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Instruction Bulletin

Subject: **SY/MAX[®]**
CLASS 8010 TYPE SLR-100, 110
CARTRIDGE TAPE LOADER/RECORDER

DESCRIPTION:

The SY MAX Class 8010 Type SLR-100 and 110 Cartridge Tape Loader Recorder enables control programs and data to be recorded onto magnetic (cartridge) tape. It also enables

programs and data to be loaded from tape into the memory of SY MAX programmable controllers. This device is compatible with all Square D programmable controllers.

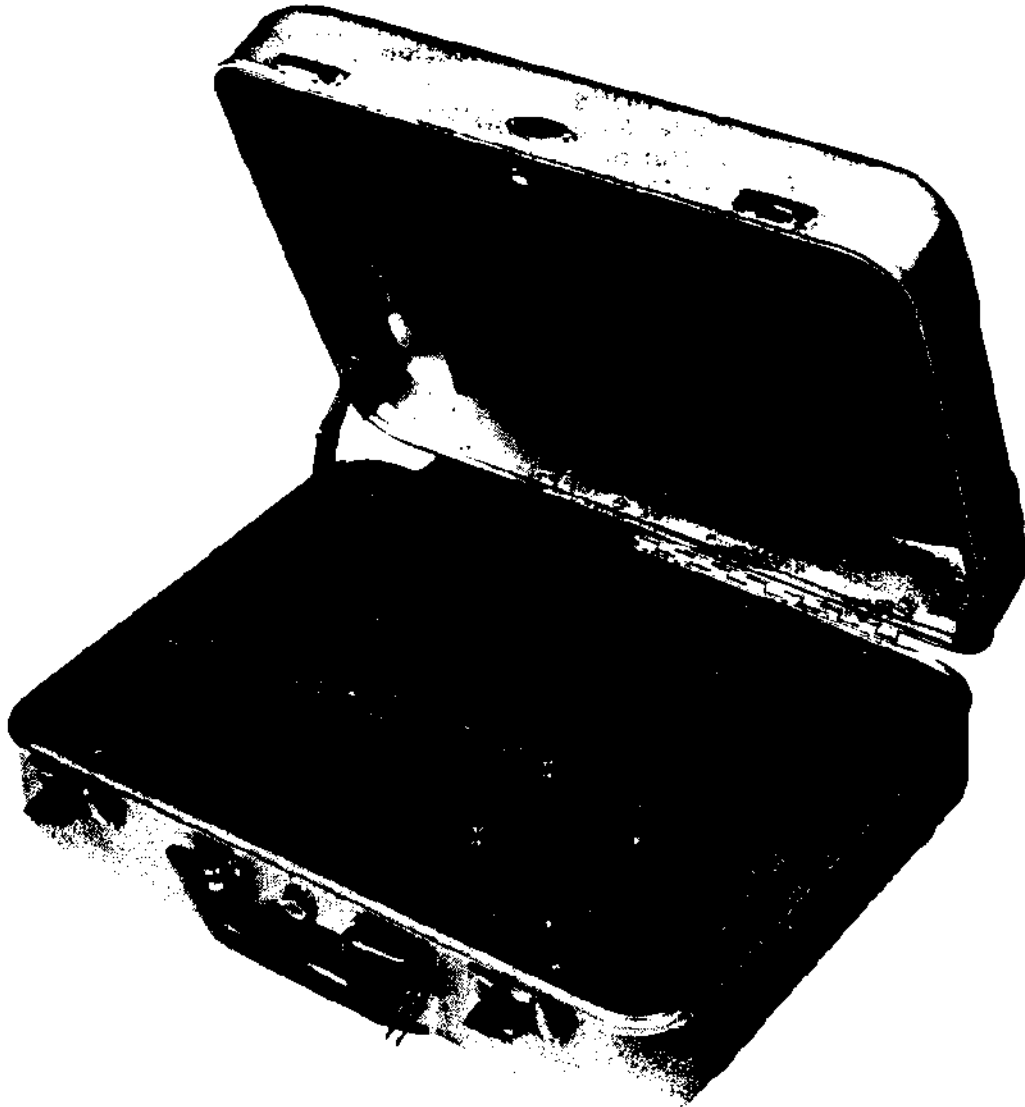


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1.0 SPECIFICATIONS

Media: 3M DC100A Mini Data Cartridge
 Data Rate: 300, 1200, or 9600 Baud switch selectable.
 Data Transfer Rate: 1.8K bytes per second.
 Recording Density: 100 bytes per inch phase encoded data.

Tape Speeds: Read Write — 18 inches per second
 Tape Handling — 60 inches per second

Tape Life: 5000 end-to-end cycles typical

Storage Capacity: 152.5 K bytes (one track)
 305 K bytes (two tracks)

Bit Error Rate: One soft error in 10^7 bits
 One hard error in 10^8 bits

Error Checking: Read after write data check with retry capability.

Recording Format: 1024 character data block plus header block with one inch inter-block gaps.

Recording Head: Dual gap, dual track read/write head

Data Formats: Automatic and Manual Mode
 8 Bits Binary + Even Parity + 1 Stop Bit

Class 8881 Mode
 8 Bits Binary + 1 Stop Bit

Interfaces: 1. 25 pin RS-232C data terminal port
 2. 9 pin differential driver port

Write Inhibit: Switch selectable on data cartridge

Power: SLR-100 108-132 VAC 50-60 Hz 90 VA
 SLR-110 220-250 VAC 50-60 Hz 90 VA

Fuse: SLR-100 MDL-1 1 AMP
 SLR-110 MDL-1 1 AMP

Operating Temperature: Limited by tape cartridge at +0°C to +40°C.

Operating Humidity: 20-80% relative humidity

Storage Temperature: 20°C to +80°C (without tape)
 0°C to +50°C (with tape)

Size: 7" x 18" x 13½", Provided in portable case

Weight: 13.5 lb/6.12 kg.

2.0 GENERAL DESCRIPTION

2.1 Cartridge Tape

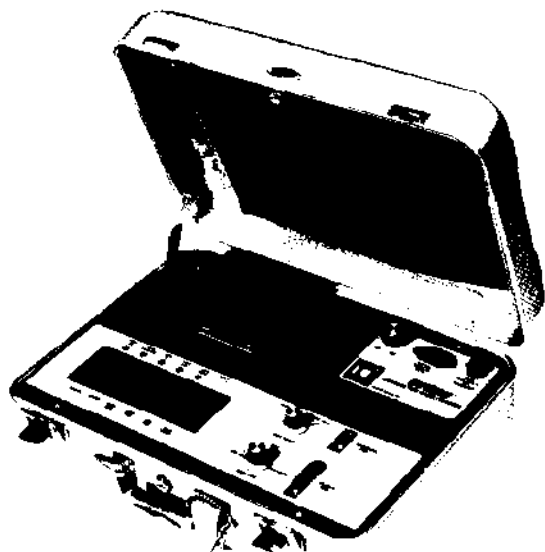


Figure 2.1 — Cartridge Tape Loader/Recorder

The Cartridge Tape Loader/Recorder utilizes the Class 8010 Type SLR-120 Data Cartridge. This data cartridge is manufactured by 3M Corporation (part number DC-100A) and has been designed exclusively as an industrial data storage medium.

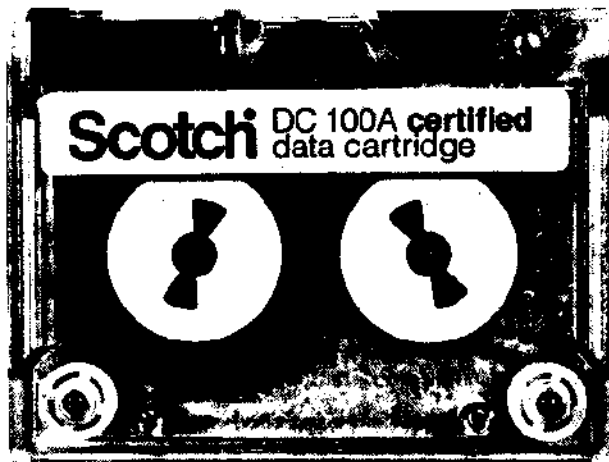


Figure 2.2 — Cartridge Tape

The unique drive mechanism of the Data Cartridge was designed to insure that the tension on the tape would remain low at all times, resulting in gentler tape handling and longer tape life. A protective flap on the front edge of the cartridge insures that the tape is not exposed until the cartridge is inserted into the Loader/Recorder, at which time this flap opens to allow the read/write head access to the tape. Enclosed in a hard, clear plastic case with a thick, precision metal base, the package provides an accurate and rugged data cartridge for industrial environments.

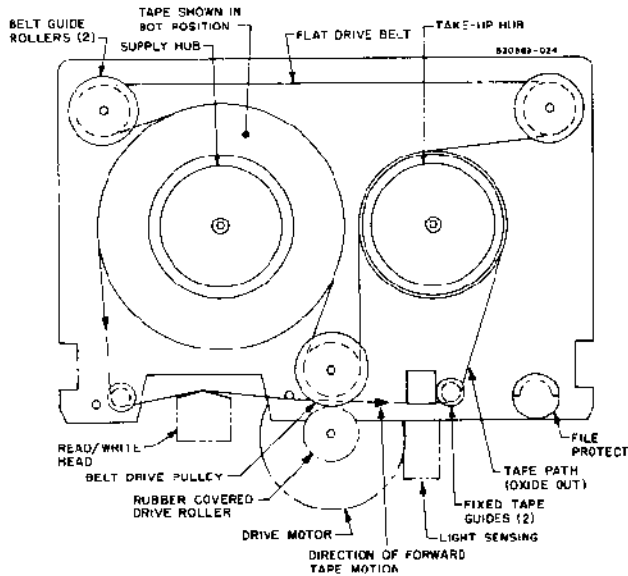


Figure 2.3 Cartridge Tape Drive Mechanism

Class 8010 Type SLR-120 Data Cartridge

- Tape Speed: 18 in./sec.
- Recording Density: 100 bytes/in.
- Transfer Rate: 1800 bytes/sec.
- Tape Tension: 1-3 oz.

Figure 2.4 — Cartridge Tape Performance Specifications

2.2 Construction of the Cartridge Tape

The Cartridge Tape, shown in Figure 2.3, incorporates the drive mechanism within the cartridge itself. A single motor in the Loader/Recorder turns the drive pulley inside the cartridge. The correct tension on the tape is always maintained by the drive belt, preventing the tape from stretching in operation or unrolling during handling.

The tape is capable of recording on two tracks, either of which may be selected by a pushbutton.

Control programs and data are recorded onto the tape in blocks of 1024 bytes. A file, which is a collection of one or more blocks of data, will be written onto, read from, or skipped in one operation. Preceding every block recorded on the tape is a group of several bytes called a header. The header contains information to identify and describe the contents of the attached block of data.

2.3 Handling the Cartridge Tape

2.3.1 INSERTING THE CARTRIDGE TAPE

Insert the Cartridge Tape into the Loader/Recorder with the metal base plate down. Press in firmly until the cartridge engages. The tape will then automatically advance forward to the end and then rewind back to the beginning to reestablish uniform tape tension (this is referred to as "packing the tape"). The tape will now be positioned at the start of the first file with Track 1 selected.

2.3.2 REMOVING THE CARTRIDGE TAPE

Prior to removing the Cartridge Tape from the Loader/Recorder, it is recommended that the cartridge be rewound. This is accomplished by depressing the REWIND button on the Loader/Recorder. After the tape stops, it may be ejected by depressing the button located directly above the tape. See Figure 2.5.

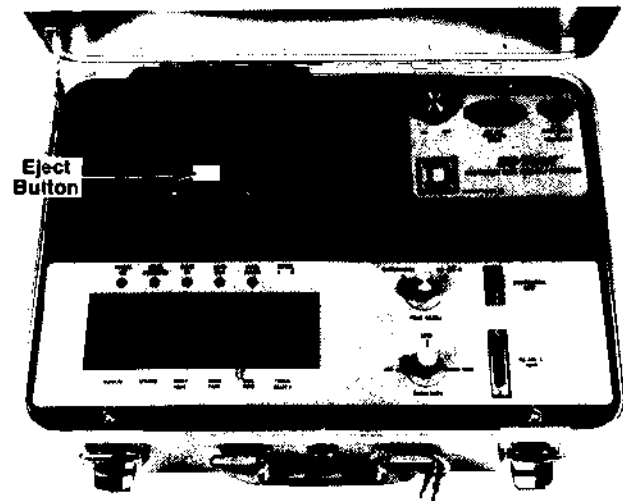


Figure 2.5 — Cartridge Tape Eject Button

2.3.3 WRITE PROTECTION

After recording, program information or data may be protected from erasure or over-writing by sliding the RECORD tab, on the top of the cartridge, inward. See Figure 2.6.

Record
Tab

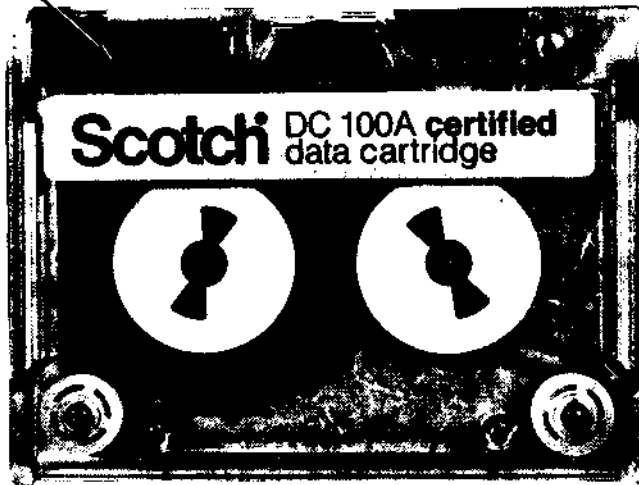


Figure 2.6 — Cartridge Tape Record Tab

2.4 Cartridge Tape Loader/Recorder Functions

2.4.1 INDICATOR LIGHTS



Figure 2.7 — Cartridge Tape Loader/Recorder Indicator Lights

POWER ON: This LED (Light Emitting Diode) indicator will illuminate when power is applied.

WRITE INHIBITED: This LED will flash when a Write Tape operation is attempted and a Write protected Cartridge Tape has been inserted into the Loader/Recorder, or no Cartridge Tape has been inserted at all. The attempted Write Tape command will be ignored, safeguarding important program data from being accidentally written over.

DATA IN: This LED will illuminate when serial data or control signals are being sent to the Loader/Recorder. An entire block of data is first written into a buffer memory before actually being recorded onto the tape.

DATA OUT: This LED illuminates when serial data or control signals are being sent out from the Loader/Recorder. A block of data on tape is first written into a buffer memory before actually being sent out.

DATA ERROR: Errors detected during Loader/Recorder operations will be annunciated by a flashing DATA ERROR LED. The flashing pattern of this LED can be used to determine the cause of the error. Refer to Section 4.0 for troubleshooting information.

TRACK: These two LED's indicate which recording track of the Cartridge Tape has been selected. Both lights will flash following an attempt to skip or read a file when the tape is past the last file on that track.

2.4.2 CONTROL PUSHBUTTONS

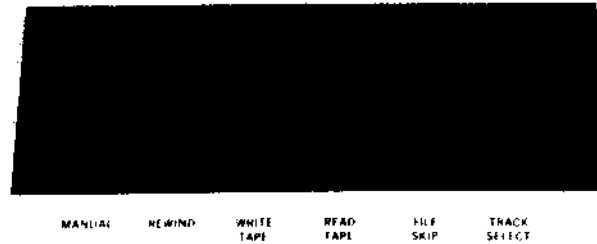


Figure 2.8 — Cartridge Tape Loader/Recorder Pushbuttons

MANUAL: This button selects between the Manual and Automatic modes of operation. When the Loader/Recorder is powered up, the Automatic mode is selected. Pressing the Manual button switches the Loader/Recorder to the Manual mode. The corresponding LED indicates Manual operation when illuminated. The Manual Mode is used when directly connected to a Class 8020 SY/MAX processor for manually initiated loading and recording operations. The Automatic mode is normally used when connected to a CRT Programmer or Class 8881 PR-3. In this mode, the Loader/Recorder is controlled by the keyboard of the CRT Programmer or Class 8881 PR-3.

REWIND: This button causes the cartridge to rewind to the first block of data on the tape. The corresponding LED turns off when this operation is completed.

WRITE TAPE: This button initiates a "Write Onto" tape operation. The corresponding LED will remain illuminated throughout the Write Tape sequence.

READ TAPE: This button initiates a "Read From" tape operation. The corresponding LED will remain illuminated throughout the Read Tape sequence.

FILE SKIP: This button instructs the Loader/Recorder to skip to the next file on the tape. A file may be one or several blocks long. The corresponding LED will remain illuminated throughout the File Skip sequence.

TRACK SELECTION: The Loader/Recorder will automatically select Track 1 when powered up. Pressing this button selects Track 2.

2.4.3 SWITCHES AND PORTS

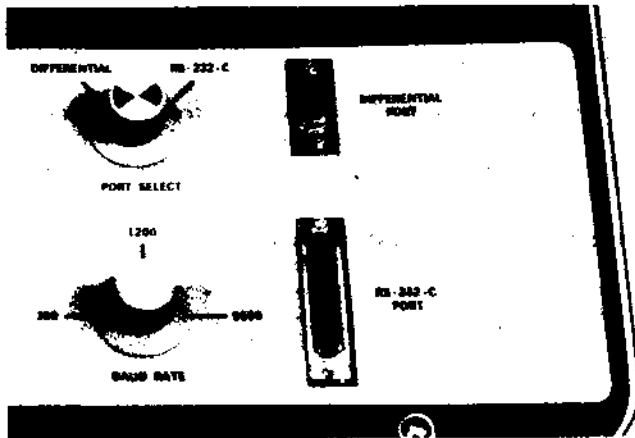


Figure 2.9
Cartridge Tape Loader/Recorder Switches & Ports

PORT SELECT: This switch selects the proper communication port on the front panel of the Loader Recorder. The Differential Port is normally used in the Manual mode when connected directly to a Class 8020 SY MAX processor. The RS-232C Port is normally used in the Automatic mode when connected to a CRT Programmer or 8881 PR-3.

BAUD RATE: This switch selects the baud rate for serial data communication. Class 8020 SY/MAX Programmable Controllers and the CRT programmer communicate at 9600 baud, while Class 8881 Programmable Controllers operate at 1200 baud. 300 baud is available for use with modem-interfaced communications.

2.5 Data Transmission and Verification

The Loader Recorder may access or be accessed by another device, which may be a Processor or a CRT Programmer. This is accomplished by an exchange of control and status codes. This system of exchange, or communication protocol, initially established the communication path and informs the receiving device what is to take place. The receiving device will then acknowledge with an appropriate code before the actual transmission of program or register data can take place. When a packet of data has been successfully transferred, it is immediately followed by a similarly structured exchange of control and status codes between the two devices that will verify that the data received precisely matches the data sent. If a transmission error is detected, the operation will be repeated several times in an attempt to resolve the error condition itself.

Data recorded onto the Cartridge Tape is further verified by automatically reading the block just recorded and comparing it to the data received in the input buffer.

3.0 OPERATING INSTRUCTIONS

3.1 Automatic Mode

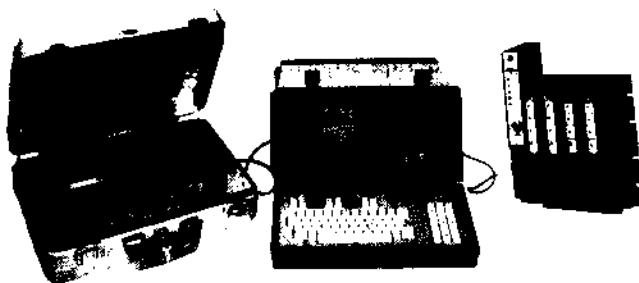


Figure 3.1
Cartridge Tape Loader/Recorder Automatic Mode

Automatic mode refers to the capability of the Loader/Recorder to be controlled by the keyboard of a SY/MAX CRT Programmer (see Figure 3.1). In this mode, the loading or recording of control programs including Rack Addressing, storage register data, plus rewinding and file skip operations, are controlled via the CRT. The steps necessary to operate the Loader/Recorder can be found in corresponding CRT Instruction Bulletins listed below.

SY/MAX CRT	Instruction Bulletin	Section
SPR-200, 201, 210, 211	30598-165-02	8.1
SPR-250	30598-160-01	8.0
SPR-300	30598-167-01	9.0

3.2 Manual Mode

The Manual mode of the Cartridge Tape Loader/Recorder is used to load or record the control programs when the Loader/Recorder is connected directly to a Class 8020 SY/MAX Processor. The entire control program will be placed into a single file and transferred to or from the Cartridge Tape in a single operation. See Figure 3.4.

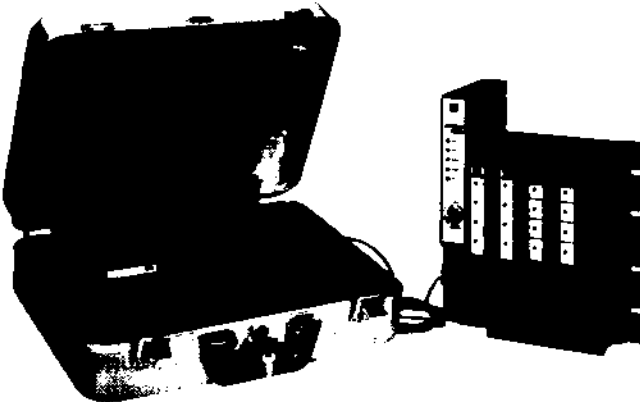


Figure 3.2 — Cartridge Tape Loader/Recorder Manual Mode

3.2.1 INITIAL STEPS

When doing FILE SKIP or when RECORDING control programs or storage registers, the Class 8020 SY/MAX processor may be left in HALT, RUN or DISABLE OUTPUTS mode. When LOADING control programs or storage registers, turn the Class 8020 SY/MAX processor key switch to HALT. The Loader/Recorder should be set to the following:

POWER LED	ON
MANUAL LED	OFF
BAUD RATE SWITCH	9600 Baud
PORT SWITCH	Differential Port
CABLE CONNECTIONS	A Class 8010 Type CC-100 or CC-101 communication cable should be connected to the Differential Port on the Type SLR-100, 110 Cartridge Tape Loader/Recorder and to the Programmer Port (Channel 1) on the Class 8020 SY/MAX Processor.

NOTE: Before making cable connections, one of the devices to be connected should be powered down to prevent chip failure due to ground potential differences.

3.2.2 LOCATE THE FILE

The position of a file recorded on tape should be remembered by its track and file numbers. Finding the file again is accomplished by rewinding the tape, selecting the proper track, and executing a number of file skips one less than the file number.

Recording a new file should be done only after skipping past all used files on the tape.

3.2.3 RECORD CONTROL PROGRAM

The following procedure describes how to record all rungs including Rack Addressing or System Definitions, of a ladder program from Processor memory onto a single file of the cartridge tape.

1. Press the MANUAL button on the Loader/Recorder. The corresponding LED should now be on.
2. Press the WRITE TAPE button on the Loader/Recorder.
3. The tape should move briefly and the DATA IN and DATA OUT lights on the Loader/Recorder will flash alternately as control signals and data are being exchanged.
4. The tape will automatically rewind to the start of the last block recorded and perform a read operation to verify the data just recorded. Steps 3 and 4 will be repeated until all the blocks in the file have been recorded.
5. Successful completion of the Record Control Program operation is indicated by the WRITE TAPE light turning off and the DATA ERROR light remaining off. If an error has been indicated, refer to Troubleshooting Section 4.0.
6. Press the REWIND button on the Loader/Recorder and wait until this operation has completed before ejecting the cartridge tape.

3.2.4 LOAD CONTROL PROGRAM

The following procedure describes how to load a control program including Rack Addressing or System Definitions, from the cartridge tape into Processor memory.

NOTE: Loading a file containing the control program into the processor will clear all processor data storage registers. Loading registers from a file containing register data can be accomplished following the loading of the control program. Data registers can be recorded as a file on the tape in the Automatic mode.

1. Press the MANUAL button on the Loader/Recorder. The corresponding LED should now be on.
2. Press the READ TAPE button on the Loader/Recorder.
3. The tape should move briefly and the DATA IN and DATA OUT lights will flash alternately as control signals and data are being exchanged. This will be repeated until all blocks in the file have been read.
4. Successful completion of the Load Program Data operation is indicated by the READ TAPE light turning off and the DATA ERROR light remaining off. If an error has been indicated, refer to Troubleshooting Section 4.0.
5. Press the REWIND button on the Loader/Recorder and wait until this operation has completed before ejecting the cartridge.

3.3 8881 Mode

The 8881 mode of the Cartridge Tape Loader/Recorder allows all control programs, MLU registers, D-Log programs, and definitions to be recorded onto tape and loaded from tape using the Type SLR-100, 110 Loader/Recorder. The SLR-100, 110 Cartridge Tape Loader/Recorder will function in the same manner as the Class 8881 Type PE-1 Cassette Loader/Recorder. When operating at the required 1200 BAUD rate, the Type SLR-100, 110 Loader/Recorder requires approximately 20 seconds for the buffer to become filled and tape movement to begin. Refer to Bulletin M-515A for complete information. See Figure 3.3. Due to the timing restrictions and data compression of the SLR-100, the "Verify MLU" function does not work properly and should be avoided.

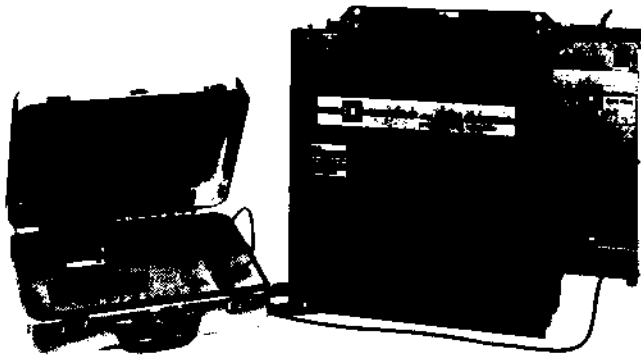


Figure 3.3 — Cartridge Tape Loader/Recorder 8881 Mode

3.3.1 INITIAL STEPS

Before starting, turn the key switch to HALT on the Class 8881 Processor. The Loader/Recorder should be set to the following:

POWER LED	ON
MANUAL LED	OFF
BAUD RATE SWITCH	1200
PORT SWITCH	RS-232C Port
CABLE CONNECTIONS	A Class 8010 Type CC-110 communication cable should be connected to the RS-232C Port on the Type SLR-100, 110 Cartridge Tape Loader/Recorder and to the CASSETTE/PRINTER Port on the Class 8881 Type PR-3 Contact Programmer.

NOTE: Before making cable connections, one of the devices to be connected should be powered down to prevent chip failure due to ground potential differences.

3.3.2 LOCATE THE FILE

The position of a file recorded on tape should be remembered by its track and file numbers. Finding the file again is accomplished by rewinding the tape, selecting the proper track, and executing a number of file skips one less than the file number.

Recording a new file should be done only after skipping past all used files on the tape.

3.3.3 WRITE TAPE

In order to record in a single file on the cartridge tape: all of the ladder diagram control program (PR-3 mode 4), all of the MLU data storage registers (PR-3 mode 8), or all of the D-Log program and definitions data (PR-3 mode 12), use the following procedure:

1. Press the WRITE TAPE button on the Loader/Recorder. The corresponding LED should now be on.
2. Initiate the PR-3 mode 4, 8, or 12, either remotely via the Type PE-5 CRT Programmer, or directly from the front panel of the PR-3.
3. The DATA IN LED will come on as serial data is being written into the buffer memory of the Loader/Recorder. When one block of data has been received in the buffer, it is then recorded onto the tape itself. This sequence will be repeated until all blocks of data have been transferred.
4. Successful completion of the Write Tape operation is indicated when the RUN light on the PR-3 turns off, the OPERATION ERROR light on the PR-3 remains off, and the DATA ERROR LED on the Loader/Recorder also remains off. In the event of a Loader/Recorder error, turn to Troubleshooting Section 4.0. For PR-3 or CRT error indications, refer to Bulletin M-515B.
5. Press the REWIND button on the Loader/Recorder and wait until this operation has completed before ejecting the cartridge tape.

3.3.4 READ TAPE

In order to load into the Class 8881 controller from a single file on the cartridge tape: a ladder diagram control program (PR-3 mode 3), all the MLU data storage registers (PR-3 mode 7), or all of the D-Log program and definitions data (PR-3 mode 11) use the procedure outlined in steps 1 through 5 below.

In order to add rungs to the existing control program in the processor (PR-3 mode 6) use the procedure outlines in steps 1 through 5 below.

In order to verify the information stored on cartridge tape against: all rungs of the ladder diagram control program (PR-3 mode 5), all the MLU data storage registers (PR-3 mode 9), or all of the D-Log program and definitions data (PR-3 mode 13), use the procedure outlined in steps 1 through 5 below.

1. Press the READ TAPE button on the Loader/Recorder. The corresponding LED should be on.
2. Initiate the PR-3 mode 3, 5, 6, 7, 9, 11, or 13 either remotely via the Class 8881 Type PE-5 CRT Programmer, or directly from the front panel of the PR-3.
3. The DATA OUT LED will come on as a block of data is transferred from the tape to the buffer memory, and then sent out serially from the Loader/Recorder. This sequence will be repeated until all blocks of data have been transferred.

4. Successful completion of the Read Tape operation is indicated when the RUN light on the PR-3 turns off, the OPERATION ERROR light remains off, and the DATA ERROR light on the Loader Recorder also remains off. In the event of a Loader Recorder error, turn to Troubleshooting Section 4.0. For PR-3 or CRT error indications, refer to Bulletin M-515A.
5. Press the REWIND button on the Loader Recorder and wait until this operation has completed before ejecting the cartridge.

4.0 TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
POWER LED Not ON	<ul style="list-style-type: none"> A) Power switch in "OFF" position B) No line voltage C) Faulty line cord D) Fuse blown on Loader Recorder 	<ul style="list-style-type: none"> A) Turn power switch to "ON" position B) Check power outlet C) Check power cord connections D) Replace fuse (See Section 1.0 for proper fuse)
Write Tape Mode Failures	<ul style="list-style-type: none"> A) Data Cartridge is Write Protected B) Cable disconnected or connected to the wrong port C) Port Switch set to the wrong port D) WRITE TAPE Button not used E) Improper RS-232C signals F) DATA ERROR LED on Loader Recorder indicating a data transfer error G) CRT Programmer screen displays error message indicating a data transfer error 	<ul style="list-style-type: none"> A) Check Data Cartridge "RECORD" tab (Figure 2.6) B) Connection to the Loader/Recorder should be: Manual Mode: Differential Port (9 pin connector) Automatic and 8881 Modes: RS-232C Port (25 pin connector) C) Port switch should be set to the port detailed in Solution B above D) Write Tape operations in the Manual and 8881 Modes require the use of the WRITE TAPE button E) Use prescribed communication cables F) Refer to Troubleshooting Section 4.1 for Loader Recorder error codes G) Refer to CRT Programmer Instruction Bulletin for CRT error codes
Read Tape Mode Failures	<ul style="list-style-type: none"> A) Cable disconnected or connected to the wrong port B) Port switch set to the wrong port C) READ TAPE button not used D) Improper RS-232 signals E) DATA ERROR LED on Loader Recorder indicating a data transfer error F) CRT Programmer screen displays error message indicating a data transfer error 	<ul style="list-style-type: none"> A) Connections to the Loader/Recorder should be: Manual Mode: Differential Port (9 pin connector) Automatic and 8881 Modes: RS-232C Port (25 pin connector) B) Port switch should be set to the port detailed in Solution A above C) Read Tape operations in the Manual and 8881 Modes require the use of the READ TAPE button D) Use prescribed communication cables E) Refer to Troubleshooting Section 4.1 for Loader/Recorder error codes F) Refer to CRT Programmer Instruction Bulletin for CRT Programmer error codes

4.1 Cartridge Tape Loader/Recorder Error Codes

The cause of a Cartridge Tape Loader Recorder error can be determined by the repeated pattern of ON pulses of the DATA ERROR LED followed by a longer pause when the LED is OFF. One to five such pulses can be counted between pauses, annunciating 5 types of data transfer errors.

# OF "DATA ERROR" LED PULSES	TYPE OF ERROR	CAUSE OF ERROR
1	Key Error	Operator entered an improper sequence of Loader Recorder control pushbuttons.
2	Tape Error #1	Loader Recorder encountered end of tape holes during a Write Tape operation.
3	Communication Error	An error was detected in the communication between the Loader Recorder and the device it is connected to.
4	Tape Error #2	a. The Loader Recorder encountered the wrong data type; for example, an attempt to load control program data from a file containing register data. b. The Loader Recorder detected a checksum error during a read after write verification cycle.
5	Processor Running	An attempt was made to load a control program into a processor while the processor was running (processor must be halted to load a program from tape).

4.2 Loader/Recorder Self-Test Function

The self-test feature of the Cartridge Tape Loader Recorder isolates the various subsystems and each subsystem is then tested individually. If a malfunction is detected in the sequence of tests, the sequence is halted and the operator is directed to the particular area in which the fault was found.

Operation

The self-test function will be initiated when power is applied to the Loader Recorder with one of the test plugs installed. The Class 8010 Type CTP-10 test plug is used for the RS-232C port test sequence, and the Class 8010 Type CTP-11 test plug is used for the differential port test sequence. The PORT SELECT switch should be set accordingly.

The following four tests in the first sequence will be repeated until an error has been detected, or the sequence is terminated by rewinding or ejecting the cartridge tape.

Visual LED Test: All LED indicators on the Loader Recorder console will be exercised. The MANUAL LED will illuminate when this test is complete.

Transmitter/Receiver Test: The communication line driver/receivers are tested through a data loop. The REWIND LED will illuminate when this test has been successfully completed.

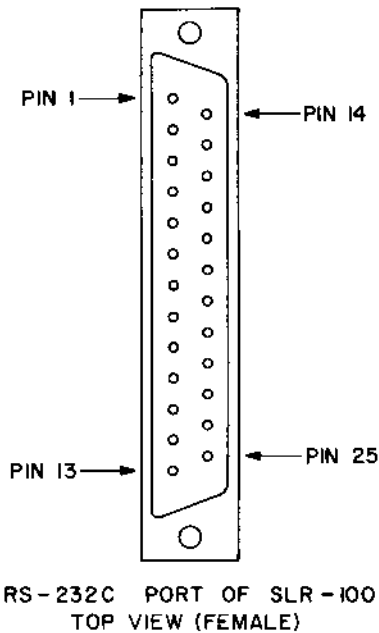
RAM Test: All RAM buffer memory bits are tested. The WRITE TAPE LED will illuminate when this test has been successfully completed.

ROM Test: A Checksum test of the system ROM verifies executive program accuracy. The READ TAPE LED will illuminate when this test has been successfully completed.

When the four LED's are illuminated indicating the successful completion of all of the above four tests, the test sequence will be repeated unless the MANUAL pushbutton is depressed at this time. If this button is depressed, the test sequence will halt, and upon release of this button a Write Tape and Read Tape test sequence will be executed, providing a cartridge is inserted into the Loader Recorder.

Write Read Test: Four blocks of data are recorded on the first track of the cartridge. The tape is rewound and the four blocks are read to verify the data written. Any errors will be announced by the DATA ERROR LED. The first test sequence will automatically follow the successful completion of this test.

5.0 RS-232C CONNECTIONS



PIN 1	Chassis Ground
PIN 2	Transmitted Data (Input to SLR-100, 110)
PIN 3	Received Data (Output From SLR-100, 110)
PIN 4	Request to Send (Input to SLR-100, 110)
PIN 5	Clear to Send (Output From SLR-100, 110)
PIN 7	Signal Ground
PIN 20	Data Terminal Ready

APPENDIX A PROGRAM CONTROL OF THE CARTRIDGE TAPE LOADER/RECORDER

A.0 Introduction

By programming communication rungs (Read and Write) into the ladder diagram control program (refer to CRT Programming Instruction Bulletin 30598-165-01), a SY/MAX PC can, under program control, locate any particular file on the Cartridge Tape and either record PC register data onto the tape, or load data from the tape into PC registers.

This appendix will serve to introduce the basic capabilities of the Loader/Recorder to be controlled by the ladder diagram control program.

A.1 Theory of Operation

Just as the SY/MAX Processor has register addresses assigned to it for I/O contact status and data storage, the Type SLR-100, 110 Cartridge Tape Loader/Recorder has its own register address space numbered S1 to S530. Addresses S1 through S512 correspond to buffer memory locations within the Loader/Recorder that may be monitored or altered. Addresses S513 to S518 correspond to a block header that enables a block of data to be given a name and later searched for. Addresses S519 through S530 allow all the Loader/Recorder operations to be controlled by the remote PC.

Set-up the Loader Recorder for operation in this mode in the following manner:

POWER LED ON
 MANUAL LED OFF
 BAUD RATE SWITCH 9600 BAUD
 PORT SWITCH Differential
 CABLE CONNECTIONS A Class 8010 Type CC-100 communications cable or equivalent should be connected to the Differential Port on the Type SLR-100, 110 Cartridge Tape Loader Recorder and to the COMM Port (channel 2) on the Class 8020 SY MAX Processor. This cable should be limited to 10,000 ft. in length.

Communication between the Processor and the Loader Recorder is initiated by communication rungs programmed in Processor memory. "Write" rungs will store the contents of a single Processor register into a Loader Recorder buffer location and subsequently onto tape. They can also store a block of consecutive Processor registers into consecutive Loader/Recorder buffer locations and then onto tape. "Read" rungs in combination with "Write" rungs will load data from tape into the Loader Recorder buffer and then transfer this data to Processor registers.

A.1.1 BUFFER MEMORY

The Cartridge Tape Loader/Recorder contains the buffer memory. This buffer is used to collect data being received by the Loader Recorder before it is actually recorded on the tape during a Write Tape operation. During a Read Tape operation this same buffer is used to hold data that was read from the tape before it is sent out from the Loader Recorder.

The buffer memory is divided into 512 16-bit words or registers and assigned the addresses S1 through S512. These Loader/Recorder registers are programmed as Remote registers in the Read and Write communication rungs and are completely separate from Processor Local registers. Remote (Loader Recorder) registers can only be accessed from within a ladder diagram control program via a Read or Write communication rung.

A.1.2 BLOCK HEADER

A file of information may contain one or several blocks of 512 registers. The Block Header identifies whether the information contained in a file is:

1. Control Program
2. Register Data
3. Definition Data

It also indicates whether the particular block being examined is:

1. The only block in the file
2. The first block in the file
3. A middle block in the file
4. The last block in the file

Further information in the Block Header identifies which specific block in a multi-block file is being examined. In addition, it is possible for the user to assign an identification number to a specific block of data. Figure A1 illustrates how the Block Header registers S513-S518 are combined with the buffer registers S1-S512.



Figure A.1 — Block Header - Buffer Memory Registers

S513 -- BLOCK FLAG OP CODE Do Not Alter This Register. This register is set by the Loader Recorder.

REGISTER	S513
.	.
.	.
.	00 HEX
.	01
.	02
.	03
.	.
.	.
.	.
.	.
01 HEX	.
02	.
03	.

Description
 Only one block in a file
 First block of a file
 Block in the middle of a file
 Last block in a file

Description
 Rung data
 Register data
 Definitions data

Figure A.2 — Block Flag/OP Code Register

S514 — SEQUENCE NO. Do Not Alter This Register. This register identifies the specific block number of a multi-block file.

S515 – S517 — NAME — These three registers can be set to an arbitrary number to name a block of data. These registers can be read by a control program in a search for a particular data block.

S518 -- SPARE Not Used.

A.1.3 LOADER/RECORDER CONTROL COMMANDS

The Loader Recorder can be controlled remotely by the ladder diagram control program through the use of Write communication rungs. The control commands listed in Figure A3 are implemented by performing a "Write" to the appropriate Remote (Loader/Recorder buffer) register address. The remote device, in this case the Loader/Recorder, interprets an attempt to write into any one of these registers as a particular command. Data is not actually loaded into these Loader Recorder registers, so any arbitrary value may be sent.

The local Processor register programmed as the Status register must be unique for each Read or Write rung.

"WRITE ONLY" REMOTE REGISTER	CARTRIDGE TAPE LOADER/RECORDER COMMANDS
S519	Rewind Tape
S520	Read Block (From Tape to Buffer)
S521	Write Block (From Buffer to Tape)
S522	Skip File
S523	Skip Backwards One File
S524	Write Inter-file Gap
S525	Track 1 Select
S526	Track 2 Select
S527	Clear Data Block and Header of Buffer Memory
S528	Clear Data Block of Buffer Memory
S529	Track Erase (Erases Tape From Present Point to the End of the Tape)
S530	Last File (Skips Past the Last File on the Tape. The Tape is Now in Position to Record a New File.)

Figure A.3 — Loader/Recorder Control Commands

A.2 Programming

Figure A.4 provides an example of a Read communication rung. A Write rung is programmed in a similar manner. A more thorough coverage of communication Read and Write rungs is presented in the CRT Programmer Instruction Bulletin 30598-165-01.

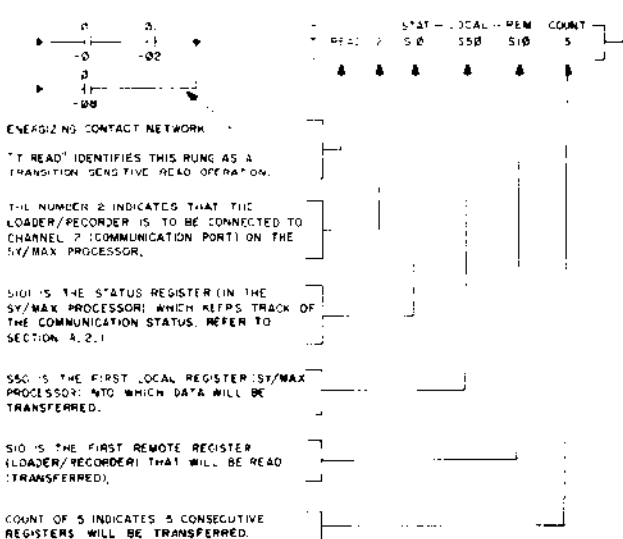


Figure A.4 — "Read" Communication Rung Example

A.2.1 STATUS REGISTER

The Status register provides a means for the remote device (the Loader Recorder) to signal the Processor that a register transfer has been completed. This local register also has the ability to indicate a number of error conditions back to the Processor. Refer to Instruction Bulletin 30598-165-01 for more information on the Status register.

A unique Status register must be dedicated to each Read or Write communication rung in the program. A Status register must not be altered anywhere else in the control program.

The Status register will be cleared when the circuit preceding the function box is opened.

Following the successful completion of a communication (Read or Write) operation, bit 16 of the Status register will be set to "1". If an error condition has been detected, bit 16 will be set to zero and bits 1 to 15 will be loaded with one of the error codes listed in Figure A.5. All error codes are odd numbers, so bit 1 of the Status register need only be tested for the presence of an error condition.

STATUS REGISTER ERROR CODE (Decimal Notation)	DESCRIPTION
31	END OF TAPE — the end of the tape was encountered before the operation could be completed.
33	TAPE DATA ERROR — the block of data involved in the Read or Write operation was faulty.
35	CARTRIDGE OUT/WRITE INHIBIT — The cartridge is not seated properly, or missing, or the "Record" tab on the cartridge has been set to the Write Inhibit position.
37	END OF DATA — An attempt to skip or read a file was made when past the last file on the tape.

Figure A.5 — Status Register Error Codes

A.2.2 WRITE COMMUNICATION RUNG EXAMPLE

(Place SY/MAX Processor Register Data Onto Tape)

The example circuits of Figure A.6 will rewind the Cartridge Tape, record Processor registers S17 to S112 on the tape, and rewind the Cartridge Tape again, all on the closure of input contact I-01.

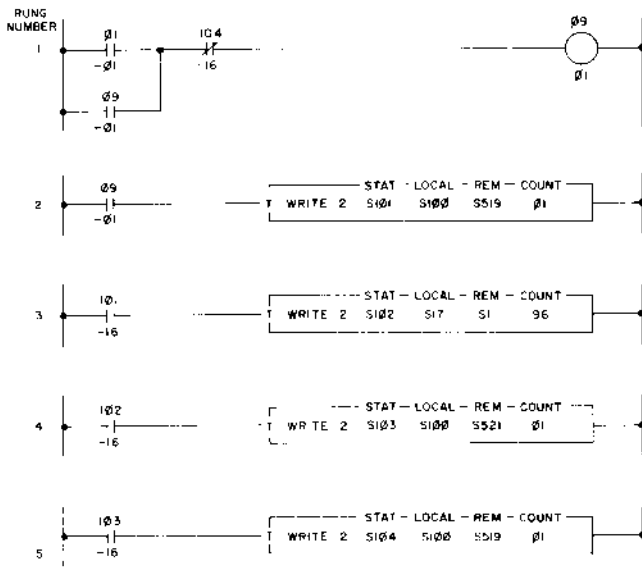


Figure A.6

A.2.3 FILE LABELING EXAMPLE

The example circuits of Figure A.7 expand on example A.2.2 by assigning a name or identification number to the data file. The identification number 7777 will be given to the data file (assume local register S98 has been preset with this value).

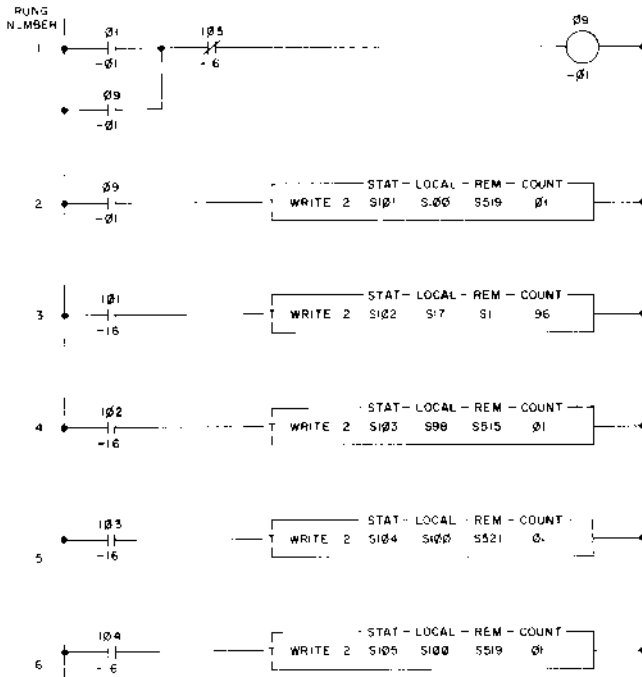


Figure A.7

A.2.4 FILE SEARCHING EXAMPLE

A general purpose search routine is presented in Figure A.8. This program is initiated by a closure of input contact I-01.

The program will first command the Loader/Recorder to rewind the Cartridge Tape and select track 1. A block of data will be read off the tape into the buffer, and the first "NAME" register, S15, of the block header will be transferred to processor register S99. The specific file name being searched for is 7777. The contents of S99 will be compared to 7777 and if they are equal the search routine is terminated. If they are not equal, the search is repeated until a match is found or until the end of the tape is encountered. At that time the cartridge is rewound, and the sequence is repeated for track 2. If the file is not found on track 2, the tape is again rewound and the routine is terminated.

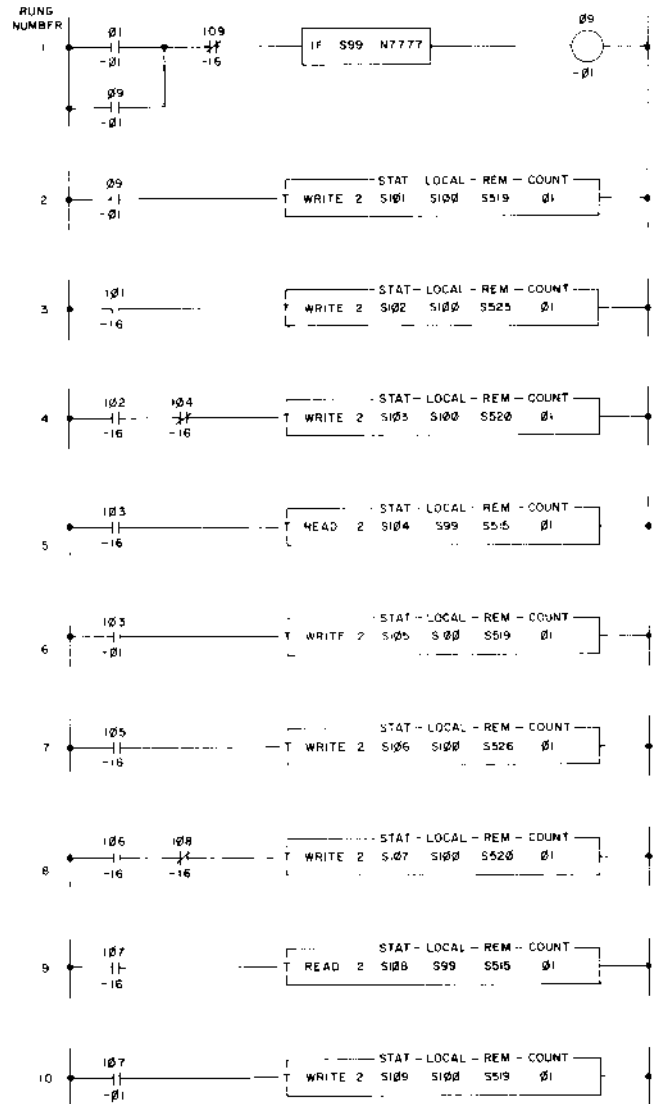


Figure A.8

APPENDIX B 8030 SLR-130 MOUNTING KIT

The 8030 SLR-130 Mounting Kit provides the hardware necessary to permanently mount the SLR-100, 110 Loader/Recorder on a wall or within a control enclosure. The kit provides the necessary hardware for both vertical and horizontal mounting.

The following steps may be used.

STEP 1A: For vertical mounting: attach the vertical brackets to the empty case, as shown in Figure B.1.

STEP 1B: For horizontal mounting: attach the horizontal brackets to the empty case, as shown in Figure B.2.

STEP 2: Mount the empty case with attached brackets to a wall or control enclosure.

STEP 3: Loosen the four hold-down screws and remove the Loader/Recorder front panel (complete with electronics and power supply attached) from the original carrying case. Insure the grounding wire is also loosened. This procedure is also shown in Figures B.1 and B.2.

STEP 4: Place the Loader/Recorder front panel with electronics into the mounted case (Step 2) and fasten the hold-down screws.

NOTE: The grounding wire must be attached to the mounted case to insure proper operation.

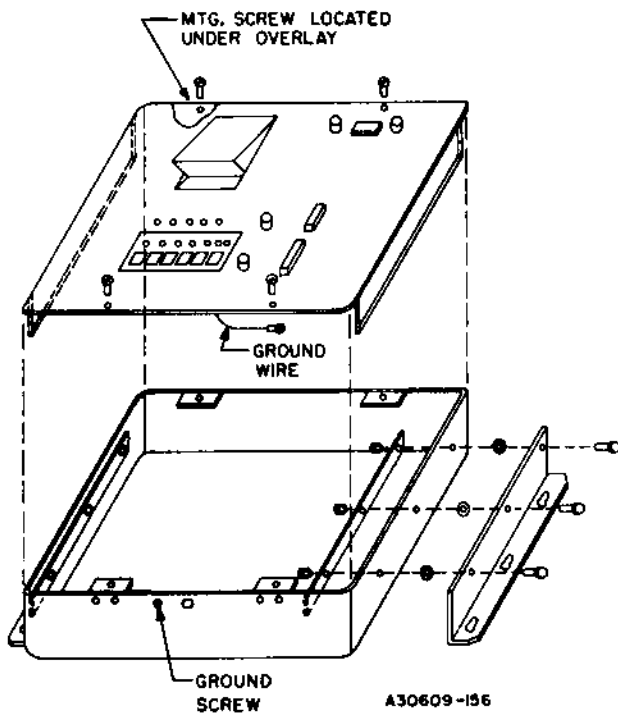


Figure B.1 — Vertical Mounting

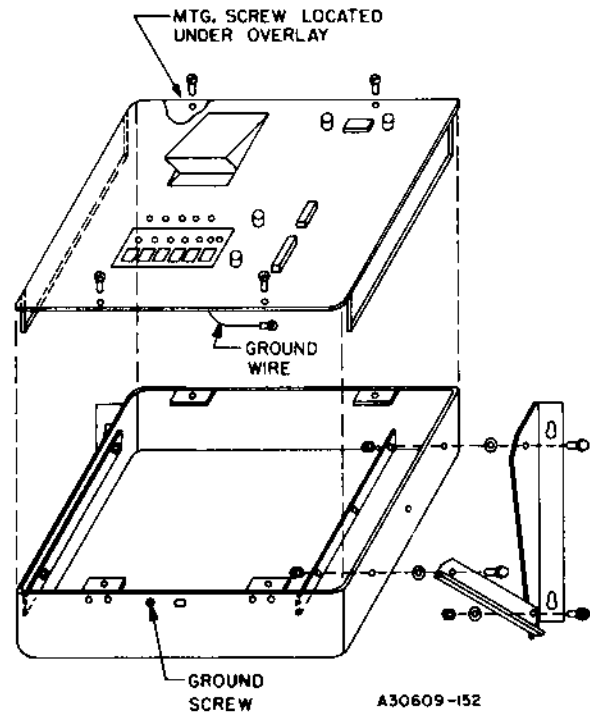


Figure B.2 — Horizontal Mounting



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