Instruction Bulletin

Subject: **SY/MAX®**

CLASS 8010 TYPE SLM-100 LOADER/MONITOR

DESCRIPTION:

The following contains detailed information on the Class 8010 Type SLM-100 Loader Monitor. Included are instructions on its operation and installation. The Loader Monitor is designed to work with the SY MAX® Programmable Controller Family. A NEMA 12 lockable cover is optionally available. A working knowledge of the various controllers' addressing schemes is assumed. For addressing information, the user should refer to the instruction bulletin which describes the particular processor being used.

Supersedes 30598-163-02, April 1982

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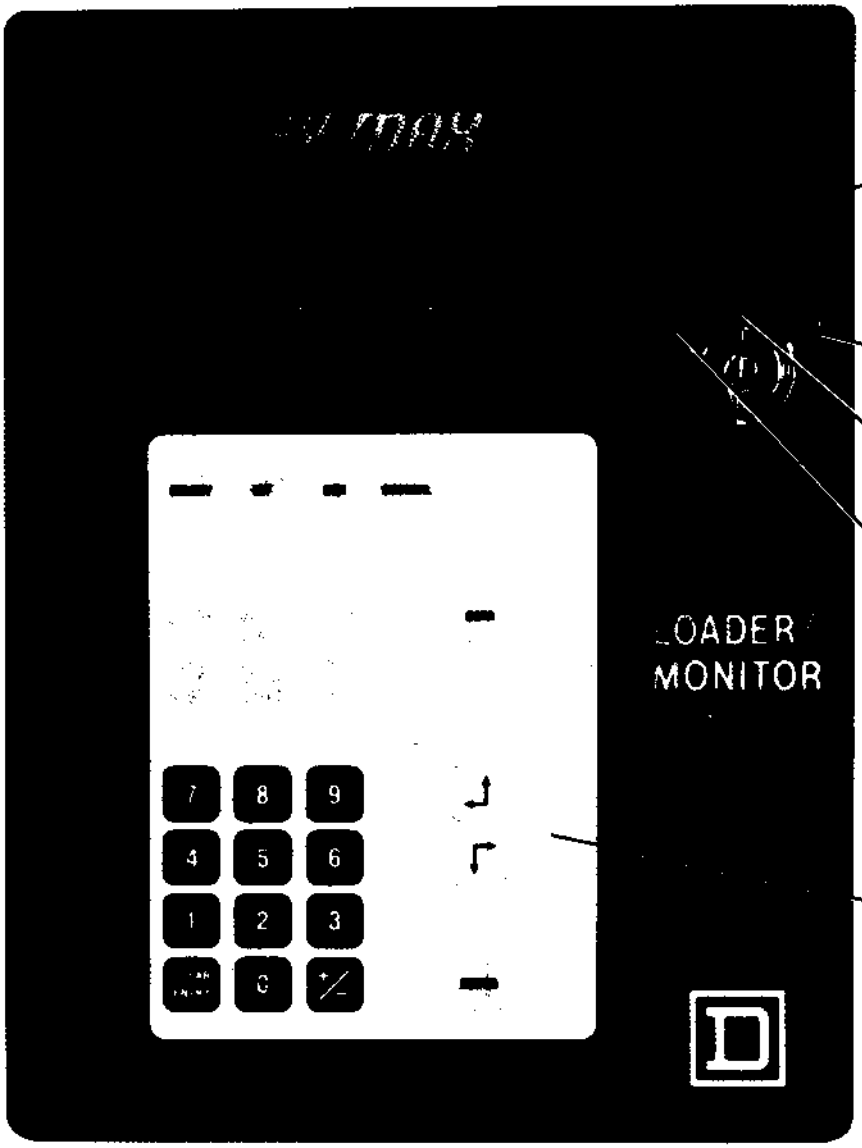
1.0 INTRODUCTION

The SY/MAX Loader/Monitor is a hand-held or panel-mounted device which provides easy access to data at a minimum cost. Any data registers within the processor can be monitored. The status of external I/O and internal outputs (relay equivalents) can also be monitored. The data within any register not protected by the processor's fencing capability can be altered (with the exception of processor control registers). The Loader/Monitor provides the user with the capability of changing timer delays, counter set-points, math constants, etc; without the need for any other programming equipment. It is also capable of displaying English language messages such as alarms, production reports, and machine diagnostic information.

The Type SLM-100 connects directly to the SY/MAX Model 100, 300, 500, and 700 Processors. It is enclosed in sheet metal and designed to be panel-mounted within 10 feet of the processor. The addition of a power supply and special cabling will extend this distance up to 10,000 ft.; see Appendix A. The front panel contains a 16 character alphanumeric display, a key-operated selector switch, and a sealed keypad.



Sixteen character alpha-numeric fluorescent display.

Key-operated selector switch.

MESSAGE - Display English language messages generated by the processor (Keyboard disabled).

ALTER - In addition to the Monitor operations, data may be altered in any unprotected register, or unfenced register.

MONITOR - Display the status of external I/O, internal outputs, and data within any storage register. No data may be altered.

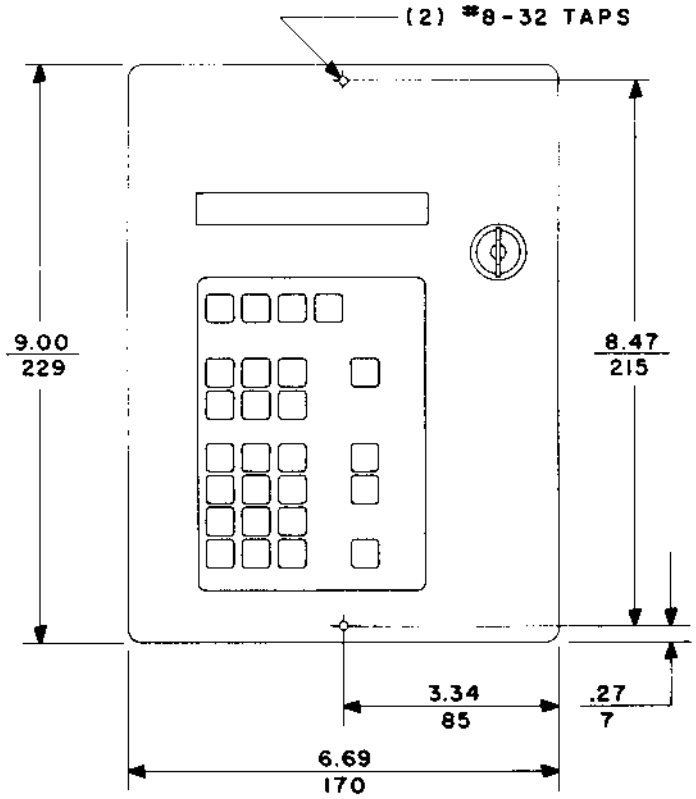
26 Key Sealed Keypad

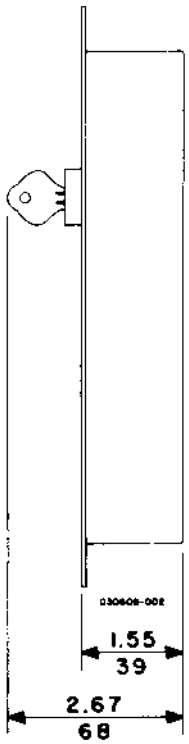
2.0 SPECIFICATIONS

Weight (Approx.) . . . . . 3.4 lb/1.54kg.

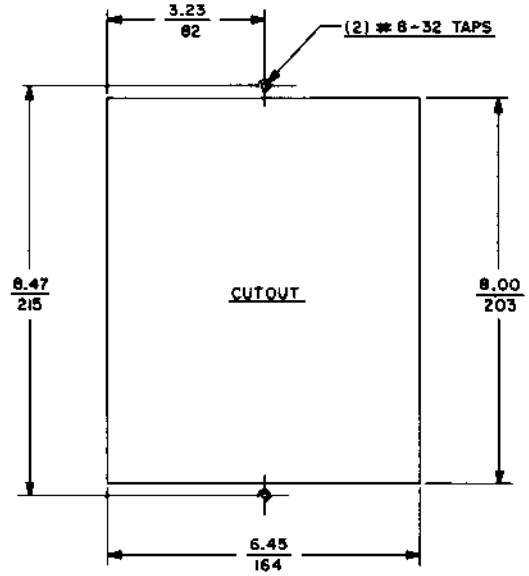
Rated Current Draw on
SY/MAX Power Supply . . . . 600mA Typical

Ambient Temperature . . . . . 0 - 60°C
Humidity Rating . . . . . 0 - 95% Non-condensing





Dual Dimensions: INCHES / Millimeters



3.0 KEY-OPERATED SWITCH

A key-operated selector switch determines the Loader/ Monitor's function. The key can be removed in any one of the three positions.

3.1 Monitor

With the key switch in the MONITOR position, data and I/O status can be monitored by entering the address of the desired register. The Loader/ Monitor then automatically displays this information. Data cannot be altered in this mode.

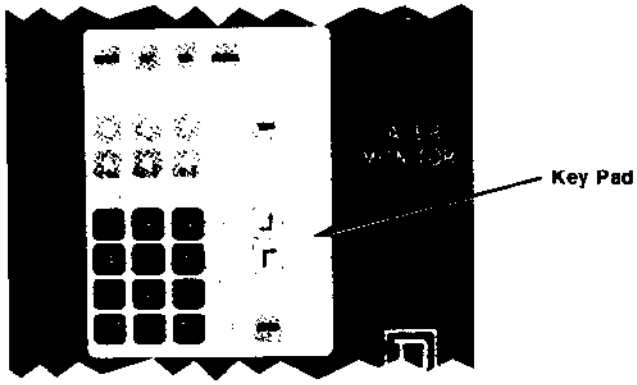
3.2 Alter

With the key switch in the ALTER position, the Loader/ Monitor is still capable of monitoring data registers as described above. In addition, the user can enter new data from the keypad. Data can be altered only in this mode. Data cannot be altered in protected registers, fenced registers, or in Processor/ Local Interface control registers.

3.3 Message

If the key switch is placed in the MESSAGE position, the keyboard is disabled. In this position the Loader/ Monitor will display any alphanumeric message generated by the processor. Using the Loader/ Monitor in this manner provides alarm annunciation and report generation without the need for any expensive, additional hardware.

4.0 KEYPAD



A numerical keypad (0 to 9) is used to enter the address of the data register to be monitored or altered. The Left/ Up Arrow Key and Right/ Down Arrow Key may be used to increment or decrement through the registers being examined. Once displayed, register data can be altered (keyswitch in ALTER position) by using the DATA and ENTER keys. The four keys labeled BINARY, BIT, HEX, DECIMAL determine the Loader/ Monitor's mode of operation. The A, B, C, D, E, and F keys are used to enter hexadecimal information.

If the DATA key is mistakenly struck, then the DATA mode can be exited by pushing the DATA key again.

4.1 Decimal Mode

For normal operation, the Loader/ Monitor will be in the decimal mode. When first initialized it automatically enters the decimal mode. Registers are addressed, and data displayed, in the decimal numbering system. If the Loader/ Monitor is in another mode, it can be returned to the decimal mode by depressing the DECIMAL key.

4.2 Hexadecimal Mode

Depressing the HEX key puts the Loader/ Monitor in the hexadecimal mode. All functions are the same as when operating in decimal mode, except all data is displayed and entered using the hexadecimal numbering system.

4.3 Bit Mode

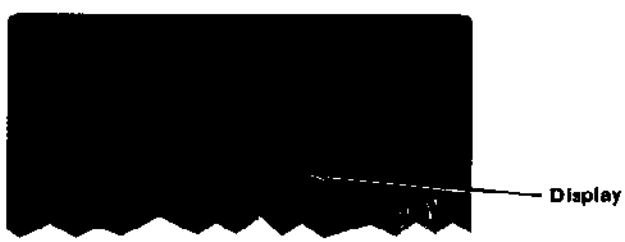
Placing the Loader/ Monitor in the BIT mode allows the user to display the ON-OFF status or alter a single I/O point or bit of any given register.

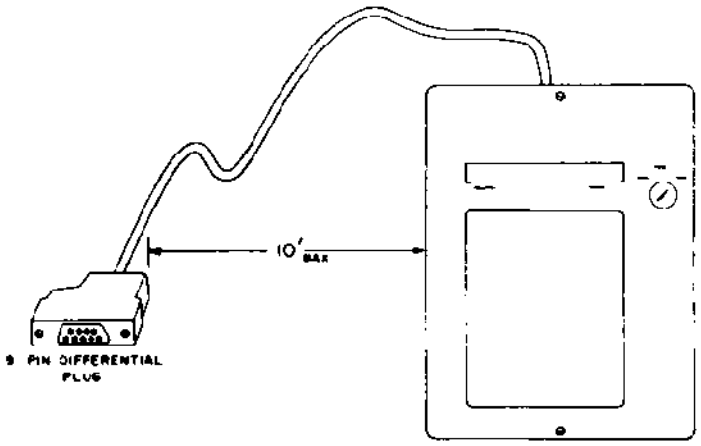
4.4 Binary Mode

Once the desired data in a register is displayed, the binary equivalent of that decimal or hexadecimal number can be shown by depressing the BINARY key. In this mode, 16 ones and zeros will appear, representing the binary data in the register.

5.0 DISPLAY

A bright fluorescent display is visible in any type of lighting environment. This display not only shows numerical data, but is also capable of displaying alphanumeric messages generated by the processor.





6.0 CONNECTIONS

A single 9 pin differential plug provides the only needed connection to the processor. All communications and necessary power are provided through this connector. The Loader/Monitor plugs directly into the PROGRAMMER or COMM port on the processor via this plug. No additional interface or AC power source is needed.

The addition of a power supply and special cabling enables the mounting distance to be extended up to 10,000 ft. See Appendix A.

7.0 POWER-UP

Because no additional power source is needed for the Loader/Monitor, it will automatically power up when connected to the processor. Initially the display will show "SY/MAX REV__" where the __ will contain a software revision letter or number, e.g., E, L1, etc. This letter identifies the specific version of operational software contained in the unit. All keys on the keypad will be disabled except for the CLEAR ENTRY key. Depressing the CLEAR ENTRY key will put the Loader/Monitor in the decimal mode; the register address value will set to ØØØ1, with its contents appearing in the DATA window.

ØØØ1	DEC	ØØØØØ
REGISTER		DATA

(The data displayed for register 1 will be ØØØØ provided all of the inputs and outputs assigned to register 1 are OFF.)

8.0 DISPLAY DATA (DECIMAL)

The following example outlines the steps for displaying data in the decimal mode.

NOTE: The keyswitch must be in either the MONITOR or ALTER positions.

KEY OPERATION	DISPLAY	DESCRIPTION
1. Depress CLEAR ENTRY Key	ØØØ1 DEC ØØØØØ (Register / Data)	REGISTER address display is set to ØØØ1
2. Enter register address to be monitored (i.e. register 17)	ØØ17 DEC Ø41Ø2 (Register / Data)	The data display indicates that the decimal number in register S17 is 41Ø2

ENTERING AN INVALID ADDRESS WILL CAUSE THE LOADER/MONITOR TO DISPLAY "ILLEGAL ADDRESS".

Subsequent register data can be displayed by depressing the CLEAR ENTRY key again and entering in the next address to be monitored. The Loader/Monitor will immediately index to that address and display the register's contents.

Registers can be sequentially displayed by depressing the Arrow keys. Each time the Arrow keys are depressed, the register address will increment or decrement by one and the DATA display will show the new data value. Holding either key down will cause the Loader/Monitor to rapidly increment or decrement the register address.

8.1 Display Data (Hexadecimal)

If is it desired to display data in hexadecimal format, simply depress the HEX key before entering in the register address. When this is done, the value in the data window will be the hexadecimal equivalent of the decimal number in that register. The Arrow keys operate as described in paragraph 8.0.

9.0 ALTER DATA (DECIMAL)

The following example outlines the steps for entering data into any given register. Protected registers, fenced registers and Processor/Local Interface control registers cannot be altered.

NOTE: Keyswitch must be in ALTER position to enter data.

KEY OPERATION	DISPLAY	DESCRIPTION
1. Depress CLEAR ENTRY Key	ØØØ1 DEC ØØØØØ Register Data	REGISTER address display is set to ØØØ1
2. Enter register address containing the data to be changed (i.e. register 20)	ØØ2Ø DEC ØØ127 Register Data	Loader/Monitor displays current data in register S20 (in this case, 127)
3. Depress DATA Key	ØØ2Ø DEC ØØ127 Register Data	Right-most digit flashes, indicating that data can now be entered.
4. Enter data (i.e. 2047)	ØØ2Ø DEC Ø2Ø47 Register Data	Number shifts in from right of DATA window
5. Depress ENTER Key	ØØ2Ø DEC Ø2Ø47 Register Data	Number entered into Register S20

9.1 Alter Data (Hexadecimal)

To enter Hexadecimal data, first depress the HEX key before entering the register address. Then follow steps 3, 4, and 5 of paragraph 9.0.

9.2 Altering Timer/Counter Decode Values

Since both timer and counter decode values are entered as fixed values when programming timer and counter rungs, they are not alterable by the Loader/Monitor. Therefore, to provide Loader/Monitor — accessible decode points, the recommended approach would be to program an IF comparison rung in addition to the timer or counter rung. The IF rung would compare the timer or counter value to a storage register to provide another decoded output. The Loader/Monitor may then be used to alter the data in the storage register, thereby changing the decode point. For additional information, refer to the CRT or Hand-Held Programmer Instruction Bulletin.

10.0 DISPLAY DATA (BINARY)

Once a desired register is addressed and its contents displayed, the binary equivalent of the data can be shown in the display window. This mode is useful to monitor the ON-OFF status of 16 external I/O or internal output points, as well as counter and timer information.

Example: To display the data in register 23 in binary format:

KEY OPERATION	DISPLAY	DESCRIPTION
1. Depress CLEAR ENTRY Key	ØØ2Ø DEC Ø2Ø47 Register Data	REGISTER address counter sets to the last register in which data has been entered
2. Enter register address to be monitored (i.e. register S23)	ØØ23 DEC ØØ999 Register Data	Indicates that the decimal number in register S23 is 999
3. Depress BIN Key	ØØØØØØ1111100111 Register Data	Display shows the combination of 16 ones and zeros which are the binary equivalent of the decimal number 999

NOTE: To display another register, the DECIMAL or HEX key must be pushed in order to enter another register address.

Individual BITS within the register can be altered by depressing the DATA key. See Section 11.0.

NOTE: Keyswitch must be in the ALTER position to enter data.

11.0 ALTER DATA (BINARY)

Bits of Processor/ Local Interface, Control Registers, Protected Registers, and Fenced Registers cannot be altered.

NOTE: Keyswitch must be in the ALTER position to enter data.

When the DATA key is depressed (still in BINARY mode) the right-most digit will flash, indicating the Loader/ Monitor will now accept data. The right-most BIT can now be altered. At this time the only numerical keys which are active are the 1 and the 0 keys. If another BIT is to be altered, pushing the Left/ Up Arrow Key will cause the next significant BIT of flash. This indicates that the second significant BIT can be altered by entering a 1 or a 0. Each time the Left/ Up Arrow Key is depressed, the flashing digit will move one space to the left; each time the Right/ Down Arrow Key is depressed, the flashing digit will move to the right. The digit which is flashing is the BIT to be altered. After the Left/ Up Arrow Key is depressed 16 times, the flashing digit will loop around back to the least significant BIT on the right. Once the display has been changed to the desired BIT pattern, the ENTER key must be pushed to transfer the data into the processor. Once ENTER has been pushed, no digits will flash, indicating that the new data has been loaded. Depressing the CLEAR ENTRY key anytime prior to pushing ENTER will set the flashing digit to the right-most position and restore the original data.

EXAMPLE:

To change BIT 3 of register S18 from a Ø to a 1.

KEY OPERATION	DISPLAY	DESCRIPTION
1. Depress CLEAR ENTRY Key	ØØ23 DEC ØØ999 Register Data	REGISTER address display is set to the last address for which data was altered
2. Enter register address containing the data to be altered	ØØ18 DEC ØØØØØ Register Data	Indicates that the decimal number in register 18 is 0000
3. Depress BIN Key	ØØØØØØØØØØØØØØØØ Register Data	Current binary value in register 18
4. Depress DATA Key	ØØØØØØØØØØØØØØØØ Register Data	Rightmost bit flashes, indicating data can now be entered
5. Depress the Left/ Up Arrow Key twice	ØØØØØØØØØØØØØØØØ Register Data	Moves flashing digit to 3rd position
6. Depress 1 Key	ØØØØØØØØØØØØØ1ØØ Register Data	New data value placed in 3rd bit position (1 is now flashing)
7. Depress ENTER Key	ØØØØØØØØØØØØØ1ØØ Register Data	Flashing bit stops flashing. This indicates that the data has loaded into the processor

When in the binary mode of operation, the entire display is used to show the BIT pattern (16 ones and zeros) of a given register. Therefore the register address and mode of operation cannot be shown. To change an address, the user must first enter another mode (DECIMAL, HEX, or BIT) so he can then enter another address.

12.0 DISPLAY DATA (BIT)

The BIT mode lets the user access data BITS within a register one at a time. This mode is most useful for displaying the ON-OFF status of a single external I/O point or internal output. When the BIT key is depressed, the register that was last displayed remains in the address window. The word "BIT-" is displayed where the word "DEC" or "HEX" would normally appear. Following the dash is the number Ø1, indicating that the data BIT displayed is the least significant BIT of the selected register.

For register S9, ØØØ9 BIT - Ø1 Ø

Register Mode Bit# Data

The right-most digit (DATA) will contain a 1 or 0 representing the status of the BIT. If an internal or external I/O address is being displayed, 1 indicates the particular I/O is ON or energized. 0 indicates that the I/O is OFF or de-energized.

Pushing the Left/ Up Arrow Key increments the BIT number and the new data is displayed at the right. Each time the Left/ Up Arrow Key is pushed the BIT number increments by one.

EXAMPLE:

Display BIT 5 of Register S52

KEY OPERATION	DISPLAY	DESCRIPTION
1. Depress BIT Key	ØØ18 BIT-Ø1 Ø Register Data	Loader/ Monitor enters BIT mode (displays the same register which was last displayed)
2. Enter Address to be Monitored (i.e. S52)	ØØ52 BIT-Ø1 Ø Register Data	Display shows current status of BIT 1 register S52
3. Push Left/Up Arrow Key 4 times	ØØ52 BIT-Ø5 1 Register Data	BIT number increments to BIT 5 and the DATA of 1 indicates this BIT is ON or energized

If BIT 16 is displayed and the Left/Up Arrow key is pushed, the register address will increment by one and BIT-Ø1 will be displayed for the next register. If BIT-Ø1 is displayed and the Right/Down Arrow key is pushed, the register address will decrement by one and BIT-16 will appear. Holding the Arrow keys down will rapidly increment or decrement the display.

If an invalid address is entered while in the BIT mode, "ILLEGAL ADDRESS" will be displayed.

13.0 ALTER DATA (BIT)

New BIT data can be entered via the following steps.

NOTE: Keyswitch must be in ALTER position to enter data. Bits of Protected Registers, Fenced Registers and Processor Local Interface Control Registers cannot be altered.

EXAMPLE:

Change BIT 2 of Register S75 from 1 to 0.

KEY OPERATION	DISPLAY	DESCRIPTION
1. Depress BIT Key	S75 BIT-01 0	Displays last register which was shown
2. Enter register address (i.e. 75)	S75 BIT-01 0	Display shows status of BIT 01 register S75
3. Depress Left/ Up Arrow Key once	S75 BIT-02 1	Display shows status of BIT 02 register S75
4. Depress DATA Key	S75 BIT-02 1	Status of BIT 2 flashes indicating the DATA can now be changed
5. Depress 0	S75 BIT-02 0	New DATA of BIT 2 appears in window (still flashing)
6. Depress ENTER	S75 BIT-02 0	The new DATA is loaded into the processor; DATA stops flashing

14.0 REGISTER CAPACITY

Any register monitored contains 16 BITS of information. Based on the address selected, this information can represent:

1. External I/O (i.e. a group of 16 inputs and outputs)
2. Internal I/O (i.e. a group of 16 relay equivalents)
3. Data (i.e. a number within the register representing a timer value, counter value, math function, shift register data, etc.)

Data within any given register is stored in binary form, but can be displayed on the Loader/Monitor in binary, hex, or decimal format.

In the binary mode, data can range from 1111111111111111 to 0000000000000000.
In the hexadecimal mode, data can range from FFFF to 0000.
In the decimal mode, data can range from -32,768 to 32,767.

The left-most (most significant) BIT of the data register is used as the sign (-) BIT, when displaying numbers in the *decimal* mode. When a negative number is displayed or entered, the most significant BIT of the register will be one (1). Therefore any numbers larger than *7FFF (HEX)* or 0111111111111111 (Binary) will appear as negative when displaying them in the decimal mode. This method of storing negative decimal data is referred to as "two's complement". For further explanation of two's complement, refer to Appendix A of the CRT or Hand-Held Programmer Instruction Bulletin

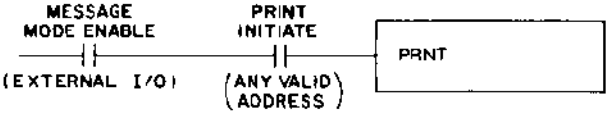
15.0 MESSAGE MODE

The capabilities of the Loader Monitor can be extended beyond data entry and monitoring functions when put in the message mode. Placing the keyswitch in the MESSAGE position transforms the Loader/Monitor into an alpha-numeric display, thus enabling the user to perform alarm annunciation and report generation at no extra cost. By utilizing a special PRNT command in the processor's user program, any English language command up to 16 characters can be displayed. This message can be triggered by a control action of the processor to produce messages such as "HIGH TEMP ALARM" or "CONVEYOR 9 DOWN" for alarm annunciation. Numbers contained in data registers can also be printed on the display. This makes report generation messages such as "PARTS COUNT 4193" or "TIME 12.09" possible. Several PRNT statements can be programmed to produce extended messages by scrolling them across the screen or by flashing up successive messages.

NOTE: Refer to the CRT programmer instruction bulletin for PRNT statement format. The port to which the Loader Monitor is connected to must be outputting the PRNT message at 9600 BAUD.

NOTE: In Loader Monitors with series designations A, B, C, or D, a disable contact from an external I/O must be programmed in series with the PRNT INITIATE contact in the PRNT rung. The external I/O disable contact must be opened before the keyswitch of the Loader Monitor is switched out of the message mode. This external contact serves to disable the PRNT message transmission when the keyswitch is placed in the Monitor or Data Enter position. If this is not done, the Loader/Monitor may lock up and can only be cleared by disconnecting power from the Loader Monitor.

Example:



16.0 ERROR MESSAGES

ILLEGAL ADDRESS User attempted to enter an invalid register number (refer to Programmer Instruction Bulletin for proper register addressing).

ILLEGAL DATA User attempted to enter data greater than 32,767 or less than -32,768.

FENCED User attempted to enter data into a register which has been protected (fenced) by the programming equipment.

PROTECTED 1) User attempted to enter data into registers 8001 thru 8192 (NOT ALLOWED). 2) User attempted to enter data after the REGISTER PROTECT command was entered by the programming equipment.

READ ONLY User attempted to write to an external input.

FORCED 1) User attempted to change the status of an output while the processor was in HALT. 2) User attempted to change the status of an I/O which had been forced by the programming equipment.

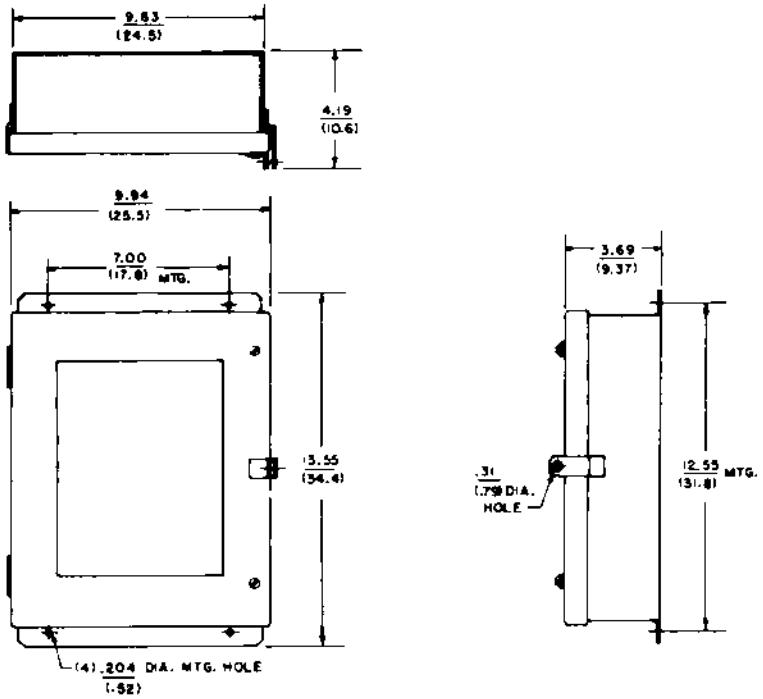
ROM CHECKSUM Self test error-faulty Loader/Monitor.

Note: Depressing the CLEAR ENTRY key will clear the error message and restore original data, (if in the data mode) or display the last selected register (if in the display mode).

17.0 NEMA 12 COVER

The Class 8010 Type SLM-100 Loader/Monitor may be mounted in the Class 8010 Type SLM-110 NEMA 12 Cover. When the cover is mounted on to a NEMA 12 cabinet, NEMA 12 protection is provided to the Loader/Monitor. The cover includes a plexiglass window to see the Loader/Monitor display, and a lockable door assembly used to access its keyboard. A user-supplied padlock may be used to restrict access to the keyboard.

Weight	9.5 lb. 4.32 kg.
Overall Dimensions (W x H x D)	10.25 x 13.55 x 4.50 inches 26.04 x 34.42 x 11.43 cm
Mounting Dimensions (W x H)	7.00 x 12.55 inches 17.78 x 31.88 cm



APPENDIX A
REMOTE MOUNTING

It is possible to locate the Loader/Monitor up to 10,000 feet from the processor. This appendix will serve as a guide for wiring the remote Loader/Monitor (see Figure A.1). Because the Loader/Monitor is located remotely from the processor, a second source of 5 volts must be supplied. The Class 8030 Type PS-10 or Type PS-40 Power Supply is recommended, however, another commercial equivalent could be used, provided it is 5 volt DC capable of 1.0 amp at 50° C, 50/60 cycle.

Necessary Equipment:

Belden #8723 or #8728 Cable

1 Amphenol DE9P (Male) or equivalent

1 Amphenol DE9S (Female) or equivalent

Class 9080 Type GM3 Terminal Block or equivalent

2 Cinch DE51218-1 (Covers)

2 ITT CANNON DE 51224-1
(Slide Lock Connector)

1 Class 8030 Type CC-40 with a PS-10 or PS-40 or minimum 16 AWG wire if equivalent Power Supply is used

1 Class 8030 Type PS-10 or PS-40 or equivalent

9 two inch 22 AWG wires

The connection between the 8030 PS-10 or PS-40 and SY/MAX Processor must be constructed by the user. The connections are shown in Figure A.2.

NOTE: Pin 9 (shield) must be carried through the entire cable.

The DC power is supplied to the Loader/Monitor via pins 5, 6, 7, and 8.

For proper mounting of the PS-10 or PS-40 Power Supply see the Power Supply Instruction Bulletin 30598-156-XX.

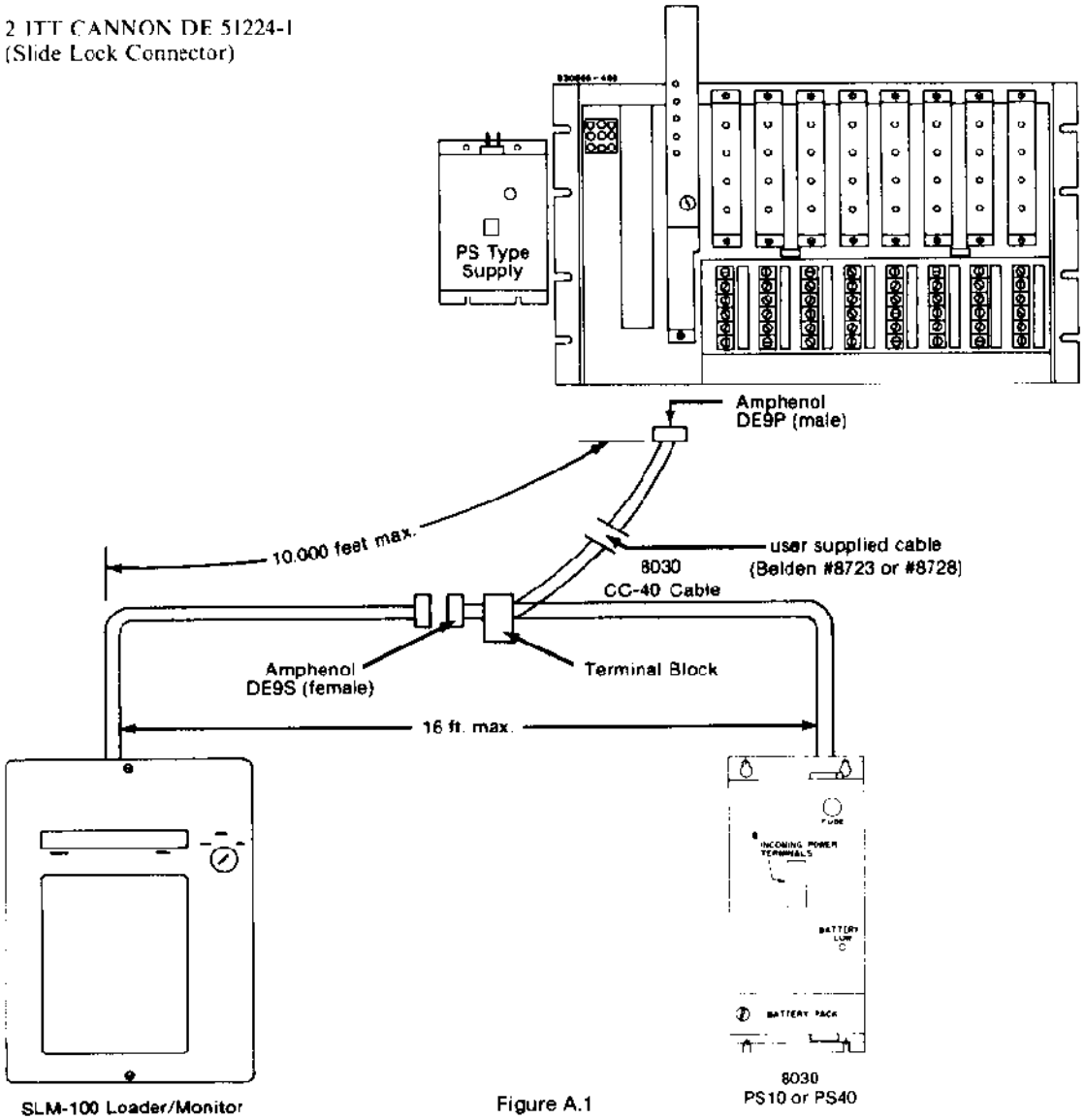
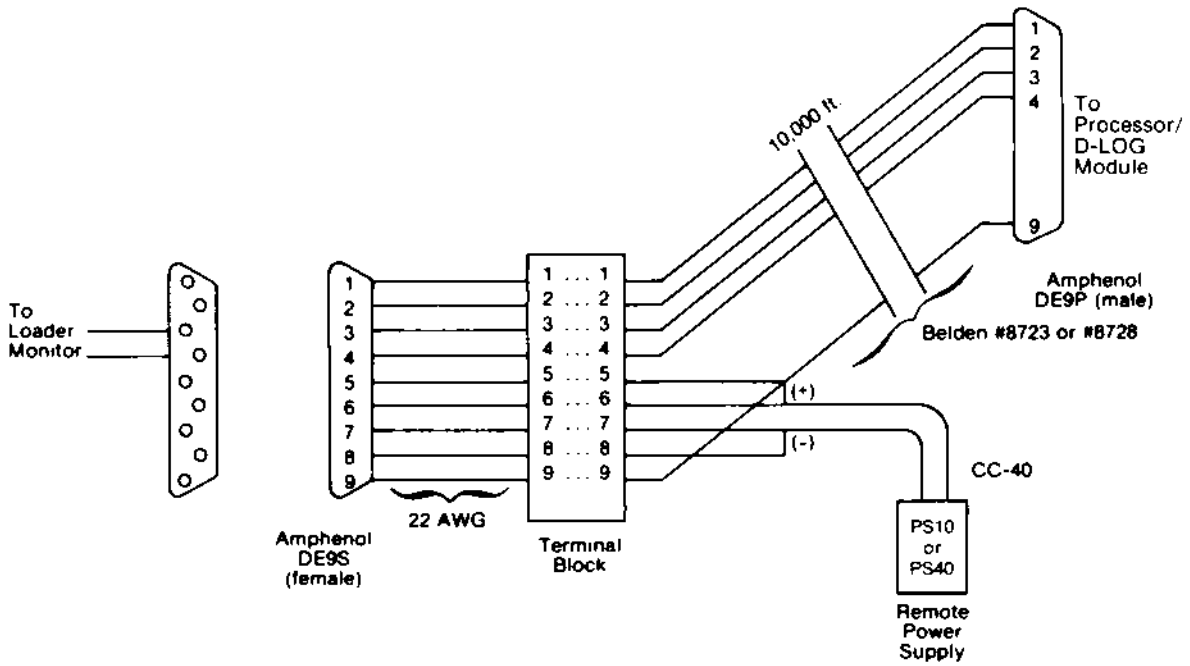


Figure A.1



CONNECTIONS
Figure A.2

APPENDIX B
DISPLAY FOR THE D-LOG DATA CONTROLLER

The Loader Monitor may be used to display PRNT messages generated by the Class 8030 Type DLM-110 or Type DLM-120 D-LOG Data Controller Modules. An external 5 volt power supply is necessary. The same configuration and connections may be used as in Figure A.1 and A.2 (see Appendix A).