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Chapter 22F

Modicon

Models

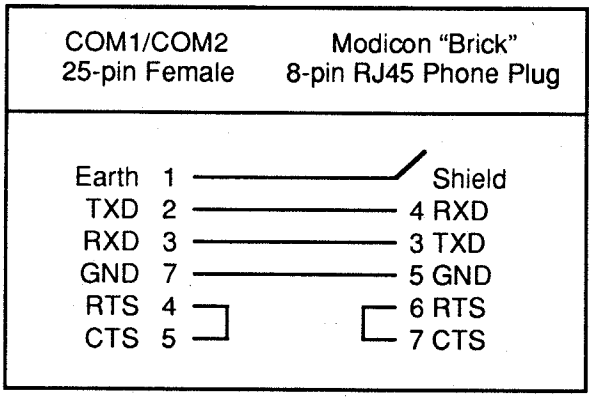
The Series 110/120 Workstations connect to all programmable controllers that support Modbus, including April, Modicon, Honeywell, Telemecanique, and Siemens. You must load G2 firmware into your Workstation.

Connections

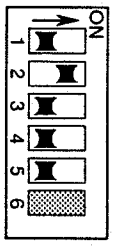
Listed below are the Modicon models that the Workstation connects to, along with the Modbus module, if required:

PLC	Modbus Module	Nematron cable
984 Micro	(3 ports built in)	CBL-C18
984	(3 ports built in)	CBL-C9 (for 25-pin, CBL-C7)
884	(1 port built in; 1 optional)	CBL-C7
584	(2 ports built in)	not available
484	J475 Modbus/484 Slave Interface	CBL-C7
184/384	Modbus interface	not available
Micro 84	J375 Modbus Interface Module	CBL-C7

The following cables show how to connect the Workstation to the Modbus port; the Micro (brick) models use the first cable, other newer models use the second cable, and older models use the third:



COM1/COM2
DIP Switch Setting:



CBL-C18: Series 110/120 COM1/COM2 to Modicon 984 Micro ("brick" PLCs with phone jack connectors)

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On each Edit screen, you must enter the "PLC Address" in any of the following formats, where *rrr* is the function code for a read command and *www* is the function code for a write request:

Format	Number Base	Read/Write Code Range	Address Range
rrr:www:aaaaa	Decimal	*rrr* or *www* = 0 to 127	*aaaaa* = 0 to 65535
rrr:www:aaaaaD	Decimal	*rrr* or *www* = 0 to 127	*aaaaa* = 0 to 65535
rr:ww:aaaaH	Hexadecimal	*rr* or *ww* = 0 to 7F	*aaaa* = 0 to FFFF
rrr:www:aaaaaaO	Octal	*rrr* or *www* = 0 to 377	*aaaaa* = 0 to 777777

For example, say you are using a Honeywell IPC 620-11/14/16 processor. (On the Configuration screen, you must select *Absolute* for "Model" and *RTU* for "Protocol.") To access an I/O location, you would use the format "2:5:n" where *n* is the I/O address minus one; for a register, the format is "3:6:n" where *n* is the register address minus one. To access register 4096, you would enter a PLC address of *3:6:4095*. For a complete application note on using the Honeywell IPC 620, please contact Nematron customer support.

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Chapter 22G

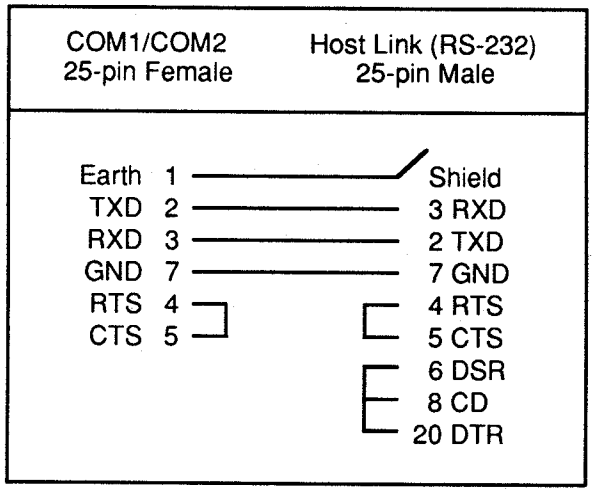
Omron

Models

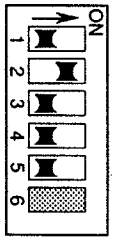
The Series 110/120 PLC Workstations are compatible with Omron models C20K, C28K, C40K, C200H, C500, C1000H, C2000H, C20, and C120. You must load G6 firmware into your Workstation.

Connections

The Workstation connects to the optional "Host Link" module available from Omron; the Workstation does *not* connect directly to the Omron programming port. The cable to connect the Workstation to the Omron Host Link modules is shown below:



COM1/COM2
DIP Switch Setting:



CBL-C7: Series 110/120 COM1/COM2 to Omron Host Link

For the PLC to communicate properly with the Workstation, you must set the Host Link selector switches and DIP switches to match the settings on the Configuration screen of the CP software. The following paragraphs describe these settings, but you should also work with Omron's Host Link documentation.

Selection	Setting
Mode Selector	"Host" (not "Local")
I/O Port Selector	"RS-232" (if using cable shown above)
Synchronization	"Internal"
CTS	Either position
5-V Power Supply	"Off"
Unit No.	Any unused station number between 0 and 31
Operating Level	Follow the instructions in the Omron manual for C500(F), for two rack-mounted Host Links, or for any other special configuration; the Workstation itself operates at any level.
Monitor/Normal	"Monitor" (may be a software setting on some models)

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On/Off Type	Format	Range
IR area	*nnnbb*	*nnn* = word 0 to maximum depending on model; *bb* = bit 00 to 15
HR area	HR*nnnbb*	*nnn* = word 0 to maximum depending on model; *bb* = bit 00 to 15
AR area	AR*nnbb*	*nn* = word 0 to maximum depending on model; *bb* = bit 00 to 15
LR area	LR*nnbb*	*nn* = word 0 to maximum depending on model; *bb* = bit 00 to 15
TC area	TC*nnn* TIMH*nnn* TIM*nnn* CNTR*nnn* CNT*nnn*	*nnn* = word 0 to maximum depending on model

Errors

When the Workstation encounters a problem in communicating with the PLC, it displays an error message and an error code. If you get an error, first double-check all of the switch settings and be sure they match the settings on the CP Software's Configuration screen.

Note If there is a mismatch between the single-link/multi-link settings on the Configuration screen and the DIP switches, you may see NO RESPONSE ERRORs or MESSAGE ERRORs. Because Omron's documentation may be incorrect with regard to the proper setting of the single/multi-link switch, you should try flipping this switch even if it appears correct.

Following is a list of messages along with the meaning of each code (error codes other than those listed are undefined):

NOT RDY ERR

This message always indicates that the CTS input to the serial port is not active, which typically indicates that the cable to the PLC is not plugged into the Workstation.

NO RESPONSE ERR

This message always indicates that the PLC is not responding to the Workstation's requests. This typically indicates that the cable plugged into the Workstation is not connected to the PLC, or that the PLC is turned off or is in some other mode that makes it non-responsive.

MSG ERROR

Error Code	Description
242	PLC received a bad frame checksum
243	PLC received an undefined command
244	Response from PLC did not match Workstation's code
245	Workstation received a bad response length
246	Response from PLC contained a mismatch in the unit number
247	Response from PLC too short
248	PLC failed to send a frame acknowledge
249	Response from PLC too long
250	Response from PLC contains too much data
251	Response from PLC contains too many frames
252	Garbled response from PLC
254	PLC received a bad unit number from the Workstation
255	Usually indicates that your single-link/mutli-link setting is wrong

SCREEN ERROR

Error Code	Description
253	PLC received a command with a bad location type

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Chapter 22H

Siemens

Models

The Series 110/120 Workstations can connect to the programming port of Siemens models 90U, 95U, 100U, 102U, 103U, 115U, and 135U. The Workstations do not support Siemens models 101U or 155U. You must load G7 firmware into your Workstation. For information about the SIMATIC/TI models, please consult Chapter 22I.

The Workstations connect to the programming port on the Siemens PLC, *not* to the CP525 Communication Processor.

Connections

To connect your Workstation, you can either use the CBL-L2 cable from Nematron, or you can make you own connections via a converter between the RS-232 port on the Workstation and the 20 mA current loop on the Siemens PLC.

Note The programming ports on various Siemens models are not identical! The following paragraphs offer some information that was current at the time of publication, but you may have to experiment to achieve proper communications.

There are several approaches available to connect your Workstation to a Siemens PLC. All models work properly with an active converter with a separate power supply, which you can purchase from a third party as indicated on the following pages; Nematron supplies CBL-L2, a converter that is usually passive, but that you can modify to be active. The table below indicates the approaches using CBL-L2 that were known to work at the time of publication:

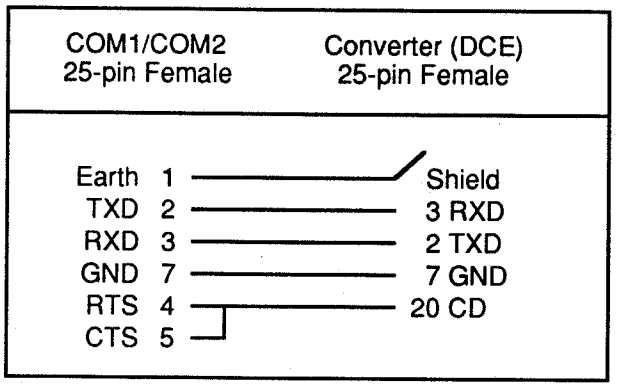
Model	Cable	Converter	Remarks
90U	CBL-L2	Passive	
95U	CBL-L2	Passive	
100U	CBL-L2 (sometimes)	Active or passive	Some samples lack sufficient current and require a third-party active converter because 24V is not present on the programming port.
102U	CBL-L2	Passive	
103U	CBL-L2 (sometimes)	Active or passive	Some Siemens models are not compatible with the CBL-L2.
115U	CBL-L2	Passive	The 944 CPU's programming port cannot support an active converter; see the following table item.
115U/944	CBL-L2 (modified)	Active	Insufficient current available from normal source requires a modified cable or an active converter.
135U	CBL-L2	Passive	

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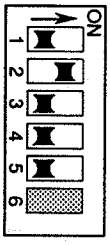
Passive Converter

The following diagrams show how to connect the Workstation to a Siemens PLC using an external converter and a passive converter. This connection scheme may not work with a Siemens models 100U, 103U and 115U/944.

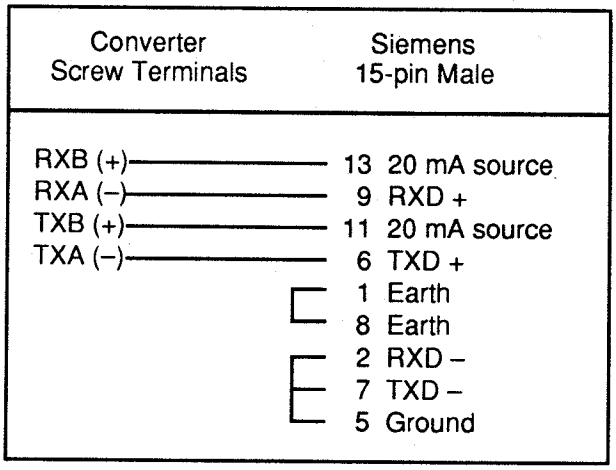
The converter in the following example is model CL412M from Black Box Corporation (you must set this converter in the "DCE" position):



COM1/COM2
DIP Switch Setting:



The following diagram shows how to connect the converter to any Siemens model except the 115U/944 and most samples of the 100U:



CBL-L2

Nematron offers a 10-foot cable with a built-in current loop converter that makes a simple connection to most Siemens models. This cable does *not* work with models 115U/944, and may also fail to work properly on other models, especially the 100U, because it is a passive converter.

If you are using model 115U/944, you can use the CBL-L2 cable if you modify it according to the following instructions:

1. At the Siemens end of the cable, remove the wires at pins 11 and 13 of the connector; connect each wire to a separate 1K, 1 Watt resistor; and connect the resistors to pin 4.

2. At the Siemens end of the cable, remove the wire connected to pin 15 and connect it to pin 10 instead.

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Extended I/O	OW*nnn* OB*nnn* OY*nnn* O*nnn*	*nnn* = byte 0 to 127 available in 135U only; read only	Word Byte Byte Byte	Either
Flag Bits	FW*nnn* FB*nnn* FY*nnn* F*nnn*	*nnn* = byte 0 to 255	Word Byte Byte Byte	Either
Timer Setpoint	IW*nnn*T*s* QW*nnn*T*s* FW*nnn*T*s* DW*xxx/yyy*T*s* DXW*xxx/yyy*T*s*	*s* selects time base: blank = none H = 0.01 sec T = 0.1 sec S = 1 sec D = 10 sec	Word	Always BCD (regardless of selected data format)
Timer Current	T*nnn*	*nnn* = word 0 to 127	Word	Always binary (regardless of selected data format)
Counter Setpoint	IW*nnn*C QW*nnn*C FW*nnn*C DW*xxx/yyy*C DXW*xxx/yyy*C		Word	Always BCD (regardless of selected data format)
Counter Current	C*nnn*	*nnn* = word 0 to 127	Word	Always binary (regardless of selected data format)
System Data Area	RS*nnn* RI*nnn* RJ*nnn* RT*nnn*	*nnn* = word 0 to 255 RI, RJ, RT available only in 135U; RJ and RT available only in 135U/928	Word	Either
Peripheral I/O	PW*nnn* PB*nnn* PY*nnn* P*nnn*	*nnn* = byte 0 to 255	Word Byte Byte Byte	Either
Data Block	DB*xxx/yyy* DR*xxx/yyy* DL*xxx/yyy* D*xxx/yyy*	*xxx* = block 2 to 255 (block range for 135U/922 and 135U/928 is 3–255) *yyy* = word 0 to 255	Byte Right byte Left byte Word	Either
Data Block	DXB*xxx/yyy* DXR*xxx/yyy* DXL*xxx/yyy* DX*xxx/yyy*	*xxx* = block 3 to 255 *yyy* = word 0 to 255 135U/922 and 135U/928 only	Byte Right byte Left byte Word	Either

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Chapter 22I

SIMATIC/TI

The Series 110/120 PLC Workstation connects directly to the programming (VPU) ports of the SIMATIC/TI 305, 435, and all 500/505 series models except the PM550.

SIMATIC/TI 305

Models

The Series 110/120 Workstations can connect to the communications module of any SIMATIC/TI 305 Series programmable controller, or directly to the RS-232 port of the 335. You must load G5 firmware into your Workstation.

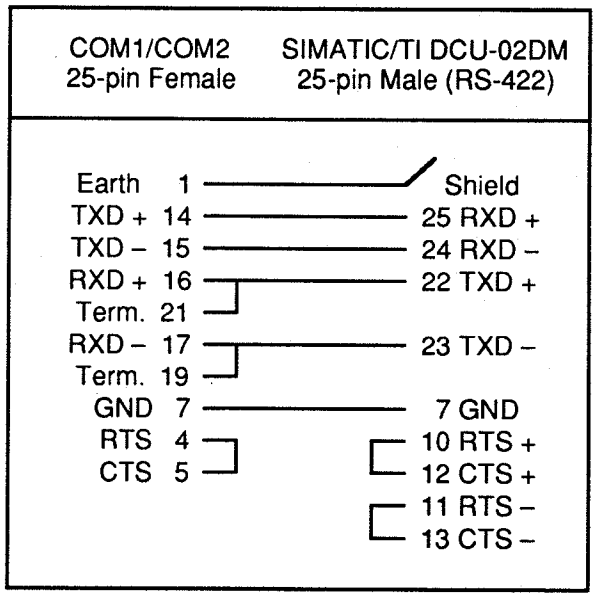
Connections

The Series 110/120 PLC Workstation can talk to one or more SIMATIC/TI programmable controllers via the communications modules listed below:

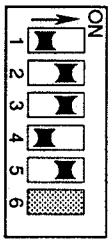
PLC	Communications Module
SIMATIC/TI 315, 325, 330	DCU-02DM (RS-422) or DCU-03DM (RS-232)
SIMATIC/TI 335	None needed

The following diagrams show how to connect the Workstation to both versions of the communications modules as well as the TI 335 serial port.

RS-422 (DCU-02DM)



COM1/COM2
DIP Switch Setting:



CBL-C6: Series 110/120 COM1/COM2 to SIMATIC/TI 305 Series (RS-422 connection)

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Addressing

When you set up a screen using the Edit function of CP software, you must enter the address within the PLC of the location to be shown on the screen in the "PLC address" field. For example, if you want to display the first I/O location, you would enter the address *000* for the "PLC address." The "Data size" almost always *Word* for timers and counters, and is either *Byte* or *Word* for data registers, I/Os, internal coils, and shift register points.

The "Data format" of timers, counters, and data registers is usually (but not always) *BCD*.

All register addresses except timers and counters are "byte" addresses; in other words, each consecutive address selects a consecutive 8-bit location. If you select a data size of *Word*, the register consists of two bytes: the byte at the address you specify and the byte that follows. For that reason, CP software rejects an address that refers to the last valid location when the data size is *Word*; for example, you cannot enter an address of 577 and a data size of *Word*.

All addresses are in octal. The following table shows the format of every register and on/off location the Workstation can access:

Register Type	Format	Range	Data Size	Data Format
I/O Points	*nnn*	*nnn* = depends on model: 315: 0-13 325/330/335: 0-15 and 70-76	Either	Either
Internal, Retentive, and Special Function Coils	*nnn*	*nnn* = depends on model: 315: 14-37 325/330: 16-37 335: 16-37 and 100-106	Either	Either
Shift Registers	*nnn*	*nnn* = depends on model: 315: 14-37 325/330/335: 40-57	Either	Either
Timers/Counters	*nnn*	*nnn* = depends on model: 315: 600-624 325/330/335: 600-677	Either	Usually BCD
Data Registers	*nnn*	*nnn* = depends on model: 315: not available 325/330: 400-577 335: 400-776	Either	Usually BCD
Timer/Counter Up Statuses	*nnn*	*nnn* = depends on model: 315: not available 325/330/335: 60-67	Either	Usually BCD

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SIMATIC/TI 435

Models

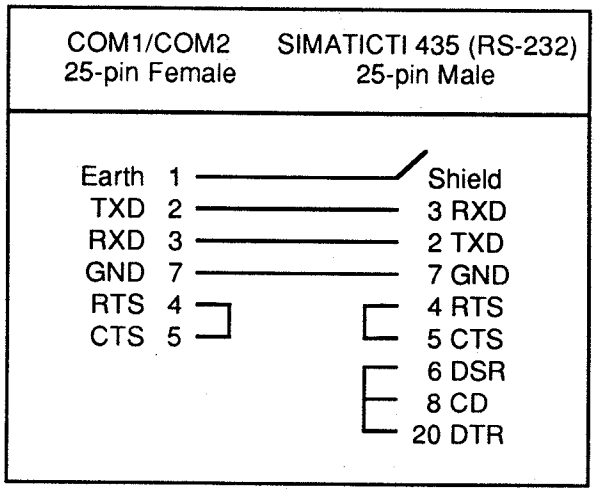
The Series 110/120 PLC Workstations are compatible only with the 25-pin communications port of the SIMATIC/TI 435 CPU; the Workstations are *not* compatible with the 15-pin programming port on the 425 and 435 CPUs. You must load G6 firmware into your Workstation.

Connections

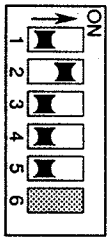
The Workstation connects to the 25-pin port on the SIMATICTI 435 CPU. This port supports the capability to connect multiple programmable controllers to a single Workstation (for more information, please consult the SIMATIC/TI documentation).

The SIMATIC/TI 435's factory default communications settings are 300 baud, odd parity, 8 data bits, and 1 stop bit. The cables to connect the Workstation to the SIMATIC/TI 435 are shown below:

RS-232 Connection



COM1/COM2
DIP Switch Setting:



CBL-C7: Series 110/120 COM1/COM2 to SIMATIC/TI 435 via RS-232 (limit of 50 feet or 15 meters)

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Station Numbers

You must enter station numbers for both the PLC and the Workstation on the Configuration screen in the CP software.

For the "PLC Station #," enter *1* if you have turned on DIP switch 2, or enter the station number you have set it up with the hand-held programmer.

For the "Station #" field under "Workstation Configuration," enter a station number between 1 and 90; this number must be *different* than your PLC station number.

If your Workstation is connected to multiple PLCs, then you must enter the proper PLC station number on each of your Edit screens as well.

Addressing

The Edit function of CP software allows you to configure each screen that the Workstation displays; among the information you must enter is the "PLC Address." This field holds the address within the PLC of the location you want to display. For example, if you want to display the current ("elapsed") value of timer/counter 1, you enter *V1* for the "PLC address." The "Data size" for registers is always *Word* and the "Data format" is normally *BCD*, although your ladder program can easily create and manipulate binary numbers too.

The following table shows the format of every register and on/off location the Workstation can access; all numbers are octal; the range depends on the memory size:

Register Type	Format	Range	Data Size	Data Format
Timer Accumulated	V*nn*	*nn* = 1 to 80 octal	Word	BCD
Counter Accumulated	V*nnnn*	*nnnn* = 1000 to 1177 octal	Word	BCD
V Memory	V*nnnn*	*nnnn* = 1400 to 7777 octal	Word	Either
Link Relays	V*nnnnn*	*nnnnn* = 40000 to 40037 octal	Word	Either
Input Status	V*nnnnn*	*nnnnn* = 40400 to 40423 octal	Word	Either
Output Status	V*nnnnn*	*nnnnn* = 40500 to 40523 octal	Word	Either
Control Relays	V*nnnnn*	*nnnnn* = 40600 to 40635 octal	Word	Either
Stage	V*nnnnn*	*nnnnn* = 41000 to 41027 octal	Word	Either
Timer Status	V*nnnnn*	*nnnnn* = 41100 to 41107 octal	Word	Either
Counter Status	V*nnnnn*	*nnnnn* = 41140 to 41147 octal	Word	Either
Spec. Relay 1	V*nnnnn*	*nnnnn* = 41200 to 41205 octal	Word	Either
Spec. Relay 2	V*nnnnn*	*nnnnn* = 41216 to 41230 octal	Word	Either

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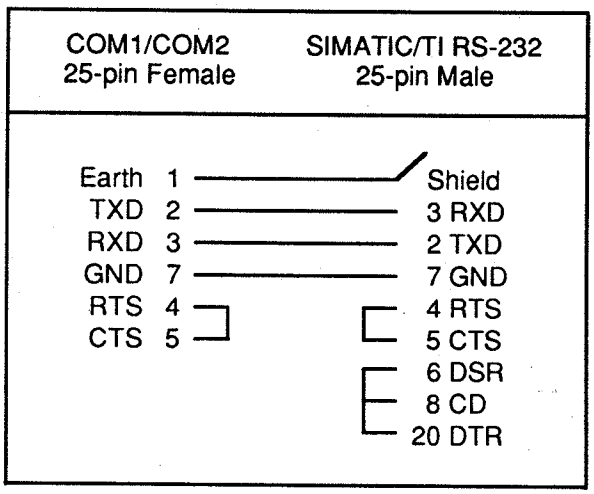
SIMATIC/TI 500/505

Models

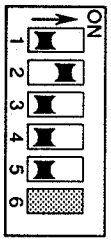
The Series 110/120 PLC Workstations are compatible with SIMATIC/TI models 510, 520, 525, 530, 535, 545, 560, and 565, including the "C" and "T" models. The Workstations are not compatible with the 5TI, PM550, or SIMATIC/TI 100 models. You must load G6 firmware into your Workstation.

Connections

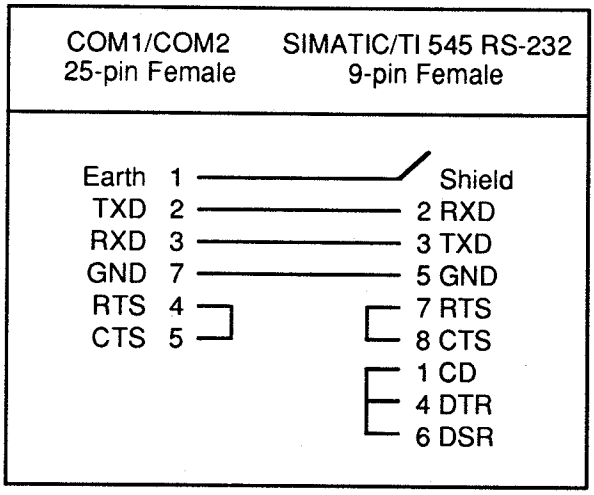
All SIMATIC/TI models provide an RS-232 port; the following cable connects the Workstation to all models except the 545; the cable diagram for the 545 follows:



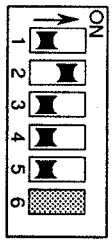
COM1/COM2
DIP Switch Setting:



CBL-C7: Series 110/120 COM1/COM2 to SIMATIC/TI (RS-232 port of all supported models except 545)



COM1/COM2
DIP Switch Setting:



CBL-C2: Series 110/120 COM1/COM2 to SIMATIC/TI 545 (RS-232)

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Input Registers	WX*nnnn*	*nnnn* = 1 to max.: 1101: 1023 1102: 512 1104: 1023 1108/1208: 1023 1112/1212: 1023 545/560/565: 4095 510: not available	Word	Forced to binary regardless of data format selection
Output Registers	WY*nnnn*	*nnnn* = 1 to max.: 1101: 1023 1102: 512 1104: 1023 1108/1208: 1023 1112/1212: 1023 545/560/565: 4095 510: not available	Word	Forced to binary regardless of data format selection
Timer/Counter Presets	TCP*nnnnn*	*nnnn* = 1 to max.: 1101: 60 1102: 256 1104: 256 1108/1208: 256 1112/1212: 400 545/560/565: 10240 510: 16	Word	Forced to binary regardless of data format selection
Timer/Counter Current	TCC*nnnn*	*nnnn* = 1 to max.: 1101: 60 1102: 256 1104: 256 1108/1208: 256 1112/1212: 400 545/560/565: 10240 510: 16	Word	Forced to binary regardless of data format selection
Drum Counter Presets	DCP*dd/ss*	*ss* = step 1-16 *dd* = drum 1 to max: 1101: 15 1102: 30 1104: 30 1108/1208: 30 1112/1212: 30 545/560/565: 255 510: 4	Word	Forced to binary regardless of data format selection
Drum Counter Current	DCC*dd*	*dd* = drum 1 to max: 1101: 15 1102: 30 1104: 30 1108/1208: 30 1112/1212: 30 545/560/565: 255 510: 4	Word	Forced to binary regardless of data format selection

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Errors

When the Workstation encounters a problem in communicating with the PLC, it displays an error message and an error code. Following is a list of messages along with the meaning of each code; error codes other than those listed are undefined:

NOT RDY ERR

This message always indicates that the CTS input to the serial port is not active, which typically indicates that the cable to the PLC is not plugged into the Workstation. Error codes 128-133 indicate that the CTS signal was lost during resynchronization, while codes 140-145 indicate that CTS was lost during normal communications.

NO RESPONSE ERR

This message always indicates that the PLC is not responding to the Workstation's requests. Error codes 134-139 indicate a timeout during resynchronization, while codes 146-151 indicate a timeout during normal communications. This typically indicates that the cable plugged into the Workstation is not connected to the PLC, or that the PLC is turned off or is in some other mode that makes it non-responsive.

MSG ERROR

An error code between 1 and 127 comes from the PLC in response to the Workstation's request. Error codes between 128 and 137 are errors that the Workstation itself detects.

Error Code	Description
1	PLC indicates "reset current transaction"
2	PLC indicates the address is out of range
3	PLC indicates the requested data was not found
4	PLC indicates it received an illegal task code
5	PLC indicates the request exceeds the program memory size
6	PLC indicates a diagnostic failure upon power-up
7	PLC indicates a fatal error
8	PLC indicates a keylock protect error
9	PLC indicates the request contained the incorrect amount of data
10	PLC indicates the request was illegal in the current mode
11	PLC indicates the network was not deleted
12	PLC indicates the attempted write did not verify
13	PLC indicates the request contained an illegal number of characters
14	PLC indicates the request was an illegal write to program memory
15	PLC indicates the data was not inserted
16	PLC indicates the data was not written
17	PLC indicates the request contained invalid data
18	PLC indicates invalid operation with the local/remote mode
19	PLC indicates the store and forward buffer is busy
20	PLC indicates no response from the special function module
21	PLC indicates the program memory contains an illegal instruction
22	PLC indicates the request was an illegal write to a protected variable (e.g., TCC and TCP)
23	PLC indicates no response (single scan not performed)
24-27	PLC indicates memory configuration error
28	PLC was too busy and unable to complete the requested operation
29	PLC indicates a communications error in the hold mode; a transition to run mode is not allowed
30	PLC indicates that a port lockout is active
33	PLC indicates an I/O configuration error (too many points)
128-137	PLC's response to Workstation's request was too short (too few bytes)

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Chapter 22J

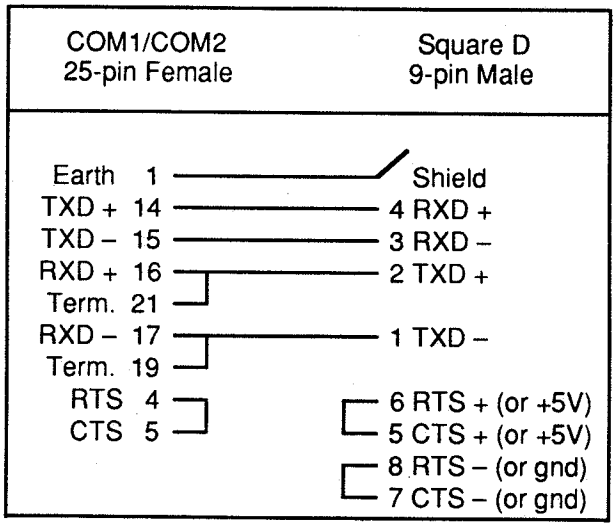
Square D

Models

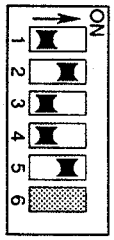
The Series 110/120 PLC Workstations are compatible with Square D models 100, 300, 400, 500, 600 and 700. You must load G5 firmware into your Workstation.

Connections

The Workstation plugs directly into the programming ("PROGRAMMER"), communications ("COMM"), or Network Interface Module using the following cable:



COM1/COM2
DIP Switch Setting:



CBL-C10: Series 110/120 COM1/COM2 to Square D

Station Numbers

If your Workstation is connected directly to the processor module, it doesn't matter what station numbers you enter for the PLC and Workstation.

For applications where one or more Workstations are connected to one or more PLCs, Square D offers Network Interface Modules (NIMs) that provide ports for the Workstation, the PLC, and the SY/NET network. You must set the PLC and Workstation numbers to their respective NIM addresses. For example, if you set the rotary switches on the NIM to 24, and if the Workstation is connected to port 0 and the PLC to port 1, then the Workstation's station number is 024 and the PLC's station number is 124.

You must set the DIP switches on the NIM for SY/MAX operation. On DIP switches S4 and S5, be sure that switches 2 and 3 are in the down position. Also, make sure that switch 1 has the factory setting of up, which disables the receive broadcast mode.

Square D refers to station numbers as "routing numbers," where the Workstation is the "source" and the PLC is the "destination." The Workstation supports only a single level of routing numbers, which means that it can access any PLC on the NIM's network, but cannot access a PLC on any other networks.

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Errors

When the Workstation encounters a problem in communicating with the PLC, it displays an error message and an error code. Following is a list of messages along with the meaning of each code; error codes other than those listed are undefined:

NOT RDY ERR

This message always indicates that the CTS input to the serial port is not active, which typically indicates that the cable to the PLC is not plugged into the Workstation. Error codes 128-133 indicate that the CTS signal was lost during resynchronization, while codes 140-145 indicate that CTS was lost during normal communications.

NO RESPONSE ERR

This message always indicates that the PLC is not responding to the Workstation's requests. Error codes 134-139 indicate a timeout during resynchronization, while codes 146-151 indicate a timeout during normal communications. This typically indicates that the cable plugged into the Workstation is not connected to the PLC, or that the PLC is turned off or is in some other mode that makes it non-responsive.

MSG ERROR

Error Code	Description
1	Workstation attempted to change the ladder program while the PLC is in the run mode
2	Workstation transmitted an invalid command code
3	Workstation's command contained an invalid checksum
4	Workstation's message contained a command overrun
5	PLC aborted the command
6	Workstation's message overran the PLC's UART (indicates that the baud rate is too fast)
7	Workstation's command contained an invalid address
8	Workstation's message caused a framing error in the PLC's UART
9	Workstation's message caused a parity error in the PLC's UART
16-17	Workstation received a garbled response from the PLC
18	PLC's response did not match the Workstation's command

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Chapter 22K

Telemecanique

Models

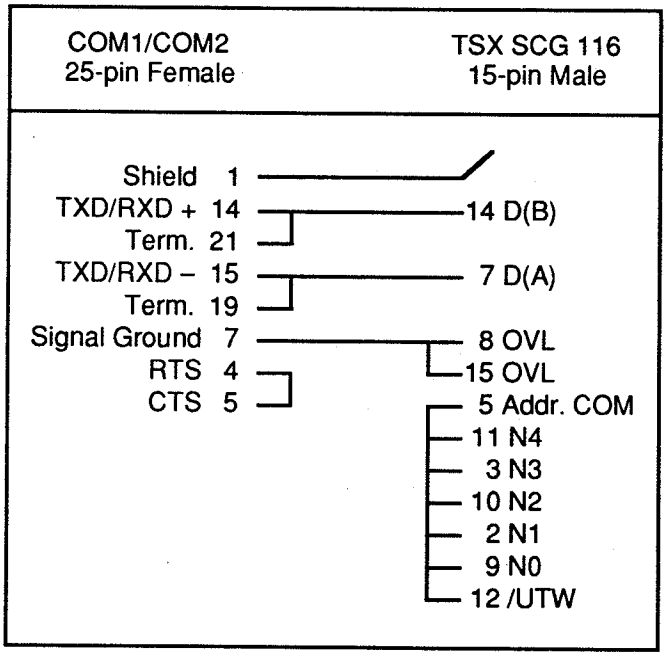
The Series 110/120 PLC Workstations are compatible with Telemecanique models TSX-17, TSX-27 and TSX-47, via Uni-Telway connections. You must load GC firmware into your Workstation.

The Workstations operate as slaves on the Uni-Telway network and can communicate with only the master PLC. The Workstations operate as clients only, although they can provide functions similar to the server functions of Telemecanique's XBT terminals.

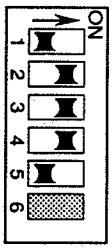
Connections

The Workstations connect to a TSX SCG 116 serial communications module, either directly or through a TSX SCA 62 subscriber socket. The TSX SCG 116 connects to the programming port of your PLC.

If you use a TSX SCA 62 subscriber socket, the DIP switch setting of the connector for the Workstation is irrelevant, because the Workstation cannot read this setting. The following schematics show how to make these connections:



COM1/COM2
DIP Switch Setting:



Series 110/120 COM1/COM2 to Telemecanique's TSX SCG 116 serial communication module

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Register LIFO/FIFO; input word	R*nn*,I	*nn* = 0-3	Word	Unsigned binary
Register LIFO/FIFO; output word	R*nn*,O	*nn* = 0-3; read only	Word	Unsigned binary
Timer Presets	T*nn*,P	*nn* = 0-31 (TSX-17) or 0-15 (others)	Word	Unsigned binary
Timer Actual	T*nn*,V	*nn* = 0-31 (TSX-17) or 0-15 (others); read only	Word	Unsigned binary

On/Off Type	**Format**	**Range**
Common Station Words	COM*ii,jjj,k*	TSX-47 only: *ii* = 0-15; *jj* = 0-3; *k* = 0-F (hex)
Constant Words	CW*nnnn,k*	*nnnn* = 0-1023; *k* = 0-F (hex); read only
System Words	SW*nn,k*	*nn* = 0-59; *k* = 0-F (hex)
Internal Words	W*nnnn,k*	*nnnn* = 0-1023; *k* = 0-F (hex)
System Bits	SY*nn*	*nn* = 0-23
Internal Bits	B*nnn*	*nnn* = 0-255
Counter Done	C*nn*,D	*nn* = 0-30 (TSX-17) or 0-15 (others); read only
Counter Empty	C*nn*,E	*nn* = 0-30 (TSX-17) or 0-15 (others); read only
Counter Full	C*nn*,F	*nn* = 0-30 (TSX-17) or 0-15 (others); read only
Monostable Running	M*nn*,R	*nn* = 0-7; read only
Register LIFO/FIFO Empty	R*nn*,E	*nn* = 0-3; read only
Register LIFO/FIFO Full	R*nn*,F	*nn* = 0-3; read only
Timer Done	T*nn*,D	*nn* = 0-31 (TSX-17) or 0-15 (others); read only
Timer Running	T*nn*,R	*nn* = 0-31 (TSX-17) or 0-15 (others); read only

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Chapter 22L

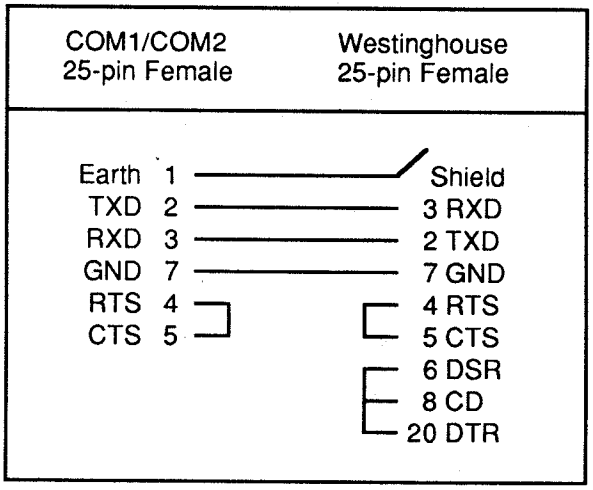
Westinghouse

Models

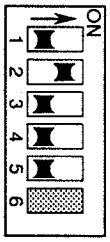
The Series 110/120 PLC Workstations are compatible with Westinghouse models 700, 900, 1100, and 1200. You must load G7 firmware into your Workstation.

Connections

The Workstations connect directly to the RS-232 programming port with the following cable:



COM1/COM2
DIP Switch Setting:



CBL-C1: Series 110/120 COM1/COM2 to Westinghouse PLCs

Station Numbers

It doesn't matter what values you enter for the PLC station number and Workstation station number.

Addressing

The Edit function of CP software allows you to configure each screen that the Workstation displays; among the information you must enter is the "PLC Address." This field holds the address within the PLC of the location you want to display. For example, if you want to display the contents of holding register 1, you enter the address *HR1* for the "PLC address." The "Data size" for registers is always *Word* and the "Data format" is usually *Unsigned Binary*.

The "bit pick" ("BP") function of input, output, and holding registers selects a bit relative to the selected register, where there are 16 bits in each register. For example BP1/IR1 refers to the first bit of input register 1, BP16/IR1 refers to the last bit in IR1, BP17/IR1 refers to the first bit in IR2, and BP512/IR1 refers to the last bit of IR32; BP17/IR2 refers to the first bit of IR3.

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Chapter 23

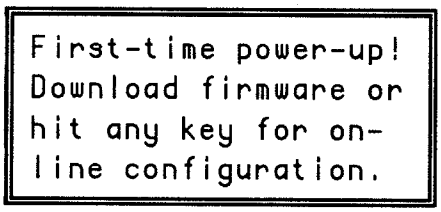
Applications

Sample Application

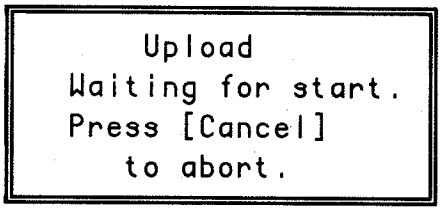
To understand how the PLC Workstation displays the information that you want from your programmable controller, you can download the "DEMO" file to the Workstation. This file is included with your setup package.

To download this file, start CP by typing *CP* and pressing [Enter]. To retrieve the file, type *F* for the File menu and *R* for Retrieve. Press the left or right arrows until the word "DEMO" is highlighted, and then press [Enter]. If this word does not appear, then the DEMO file is not on the same directory as CP.

Make sure your Workstation is ready to accept a download. If your unit is brand new, then you should see the following screen:



If your unit already has a PLC Workstation application installed, then press [Upload], which should bring up the following screen:



After you retrieve the file and your Workstation is ready to accept a download, press *D* for the Download menu and then *G* to start downloading.

If your Workstation already has a current revision of PLC Workstation firmware, then downloading takes only a few seconds. If not, then CP downloads new firmware, which takes about two minutes.

If you have downloaded successfully, the Workstation displays the first screen, as shown below. You can press [↓] on the Workstation once to see each subsequent screen:

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Screen 3

To display screen 3, press [↓]:

```
State displays

=Internal coil on
=Undefined State
```

Screen 3 shows two types of state displays, an on/off location and a selector switch. Line 1 is a fixed text message and line 2 is empty. Line 3 shows the current state of an on/off location: either "Internal coil off" or "Internal coil on." Line 4 displays one of eight messages, depending on the status of a register; if bit 0 of the register is set, the Workstation displays "Message for bit 0." If none of the lower 8 bits is set, the Workstation displays the message "Undefined State."

Screen 4

To display screen 4, press [↓]:

```
Enter new values:
>     .00 widgets/min
=Undefined state
=0000 0000 0000 0000
```

Screen 4 allows you to try entering new values for various types of displays. Line 1 is a fixed text message. Line 2 is a register, which you can jog in increments of 0.50 by pressing [→] or [←], or which you can change by entering a new value between 0.00 and 10.00.

Line 3 is a selector switch, which you change by pressing [→] or [←]; when the Workstation displays the state you want, press [Enter]. Finally, line 4 displays a register in the bit format; to change a bit, press [0] or [1]; to skip a bit, press [→]; when you're finished with your entry, press [Enter].

Screen Select

If you press [Select] while the Workstation displays screen 4, you'll see:

```
Screen#:  4
Enter ne  S# 004/004
Fluid le  S# 001/004
Reg. dis  S# 002/004
```

As you can see, the Workstation displays the first eight characters of the first line, and then displays the screen number and the total number of screens. If you press 1 and then [Enter], the Workstation displays screen 1.

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Menus

The most useful function of menus is to provide the operator with an easy way to navigate through a system of many screens.

For example, say you have an application with three sets of screens, where the first set allows a technician to tune the system, the second set allows the operator to run the system, and the third set allows a supervisor to operate the system manually. You might set up the first screen as a Custom screen with four lines of text:

```
"          "                        Screen 2 of 2
Enter the network station number (if any) for the PLC (0 to 255): 8

Type: Custom

      Main Menu
 1 - Tune system
 2 - Operate system
 3 - Run manually

Previous [↑] screen:
    Next [↓] screen:
       Enter screen:

Key definitions (1):
Key definitions (2):
```

Key	S	F	Passcode	Sta/Scn	PLC Address
0	U				
1	L	G	7447		5
2	L	G			9
3	L	G	6681		13
4	U				
5	U				
6	U				
7	U				
8	U				
9	U				
.					
-					
BkSpc					
←					
→					

```
"          "                        Screen 2 of 2
Enter the network station number (if any) for the PLC (0 to 255): 8

Type: Custom

      Main Menu
 1 - Tune system
 2 - Operate system
 3 - Run manually

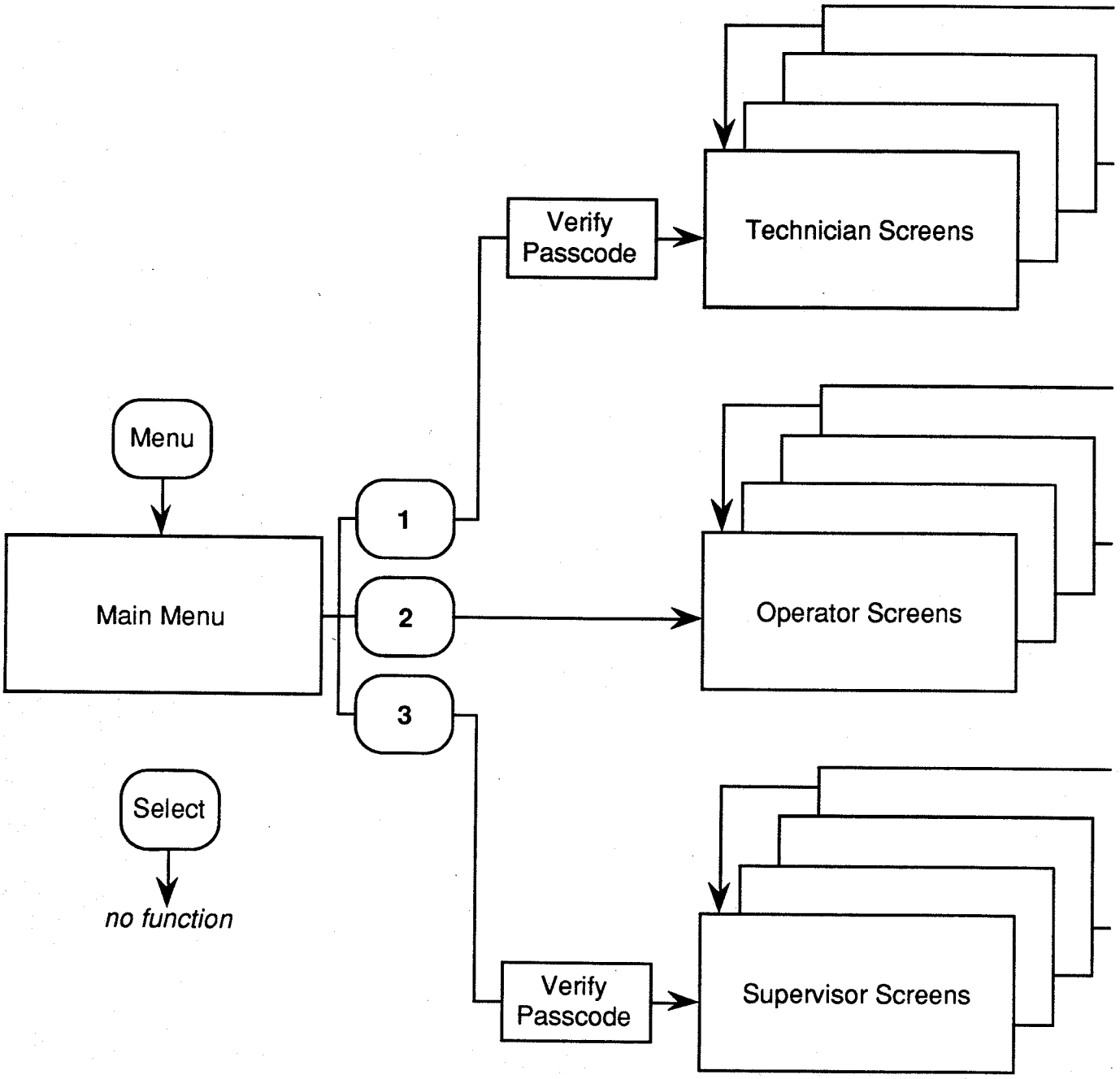
Previous [↑] screen:
    Next [↓] screen:
       Enter screen:

Key definitions (1):
Key definitions (2):
```

Key	S	F	Passcode	Sta/Scn	PLC Address
Screens	U				
Alarms	U				
Select	G	D			
Upload	U				
Menu	G	G			2
Help	U				
Setup	U				
F()	U				
Cancel	U				
↑	U				
↓	U				
Enter	U				
F()Canc	U				

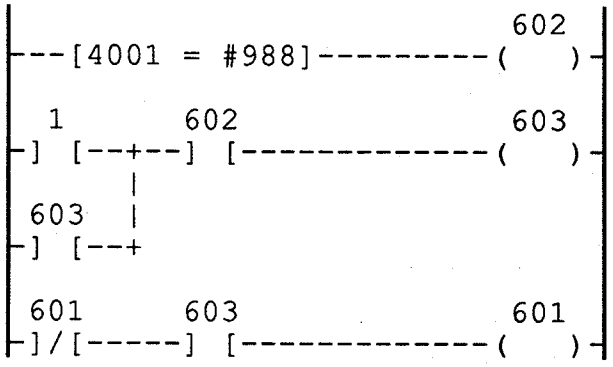
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The following diagram illustrates this sample application:



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A summary of the PLC logic follows:



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Chapter 24

Troubleshooting

This chapter describes typical problems and their solutions. At the end of this chapter is a complete list of error messages and explanations for both CP and the PLC Workstation itself.

Faulty Operation

This section describes operational problems that do not generate any type of error message. Explanations of error messages are in the next sections of this guide.

Run LED flashes very quickly for more than five minutes.	Firmware memory (flash EPROM) is probably faulty; you must return unit to factory.
Run LED flashes slowly.	Indicates that the display is faulty; you must return unit to factory.
Alarm LED flashes very slowly.	Battery is low; you must replace the battery.
Alarm LED on; others off.	External RAM memory failure; you must return unit to factory.
Comm LED on; others off.	Internal microprocessor memory failure; you must return unit to factory.
Kbd LED remains on continuously.	Key may be stuck; repeatedly press each key until the LED goes out; if the LED doesn't go out, return unit to factory.
No response to some keypresses.	Loose keyboard connector or faulty keyboard; try to fully seat keyboard connector. If the keyboard still fails, return unit to factory.
Firmware download reports that Flash is empty or invalid.	Usually indicates that you are using a version of DOWNLOAD that is older than V1.40; you must use V1.40 or later. In extremely rare cases, the firmware may actually be faulty, which requires you to return the unit to factory.
Power appears to cycle repeatedly or unit sometimes won't power up at all.	May indicate a loose or shorted power cable; a short in a communications cable; the Workstation is not connected to earth ground (required even in DC-powered applications); excessive voltage potential between earth grounds of Workstation and other devices connected to its communications ports; loose integrated circuits inside; faulty power supply; or low voltage on the incoming power source.
Nothing happens; all the LEDs remain off, the screen remains dark, and there is no starting "bugle call" of the beeper.	Indicates a blown fuse, a total failure of the power supply, or a lack of power. If your Workstation is plugged in and if the fuse is not blown, you will have to return your unit for repair.
Unit powers up, completes its self-test, and then displays a blank screen.	Indicates either that your first screen is really blank, or that your Workstation actually has Terminal firmware. To check the type of firmware, cycle power and look at the top line of the Workstation's screen during the self-test. If it says "Terminal" instead of "PLC W.S.," then you've got the wrong firmware.

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Incorrect register status: the Workstation displays the incorrect status of a register.	This indicates a problem in the Register's setup on the Edit screen, and can involve Data size, Data format, and scaling (raw data and operator units). For example, if you select a Data format of *Unsigned Binary* and the register is actually BCD, the Workstation displays a value of 20 as 32; you will also see jumps as a register changes, because the Workstation displays 9 correctly, but displays 10 as 16. For another example, if you select a Raw data maximum that is less than the actual maximum value of the register, then the Workstation can display some very strange values, including negative numbers. To track down the problem, you should remove the scaling parameters (set the Operator units minimum and maximum equal to the Raw data minimum and maximum) and see what the register actually shows. Eliminating the scaling to operator units also makes it easier to find a Binary/BCD problem. Another possible cause of this problem is that you specified *Test* in the PLC field on CP's Configuration screen. In the Test mode, the Workstation simply simulates the operation of a PLC and doesn't actually communicate with your PLC. Instead, it continually increments the value of each register it displays.
The Workstation ignores the [Select] key or ignores your attempts to choose the "Select" option on the Function Menu.	There are several possible causes of this problem: 1) your screen file has fewer than four screens; 2) you have enabled the Screen Select Register and its current value is not zero; or 3) you have disabled the [Select] key entirely under "Key Definitions" on an Edit screen.
Workstation ignores the [Upload] key.	If you have disabled the [Upload] key, either under "Key Definitions" on an Edit screen or under "Upload Key" on the Configuration screen, then you can access the Upload function only by pressing [Upload] during the Workstation's power-up self-test.
Workstation issues two alarm messages for a single alarm limit.	This indicates a problem in the Register's set up on the Edit screen, and involves the Data format selection or Binary or BCD. For example, if you choose *BCD* when the actual register is Binary, the Workstation misinterprets some of the numbers, and the result can be two alarms where one should have occurred.
Workstation seems not to accept operator changes exactly.	It's possible for the operator to enter one number and have the Workstation display a slightly different number. This occurs because the Workstation must round off when it converts from operator units to raw data, so it writes raw data to the PLC that is not exactly equivalent to what the operator entered. To understand this problem, consider an example: the raw data varies between 0 and 99, and the operator units vary between 0 and 198. (This may not be a practical example, but its simple 1:2 ratio is easy to understand.) When the operator enters 198, the Workstation divides it in half and writes 99 to the Workstation. However, if the operator enters 197, the Workstation has to round off the result of 98.5 to 98; when the Workstation reads back 98, it doubles it and displays 196. So the operator enters 197 and sees it appear as 196.
Workstation does not accept operator changes or operator changes don't "stick."	This typically indicates that you are trying to use the Workstation to control a location that is either a real-world input or a location that your PLC actually controls. For example, you cannot use the Workstation to control an internal coil if your PLC program contains a rung whose coil refers to that same location.
Workstation displays current values that appear entirely unrelated to the PLC.	You probably specified *Test* in the PLC field on CP's Configuration screen. In the Test mode, the Workstation simply simulates the operation of a PLC and doesn't actually communicate. When it displays a register, it continually increments that register's value.

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Workstation fails to print a screen when the SSR changes.

Most of the causes of this problem are the same as those for display problems, so you should first consider the causes above. Other causes to consider are:

1. You should verify that you have configured your printer correctly on the Configuration screen and that it is actually connected and functioning properly.

2. If your PLC sets the Print Flag after setting the SSR, the Workstation may not see it. If you want to print instead of display, your PLC should set the Print Flag *before* setting the SSR.

   Note The Workstation reads the Print Flag only when the SSR changes. You cannot make the Workstation display a screen and then print that same screen without first resetting the SSR to zero, turning on the Print Flag, and changing the SSR back to the screen number. You can, however, select *Always Print and Display* for the "SSR" field on the Edit screens.

Workstation continually prints on the same line.

Usually indicates that the Workstation is not sending the correct code at the end of a line. To change this, go to the *Line-end* field on the Configuration screen and try the *CR/LF* option.

Printer prints one line and continually overprints the last character.

If your printer fails to return the print head to the left side, then you should go to the Workstation Printer section of the Configuration screen and specify a Line-end of CR/LF or CR. You may also have to adjust your printer, either by changing DIP switches or by sending it a special message telling it how to handle line ends. See the description of the "Initialization string" on page 9-10 for a way to transmit special commands to the printer.

Printer continually prints over and over on the same line.

If your printer prints each line on top of the next without advancing the paper, then you should go to the Workstation Printer section of the Configuration screen and specify a Line-end of CR/LF or LF. You may also have to adjust your printer, either by changing DIP switches or by sending it a special message telling it how to handle line ends. See the description of the "Initialization string" on page 9-10 for a way to transmit special commands to the printer.

Printer prints a blank line between each printed line.

If your printer prints a blank line between each printed line, then you should go to the Workstation Printer section of the Configuration screen and change the Line-end from CR/LF to CR or from LF to none. You may also have to adjust your printer, either by changing DIP switches or by sending it a special message telling it how to handle line ends. See the description of the "Initialization string" on page 9-10 for a way to transmit special commands to the printer.

[↑] and [↓] keys don't always go to the previous or next screen.

This indicates that you have set up the "Previous screen" and "Next screen" fields as described on page 10-3 in order to alter the normal operation of the [↑] and [↓] keys.

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Disk error: couldn't retrieve the file.
Indicates that CP was unable to retrieve a file because of a disk error such as drive door open, unformatted disk, or a drive failure.

Disk error: couldn't save the file.
Indicates that CP was unable to save a file because of a disk error such as drive door open, write-protect notch covered, unformatted disk, or a drive failure.

Disk error: couldn't save the formats.
Indicates that CP was unable to save the print formats on the disk because of a disk error such as drive door open, unformatted disk, or a drive failure.

Disk error: drive not ready.
CP tried to access the disk drive when the drive door was open, there was no disk in the drive, or the drive had failed.

Disk error: sector not found.
CP tried to access the disk drive and failed to find an area of data on the disk. This may indicate an unrecoverable loss of data, so you should retry the operation several times before giving up.

Disk error: seek problem.
CP tried to access the disk drive and found the disk unreadable. This probably means that the disk was not formatted; if the disk was formatted, then this error may indicate an unrecoverable loss of data. You should retry the operation several times before giving up.

Disk error: unknown media type.
This probably indicates a flawed system configuration in your PC. You should consult your owner's manual for further information.

Disk error: write-protected.
CP tried to write to the disk when the write-protect notch was covered. You must remove the cover or save to another disk.

Error: decimal point entered; enter only 0 through 9.
Indicates that you entered a number with a decimal point when CP was expecting only an integer.

Error: insufficient memory to run CP.
Indicates that your PC lacks sufficient memory to run CP, either because you have too many other programs currently occupying memory, or because your PC lacks the full 640K required. You must modify your AUTOEXEC.BAT so that fewer TSR programs are loaded, move DOS to high memory, or install more memory in your PC.

Error: non-numeric character entered; enter only 0 through 9.
Indicates that you entered a character other than a digit when CP was expecting nothing but numbers.

Error: out of range; enter between *nnnnn* and *ppppp*.
Indicates that you have entered a number outside the expected range. You must enter a number no lower than *nnnnn* and no higher than *ppppp*.

Error: read fault.
Indicates that CP was unable to complete a "read" operation from the disk drive or a communications channel. You should check your connections and conditions and try again.

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Printer error: out of paper.
Indicates that your printer is returning a signal that it is out of paper.

System error: bad request structure length; call factory.
If you see this error, call us and report it.

System error: not enough memory to print screen file; call factory.
If you see this error, call us and report it.

System error: undefined; call factory.
If you see this error, call us and report it.

System error: unknown command; call factory.
If you see this error, call us and report it.

System error: unknown unit; call factory.
If you see this error, call us and report it.

Workstation memory error: actual memory is insufficient.
Indicates that your screens require more Workstation memory than is actually available and that CP aborted downloading. You must reduce your memory requirements or enlarge your Workstation's memory capacity.

Workstation memory error: configuration indicates insufficient memory.
Indicates that your screens require more Workstation memory than the capacity of the model you have configured and that CP aborted downloading. You must reduce your memory requirements or select a Workstation with more memory.

Version error: call factory.
After CP downloads a new firmware file, it double-checks to ensure that the new firmware file is truly compatible with the version of CP you're using and with the PLC you have specified. If not, CP issues this error message, which indicates that there is an unrecoverable mismatch between software and version numbers. If you see this message, please note the release numbers and file dates of your CP.EXE and G*n*.ROM file before you call us.

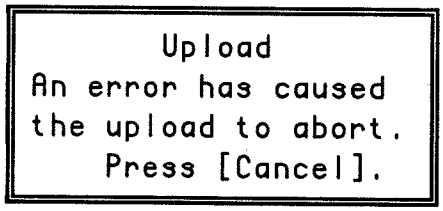
Version error: can't find disk file to replace wrong firmware.
Indicates that you have tried to download to a Workstation with firmware that does not support the type of PLC that you specified in CP, and that the correct firmware file is not on the same directory as CP itself. You must download the correct firmware for your PLC or install the correct firmware on the same directory as CP.

Version error: couldn't retrieve the file.
Indicates that the file on the disk was originally created under a version of CP that is not compatible with the current version. You should obtain several older versions of CP from Nematron and try successively loading and saving your screen file under progressively newer versions. If that doesn't work, then the only remedy is to use a compatible version of CP, print out the file, and type in the file under the new version of CP.

Version error: Workstation not compatible with CP.
Indicates that the Workstation model is IWS-101, IWS-102, or IPT-100, which CP version 3.30 and later does not support. You must use CP, V3.10 or earlier to download screen files to those older models.

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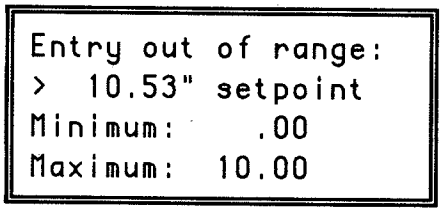
Upload Error



This message indicates that an error has interrupted the downloading process. The possible causes, listed from most likely to least likely, are:

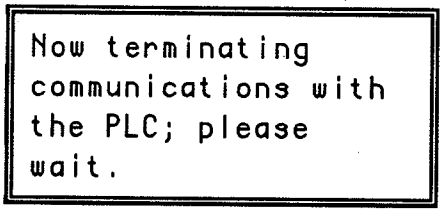
- CP software looked for a firmware file and failed to find it.
- Faulty cable between Workstation's COM1 port and PC's COM1 port.
- Loose cable connection.
- Faulty communications port in Workstation or PC.

Out of Range



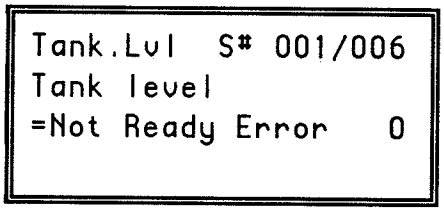
This message indicates you have entered a value that is below the minimum or above the maximum value that the Workstation accepts. To return to the previous screen, press [Cancel].

Now Terminating Communications



When you select the Workstation's Upload or Setup functions, the Workstation first ends all communications with the PLC. At that time, the Workstation also briefly displays this message, which simply reminds you that alarm scanning ceased.

Not Ready Error



This message usually indicates that there is no cable connected to the Workstation's COM port to the PLC. The Workstation displays this message if its serial port's CTS input is not active.

If you have a cable connected between the Workstation and the PLC, then the cable or the Workstation's serial port is probably faulty.

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