

APPENDIX A AUXILIARY UNITS

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PROGRAMMING PANEL, MODELS 102,112

DESCRIPTION

Models 102 and 112 differ only in that Model 102 is not designed to implement calculation and data transfers. In all other respects, the units are identical.

The Model 112 Programming Panel is used to program the 184/384 Controller to perform logic, Timing, Counting, Calculating and Data Transfers. The Panel is a portable unit that connects to the Controller thru an interface. It allows the user to:

Enter the Control Program consisting of Relay Logic, Timers, Counters, Calculate Plus and Minus, and the various Data Transfer Functions (DX).

Check out the entire Control System from limit switches and pushbuttons to solenoids and motor starters.

Debug and troubleshoot the machine or process from start-up to on-line operation.

The Control Program entered via the Programming Panel, is in the format of the conventional elementary diagram or ladder diagram (Figure A-1). Each line of the ladder diagram contains an output which is controlled by four control elements, the equivalent of relay contacts in the line. They will be normally open or closed, connected in series or in parallel combinations. Timers, Counters, Calculators and Data Transfer Lines, are also entered into the same four element line. Timers may be set for times from 0.1 seconds to 999 seconds. Counters may be set from 1 to 999. Remote set allows presets up to 9999.

Using the pushbuttons and switches on the Programming Panel, each control and pilot device shown on the elementary diagram is entered into the controller memory. Changes may be made in the manner as original entry, modifying only the specified line affected by the changes. The Panel may also be used to display the stored control program line by line.

SPECIFICATIONS

Power Requirements: 115 Vac \pm 20%
(50 Hz/60Hz),
20 Volt amps

Environmental Requirements:
Ambient Temperature 0° to 50°C
Humidity 0% to 95%
(non-condensing)

Dimensions: 14-3/4 in. x 14 in. x 10-1/2 in.

Weight: 20 lb.

INSTALLATION

To connect the Panel:

1. Turn the Controller interlock knob on the left front of the controller to the full counter-clockwise position. This removes controller power and unlocks the service connector.
2. Uncoil the Panel cables and remove the Panel interface from the panel case.

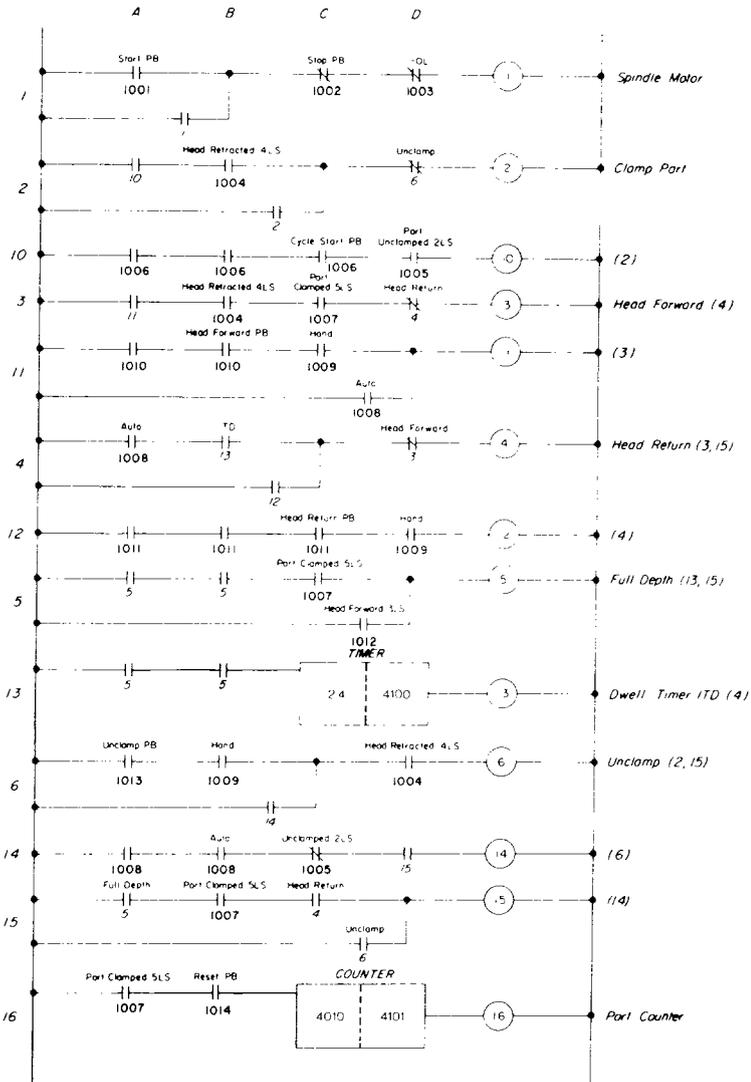


Figure A-1. Typical Ladder Diagram

3. Place the Panel interface on the hinge post to the left of the controller and swing the interface closed, engaging the interlock knob.
4. Secure the interface by rotating the interlock knob clockwise to its first detent.
5. Plug the Panel power cord into the 115 Volt convenience outlet located in the Controller's Power Supply.
6. Turn the Control knob on the Controller housing clockwise to the Power On position. This locks the interface to the Controller, preventing its removal while power is applied.

NOTE

The Panel may be disconnected from the Interface *without* removing controller power.

Controls and Indicators

Line Number Switches — The line number thumbwheel switches *select the line to be programmed* or the input or register to be displayed.

Line Type Pushbuttons — The line type pushbuttons are back-lighted pushbuttons that indicate whether the line selected is:

RELAY
TIMER SECOND
TIMER TENTHS
COUNTER
CALCULATE
DATA TRANSFER

To change a Line Type, press the desired Line type pushbutton. It will light and any light previously lit will go off. If TIMER TENTHS is selected, the line may be programmed for time settings of from .1 to 99.9 seconds in increments of .1 seconds. If a SECONDS TIMER is selected, times up to 999 seconds may be programmed.

Selected Element Pushbuttons [A-B,C,D] — The four SELECTED ELEMENT pushbuttons each contain two lights. The light in the lower half of the pushbutton indicates which of the four element positions is selected for display and entry. Pressing another of these pushbuttons will select that position and it in turn will light. The upper half of the display is labeled POWER with an arrow pointing to the right. It lights if power is being conducted through that element to the next position to the right. For example, if the A, B, and C POWER lamps are lit and the D lamp is not, then contacts in positions A, B, and C are closed while contact D is opened.

Reference Number Display — The reference number display shows the number of the input or line that controls the contact in the element position currently selected for display or entry. A new reference number may be selected, and entered by pressing the appropriate ELEMENT TYPE. The display will also show the Constant set into the C element of a counter, timer or calculator as well as the data storage location in B, C, or D positions of non-relay lines. To view the contents of these locations, hold the SELECTED ELEMENT depressed.

NOTE

The C element of a counter or timer may also be programmed to reference a register location. In this event the actual preset is obtained from that *location* which will contain a *number*, entered via external switches or as a result of control decisions programmed into the controller. With the C position selected, the register location is displayed. Depressing the C element will display the current contents of that location.

Element Type Pushbuttons.The four ELEMENT TYPE pushbuttons indicate the four contact types that may be programmed into the four positions of a relay line. They are:

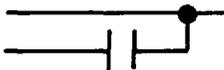
Series Normally Open Contacts



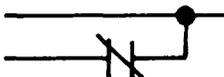
Series Normally Closed Contacts



Parallel Normally Open Contacts



Parallel Normally Closed Contacts



When entering contacts in a relay line, the A and B element positions of a timer or counter line, or the A element of a calculate or DX line, pressing one of the ELEMENT TYPE pushbuttons will enter that contact type in that position of the line. At the same time, it will enter the input or line number associated with that contact from the REFERENCE NUMBER switches. The ELEMENT TYPE pushbuttons are also used for entering a preset constant in the C element position of a counter, timer line, or calculate line. In this case all of the ELEMENT TYPE lights are illuminated indicating that any one of them can be used to enter the number from the REFERENCE NUMBER switches in the controller memory. The element type switches are likewise used to enter register locations in the B, C, and D element positions of calculate and data transfer (DX) lines, as well as the function call code into the C position of a DX line.

Disable Pushbutton/Output Pushbutton — With the Controller memory protect off, pressing the DISABLE pushbutton will light the pushbutton and transfer control of the designated line from the elements as programmed to manual control from the OUTPUT pushbutton. Once a line has been disabled it may be controlled by the OUTPUT pushbutton. Pressing OUTPUT will power the designated line from on to off or from off to on. The line is on when the OUTPUT light is illuminated.

If an input number is selected and the DISABLE pushbutton is pressed the contacts in the control program are no longer controlled by the state of the input, instead they are controlled by the OUTPUT pushbutton just as for outputs. With the OUTPUT illuminated, the input is assumed energized.

The use of the DISABLE and the OUTPUT pushbuttons greatly facilitates both initial program checkout and system diagnosis. However, care must be exercised to return inputs and lines to the desired state of control prior to removing the program panel. Once DISABLE mode has been selected for an input or line it remains in DISABLE until taken out by the programmer.

CAUTION

Use of the DISABLE feature could cause an output or input to be energized without safety interlocks resulting in damage to the machine or process.

PROGRAM LOADER, MODEL 202

DESCRIPTION

The Model 202 Program Loader is a magnetic tape cartridge unit designed for field recording and reloading of user programs into MODICON 184 Programmable Controllers. The Program Loader features ease of operation and fully automatic error detection and protection. The Model 202 Program Loader permits the user to:

Record his control programs on magnetic tape cartridges.

Load a control program from a magnetic cartridge into the Controller.

The Model 202 is housed in a rugged case which also houses the plug-in module (Figure A-2). The case also provides space, in a dust-proof compartment, for storage of up to 14 magnetic tape cartridges. Each cartridge can store up to two MODICON "184" Programs, each consisting of an entire Programmable Controller Memory. (See Figure A-3 for cartridge insertion.)

The case is provided with a convenient hanger (Figure A-4.) which allows the Model 202 to hang from the Controller enclosure door and open like a book. This provides the optimum protection against contaminants entering the tape record/play area.

SPECIFICATIONS

Physical

Dimensions:	15 in. x 18 in. x 7-1/2 in.
Weight:	28 lb.
Cartridge Size:	3-11/16 in. x 3-1/8 in. x 3/4 in.
Cartridge Capacity:	190 feet of 0.5 mil mylar tape
Speed: Search	21 in./sec.
Rewind	21 in./sec.
Read/Write	7 in./sec.
Write Protect:	Removing the button from the cartridge inhibits further recording on that cartridge

CONTROLS AND INDICATORS (Figure A-5.)

Controls

START:	Pushbutton (black) — Depressing the START control initiates the action selected by the three position mode switch.
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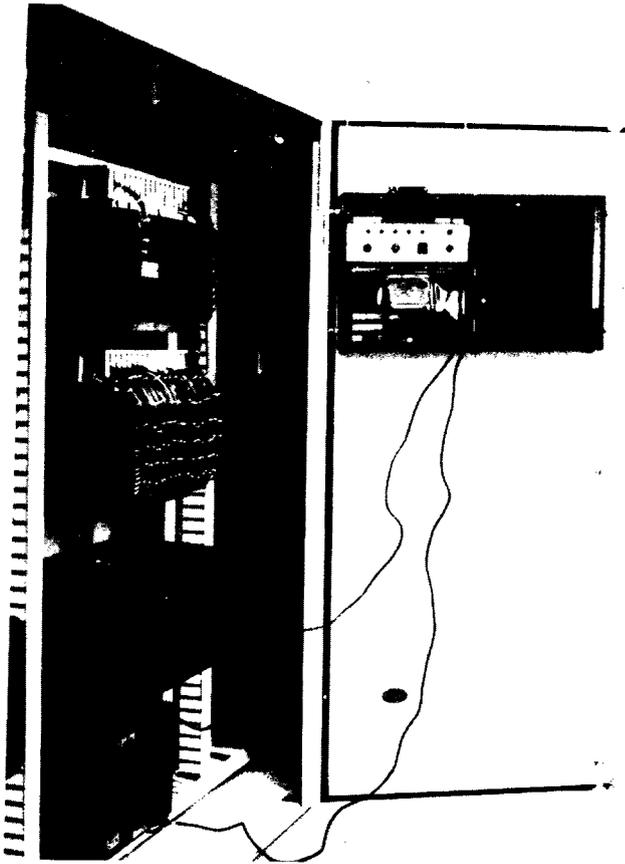


Figure A-2

MODE SELECTION:

LOAD:

The counter-clockwise position of the mode selector switch. When LOAD is selected and the START pushbutton pressed, the tape advances to the selected program number (0-1) and copies the data from tape into the Controller memory.

RECORD:

The clockwise position of the mode selector switch. When RECORD is selected and the START pushbutton pressed, the contents of the CONTROLLER memory is written at the position on tape designated by the program number switch.



Figure A-3

- RUN:** The center position of the mode selector switch. When RUN is selected and the START pushbutton pressed, the normal control cycle of the Controller is restarted.
- RESET:** The RESET pushbutton is a red pushbutton for emergency use only. If it is pressed while the tape is rewinding, the tape motion is stopped. At any other time pressing RESET will cause the operation progress to stop and the tape to be rewound.

Program Number [0-1]

This switch selects the starting position on the tape at which data will be recorded or from which data will be loaded into the controller.

Indicators

- POWER:** This lamp indicates that power has been applied to the program loader.

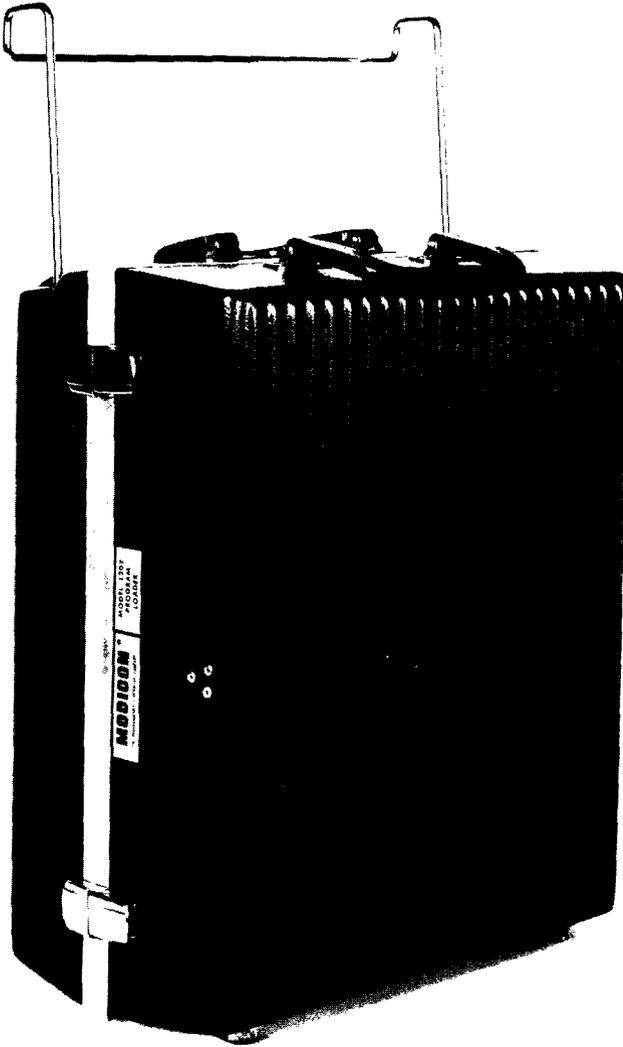


Figure A-4

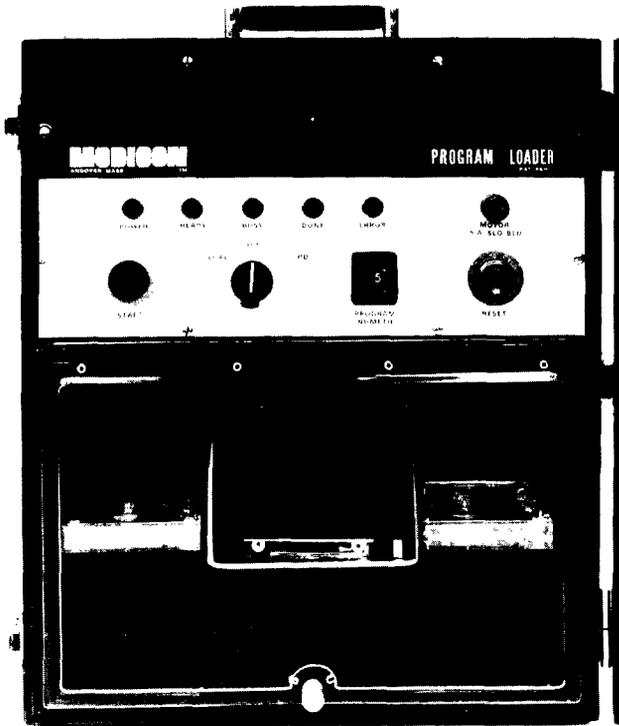


Figure A-5

READY: Indicates that the cartridge is in place, the dust-tight door is closed, no operation is currently in progress, and a load or record operation has been selected.

NOTE

Both "Power" and "Ready" must be illuminated prior to commencing an operation.

DONE: The DONE lamp indicates the selected operation has been completed. It remains on until the next operation has started.

ERROR: If this lamp is illuminated, a fault in the operation has been detected. Types of faults detected include:

- a. Attempting to record on protected tape.
- b. Attempting to load a non-existent program.
- c. Data errors in recording.

- d. Power failure.
- e. Opening the dust-tight door during an operation.
- f. Pressing reset while an operation is in progress.

BUSY: This lamp indicates an operation is in progress.

In addition to the five status displays and four switches, a fuse holder is mounted on the control panel. This fuse is for the 120 Vac supplied to the power supply for the tape drive motor. It contains a 1/2 amp Slo-blo fuse.

Operating Procedures

CONNECTION: Hang the program loader on the enclosure door (Figure A-2). Open the case and remove the plug-in from its compartment on the right. Open the Controller Service Port and connect the interface module to the Controller. Ensure that the interface cable is connected to the interface module. Connect the program loader ac cord to the Controller convenience outlet and turn on Controller power. The program loader POWER lamp will now be lit.

RECORD: Connect the program loader as above and select a cartridge on which you want to RECORD. (THE INTERLOCK BUTTON MUST BE IN PLACE ON THE CARTRIDGE IN ORDER TO RECORD.) Select the program number you are assigning to this tape entry. (The position on the cartridge at which the program will be entered.)

NOTE

On a new tape, recording must be at location zero. On an already recorded tape, recording at location zero will destroy the recording at location one, thus zero must only be used if the program at location one is no longer required or has not yet been recorded.

Insert the cartridge and close the dust-tight door. Place the mode selector switch in the RECORD position. At this time the READY light will be lit.

Press START: This will stop the Controller, advance the tape to the selected position and copy the Controller memory onto tape. When the operation is completed, the DONE light will come on. Return the mode selector to the RUN position and press START. This will restart the Controller causing its "RUN" light to come on. The average time for a RECORD is 6-1/2 minutes, while the maximum time is 8 minutes.

LOAD: Select the cartridge having the desired program. On the program loader control panel, dial the desired program number (0 or 1). Insert the cartridge into the tape drive mechanism (Figure A-3). Close the dust-tight cover. Move the mode selector switch to the load position. WHEN THE ABOVE STEPS ARE COMPLETED, THE "READY" LAMP WILL LIGHT. Press START. This stops the Controller's normal cycle and begins the LOAD operation. The BUSY lamp will light during this time. At the completion of the LOAD, the tape will automatically rewind and the DONE lamp will light.

(BUSY will go off.) Return the mode selector to the RUN position and press START to place the Controller in normal operation. The average time for a LOAD is 4 minutes.

ENVIRONMENTAL

Operates in ambient of 10°C to 50°C up to 90% humidity, and incorporates shielding and filtering for protection against both conducted and radiated, electromagnetic and electro-static noise and magnetic fields.

ELECTRICAL REQUIREMENTS

10 watts of 120 Vac single-phase at 50 to 60 H.

5 watts of +5 Vdc from Controller Power Supply.

1 watt of -5 Vdc from Controller Power Supply.

POWER-UP CONSIDERATIONS

The mode selector switch will normally be left in the "RUN" position at the completion of an operation. When power is applied to the Controller with the program loader connected and the mode selector in RUN, the Controller will operate normally. If the mode selector is in either the LOAD or RECORD position when the power is applied, the Controller will remain idle (RUN lite out). To start, place mode selector to RUN and press START.

NOTE

Model 202 Program Loader is designed for use with only the model 184 controller. Model 206 Program Loader is designed for use with both the model 184 and 384 controllers (see page A-25).

TELEPHONE INTERFACE, MODELS 151, 152

DESCRIPTION

The MODICON Telephone Interface is a device which allows the Programmable Controller to be linked to the MODICON Service Center over standard voice grade telephone lines. It consists of an acoustical data coupler which mates with the standard telephone hand-set and an electronics package which interfaces with the Controller. Both of these are housed in a rugged case for portability and safe storage.

No special knowledge or training is required to use the Telephone Interface.

The MODICON Telephone Interface in its carrying case weighs 30 lb. and has outside dimensions of 14-3/4 in. x 14 in. x 10-1/2 in. The plug-in portion is designed for 0°C - 60°C ambient air operation, while the acoustic coupler section can operate in 0°C - 50°C ambient air. Both sections will operate in 10% - 95% relative humidity, non-condensing.

INSTALLATION

The Telephone Interface is connected to the Controller in the same manner as the Program Panel and other peripheral devices. This requires that:

1. The controller interlock be released,
2. The interface to be plugged into the Service Port, and the Control Knob turned ON,
3. The Telephone Interface is connected to 115 Vac and its power switch turned "ON",
4. The Telephone Coupler selector switch be placed in the "Full" position, and
5. The Controller Run/Set-up switch should be in the set-up position to prevent the machine or process from accidental functions.

OPERATING PROCEDURE

At this time the interface will have the "Idle" lamp on the plug-in illuminated as well as the red "Power" lamp on the acoustic coupler. It is now ready to place your call to the MODICON Service Center, (617) 475-1181. Your phone call will be answered by the Service Center Operator who will want to know:

1. Your name and company,
2. The serial number of the Controller to which you are connected, and
3. What service you desire.

He will probably ask other questions when the call is for diagnostic service.

After this discussion he will request that you switch over to "Data". At his end this entails switching from phone to data. If you are still listening, you will hear an audible tone. At your end, to make the "Data" connection, you must place the handset firmly into the rubber cups of the acoustical coupler. One of the cups is lettered CORD, which identifies the cup receiving the CORD end of the handset. The rubber cups fit snugly about the handset receiver and transmitter, reducing the possibility of room noise affecting the communication.

When you have placed the handset correctly, and the Service Center Operator has switched from voice to data, the green "Carrier" lamp on your acoustic coupler will light. The Service Center Operator is now in control. When he causes the Service Center computer to communicate with the Controller, you may observe the plug-in status lamps flashing. You must watch, however, the green "Carrier" lamp. When this lamp goes off, the Operator has switched to voice and is waiting for you to pick up the handset again.

There are four status lamps on the plug-in. The "Idle" indicates power is present but no communication is in progress. The top lamp, "Run" lights when communication is in progress. The second and third lamps, "TO" and "FROM", respectively, indicate the direction of the data being transferred. "TO" means data to the Controller.

Since communication cannot normally be accomplished while the Controller is controlling a process, you will note that shortly after switching to data a short communication will occur which will turn off the Controller "Run" lamp. Prior to terminating the call, the Operator may request that you cycle power on the Controller to restore the "Run" lamp.

It is good practice, when placing your call through your company switchboard, to explain to the operator that you are making a data call. Operators have been known to break the connection when they hear a tone rather than voices.

The Model 151 TI and the Model 152 TI transmit at 300 baud.

The Model 151 is designed to interface directly with Modicon Model 084 Programmable Controllers, and requires a Model X-435 adapter connector to interface with Model 184/384 Controllers. Telephone Interface Model 152 is designed for Model 184/384 Controllers (no adapter connector necessary), but will not interface with Model 084 Controllers.

COMPUTER INTERFACE

DESCRIPTION

The Computer Communication Equipment provides the means to interface MODICON 184/384 Controllers with a digital computer for monitoring and control purposes. Through the communications equipment the digital computer can monitor any portion of the controller memory or alter any portion of the memory (with memory protect turned off). The computer may thus accomplish virtually any type of monitoring or controlling function.

Examples of the use of the Computer Communications Equipment with a digital computer and Controller include:

1. Management reporting of: production, down-time, reject count, parts failure, etc.
2. Computer monitoring and switch-over of redundant controllers for extreme reliability.
3. Computer Service Center for program loading, diagnostics, and ladder listings.
4. Connection of the Controller to a computer hierarchy controlling and/or monitoring a production line, process, plant or company.

DESCRIPTION OF THE COMPUTER COMMUNICATIONS EQUIPMENT

The Computer Communications Equipment line consists of seven standard modules. Each module has a specific purpose and may be configured with other Computer Communication modules to fit a particular application. The next paragraphs describe, in turn, each of these equipments.

List of Computer Communication Equipment

Type Number	Name	Purpose
1646-1	Computer Interface	300b/sec
1646-2	Computer Interface	2400 b/sec
1646-3	Computer Interface	4800 b/sec
1646-4	Computer Interface	9600 b/sec
1642	EIA Adapter	for 300 b/sec, used for distances between 50 and 2000 feet.
1643	EIA Adapter	for 600 to 9600 b/sec, used for distances between 50 and 1000 feet.
1644	Housing	for the 1642 and 1643 (accommodates up to eight Adapters).

I646 Computer Interfaces

The I646 series of computer interfaces contains the logic required to obtain data from, and insert data into the controller memory. This means, for example: 1) that the state of inputs, outputs and registers may be examined by a computer, 2) that the ladder diagram and/or executive program may be examined by a computer, 3) that the state of registers may be modified by a computer, and 4) that the ladder diagram and/or executive program may be modified by a computer.

Any one member of the I646 series is a portable plug-in unit that inserts into the service port of the Controller, and receives its power from the Controller (Figure A-6). It may interface directly with a computer up to 50 feet away through a serial data interface conforming to EIA specification RS-232-C (Type E). Longer distances may be accommodated through the use of the I642 or I643 Adapter modules (see below).

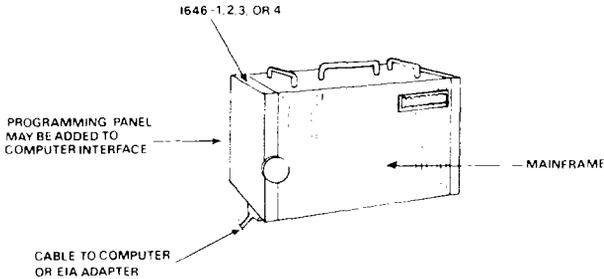


Figure A-6. I646-1, 2, 3, or 4 Connected to 184/384 Service Port

Note that the programming panel may be attached to the Controller, without disturbing the computer interface, via a connector on the computer interface.

The four models of the I646 line (-1, -2, -3, -4) provide standard asynchronous data rates of 300, 2400, 4800, and 9600 b/sec respectively. On special order, rates of 150, 200, 600, 900, 1200, 1800, 3600, 7200 and others may be provided.

In addition to direct connection to a computer, the I646 series is capable of interfacing to data sets, such as the Bell 103A, or acoustic couplers, such as the Anderson Jacobson Series 240, that meet the requirements of EIA-RS-232-C (Type E). These data sets are used when communicating at a distance longer than 2000 feet.

I642 and I643 Adapter Modules

The I642 and I643 Adapter Modules are used for interfacing a digital computer with cables longer than 50 feet (See Figure A-7.) In conjunction with I646-1, Computer Interface, the I642 may drive and terminate cables, at 300 b/sec, up to 2000 feet in length. In conjunction with the I646-2, -3, or -4, Computer Interface, the I643 may drive and terminate cables, at data rates greater than 300 b/sec, up to 1000 feet in length.

The interface between the I642 or the I643 Adapter Module and the computer is asynchronous, full duplex, and conforms to EIA Specification RS-232-C (Type E). The I642 or I643 is a plug-in module containing a cable

driver and receiver, EIA driver and receiver, noise filters and activity indicators. They plug into and receive power from an I644 Adapter Module housing described below.

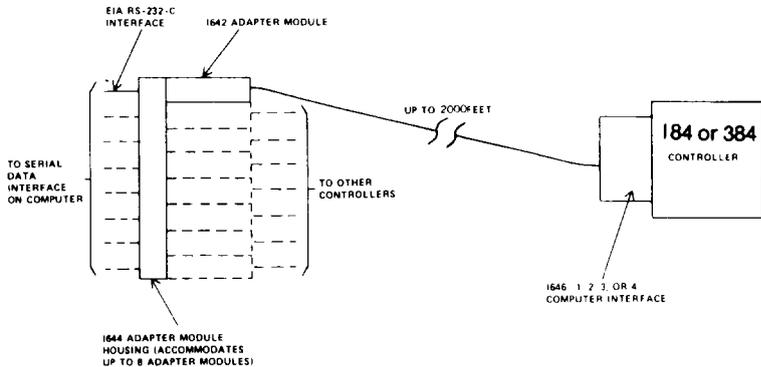


Figure A-7. Remote Computer Communication through an I642 or I643

I644 Multiple Adapter Housing

The I644 Multiple Adapter Housing is a unit for housing up to eight of the I643 and/or I642 Adapter Modules in proximity to the digital computer. It supplies the power required by the Adapter Modules.

The front of the I644 has displays for the "POWER ON" state and for the activity status of each Adapter Module data channel to and from the Controller. The activity indicator will be ON when the channel is idle and flashing when the channel is active. When the indicator is OFF, the channel is disconnected.

CONFIGURATION

The quantity and interconnection of each of the units comprising the Computer Communication Equipment to be used on an installation will depend upon the particular requirements. If the Controller is less than 50 feet from the computer, only the I646-1, -2, -3, or -4 Computer Interface is required. Any Controller at a distance greater than 50 feet from the computer will require, in addition to an I646-1, -2, -3, or -4 Computer Interface, an I642 (for 300 bps) or an I643 Adapter Module (for > 300 bps). If an I642 or an I643 are required, at least one I644 will be required. The following allows determination of the number of each unit required for an installation.

- a. I646-1: One for each Controller communicating at 300 bps.
- b. I646-2: One for each Controller communicating at 2400 bps.
- c. I646-3: One for each Controller communicating at 4800 bps.
- d. I646-4: One for each Controller communicating at 9600 bps.
- e. I642: One for each Controller at a distance of more than 50 feet but not more than 2000 feet from the computer, communicating at 300 bps or less.
- f. I643: One for each Controller at a distance of more than 50 feet but not more than 1000 feet from the computer, communicating at greater than 300 bps.

WIRING INSTALLATION

The Computer Interface Equipment can be applied in three ways:

- a. Distant (greater than 50 ft.) computer communication through an I642 or I643.
- b. Direct computer communication (less than 50 ft.)
- c. Telephone data set communication.

Each of these arrangements require somewhat different wiring. In the distant computer communication system, two cables are required:

- a. The cable between the I646-1, -2, -3, or -4 Computer Interface and the EIA Adapter (I642 or I643) (Cable A).
- b. The cable from the computer to the EIA Adapter (I642 or I643) (Cable B).

The connectors for Cable A are provided with the I646-1, -2, -3, or -4 Computer Interface. The cable itself is not. The cable should have two twisted pairs each individually shielded, and 22 gauge (7 x 30), such as Belden 8777 or Alpha 6010. Figure A-8 shows the interconnection for Cable A. If either the Memory Protect Option or the Flag Character option is required, the jumpers must be added to the connector that plugs into the I646-1, -2, -3, or -4. Cable B is wired in accordance with EIA specification and is not supplied with Adapters.

Table A-1. I646-1, -2, -3, and -4 Connector Pin Assignments

Pin	Signal
1.	Protective Ground
2	Transmitted Data
3	Received Data from I646-1, -2, -3, or -4 Computer Interface
4	(Not Used)
5	Clear to Send
6	Data Set Ready
7	Signal Ground
8	Received Line 5
9	Shield Ground
10	Shield Ground
11	From I646-1, -2, -3, or -4 Computer Interface
12	DC Power Ground
13	DC Power Ground
14	+5 Vdc
15	(Not Used)
16	+5 Vdc
17	(Not Used)
18	To I646-1, -2, -3, or -4 Computer Interface
19	(Not Used)
20	Data Terminal Ready I646-1, -2, -3, or -4 Computer Interface
21	To (TP 2)
22	(Not Used)
23	Flag Character Enable
24	Shield Ground
25	Memory Protect Enable

In the telephone data set system, the connections between I646-1, -2, -3, or -4 CI and the data set are shown in Figure A-9. Again, the cable length is limited to fifty feet and the jumpers must be added to the connector if the Memory Protect or Flag Character Options are required. The cable shield is wired to pin 1 of both Connectors. A 10,000 ohm, 1/4 watt resistor is required between pins 9 and 20 of the connector at the data set end of the cable.

- g. I644: One for each group of eight I642 or I643. Any mix of I642 or I643 is allowed in one I644.
- h. Data set (not supplied): Two for each Controller at a distance greater than 2000 feet from the computer.

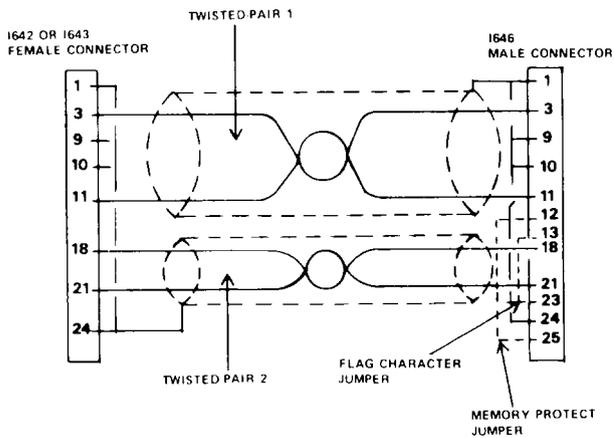
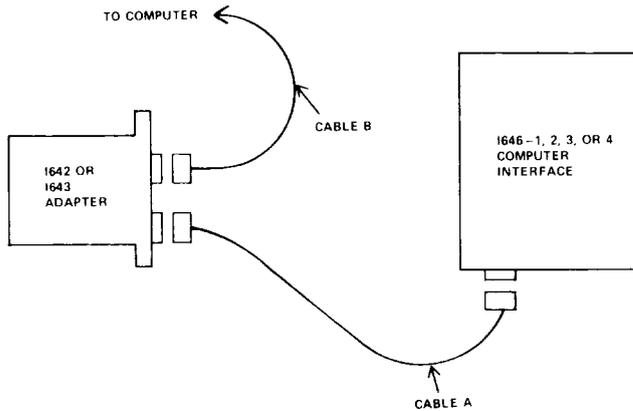


Figure A-8. Cable A

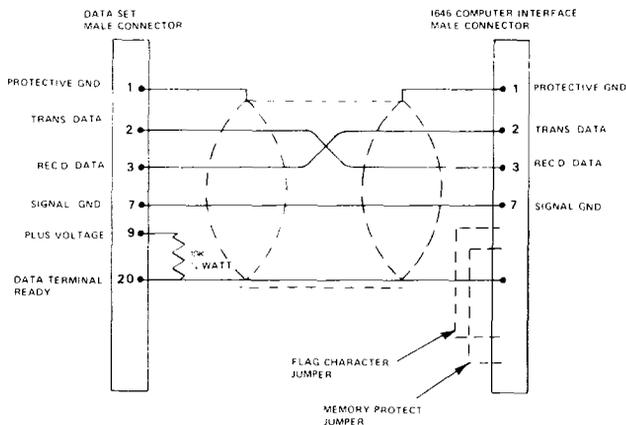


Figure A-9. Connectors Between I646-1, 2, 3, and 4 and Data Set

PROGRAMMABLE PRINTER

DESCRIPTION

The P500 Programmable Printer is designed to provide hard-copy printouts of data such as machine conditions, running time, tool life, down-time, alarm monitoring, fault diagnostics, and management information. It is a single modular unit with heavy-duty housing, designed to withstand severe industrial environments.

The Printer is not only capable of providing printouts from a user's computer or other controller, but is specifically engineered to connect easily into 084, 184, or 384 MODICON Controller I/O housings.

Three operation formats are provided:

1. Printout of a number contained in any storage location within the processor;
2. Printout of any one of 108 pre-determined message lines stored in the Printer's own (read-only) memory;
3. Printout of a combined message.

SPECIFICATIONS

Power:	115 Vac; 50 Hz or 60 Hz
Control:In/Out:	115 Vac; 24 Vdc;
Size:	19 in. x 11 in. x 17-1/2 in.
Weight:	60 lb. (approx.)
Temperature:	0°C to 60°C ambient
Humidity:	10% to 70% relative

Read Only Memory:	108 lines of stored messages
Character Set:	Full alphanumeric plus symbols
Paper:	3-1/2 in- wide, pressure sensitive fan-fold; various colors (pre-printed - optional)
Optional Interfaces:	Parallel BCD or ASCII Serial EIA RS-232C-compatible

CONTROLS AND INDICATORS

The following controls and indicators are located on the face of the Printer:

MOTOR ON
 DC POWER
 I/O POWER
 PAPER FEED
 PAPER OUT
 BELL
 FORM BUSY
 BUSY

AUXILIARY POWER SUPPLY, MODEL P421

DESCRIPTION

The 184/384 Controller Auxiliary Power Supply (Figure A-10) is required to provide +5 Vdc power for additional I/O channels of the system. One supply is required for each additional four I/O housings (one channel). Figure A-11 shows the method of connecting the expanded configuration together with modem option.

The Auxiliary Power Supply provides data interconnection paths and also serves as a housing for data transmission circuitry. As shown in the illustration, it is mounted (via hanger with bolt-holes) next to the first housing of any channel (up to four housings). Connection is the same as that between I/O housings.

SPECIFICATIONS

Power:	115 Vac or 230 Vac;50 Hz or 60 Hz; 150 Volt amps (Max)
Size:	18 in. x 5-1/2 in. x 7-3/4 in.
Weight:	10 lb. (approx.)
Temperature:	0°C to 70°C ambient
Humidity:	10% to 90% relative (non-condensing)

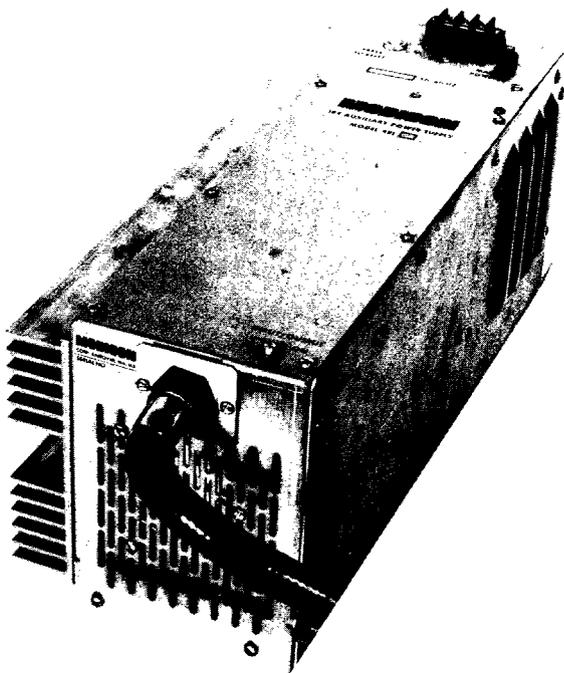


Figure A-10. Auxiliary Power Supply

CONTROLS AND INDICATORS

Two indicators are standard:

DC power	LED indicator showing the presence of dc power
Line power	Neon indicator showing the presence of power on the input line terminals

A third indicator (provided with the modem option) shows the presence of activity on both Send and Receive channels of the modem when the remote option is used.

A circuit breaker is provided to protect primary circuits.

REMOTE I/O DRIVER

DESCRIPTION

The Remote Input/Output Driver provides the capability to physically locate a channel of the 184/384 Controller's Input/Output interface (128 inputs and 128 outputs) up to 5000 feet from the mainframe. Any or all of

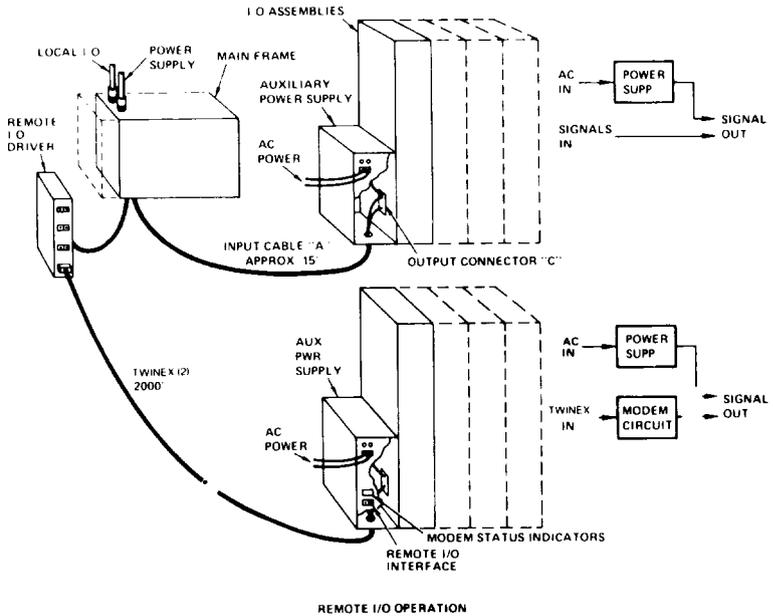


Figure A-11. Auxiliary Power Supply System Options

the 184/384 Controller's four I/O channels can be located at remote locations; each channel so located will require one I426 Remote I/O Driver. Any remote channel connected to a I426 Driver can be divided into four units of varying size, each 5000 feet from the driver, provided the total number of input or output modules used does not exceed eight (128 inputs or 128 outputs). However, each of these locations individually connected to the I426 Driver will require a P421 Auxiliary Power Supply and an I431 Remote I/O Interface.

This unit is normally supplied with a six-foot cable for connecting to the mainframe; cable type W604-006 is used when remoting channel I and W603-006 is used for remoting channels II, III, or IV. Remote Drivers can be supplied with a twelve-foot cable by specifying cable W604-012 (for channel I) or W603-012 (for channels II, III, or IV).

The I426 Driver obtains its electrical power from the mainframe and does not require any additional source of electrical power. To ensure proper heat dissipation, the I426 Driver should be mounted in the vertical position as shown. At least one-inch clearance should be provided between the Driver and the mainframe. Each I426 Driver is capable of supplying Input/Output communications for the channel to which it is connected to four separate locations. If less than four locations are utilized, no special terminations are required of the un-used connections.

Communications is provided to the remote I/O Interface mounted in the Auxiliary Power Supplies via cables containing two pairs of shielded wires and are not supplied by MODICON; Belden type 8227 or equal should be utilized and provided by the customer. Up to 5000 feet of cable can be driven by each output of the I426 Driver.

The I431 Remote I/O Interface is installed in the Auxiliary Power Supply and does not alter the size or mounting dimensions of this unit. Since dc

power is not transferred via the twin axial cables, each location where Remote I/O units are to be installed will require a P421 Auxiliary Power Supply equipped with an I431 Interface

INSTALLATION

The I426 Driver should be mounted in the vertical position per the mounting dimensions provided in Figure 9. Connect each cable from up to four remote locations to the terminal provided on the I426 Driver (see Figure A-13). Connect the interface cable to the main-frame connector for the channel to be remoted.

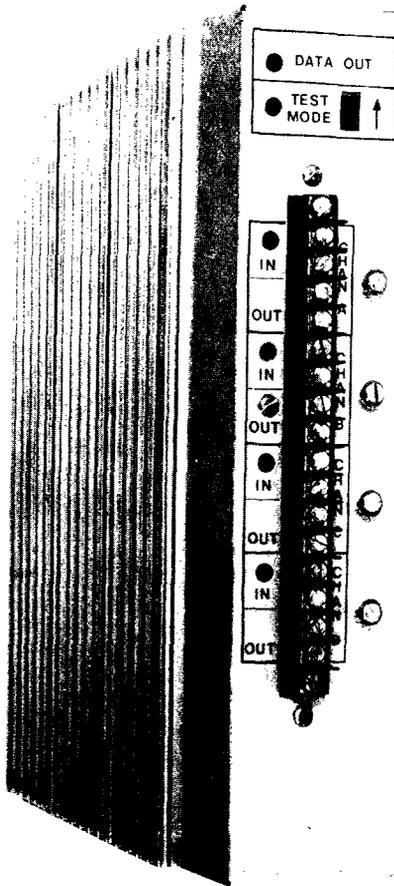


Figure A-12. I426 Remote Driver

The I431 interface will normally be factory-installed on the Auxiliary Power Supply. If this interface is to be added to an existing Auxiliary Power Supply, or if the Power Supply requires replacement with a unit not equipped with the interface, the following procedure should be utilized:

1. Remove 5 in. x 13 in. front cover secured by six screws from Auxiliary Power Supply.
2. Remove interface cable type W602 (for channel I) or type W606 (for channels II, III, or IV), including internal connector and bottom mounting plate secured by two screws.
3. Place I431 Interface on front of Auxiliary Power Supply inserting connector onto printed circuit board in location vacated by interface cable connector. Secure in place with six screws on front and two screws on bottom.

NOTE

When replacing a failed Auxiliary Power Supply, reinstall interface cable and front cover removed from new unit onto failed unit prior to return to MODICON for repair.

The Auxiliary Power Supply with I431 Interface is installed adjacent to the I/O housings of the remote location. The cables are connected to the terminal board on the I431 Interface per Figure A-13.

NOTE

Test Mode to be used ONLY by trained service personnel.

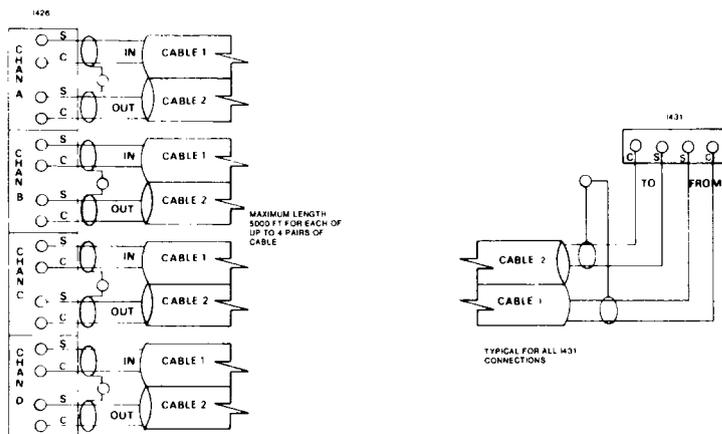


Figure A-13. Wiring Details (I426 and I431 Interface)

OPERATION

Prior to commencing operation, ensure that the screwdriver test switch on the front of the Remote I/O Driver is in the down position and that the test indicator is not lit. This test switch is utilized to perform maintenance diagnostics available only from the MODICON Service Center. No other controls or adjustments are necessary for proper operation of the Remote Driver and transfer of I/O status from the mainframe to the remote locations.

The DATA OUT Indicator on the Remote Driver indicates data is being supplied to the output cables; the indicator opposite each of the four subchannel connections indicates data is being received from each of these subchannels. The LINE TO and LINE FROM indicators on the Remote Interface indicates data is being transferred via the To and From lines respectively. As previously noted, the Test Mode indicator on the Remote interface is used only with special maintenance diagnostics available from MODICON.

PROGRAM LOADER, MODEL 206

DESCRIPTION

The Model 206 Program Loader is a magnetic tape cartridge unit designed for field recording and reloading of user programs with both 184 and 384 Programmable Controllers. This loader is also compatible with models 084, 284, and 1084 controllers with different interface unit. The Program Loader features ease of operation and fully automatic error detection and protection. The Model 206 Program Loader permits the user to:

- Record his control programs on magnetic tape cartridges.
- Load a control program from a magnetic tape cartridge.
- Verify a tape, either against controller's memory or internal parity check.

The Model 206 is housed in a rugged case and requires a Model I646 Computer Interface set for any standard baud rate. The case also provides space for storage of up to five magnetic tape cartridges. Each cartridge can store only one MODICON program regardless of controller type. The program from a 184 or 384 controller consists of the entire Programmable Controller core memory.



Figure A-14

SPECIFICATIONS

Dimensions:	15" x 21" x 8"
Weight	35 pounds
Cartridge Size:	300 feet
Cartridge Capacity:	512 blocks, each block 128 sixteen bit words

Speed:	Read/Write -- 18" per sec. Rewind -- 100" per sec.
Write Protect:	Rotating or removing the coded flap on the bottom of the tape cartridge inhibits recording on that cartridge.
Baud Rates:	110, 150, 200, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, 9600, and 19,200 baud.
Power Requirements:	115 V \pm 10%, 50-60 Hz or 230 V \pm 10%, 50-60 Hz, 60 VA
Environment:	Ambient Temperature 10-50°C Humidity up to 95% Non-Condensing

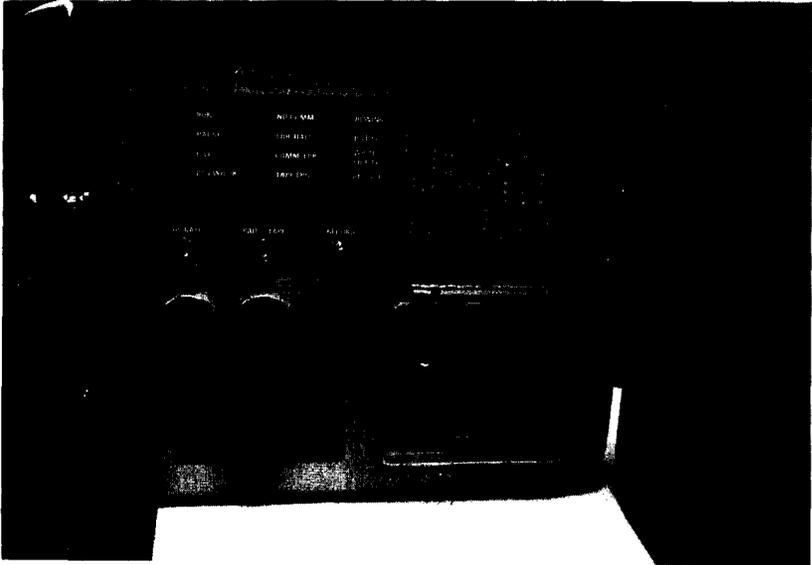


Figure A-15. Controls and Indicators

CONTROLS AND INDICATORS

ON/OFF:	Controls application of AC power.
Main Power:	Indicates when AC power has been applied.
Operate/Verify:	Selects mode of operation, either operating with tape (record tape or load controller) or verify data on tape.
Record/Load:	Selects type of operation, either recording on tape or load from tape to controller. Spring loaded toward Record position.
Pause Tape:	Interrupts tape operation; tape operation continued from where stopped by depressing GO or returned to beginning of tape by depressing RESET.
GO:	Pushbutton that initiates selected mode of operation.
RESET:	Pushbutton that terminates operation and returns tape to beginning.

Controller Type:	Twelve position thumbwheel used to select type of controller that is connected to program loader. Set to one for 184 controller and three for 384 controller.
Run:	Indicates when loader is in operating condition.
Pause:	Blinks when loader is in pause condition
Idle:	Indicates when loader is not operating but available.
DC Pwr OK:	Indicates DC power from internal power supply is within regulation.
No Comm.:	Indicates when operating was started but terminated due to inability to communicate with controller.
Error Halt:	Indicates when operation was halted by detection of sufficient error to result in unreliable operation.
Comm. Error:	Indicates whenever error is detected in communications between controller and loader.
Tape Error:	Indicates whenever error is detected in tape operation.
Rewind:	ON when rewind in progress or tape has been completely rewound.
BOT/EOT:	ON when tape is at beginning of tape (BOT) or end of tape (EOT).
Write Protect:	ON when tape inserted is protected from being written ON.
Record:	ON when tape is being recorded from controller.
Baud Rate:	Four indicators that indicate baud rate and an active communication channel to controller.

OPERATING PROCEDURES

SET-UP	<p>Connect communications cable to controller. Cable adapter used only with 284 controller. Insert tape cartridge with side A up.</p> <p>Turn AC power ON.</p> <p>Select Controller Type</p>
RECORD:	<p>Insure Write Protect indicator is not lit. Select Operate mode and Record operation.</p> <p>Depress GO pushbutton. Loader will automatically select proper baud rate, starting with 19,200 baud, that matches Computer Interface to which it is connected.</p> <p>Once communications at the proper baud rate is established, the loader automatically "traps" the controller, ceasing its scanning. To untrap, the controller must be cycled ON/OFF/ON.</p>

At end of record, tape is automatically rewound to beginning.

LOAD:

Select Operate mode. Depress and hold spring return Load operation; simultaneously depress GO pushbutton. Release both switches.

Loader will automatically select proper baud rate, starting with 19,200 baud, that matches Computer Interface to which it is connected.

Once communications at the proper baud rate is established, the loader automatically "traps" the controller, ceasing its scanning. To untrap, the controller must be cycled ON/OFF/ON.

At end of load, tape is automatically rewound to beginning.

Verify:

Select Verify mode. Two types of verify are possible, selected as follows:

- 1) Verify tape format (parity check). Select Record Operation.
- 2) Verify tape against controller memory. Select and hold Load Operation.

After type of verify is determined, depress GO pushbutton to start COMPARE. If verify against controller memory is selected, the controller will be trapped.

Failure of the verify will result in terminating of the operation with Error Halt indicator ON.

Operating Notes:

- 1) Once an operation has begun, all controls have no effect on the operation except Reset and Pause. The Reset pushbutton, when depressed, terminates any operation in progress and rewinds the tape to the beginning. The Pause switch causes any operation in progress to be suspended and the tape stopped. All other controls can be repositioned without affecting any operation once begun.
- 2) The following indicators will be on for the various modes of operation:

Mode	Run	Record	Baud Rate
Record	x	x	x
Load	x		x
Verify Tape	x		
Verify Against Memory	x		x

- 3) The dust cover can be opened without affecting an operation in progress.
- 4) If a tape is not rewound to the beginning at the start of the operation, it will be automatically rewound prior to commencing the operation.
- 5) Whenever an error is detected, a single tone is provided by the loader. If the error is recoverable, the operation continues

and a valid result is obtained; if the error is not recoverable, the operation is halted with Error Halt indicator lit. Poor communications or gradual degradation of tape after many uses can be detected by the number of tones issued during a successful load.

- 6) Communications is compatible with RS-232 type D. In the service center position, the communications cable can be connected to a computer (via Telephone Interface, if necessary) to load/record from the computer.

Functional Description:

All data is recorded at least twice in 128 word blocks with parity on each block. If the first block has good parity, the second is not used; if the first has incorrect parity, data is obtained from the second block. During a record operation, parity is verified on each block. If incorrect parity is detected, successive blocks are written until at least two blocks have valid parity. The Record is terminated if more than seven blocks are required to record any block due to successive parity failures.

During a load operation, invalid parity when reading from the tape, causes successive blocks to be used until good parity is obtained. If invalid parity is obtained for all records of the same block, the operation is terminated with Tape Error indicated. Once good parity is obtained, all successive records of that block will be ignored until the next block is located.

Time required to record load depends upon baud rate and core size. The following are some typical times to record a 4K 184 or 384:

Baud Rate	Time
9600	25 seconds
4800	45 seconds
1200	3 minutes
600	5 minutes
300	10 minutes

Loading or Verifying typically takes 1/2 the time required to record a program.

CRT PROGRAMMER MODELS 140, 145

DESCRIPTION

The CRT Programmers are designed to operate not only with MODICON's 184 and 384 controllers, but also with other controllers MODICON has built. Thus they can also be referred to as Universal Programming Panels (UPP). For details in interfacing them with other controllers, refer to the manual that describes that controller and its peripheral equipment. This appendix will describe how the UPP's are connected to the 184/384 controllers and the capabilities provided with these controllers.

The model differences between 140 and 145 are mainly their size. The model 140 (see figure A-16) incorporates a 9" screen and is designed to be easily carried to various installations. The model 145 (see figure A-17) incorporates a 12" screen and is designed mainly for a fixed operation. In addition, the model 145 has a complete ASCII keyboard; however, since this keyboard is used only with the model 1084 Programmable Controller, this difference does not affect its capabilities with the 184/384 controllers. All features described below, such as dual modes of operation (multi-node and four node), on site ladder diagrams, multiple controller connections, real time programming, etc., are applicable to both model 140 and 145 unless otherwise indicated.

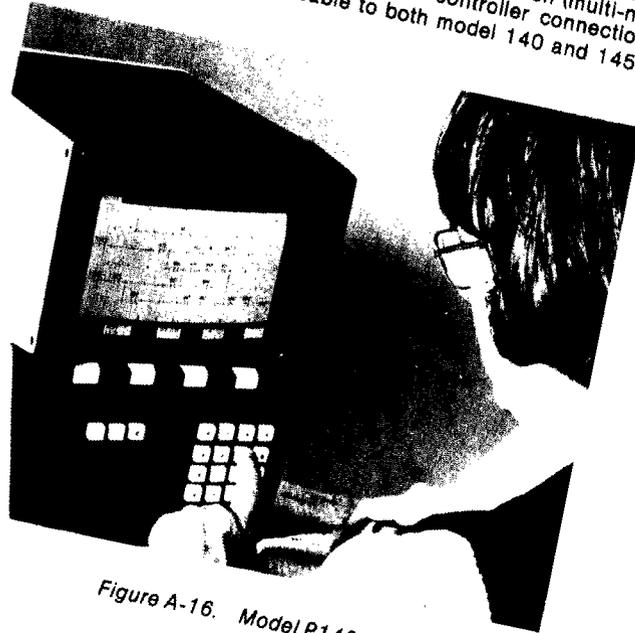


Figure A-16. Model P140

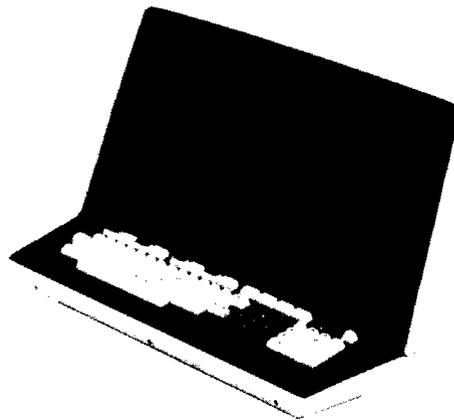


Figure A-17. Model P145

The four node format (see figure A-20) allows programs to be built in the standard MODICON four element logic line. The screen will be split to allow logic to be shown on both the left and right half. Any logic can be shown on either side. Since the logic is displayed under operator control, data does not have to be in numerical order when displayed. Up to fourteen logic lines, 40 registers, 40 inputs, 40 latches, or combinations thereof in any order that can be seen on the screen, can be displayed. The real time power flow and coil status of any one logic line on the screen can be obtained. Register contents can be shown in decimal, hexadecimal, or binary; one register content is updated every scan of the controller.

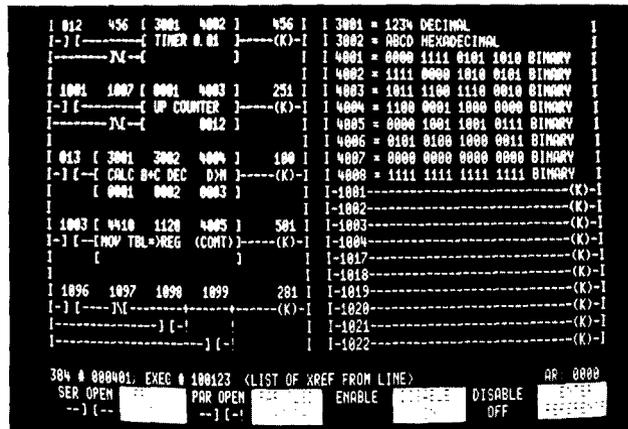


Figure A-20. Four Node Format

The CRT Programmer can be simultaneously connected to sixteen controllers at one time. These connections are in a "daisy-chain," such that the distance from the CRT to the first controller, or the distance between controllers can be up to 1000 feet. If all 16 controllers are 1000 feet apart, the overall distance from the CRT to the last (16th) controller is 16,000 feet (approximately 3 miles). The cabling between the CRT and the controllers is one Belden type 8777 or Alpha type 6010 cable or their equivalent. Which controller is being programmed (only one can be actively connected to the CRT at one time) is under the operator's control and does not require action at any controller.

Each CRT Programmer is capable of interfacing to a standard RS-232C device. This capability allows on-site ladder diagrams to be provided in either multi-node or the standard four node format. This interface can be driven with various baud rates set by the operator up to 9600 baud. Data that is in the keyboard register (under operator control) will be printed at the top of each page, to allow the operator to date or otherwise identify the ladder diagram.

SPECIFICATIONS

P140

P145

Power

Requirements:

115VAC \pm 10%
(50 or 60 Hz)
150 Volt Amps

115 VAC \pm 10%
(50 or 60 Hz)
200 Volt Amps

Environmental Requirements:

	P140	P145
Ambient Temperature:	10 to 40°C	10 to 38°C
Humidity:	20 to 80% (non-condensing)	20 to 80% (non-condensing)
Dimensions:	15 in. x 10 in. x 24 in.	25 in. x 22 in. x 16 in.
Weight:	35 lbs.	68 lbs.

DETAIL CAPABILITIES

MULTI-NODE

When in the multi-node format, the operator builds his logic in a convenient 10 x 7 matrix of relay contacts/logic entries. Once he has entered his logic, the CRT will, upon command, break the multi-node logic into four node elements and place them into the controller's standard four element logic lines. If any of the user's logic is incomplete due to branches that do not connect or reference numbers that are not entered, an error statement will appear. The operator must correct the error before the compiling can be accomplished and the controller's memory altered.

When entering the multi-node format, the operator designates those logic lines (e.g., lines 1-144) that he wants to reserve as output lines. The CRT Programmer will assign all other lines (e.g. lines 145-831) for internal storage, to be used by the compiler for multiple node logic storage. When assigning logic coils on the CRT screen, output coils only must be used. Once programmed, all logic lines whether used as output lines or internal lines, are still compatible with the other programming tools, such as the P112 or P102. The CRT programmer (e.g., model 145) can be used to install and check out a program and the other programmers (e.g., models P102, P112, or P140) can be used to troubleshoot and maintain the system. Power flow is shown by reversing (white symbols on black background) all relay contacts that are closed, i.e., can pass power if it is available from the left.

Once programmed in multi-node, a system can be reconnected at a later date to a CRT programmer and the identical multi-node logic will be displayed "packed" to the top left; however, the logic itself including element order, will not have been changed. A program that has been entered by a multi-node programmer, but modified (not just monitored) by a four element device, will most likely result in a logic system that is *not* compatible with the multi-node CRT programmer. The only method of restoring compatibility is to reload the original logic.

FOUR-NODE

When displaying the standard four element logic line, the CRT can make use of the maximum capability of the 184/384 controller. Logic lines or inputs or registers are entered onto the screen at the bottom of either the left or right side, and all existing data being displayed is shifted towards the top. Exactly what reference is displayed and on which side, is under operator control and can be varied at will. Registers and/or inputs can be inter-mixed with logic lines. Power flow is shown again by reversing the relay contacts (i.e., white symbols on black background) that are closed, i.e., can pass power if it is available from the left. Power flow is shown on one logic line or coil as selected by the operator.

SPECIAL FEATURES

1. Search All—Coils can be searched for a disable condition and those that match the condition are either listed or displayed as the operator desires. The search can be conducted through line coils only, input

coils only, or both line coils and inputs. The disable conditions can be just disabled, or disabled OFF, or disabled ON, or enabled.

2. Trace—A reference on one selected relay contact can be displayed on the screen as a separate logic line, to verify either its disable status or power flow condition. The logic line from which the trace was performed is stored and can be used to return immediately by retracing. Up to sixteen logic lines can be stored sequentially for retrace before the oldest entry is lost.
3. Cross-Reference—A reference can be selected and all logic lines where that reference is used are listed on the screen. This reference can be an input, logic line coil, register, or even a latch.
4. Variable Labeled Pushbuttons—Eight pushbuttons, through which the user performs the majority of his programming, have labels that are assigned by the CRT depending upon where the user is in his programming. This reduces both the quantity of pushbutton on the CRT and the opportunity to depress the wrong pushbutton, since only those that are legal are available to the operator.

D285 CRT DISPLAY UNIT

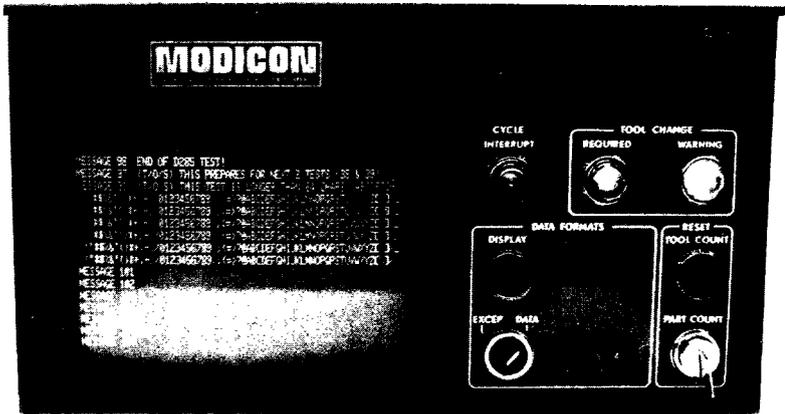
This unit provides the ability to display error messages, status reports, management information, and other data via a CRT display. This unit is very simply programmed and interfaced to the 184 or 384 controller; its internal design is very similar to the P500 Printer. In fact, it is connected to the controller exactly as the P500 Printer is, requiring one output module (register - 115Vac or 24Vdc) and two discrete inputs (busy and form busy) per D285. Multiple D285's and/or P500's can be connected and controlled by a single 184 or 384 controller. A W280 cable is available to connect the D285 to the 184/384 Input/Output Section.

The D285 utilizes the same hand-shaking communications as does the P500 Printer. Controllers shipped three years ago, that currently have the P500 DX Print capabilities, can drive the D285 Display Unit. The D285 utilizes an industrial 12" CRT that is capable of displaying up to sixteen lines of alpha-numerical information; each line can contain up to 64 characters. Within the D285 is a PROM memory for storage of message format. This memory contains lines of messages, each line 64 characters wide. The basic unit with 8K of memory provides 112 message lines; the maximum memory (32K) provides 496 message lines. Any unit can have up to 496 unique message addresses; messages are addressed 1 to 496. The following are the major characteristics of the D285:

Screen Size:	12 inch (diagonal measurement)
Screen Format:	16 lines, each 64 characters
Message Entry:	Either bottom entry schrolling up, or top entry schrolling down
Blinking Rates:	Any portion of a line at 2, 4, or 8 cycles per second
Memory Size:	8K with optional 2K increments up to 32K
Character Set:	Any ASCII character
Input/Output Voltage:	115Vac or 24Vdc \pm 20%
AC Power:	115Vac \pm 10%, 50 or 60 Hz \pm 5%, 130VA
Size (WxHxD):	20x11x25 inches
Weight:	95 pounds
Environment:	Temperature - 0 to 55°C Humidity - 10 to 80% (non-condensing) Max. altitude - 10,000 feet

Options: Additional Memory, 2K increments, maximum 12 increments
 Input/Output Devices (wired separately to controller I/O)
 ASCII output port for hard copy

Memory is coded at the factory and can be altered by replacing PROM's. Any legal ASCII characters can be used; forms are available from any sales office for coding the PROM memory. Blanks can be left in any message for digits to be entered from controller's registers. Messages can be coded to be entered either at the bottom of the screen or at the top; to save error conditions, the most recent four messages entered at the top are retained when messages are entered at the bottom and schrolled up. Any portion of a message up to one line long can be blinked to obtain operator attention; three rates are available, with only one provided with any D285. As an option, an ASCII port can be provided to output messages as they are placed on the CRT screen. The controller can select messages for CRT only or both CRT and ASCII port.



D285 CRT Display Unit

J540 ADAPTER

This adapter allows the 500 series of I/O modules to be interfaced with any 184/384 controller. One adapter is required per I/O channel providing 128 input points and 128 output points. The 500 series of I/O modules provide I/O points in groups of four in lieu of the 200 series which provides I/O points in groups of sixteen. The modules are totally input or output (four points per module) and are similar in industrial performance as the B230 to B237 modules discussed in Appendix B. For exact specifications, wiring details, and cost, contact your nearest MODICON Sales Office.

The J540 Adapter can be interfaced to the 184/384 controller in a number of methods as listed below:

1. W600 or W601 Cable
2. Auxiliary Power Supply (P421) with W602/W606 Cable or at end of Remote Driver.
3. B240 I/O Housing containing standard 200 Series I/O Modules.

The total quantity of I/O points per channel is the same as listed in this manual (Section II). Within the 500 Series of I/O, modules are placed in housings, 8 modules per housing, for a total of 32 I/O points per housing. There is no limitation of module placement within a housing (i.e., input vs. output, or 5 VTTL vs. 115 Vac, etc.). Since a channel can be 128 input and 128 output points (total 256 I/O points), eight housings are required for an entire 184/384 I/O channel. Each housing can be separately addressed as number 1 to 4. Two housings can be addressed as the same number to allow a total of eight housings. When two housings have the same address, one must be the exact opposite of the other (inputs versus outputs).

On the front of the J540 Adapter, there are four indicators and two sets of switches. Indicators are as follows:

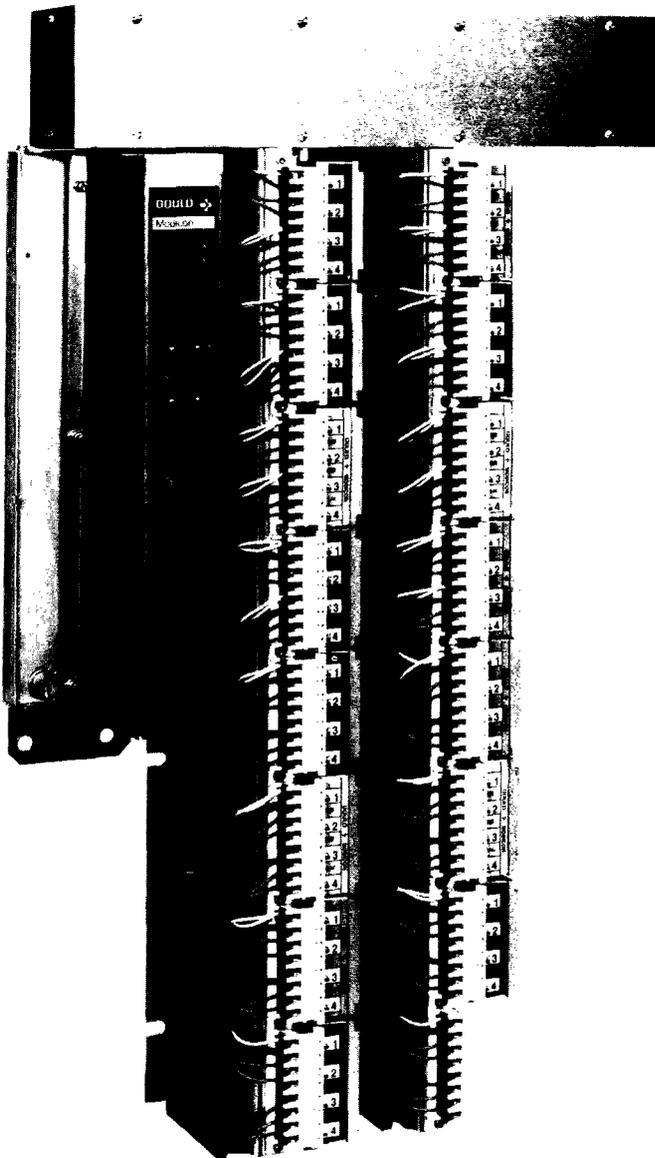
- POWER — ON if DC power has been applied.
- RUN — ON if adapter being serviced by 184/384 Scan at least once every 200 msec.
- ERROR — ON if I/O communication has been detected and cannot be corrected by error checking capabilities.
- TEST — ON if in test mode to be utilized by MODICON Service technicians only.

The switches enable the 500 series I/O to provide information normally obtained from the address index pin in that channel. Two sets of switches are provided, one controlling inputs and the other outputs. Normally, these switches will all be ON. However, if a channel has a mix of 200 series I/O and 500 series I/O, they can be used to "lock-out" the 500 series from those index pins whose information is being used by the 200 series I/O. Correlation between index pin location and 500 series I/O is as follows:

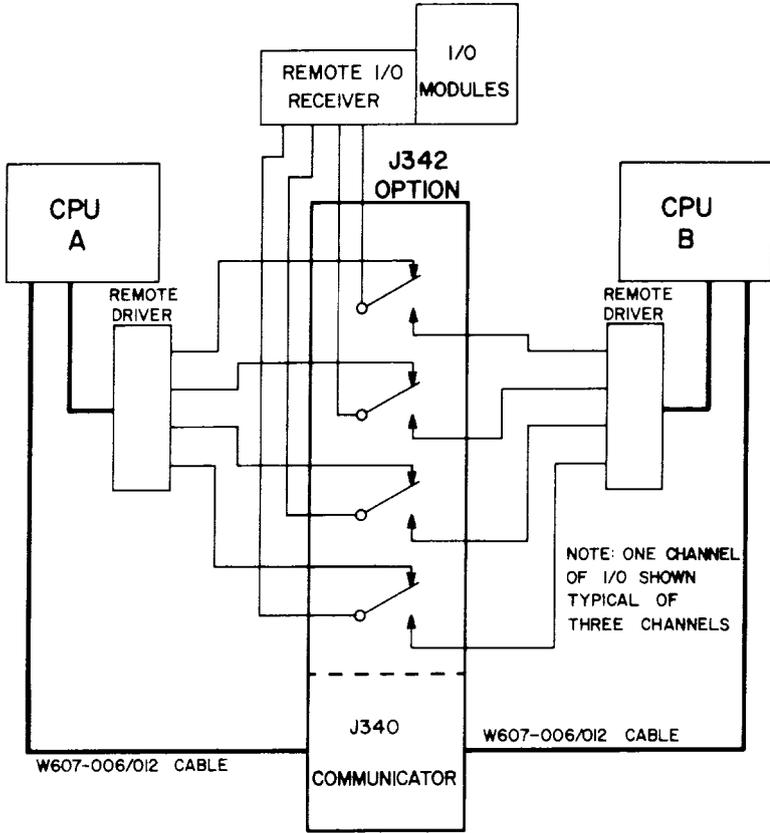
184/384 Index Pin	500 Series I/O Module Location	
	Housing	Top/Bottom Four Modules
1	1	Top
2	1	Bottom
3	2	Top
4	2	Bottom
5	3	Top
6	3	Bottom
7	4	Top
8	4	Bottom

J340/J342 I/O COMMUNICATOR

This communicator connects the output from one channel of a controller to the inputs of another controller. Up to 128 discrete outputs, or 8 output registers, or some mix of both can be transferred simultaneous in each direction every scan. The communicator can be used to link the logic and I/O of two 184/384 Controllers or to use one controller as numerical storage for a second. No modification of either controller is required to use the communicator; nor are special executive programs required. The information transferred is under the control of the I/O Allocation Table (Traffic Cop) of each controller. When connected by the communicator, each controller operates independently upon its stored logic in a scan mode.



J540 Interface with 500 Series I/O



Connections of I/O Communicator