING NUMBER
BE-114-3
QUALITY DRIVES INDRAMAT
INFO.
NAME
DATE
DRAWN BY
D. PADILLA
10-10-91
CHECKED BY
ENGINEER APPROVAL
REV
DESCRIPTION
DATE
NAME
E.C.O NUMBER
PART NUMBER
A
SEE PAGE B
03-18-92
C.M.
920312-01
B
SEE PAGE 1
10-15-93
C.M.
931005-01
C
SEE PAGE 10
01-02-95
D.H.
941128-01
D
REVISED PER E.C.O.
01-14-97
D.H.
970110-03
SCALE N.T.S.
SHEET 7 OF 11
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CONNECTOR X1
PIN #
INDRAMAT CABLE IKS 0727
(USED FOR REGISTRATION)
LARGE WHITE
LARGE BROWN
BLACK
RED
BROWN
GREEN
GRAY
PINK
BLUE
TB3
151
152
153
154
155
156
157
158
159
SHD
1)
INDRAMAT CABLE IKS 0301
AXIS #1
0VDC
+5VDC
MARKER
MARKER
CHANNEL A
CHANNEL Ā
CHANNEL B
CHANNEL B̄
LAMP CHECK
SHIELD
INCREMENTAL ENCODER
(NOT USED)
CLM-01.3
NOTE:
1) THE VIOLET WIRE (NOT SHOWN) ON THE INDRAMAT CABLE 03-0500 IS NOT USED.
THIS PAGE SHOWS ONLY INCREMENTAL ENCODER WHEN USING REGISTRATION CABLE IKS 0727
WHEN USING REGISTRATION PARAMETERS, YOU DO NOT HAVE THE OPTION OF USING A MEASURING WHEEL ENCODER.
REXROTH INDRAMAT
HOFFMAN ESTATES, IL.
CLM-01.3-Z/SOT/TDM1/MAC INTERCONNECTION
DRAWING NUMBER BE-1143
QUALITY DRIVES INDRAMAT
INFO. NAME DATE
DRAWN BY D. PADILLA 10-10-91
CHECKED BY
ENGINEER APPROVAL
REV. DESCRIPTION DATE NAME E.C.O. NUMBER PART NUMBER
A REVISED PER E.C.O. 03-18-92 C.M. 920312-01
B SEE PAGE 1 10-15-93 C.M. 931005-01
C SEE PAGE 10 01-02-95 D.H. 941128-01
D REVISED PER E.C.O. 01-14-97 D.H. 970110-03
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SOT
CONNECTOR X4
OUTPUTS
CABLE #
IKS 0043
TO CLM
CONNECTION X3
(SEE PAGE 4)
CYCLE STOP
AUTOMATIC MODE SELECT
SET UP MODE SELECT
CYCLE START
RESUME CYCLE
JOG FORWARD
JOG REVERSE
CLEAR
VIOLET
BLUE
PINK
GRAY
GREEN
BROWN
BLACK
RED
TWISTED
PAIRS
LG BROWN
LG WHITE
JUMPER
JUMPER
TB1
24
TB1
22
5E7
24V
5D9
0V
SHIELD
EG
SOT
CONNECTOR X2
RS485
CABLE #
IKS 0754
CLM
CONNECTOR X6
GND
RX/TX
RX/TX
GREEN
WHITE
BROWN
1 SHIELD
7 GND
11 RX/TX
12 RX/TX
RS 485 MAX. LENGTH=1000m (≈3280 ft.)
NOTE 1.) THE SOT OUTPUTS HAVE A MAXIMUM CURRENT CAPABILITY OF 50mA.
REXROTH
INDRAMAT
HOFFMAN ESTATES, IL.
CLM-01.3-Z/SOT/TDM1/MAC
INTERCONNECTION
DRAWING NUMBER
BE-1143
QUALITY DRIVES INDRAMAT
INFO. NAME DATE
DRAWN BY D. PADILLA 10-10-91
CHECKED BY
ENGINEER APPROVAL
REV. DESCRIPTION DATE NAME E.C.O. NUMBER PART NUMBER
A SEE PAGE 8 03-18-92 C.M. 920312-01
B SEE PAGE 1 10-15-93 C.M. 931005-01
C SEE PAGE 10 01-02-95 D.H. 941128-01
D REVISED PER E.C.O. 01-14-97 D.H. 970110-03
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IDS BOARD
5VDC 5
0VDC 4
0VDC 3
TxD 2
RxD 1
CLM TO IDS CABLE IKS 0742
MAX. LENGTH 9.906 M(32.5 FT)
PINK
GRAY
YELLOW
BROWN
WHITE
CLM 01.3
24 5V
8 0V
7 0V
3 RxD
2 TxD
1 GND
CONNECTOR
X6
VORNE DISPLAY
-SERIAL IN
+SERIAL IN
GROUND
110 VAC
2
3
NOTE: THE USE OF THE IDS PANEL AND VORNE DISPLAY
ARE OPTIONAL WITH SOFTWARE VERSION LZ01.3-002.X
REXROTH INDRAMAT
HOFFMAN ESTATES, IL.
CLM-01.3-Z/SOT/TDM1/MAC
INTERCONNECTION
DRAWING NUMBER
BE-1143
INFO. NAME DATE
DRAWN BY D. PADILLA 10-10-91
CHECKED BY
ENGINEER APPROVAL
REV. DESCRIPTION DATE NAME E.C.O. NUMBER PART NUMBER
A SEE PAGE 8 03-18-92 C.M. 920312-01
B SEE PAGE 1 10-15-93 C.M. 931005-01
C REVISED PER E.C.O 01-20-95 D.H. 941128-01
D REVISED PER E.C.O. 01-14-97 D.H. 970110-03
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SHEET 10 OF 11
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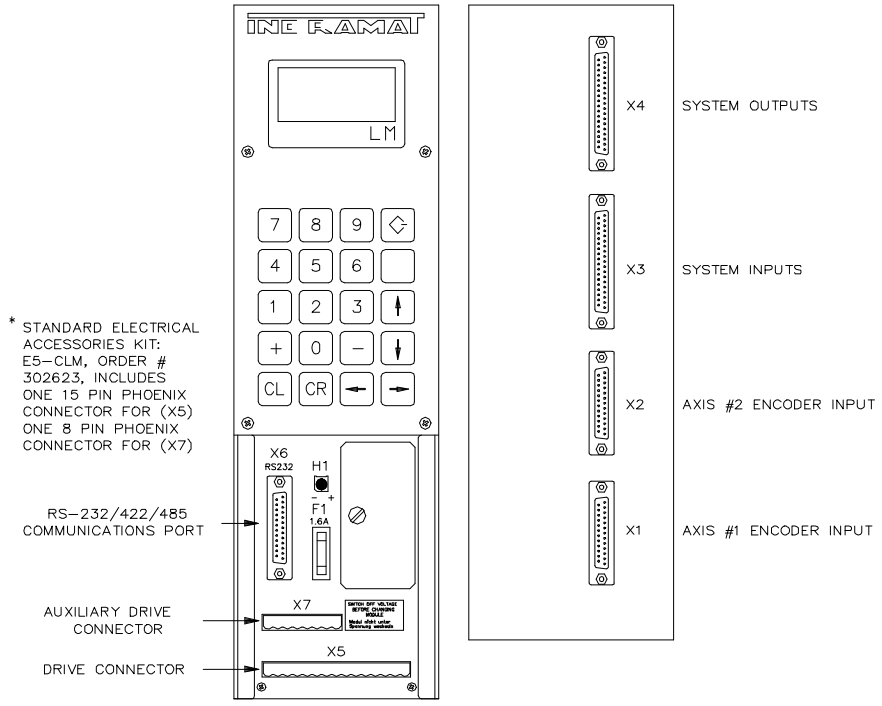

CLM-01.3-Z-E EXPANSION (ONLY) INPUTS
CLM-01.3-Z-E EXPANSION (ONLY) OUTPUTS
TB1
TB1 con't
TB1 (CONT)
TB2
TB2 con't
TB2 (CONT)
TB4
TB3
TB5
TB7
TB6
LARGE
CABINET GROUND
NOTE:
1) LOCATE CABINET GROUND NEAR 1CB.
2) E G TERMINALS ARE GROUNDING TYPE OR CONNECTED TO CABINET GROUND WITH 12 GA. GREEN WIRE.
3) SHD AND PE ARE NOT GROUNDED AT TERMINAL.
4) TB6 SHOULD BE LOCATED NEAR TB5 TO ALLOW THERMAL SWITCH AND BRAKE WIRE CONNECTIONS FROM MOTOR POWER CABLE.
REXROTH INDRAMAT
HOFFMAN ESTATES, IL.
CLM-01.3-Z/SOT/TDM1/MAC INTERCONNECTION
DRAWING NUMBER BE-1143
INFO. NAME DATE
DRAWN BY D. PADILLA 10-10-91
CHECKED BY
ENGINEER APPROVAL
REV. DESCRIPTION DATE NAME E.C.O. NUMBER PART NUMBER
A SEE PAGE 8 03-18-92 C.M. 920312-01
B SEE PAGE 1 10-15-93 C.M. 931005-01
C SEE PAGE 10 01-20-95 D.H. 941128-01
D REVISED PER E.C.O. 01-14-97 D.H. 970110-03
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APPENDIX E: INSTALLATION DRAWINGS

CAUTION: *Drawings in this appendix are included for illustrative purposes only and are subject to change without notice.*

This appendix includes the following information:

- CLM Interface Terminal Locations - Standard Model
- CLM Interface Terminal Locations - Optional Expansion I/O Model
- CLM Outline (Mounting Dimensions)
- CLM Keypad Remote Installation Drawings
- CLM Expansion Input Connector X11
- CLM Expansion Input Connector X12
- CLM Expansion Output Connector X13
- IDS and Remote Display Option Drawings



* ELECTRICAL ACCESSORIES KIT AND CABLE SET ARE ORDERED SEPARATELY AT TIME OF CLM PURCHASE. (STANDARD CABLE LENGTH: 2.5 METERS)

FRONT VIEW

TOP VIEW

REXROTH INDRAMAT
HOFFMAN ESTATES, IL.

CLM INTERFACE TERMINAL LOCATIONS
STANDARD MODEL

DRAWING NUMBER AG-1028

QUALITY DRIVES INDRAMAT

INFO.	NAME	DATE
DRAWN BY	C.MARTINEZ	3-23-92
CHECKED BY		
ENGINEER APPROVAL		

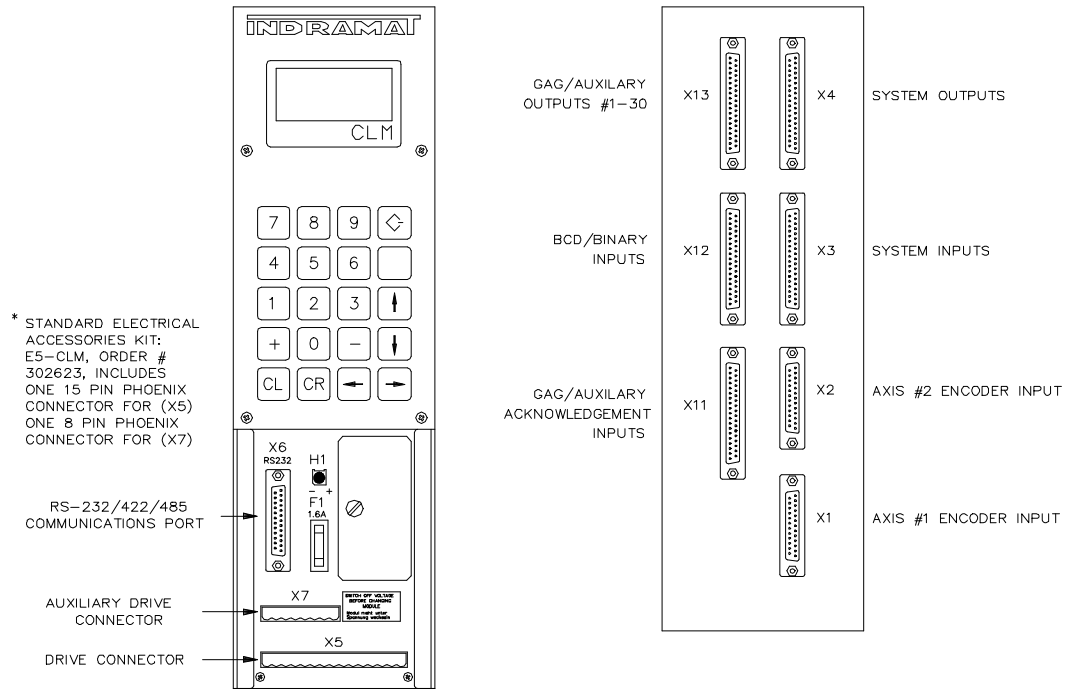
REV.	DESCRIPTION	DATE	NAME	E.C.O. NUMBER	PART NUMBER

SCALE N.T.S. SHEET 1 OF 1

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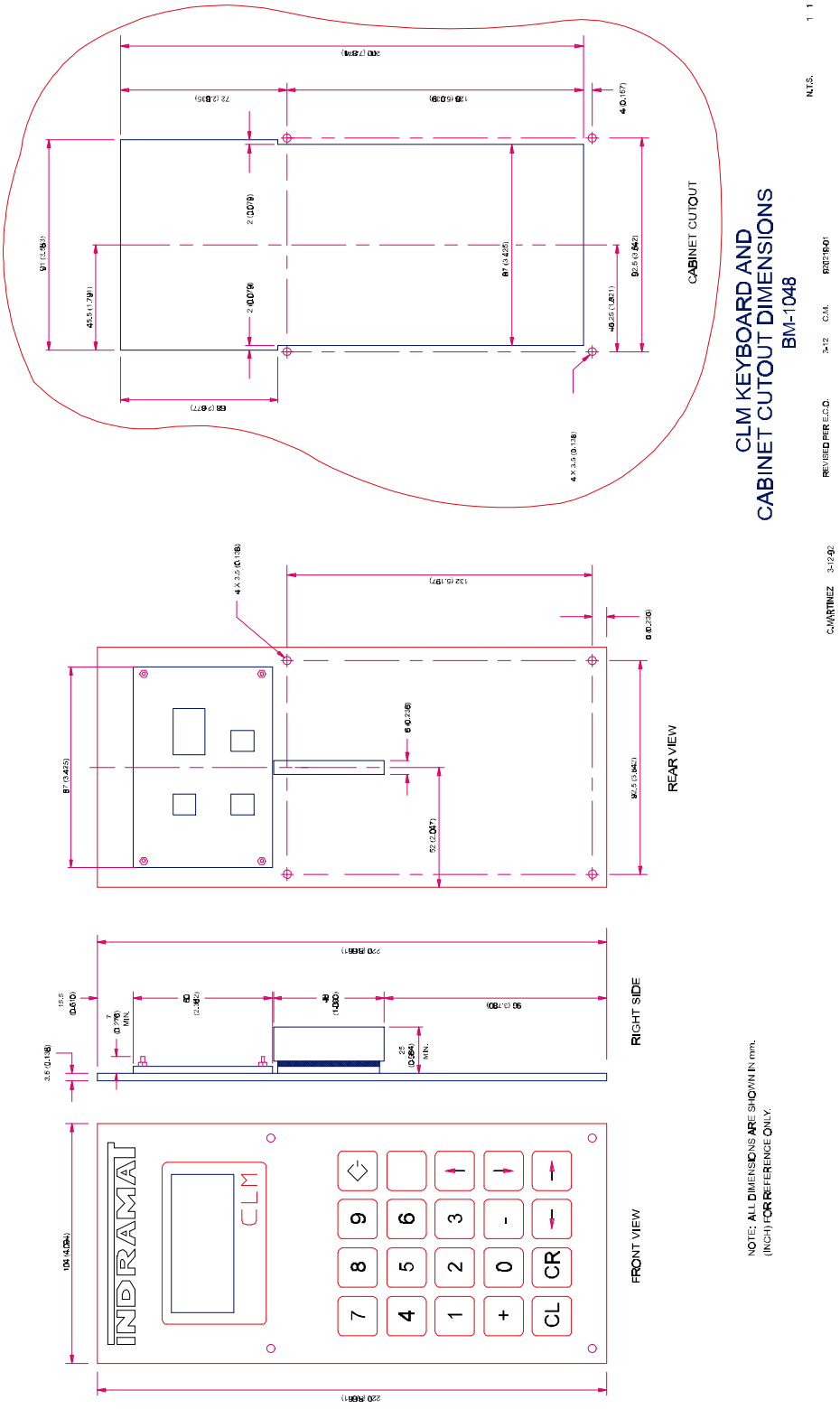
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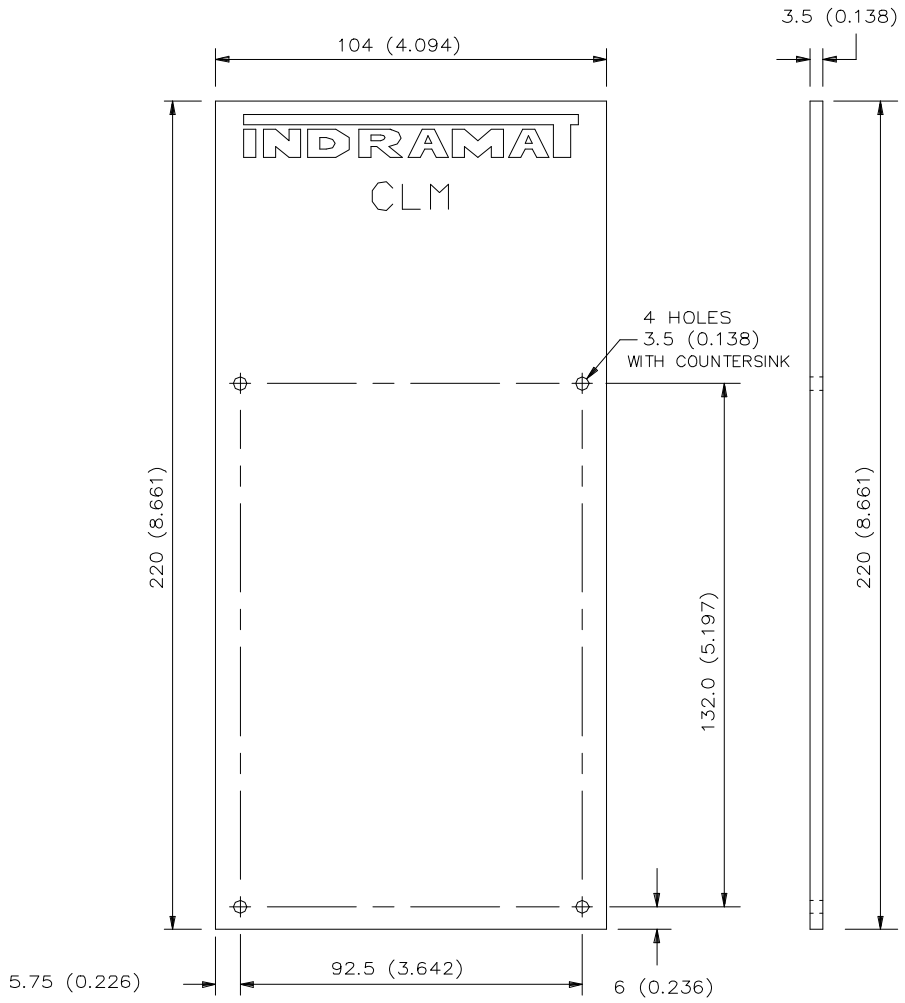


REXROTH INDRAMAT HOFFMAN ESTATES, IL.			CLM INTERFACE TERMINAL LOCATIONS EXPANSION I/O MODEL							QUALITY DRIVES INDRAMAT	
			DRAWING NUMBER AG–1029								
INFO.	NAME	DATE	REV.	DESCRIPTION	DATE	NAME	E.C.O. NUMBER	PART NUMBER		SCALE N.T.S.	SHEET 1 OF 1
DRAWN BY	C.MARTINEZ	4–09–92								REVISION FOR	
CHECKED BY											
ENGINEER APPROVAL										REVISED BY	

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CLM Keypad Remote Installation Drawings





NOTE: ALL DIMENSIONS ARE SHOWN IN mm.
(INCH) FOR REFERENCE ONLY.

REXROTH INDRAMAT
HOFFMAN ESTATES, IL.

CLM01.3 KEYPAD REPLACEMENT PANEL

DRAWING NUMBER AM–1052

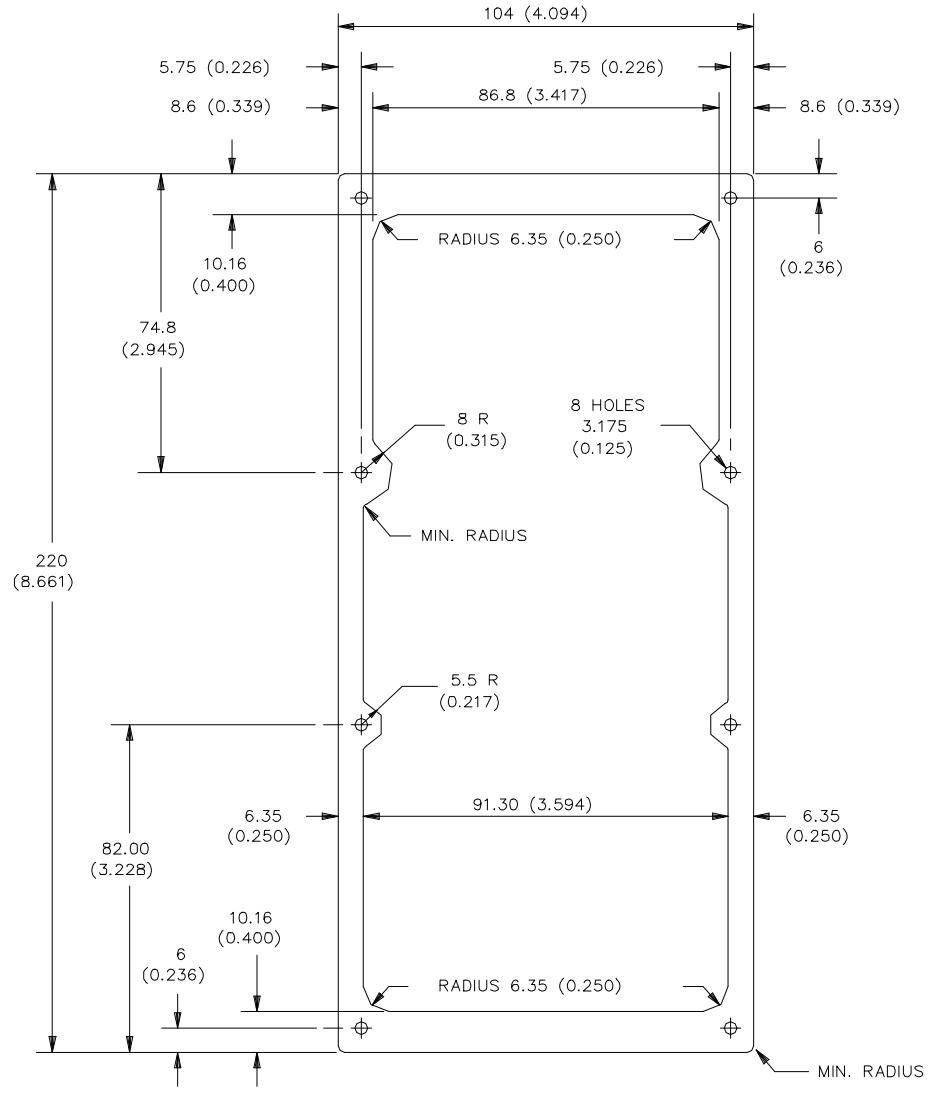
QUALITY DRIVES INDRAMAT

INFO.	NAME	DATE
DRAWN BY	D. PADILLA	5–15–92
CHECKED BY		
ENGINEER APPROVAL		

REV.	DESCRIPTION	DATE	NAME	E.C.O. NUMBER	PART NUMBER
A	REVISED PER E.C.O.	5/92	D.P.	920515–01	

SCALE N.T.S. SHEET 1 OF 1
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NOTES:
1.) ALL DIMENSIONS ARE SHOWN IN mm, (INCH) FOR REFERENCE ONLY.
2.) GASKET THICKNESS = 3/16"
3.) GASKET MATERIAL = CLOSED CELL NEOPRENE BLEND FOAM
4.) BOTH SIDES OF GASKET HAVE APPLICATION OF PRESSURE SENSITIVE ADHESIVE

REXROTH INDRAMAT
HOFFMAN ESTATES, IL.

CLM/CTA KEYPAD REMOTE INSTALLATION GASKET

DRAWING NUMBER AM-1035

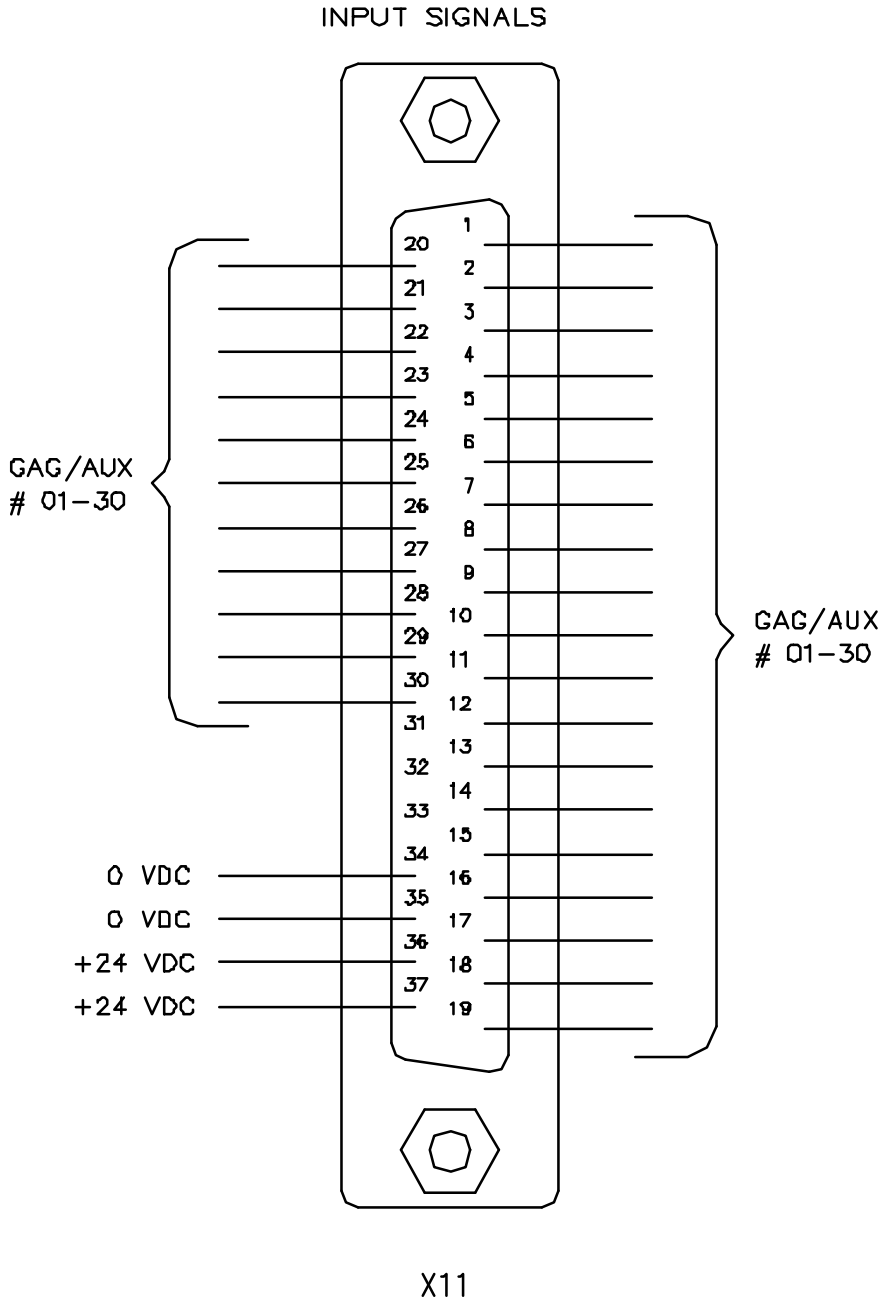
QUALITY DRIVES INDRAMAT

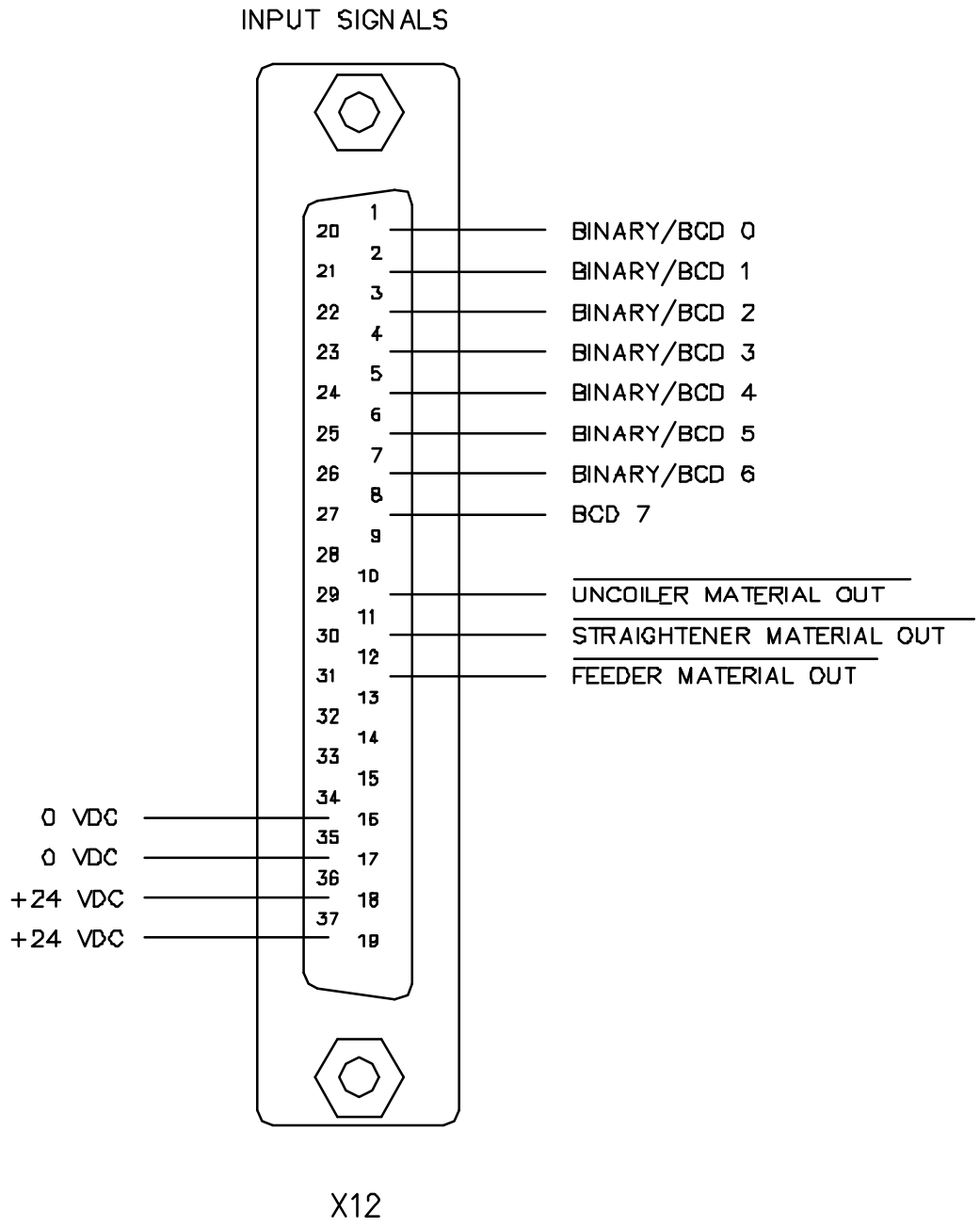
INFO.	NAME	DATE
DRAWN BY	D. PADILLA	6/16/89
CHECKED BY		
ENGINEER APPROVAL		

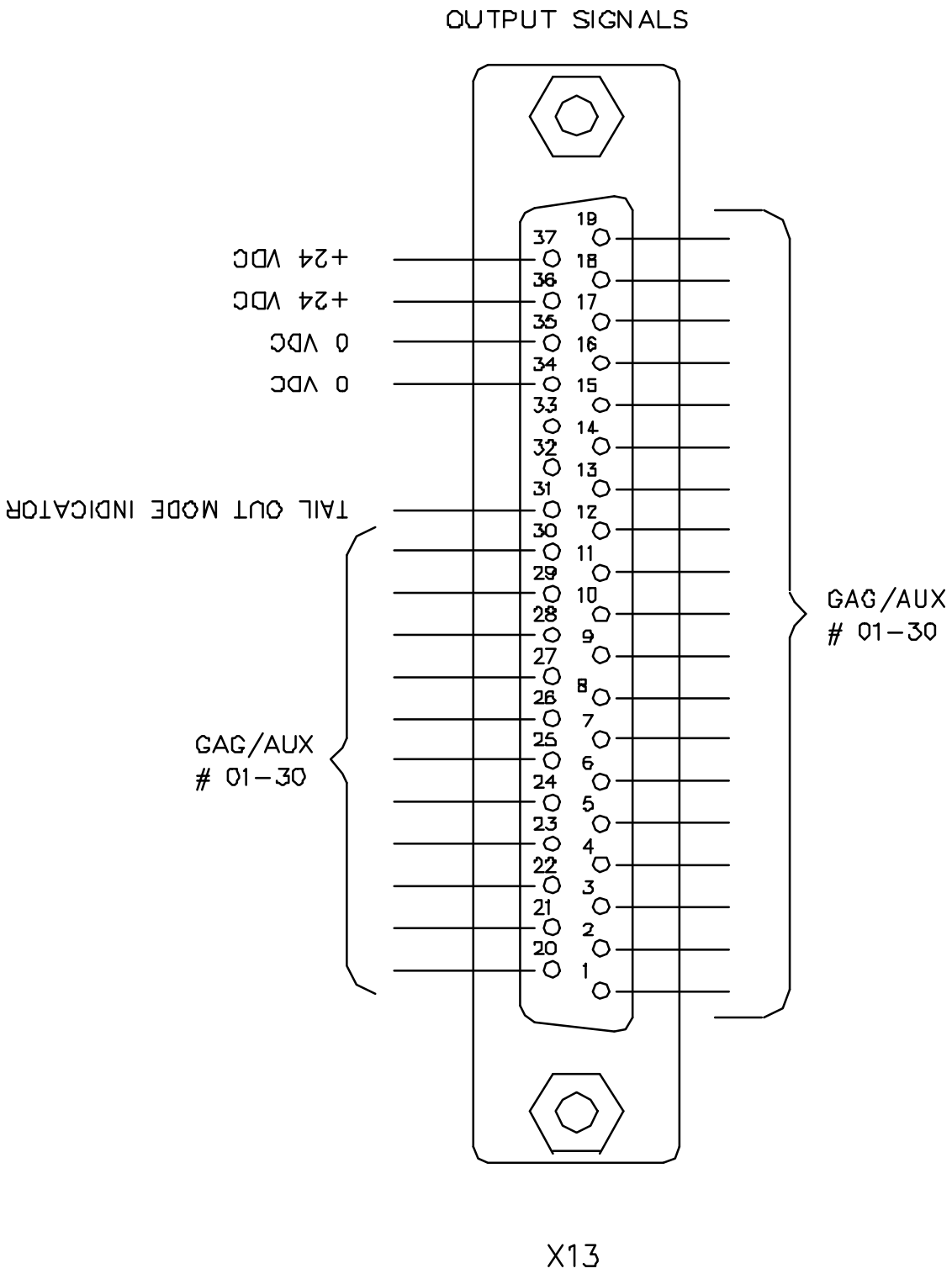
REV.	DESCRIPTION	DATE	NAME	E.C.O. NUMBER	PART NUMBER
A	CORRECTED NOTES 2 & 3, ADDED 4	07/17/89	D.P.		
B	MODIFIED GASKET FOR BOTH CLM'S	06/04/91	D.P.		
C	REVISED PER E.C.O.	03/18/93	C.M.	940218-03	

SCALE N.T.S. SHEET 1 OF 1
REVISION FOR
REVISED BY

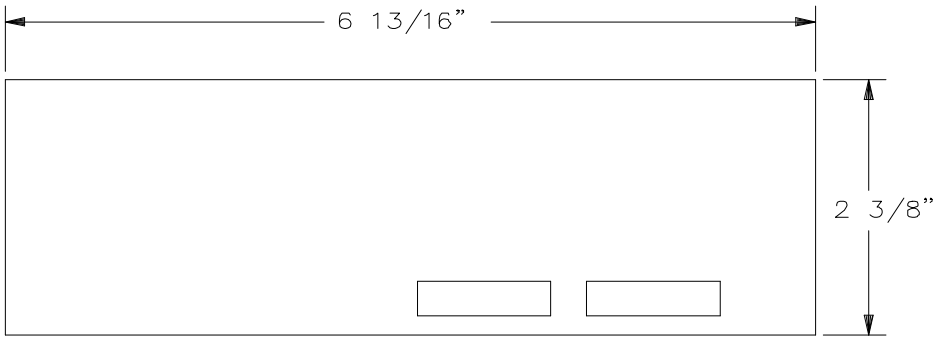
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INPUT SIGNALS
GAG/AUX
01-30
0 VDC
0 VDC
+24 VDC
+24 VDC
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
GAG/AUX
01-30
X11

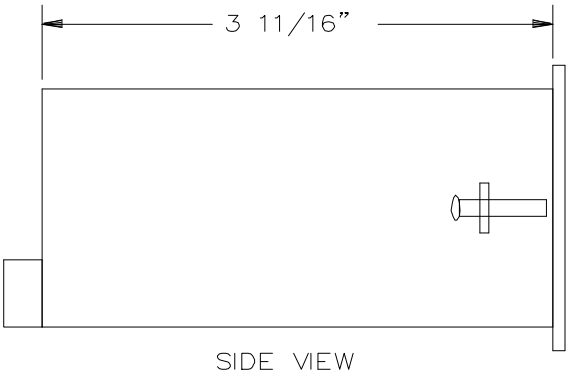

INPUT SIGNALS
1
20
2
21
3
22
4
23
5
24
6
25
7
26
8
27
9
28
10
29
11
30
12
31
13
32
14
33
15
34
16
35
17
36
18
37
19
BINARY/BCD 0
BINARY/BCD 1
BINARY/BCD 2
BINARY/BCD 3
BINARY/BCD 4
BINARY/BCD 5
BINARY/BCD 6
BCD 7
UNCOILER MATERIAL OUT
STRAIGHTENER MATERIAL OUT
FEEDER MATERIAL OUT
0 VDC
0 VDC
+24 VDC
+24 VDC
X12


OUTPUT SIGNALS
+24 VDC
+24 VDC
0 VDC
0 VDC
TAIL OUT MODE INDICATOR
GAG/AUX
01-30
GAG/AUX
01-30
X13

REMOTE DISPLAY DIMENSIONS

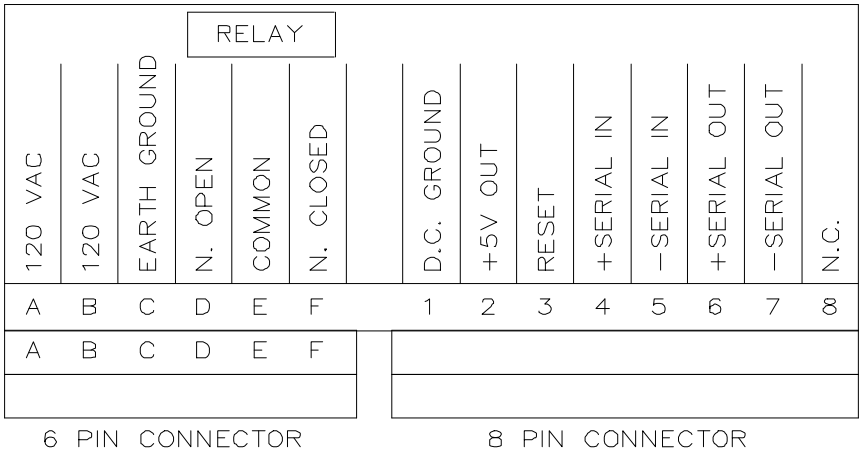


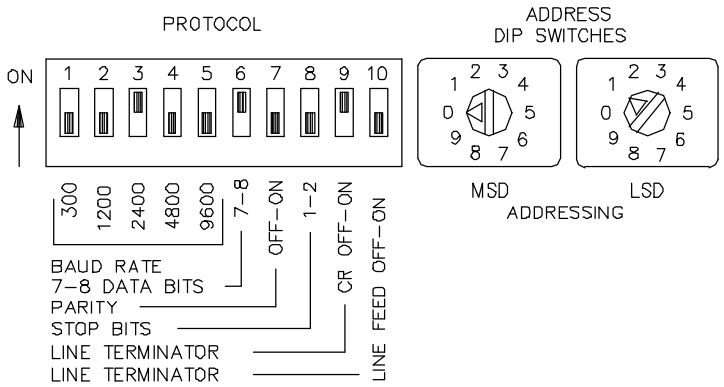
BACK VIEW



SIDE VIEW

REMOTE DISPLAY CONNECTIONS





ADDRESSING MUST BE SET TO 01.

2400 BAUD
8 DATA BITS
1 STOP BIT
CR ON LINE TERMINATOR
LINE FEED OFF LINE TERMINATOR

APPENDIX F: CLM-R/Z FEATURE CROSS-REFERENCE

CLM - R/Z Feature Reference Chart	LR01.0-0X.X						LR01.2-0X.X			LR01.3-0X.X (LZ01.3)				
	LR2.0	LR3.0	LR4.0	LR4.1	LR4.2	LR4.3	LR5.0	LZ1.1 LR5.1	LR5.3 LR5.2	LR6.0	LZ2.1 LZ2.0	LR6.2	LR6.4	LZ2.4
IDS W/Alpha Numeric Display Option	X	X	X	X	X	X	X	X	X	X	X	X	X	X
IDS W/2 Digit LED Diagnostic Display										X	X	X	X	X
Standard Interface Option (Keyboard Data Entry)			X	X	X	X	X	X	X	X	X	X	X	X
Foreign Language: German			X	X	X	X	X	X	X	X	X	X	X	X
French							X	X	X	X	X	X	X	X
Spanish										X	X	X	X	X
RS232 (9600 Baud)						X								
RS232/422 (9600 Baud)							X							
RS232/422/485 (19200 Baud)								X	X	X	X	X	X	X
Parameters With Adjustable Decimal Points			X	X	X	X	X	X	X	X	X	X	X	X
Drive Sensitivity Parameter	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Drive Runaway Detection	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Drive Stalled Detection					X	X	X	X	X	X	X	X	X	X
Separate Acceleration/Deceleration					X	X	X	X	X	X	X	X	X	X
Jerk Limiting (S Curve)					X	X	X	X	X	X	X	X	X	X
Signed Auxilliary Feed Length				X	X	X	X	X	X	X	X	X	X	X
Compatible With: 2 Line LCD	X	X	X	X	X	X	X	X	X					
4 Line LCD								X	X	X	X	X	X	X
Jog Step Mode						X		X	X	X	X	X	X	X
Feed Rate Override								X	X	X	X	X	X	X
Low Feed Angle Threshold					X	X	X	X	X	X	X	X	X	X
Press Timeout						X		X	X	X	X	X	X	X
Press Cycle Mode Change on the Fly									X	X	X	X	X	X
Strokes/Min Display					X	X	X	X	X	X	X	X	X	X
% Time Used Display & Time Available Output						X		X	X	X	X	X	X	X
Inputs/Outputs Status Display					X	X	X	X	X	X	X	X	X	X
Actual Distance Fed Display					X	X	X	X	X	X	X	X	X	X
Length Accumulator Display						X		X	X	X	X	X	X	X
Piece Accumulator Display						X		X	X	X	X	X	X	X
Measuring Wheel Option: Dynamic Correction						X		X	X	X	X	X	X	X
MW Encoder Only													X	X
High/Low Feed Angle Encoder Switch													X	X
Loop Control Option:										X		X	X	
Loop Initial Velocity Setting On Line												X	X	
Loop Material Tail Out Mode													X	

INDRAMAT

CLM - R/Z Feature Reference Chart	LR01.0-0X.X						LR01.2-0X.X			LR01.3-0X.X (LZ01.3)				
	LR2.0	LR3.0	LR4.0	LR4.1	LR4.2	LR4.3	LR5.0	LZ1.1 LR5.1	LR5.3 LR5.2	LR6.0	LZ2.1 LZ2.0	LR6.2	LR6.4	LZ2.4
Registration: Continuous							X	X	X	X	X	X	X	X
Continuous W/Offset										X	X	X	X	X
Averaging							X	X	X	X	X	X	X	X
High Speed Input								X	X	X	X	X	X	X
Manual Roll Control					X	X	X	X	X	X	X	X	X	X
Low Battery/Low Power Detection							X	X	X	X	X	X	X	X
Batching: 16 Individual Batches Option for Binary Batch Select					X	X	X	X	X					
Batching: 99 Individual Batches W/6 Feed Lengths, Option for Shear, Gagging BCD/Binary Batch Select										X	X	X	X	X
Axes Torque Compensation **														X
Manual IA.#	74729	74729	74734 REV A	74734 REV A WITH ******	74734 REV B WITH ******	74734 REV B WITH ******	74734 REV B	74734 REV B WITH ******	74734 REV B REV B WITH ******	74790 REV A	74790 REV A	74790 REV A	74790 REV B	74790 REV B
SOT Software Version Compatibility	NA	NA	NA	NA	NA	NA	SCR01 -01.00	SCR01 -01.10	SCR01 -01.10	SC2.00 -CR.06.0	SC2.00 -CZ.02.0	SC2.00 -CR.06.1	SC2.00 -CR.06.4	SC2.00 -CZ.02.4
SOT Serial Port Pass Through Mode													X	X
Recommended Upgrade (see below)	LR3.0 $ #	$ #	$ #	#	#	#	LR01.2 -005.2	LR01.2 -005.2		LR01.3 -006.3	LZ01.3 -002.4	LR01.3 -006.4		

NOTE: Always Include New Manual or Manual Addendum When Upgrading.
$ = Can Upgrade to LR4.1 With Manual Included, Customer Approval Suggested.
 # = Can Upgrade to LR4.3 With Manual Included, Customer Approval Suggested.
** = Engineering Approval Required on All LZ Applications

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READER COMMENT CARD AND REGISTRATION FORM

We welcome your evaluation of this manual. Please complete this form to help us to improve our publications and also to receive notification of revisions to this manual.

Publication: **CLM-01.3-R/Z FEED-TOLENGTH USER'S MANUAL W/ SOT SUPPLEMENT**
Publication No. IA 74790
Revision B, DECEMBER 1993

Please indicate the degree to which each statement applies to you by circling whether you ① strongly agree, ② agree, ③ are uncertain, ④ disagree, or ⑤ strongly disagree with the statement.

1.	The manual is well organized.	① ② ③ ④ ⑤
2.	I can find the information I want.	① ② ③ ④ ⑤
3.	The index is thorough.	① ② ③ ④ ⑤
4.	The information is easy to understand.	① ② ③ ④ ⑤
5.	The manual is clearly written.	① ② ③ ④ ⑤
6.	Concepts and vocabulary are easy to understand.	① ② ③ ④ ⑤
7.	Examples are clear and helpful.	① ② ③ ④ ⑤
8.	The manual contains enough illustrations.	① ② ③ ④ ⑤
9.	Layout and format enhance the manual's usefulness.	① ② ③ ④ ⑤
10.	The quality of this manual would influence any repeat purchase decision.	① ② ③ ④ ⑤
11.	The scope of the information in the manual meets my needs.	① ② ③ ④ ⑤

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