
PanelMate® Siemens Communication Driver Manual

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Introduction

1

In this chapter, you will learn:

- *About driver installation*
- *How to download drivers to a PanelMate unit*
- *The supported memory types*

Introduction

The Operator Station can communicate with a variety of programmable controllers in the Siemens PLC family.

When using the serial port on a CP524 or CP525 communications coprocessor board mounted in the PLC, the Operator Station can communicate with the S5-115U, S5-135U, and S5-155U models using the 3964R driver. Note that the CP525 board has two independent serial ports while the CP524 board has only one serial port. (All references to the CP525 will include the CP524 unless otherwise noted.)

When using the programming port of the PLC, the Operator Station can communicate with the S5-90U, S5-95U, S5-100U, S5-115U, S5-135U, S5-150U, and S5-155U models using the AS511 driver.

When using the MPI port on an S7-300/400 PLC, the Operator Station can communicate with any S7-300 or S7-400 model using the Siemens S7 driver. Access to a PLC on an MPI network is possible through an HMI Adapter. The HMI Adapter provides Point-to-Point communication between a PanelMate and a Siemens S7 PLC.

The 3964R, AS511, and Siemens S7 drivers take responsibility for communications to the PLC, generating the protocol necessary to request information from and send information to the PLC.

Unsoliciteds are not supported and should not be used. It is possible to reference non-data block memory that does not exist without experiencing an error.

Note: Care should be used when specifying references. Do not specify references larger than supported by the PLC.

Note: Even though the S7 driver communicates via an HMI (multi-point) adapter, the S7 driver only supports a single-point connection.

Note: Check the Cutler-Hammer web site for current information on PanelMate PC connectivity to the Siemens driver.

Installing Drivers

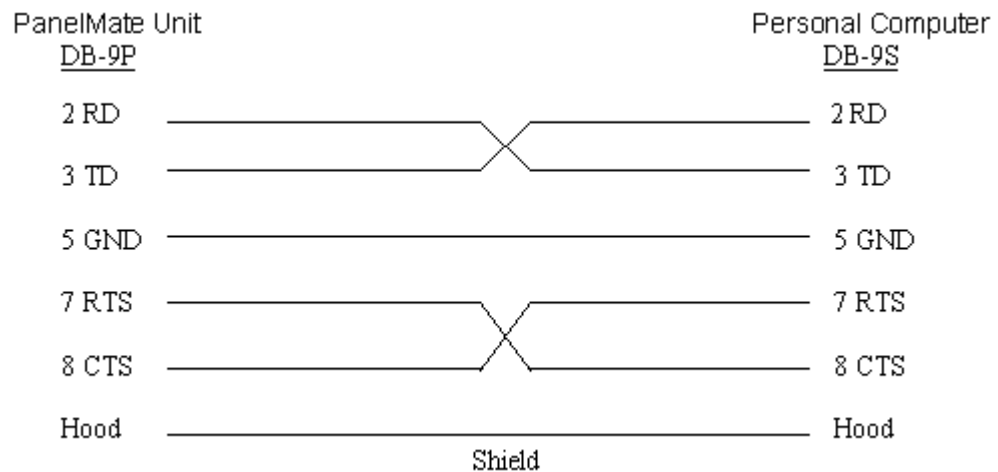
PanelMate Configuration Editor software is installed using a CD-ROM. To install the drivers from the CD-ROM, select the **Install Software** option and then **Install Drivers**. From the dialog box, select the driver you wish to install.

Downloading Drivers to a PanelMate Unit

- In the VCP Transfer Utility, choose the “Executive” tab and select the proper Executive Firmware to download to the PanelMate unit.
- Click the button labeled “Add to Operation List.”
Note: In order to download to a PanelMate for the first time or to clear the existence of another driver, the PanelMate must first be loaded with Executive Firmware.
- Choose the “Driver” tab.
- Select the appropriate driver to be downloaded to the PanelMate.
- Click the button labeled “Add to Operation List.”
- Place the PanelMate unit in Serial Transfer Mode.
- Connect a serial transfer cable from the correct port on the PC to port 1 on the PanelMate. (See cabling below.)
- Click “Start” at the bottom of the VCP Transfer Utility window.
- **Note:** For a more detailed description of downloading procedures and troubleshooting see *PanelMate Power Series, PowerPro, Pro LT Transfer Utility User’s Guide*.

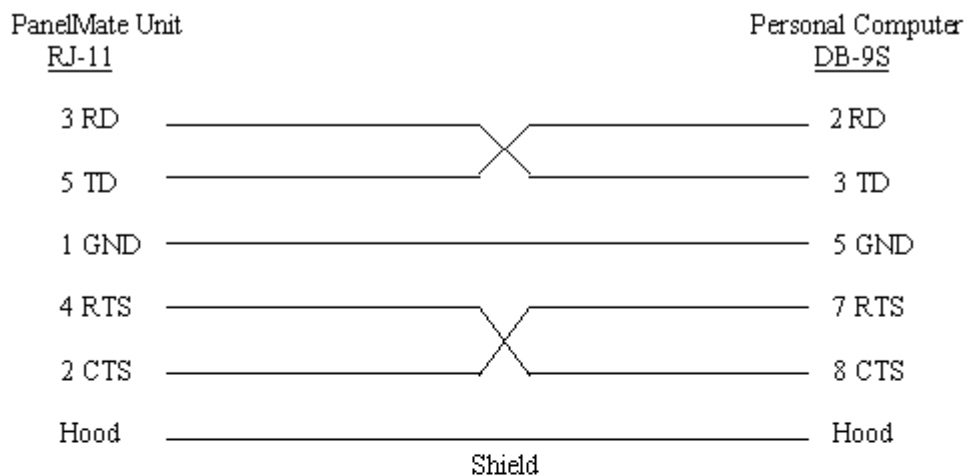
Serial Transfer Cables

Cable P/N 0518

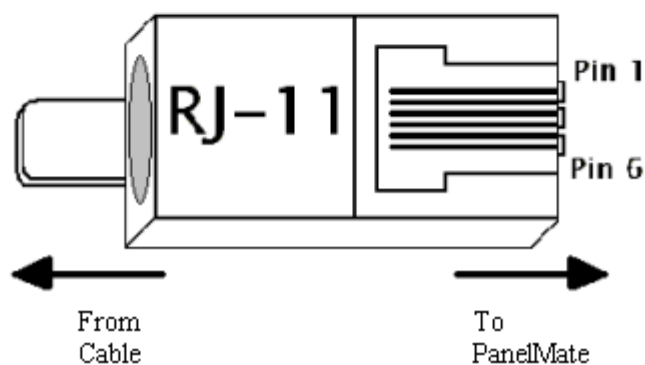


Cable P/N 0818

(PanelMate Power Series 1500 and PanelMate 500 only)



RJ-11 pin configuration



Memory

S5 PLCs

The following list contains the memory types supported by the Siemens S5 (3964R and AS511) drivers.

D	Data Block
I	Input (Read only)
F	Flag
C	Counter (Read only)
Q	Output
T	Timer (Read only)

Note: Absolute, System and Extended memory areas are not supported.

The PLC models supported by the 3964R driver are shown below.

S5-115U

S5-135U

S5-155U

The PLC models supported by the AS511 driver are shown below. Note that both Siemens and Westinghouse PLC models are supported.

Siemens	Westinghouse
S5-90U	PC-50
S5-95U	PC-55
S5-95F	
S5-100U	PC-500
S5-102U	PC-502
S5-103U	PC-503
S5-115U/CPU-941	PC-2000-11
S5-115U/CPU-942	PC-2000-21
S5-115U/CPU-943	PC-2000-32

Siemens	Westinghouse
S5-115U/CPU-944	PC-2000-42
S5-115U/CPU-945	
S5-135U/CPU-922	
S5-135U/CPU-928	
S5-150U	
S5-155U/CPU-948	

The memory ranges supported by the AS511 driver are dependent upon the PLC reference field's range in the Configuration Editor. For example, if the PLC reference field allows you to enter a 3-digit reference, you may enter any reference from 0 through 999 even though all of the references may not be valid. It is the user's responsibility to ensure that the specified reference is within the valid memory range.

There are several rack models within the Siemens S5 family of products. Each rack model can have different CPUs. Each CPU model may have different memory limits. The maximum address value for each of the supported PLC models is given in the following tables.

The Memory Configurations for the S5-90U, S5-95U, and S5-100U CPU are shown below:

	90U	95U	S5-100U CPU 100	S5-100U CPU 102	S5-100U CPU 103
Data Block (words)	256	256	256	256	256
Inputs (bytes)	26	60	32	56	56
Flags (bytes)	128	256	128	128	256
Counters (words)	32	128	16	32	128
Outputs (bytes)	26	60	32	56	56
Timers (words)	32	128	16	32	128

Note: Models S5-90U, S5-95U, and S5-100U are not supported by the 3964R protocol.

The Memory Configuration for the S5-115U CPU is shown below:

	S5-115U CPU 944	S5-115U CPU 943 (R Processor)	S5-115U CPU 942 (S Processor)	S5-115U CPU 941 (M Processor)	S5-115U CPU 945
Data Block (words)	256	256	256	256	256
Inputs (bytes)	128	128	128	64	128
Flags (bytes)	256	256	256	256	256
Counters (words)	128	128	128	128	256
Outputs (bytes)	128	128	128	64	128
Timers (words)	128	128	128	128	256

The Memory Configuration for the S5-135U CPU is shown below:

	S5-135U CPU 928	S5-135U CPU 922 (R Processor)	S5-135U CPU 921 (S Processor)	S5-135U CPU 920 (M Processor)
Data Blocks(words)	256	256	256	256
Inputs (bytes)	512	512	512	512
Flags (bytes)	256	256	256	--
Counters (words)	256	128	128	--
Outputs (bytes)	512	512	512	512
Timers (words)	256	128	128	--

The Memory Configuration for the S5-150U CPU is shown below:

	S5-150U
Data Blocks(words)	256
Inputs (bytes)	128
Flags (bytes)	256
Counters (words)	256
Outputs (bytes)	128
Timers (words)	256

Note: The Model S5-150U is not supported by the 3964R protocol.

The Memory Configuration for the S5-155U CPU is shown below:

	S5-155U CPU 946/7	S5-155U CPU 922 (R Processor)	S5-155U CPU 921 (S Processor)	S5-155U CPU 920 (M Processor)
Data Blocks(words)	256	256	256	256
Inputs (bytes)	512	512	512	512
Flags (bytes)	256	256	256	--
Counters (words)	256	128	128	--
Outputs (bytes)	512	512	512	512
Timers (words)	256	128	128	--

Note: -- indicates that the CPU model does not support the memory area.

Note: CPU 920 and CPU 921 are not supported by the AS511 protocol.

The S5-135U and S5-155U can operate in a multiprocessor configuration using either the M, S, R processors or CPU 928. These processors can also be used in stand-alone mode in the S5-155U. The following is a brief description of each processor.

CPU928	This processor is designed for multiple tasks. It provides fast binary signal processing (open-loop control) as well as fast word processing (computing and closed-loop control).
M Processor	This processor is used for data processing, arithmetic and statistics.
R Processor	This processor is used mainly for fast word processing (computing and closed-loop control). It can also be used for binary signal processing.
S Processor	This processor is used mainly for fast binary signal processing (open-loop control). It can also be used for computing and closed-loop control.

S7 PLCs

The following list contains the memory types supported by the Siemens S7 driver.

DB	Data Block
I	Input
M	Memory
C	Counter
Q	Output
T	Timer (Read only)

All S7-300 and S7-400 model PLCs are supported by the Siemens S7 driver.

The memory ranges supported by the Siemens S7 driver are dependent upon the specific PLC model. For example, if the PLC reference field allows you to enter a 5-digit reference, you may enter any reference (from 0 through 99999) even though all of the references may not be valid. It is the user's responsibility to ensure that the specified reference is within the valid memory range.

Possible Configurations

2

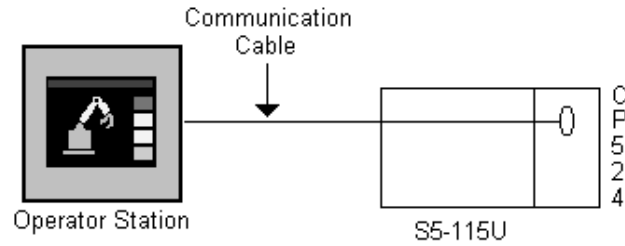
In this chapter, you will learn:

- *How to connect an operator station to Siemens PLCs*
- *How to connect two operator stations to Siemens PLCs*

Direct Connection

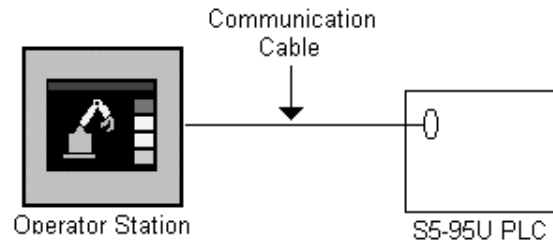
3964R

The following figure shows a 3964R direct connection between one Operator Station and one Siemens PLC via the serial port on the CP524 communications coprocessor.



AS511

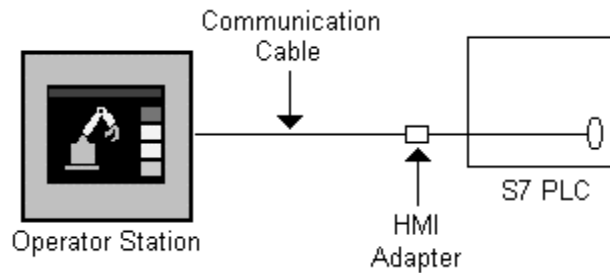
The following figure shows an AS511 direct connection between one Operator Station and one Siemens PLC via the PLC programming port.



Note: The AS511 protocol does not support multiple drops on a single port.

S7

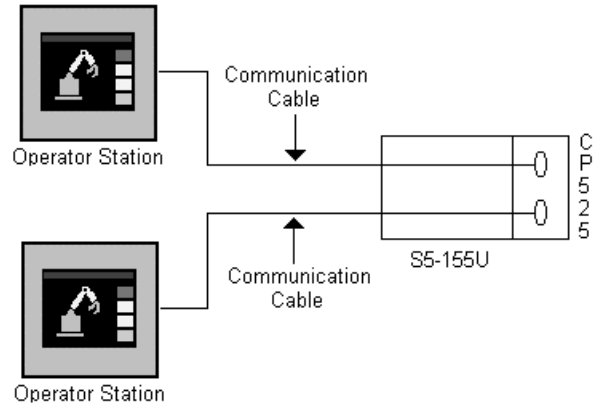
The following figure shows a S7 direct connection between one Operator Station and one Siemens S7 PLC via the MPI port.



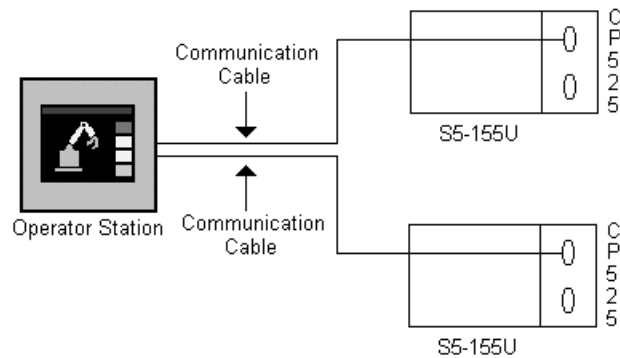
Multiple Connection

3964R

The following figure shows a 3964R multiple connection consisting of two Operator Stations and a Siemens PLC.

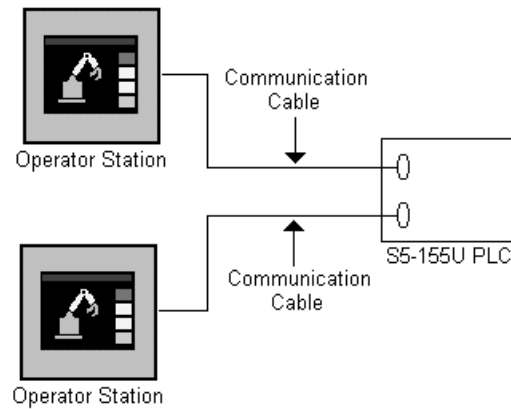


The following figure shows a 3964R multiple connection consisting of an Operator Station and two Siemens PLCs.



AS511

The following figure shows an AS511 multiple connection consisting of two Operator Stations and a Siemens PLC.



Note: Some Siemens S5 PLCs will have only one port.

Note: The connection of multiple Operator Stations to the PLC is dependent upon the number of programming ports available. The AS511 protocol does not support multiple drops on a single port.

Cabling and Communication Parameters

3

In this chapter, you will learn:

- *The cabling requirements for Siemens PLCs*

Cabling for the 3964R Driver

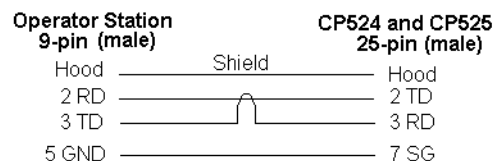
Operator Station to Processor Cabling

The Siemens 3964R driver supports RS232C communications only.

The following figure shows the cable configuration between the Operator Station and CP524 and CP525 coprocessor boards.

The Operator Stations that have 9-pin female connectors (DB-9S) must have cables configured with male connectors (DB-9P).

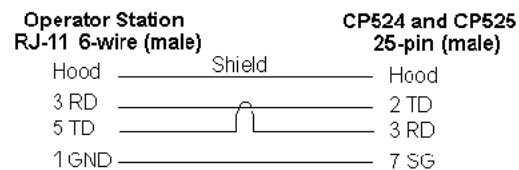
SI 21



 Denotes a twisted pair

Note: A 15-foot PLC cable can be purchased from the Cutler-Hammer for RS232C communications. Contact the Customer Support Group (see the Preface of this manual) or your local distributor for more information. Refer to the PLC Cabling Cross-Reference List in Appendix A for cabling catalog numbers.

The Operator Stations that have RJ-11 6-wire modular jacks must have cables configured with male modular connectors.



 Denotes a twisted pair

Cabling for the AS511 Driver

Operator Station to PC-Converter Cabling

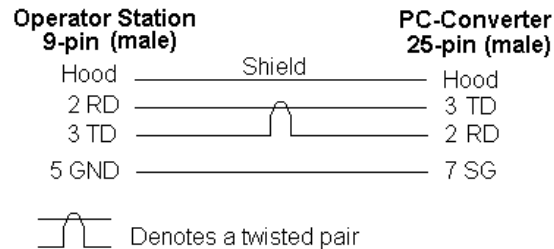
The Siemens AS511 driver supports RS232C communications only. The programming port on the Siemens S5 PLCs supports 20 mA current loop communication. A 20 mA to RS232C converter (such as the Siemens PC-converter cable, PN 6ES5 734-1BD20, or Westinghouse programming cables, PN NLCC-3100 or NLCC-3300) is required for communications between the Operator Station and the Siemens S5 PLCs.

The S5-135U model with a CPU 928 requires that a powered 20mA to RS232 converter be used (such as the Westinghouse programming cable, PN NLCC-3100, or a compatible Siemens cable).

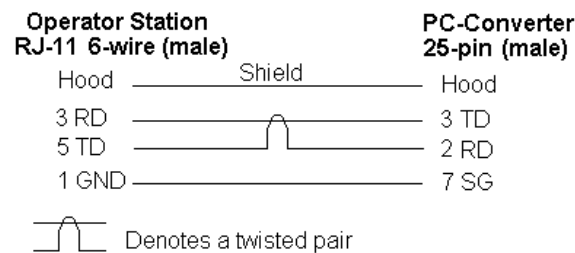
The S5-150U PLC model requires a Siemens communication cable, PN 6ES5 731-OB20, and an RS232 to current loop converter (such as the B&B electronics model 232PCLR with a 12 volt power supply, PN AD1210BB3).

The following figures show the cable configuration between the Operator Station and the PC-converter.

The Operator Station that has 9-pin female connectors (DB-9S) must have cables configured with male connectors (DB-9P).



The Operator Stations that have RJ-11 6-wire modular jacks must have cables configured with male modular connectors.



Cabling for the S7 Driver

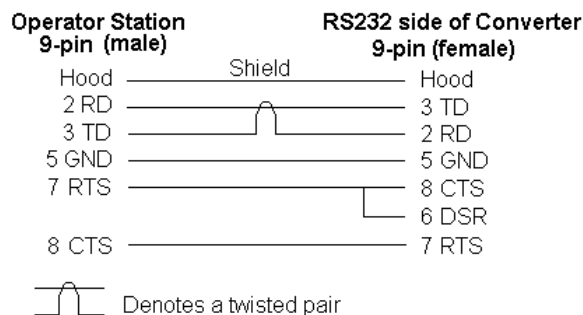
Operator Station to HMI Adapter Cabling

The Siemens S7 driver supports RS232C communications only.

The following figure shows the cable configuration between the Operator Station and the RS232 port of the HMI Adapter.

The Operator Stations that have 9-pin female connectors (DB-9S) must have cables configured with male connectors (DB-9P).

SI 22



Note: For PanelMate PC applications, a female 9-pin connector is required for connecting to a male 9-pin port. To quickly convert a Cutler-Hammer cable for PC use, simply attach the 9-pin Gender Changer found in the PanelMate PC Runtime Kit.

Communication Parameters

3964R Driver

The default communication parameters for the Siemens 3964R driver are shown below. If you intend to use any baud rate other than the default, you must use the Siemens programmer to change it. The data bits, parity, and stop bits must be set as show below and cannot be changed on the Siemens PLC.

Data bits	8
Parity	Even
Stop bits	1

Note: The baud rate is configurable to these settings: 19200, 9600, 4800, 2400, 1200, 600, 300 and 110. When using a CP525, the sum of the baud rate on the two serial ports must not exceed 19200. In all cases, configure the Operator Station's serial port to match the selected baud rate.

Note: In order for the Operator Station and the Siemens PLC to communicate, the Siemens PLC must be set to the higher priority. The Siemens SEND-ALL and RECEIVE-ALL functions must be executing in the CPU.

AS511 Driver

The default communication parameters for the Siemens AS511 driver are shown below. The baud rate, data bits, parity, and stop bits must be set as shown below and cannot be changed on the Siemens PLC.

Baud Rate	9600
Data bits	8
Parity	Even
Stop bits	2

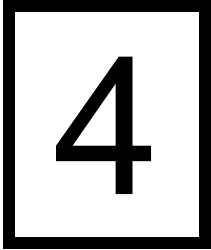
S7 Driver

The default communication parameters for the Siemens S7 driver are shown below. The baud rate can be set in the PLC Name and Port Table and is configurable to the following settings: 9600, 19200, and 38400. The data bits, parity, and stop bits must be set as shown below and cannot be changed on the Siemens HMI Adapter.

Baud Rate	9600
Data bits	8
Parity	Odd
Stop bits	1

Note: When communicating at rates other than 9600 baud, a communications error may occur when the PanelMate unit goes online. This error occurs when the Siemens HMI Adapter fails to respond to the initial request to reset its baud rate and can be ignored once communications are established a few seconds after the first page is drawn.

Word, Byte, and Bit References



In this chapter, you will learn:

- *How to configure word, byte, and bit references*

S5 Word Referencing Method

The general word referencing method is:

[plcname,word#format]

The "plcname" is the name of the designated PLC as listed in the PLC Name and Port Table. The "word" is the reference number (address) of the word or register to be read or written. The "#format" is a code which specifies the format of the data being read or written. The "plcname" and "#format" are optional.

The general bit referencing method is:

[plcname,bit]

The "plcname" is the designated PLC as listed in the PLC Name and Port Table. The "bit" is the reference number (address) of the bit, coil, or input to be written or read.

See the "Word and Bit References" topic in the Configuration Software Online Help for a more detailed explanation of word and bit references, including format descriptions.

Word, Byte, and Bit References for the 3964R Driver

The Siemens 3964R driver supports models S5-115U, S5-135U, and S5-155U. These models use decimal block numbers, register addresses and bit offsets.

Note that there is a one or two-character prefix that identifies the type of variable being referenced followed by the specific number of the variable. The following list contains the memory types supported by the Siemens driver.

C	Counter (Read only)
T	Timer (Read only)
DW	Data Word
FW	Flag Word (Read only)
IW	Input Word (Read only)
QW	Output Word (Read only)
DL	Left Byte in Data Word
DR	Right Byte in Data Word
FY	Flag Byte (Read only)
IB	Input Byte (Read only)
QB	Output Byte (Read only)
D	Data Bit
F	Flag Bit
I	Input Bit (Read only)
Q	Output Bit

Note: The prefixes are used to identify the usage of the variable to the Siemens PLC.

Word References

The following is the format for a data word memory reference.

[mddd:www]

m	Word memory type symbol (i.e., DW).
ddd	Data block number, 3-digit maximum, leading zeroes allowed.
www	Word offset within data block; 3-digit maximum, leading zeroes allowed.

The following is the format for a word memory reference or a register (16-bit word) reference in timer or counter memory (read only).

[m:www]

m	Word memory type symbol (i.e., IW, FW, QW, T, C).
www	Word, timer, or counter number; 3 digit maximum, leading zeroes allowed. (Input words are read only).

Byte References

The following is the format for a data byte memory reference.

[mddd:www]

m	Byte memory type symbol (i.e., DL, DR).
ddd	Data block number; 3-digit maximum, leading zeroes allowed.
www	Word number; 3 digit maximum, leading zeroes allowed

The following is the format for a byte memory reference.

[m:bbb]

m	Byte memory type symbol (i.e., IB, FY, QB).
bbb	Byte number; 3 digit maximum, leading zeroes allowed. (Input bytes, Flag bytes and Output bytes are read only.)

Bit References

The following is the format for a data bit reference within a data block.

[mddd:www.tt]

m	Byte memory type symbol (i.e., D).
ddd	Data block number; 3-digit maximum, leading zeroes allowed.
www	Byte number; 3 digit maximum, leading zeroes allowed.
tt	Bit number; 2 digit maximum.

The following is the format for a bit reference within a byte.

[m:bbb.t]

m	Byte memory type symbol (i.e., I, F, Q,).
bbb	Byte number, 3 digit maximum, leading zeroes allowed. (Input bits are read only).
t	Bit number; 1 digit maximum.

Word, Byte, and Bit References for the AS511 Driver

The Siemens AS511 driver supports models S5-90U, S5-95U, S5-100U, S5-115U, S5-135U, S5-135U, S5-150U, and S5-155U. These models use decimal block numbers, register addresses and bit offsets.

Note that there is a one or two-character prefix that identifies the type of variable being referenced followed by the specific number of the variable. The following list contains the memory types supported by the Siemens AS511 driver.

C	Counter (Read only)
T	Timer (Read only)
DW	Data Word
FW	Flag Word (Read only)
IW	Input Word (Read only)
QW	Output Word (Read only)
DL	Left Byte in Data Word
DR	Right Byte in Data Word
FY	Flag Byte (Read only)
IB	Input Byte (Read only)
QB	Output Byte (Read only)
D	Data Bit
F	Flag Bit
I	Input Bit (Read only)
Q	Output Bit

Note: The prefixes are used to identify the usage of the variable to the Siemens PLC.

Note: Extended data blocks are not supported. Data blocks 0 through 4 cannot be accessed by the Operator Station. These blocks are reserved for internal use by the S5 PLCs. String and floating point formats are not supported.

Word References

The following is the format for a data word memory reference.

[mddd:www]

m	Word memory type symbol (i.e., DW).
ddd	Data block number, 3-digit maximum, leading zeroes allowed.
www	Word offset within data block; 4-digit maximum, leading zeroes allowed.

The following is the format for a word memory reference or a register (16-bit word) reference in non-data block memory.

[m:www]

m	Word memory type symbol (i.e., IW, FW, QW, T, C).
www	Word, timer, or counter number; 3 digit maximum, leading zeroes allowed. (Input words, timers, and counters are read only).

Byte References

The following is the format for a data byte memory reference.

[mddd:www]

m	Byte memory type symbol (i.e., DL, DR).
ddd	Data block number; 3-digit maximum, leading zeroes allowed.
www	Word number; 4 digit maximum, leading zeroes allowed. (Data left bytes and Data right bytes are read only.)

The following is the format for a byte memory reference.

[m:bbb]

m	Byte memory type symbol (i.e., IB, FY, QB).
bbb	Byte number; 3 digit maximum, leading zeroes allowed. (Input bytes are read only.)

Bit References

The following is the format for a data bit reference within a data block.

[mddd:www.tt]

m	Byte memory type symbol (i.e., D).
ddd	Data block number; 3-digit maximum, leading zeroes allowed.
www	Byte number; 4 digit maximum, leading zeroes allowed.
tt	Bit number; 2 digit maximum.

The following is the format for a bit reference within a byte.

[m:bbb.t]

m	Byte memory type symbol (i.e., I, F, Q,).
bbb	Byte number, 3 digit maximum, leading zeroes allowed. (Input bits are read only).
t	Bit number; 1 digit maximum.

3964R Bit/Byte Function Block

The 3964R Protocol does not support bit and byte writes. The following Bit/Byte Write function block is required to provide this type of functionality. It allows the Operator Station to write to data word bits, output bits, flag bits, and data word bytes. The Operator Station writes directly to Data Block 230. Data Block 230 must exist in the PLC and be ten words in length.

Note: If the PLC Bit/Byte Write program uses interrupts which write to flag words 200-210, then these flag words should not be used. A solution would be to increase the size of data block 230 to 21 words and replace the flag word references with the new data block words.

ADDRESS	COMMAND		DESCRIPTION
000B	:		BIT/BYTE WRITE FUNCTION BLOCK
000C	:		*****
000D	:		
000E	:C	DB 230	CALLS DATA BLOCK 230
000F	:		
0010	:		OUTPUT BIT WRITE ROUTINE
0011	:		*****
0012	:L	KM 00000000	LOAD MASK INTO ACCUM1
0014	:L	DW 1	GET DW1 (OPERATOR STATION Q BIT WRITES)
0015	:<=F		TEST TO SEE IF BIT WRITE REQUESTED
0016	:JC	=M001	IF BIT WRITE PRESENT .. CONTINUE
0017	:		ELSE JUMP OVER SUBROUTINE
0018	:		
0019	:T	FW 200	TRANSFER DATA TO FW200 (FASTER).
001A	:L	KM 00000111 01111111	STRIP ALL BUT BIT # AND ADDRESS
001C	:AW		AND MASK WITH DATA.
001D	:T	FW 202	TRANSFER RESULT INTO FW202.
000E	:=	F 210.0	RESET THE FIRST OPERATION BIT.
001F	:A	F 200.4	CHECK FOR SET/RESET ==> INTO ROL.
0020	:DO	FW 202	LOAD BIT AND WORD ADDR. OF OUTPUT.
0021	:=	Q 0.0	COPY ROL VALUE INTO OUTPUT BIT.
0022	:0023	:L KH 0000	ZERO OUT DW1 IN DB230 SO ANOTHER
0025	:T	DW 1	BIT WRITE CAN BE PERFORMED.
0026	:		
0027	:		
0028	:		
0029	:		FLAG BIT WRITE ROUTINE.

ADDRESS	COMMAND	DESCRIPTION
002A M001	:	*****
002B	:L KM 00000000 00000000	LOAD MASK INTO ACCUM1.
002D	:L DW 2	GET DW2 (Operator Station F BIT WRITES)
002E	:<=F	TEST TO SEE IF BIT WRITE REQUESTED.
002F	:JC =M002	IF BIT WRITE PRESENT .. CONTINUE
0030	:	ELSE JUMP OVER SUBROUTINE.
0031	:	
0032	:T FW 200	TRANSFER DATA TO FW200 (FASTER).
0033	:L KM 00000111 11111111	STRIP ALL BUT BIT # AND ADDRESS
0035	:AW	AND MASK WITH DATA.
0036	:T FW 202	TRANSFER RESULT INTO FW202.
0037	:F 210.0	RESET THE FIRST OPERATION BIT.
0038	:A F 200.4	CHECK FOR SET/RSET ==> INTO ROL.
0039	:DO FW 202	LOAD BIT AND WORD ADDR OF OUTPUT.
003A	:F 0.0	COPY ROL VALUE INTO FLAG BIT.
003B	:	
003C	:L KH 0000	ZERO OUT DW2 IN DB230 SO ANOTHER
003E	:T DW 2	BIT WRITE CAN BE PERFORMED.
003F	:	
0040	:	
0041	:	
0042	:	DATA BIT WRITE ROUTINE.
0043 M002	:	*****
0044	:L KM 00000000 00000000	LOAD MASK INTO ACCUM1.
0046	:L DW 3	GET DW3 (OPERATOR STATION DATA BIT WRITES).
0047	:<=F	TEST TO SEE IF BIT WRITE REQUESTED.
0048	:JC =M003	IF BIT WRITE PRESENT .. CONTINUE
0049	:	ELSE JUMP OVER SUBROUTINE.
004A	:	
004B	:T FW 200	TRANSFER DATA TO FW200 (FASTER).
004C	:L KM 00001111 11111111	STRIP ALL BUT BIT # AND ADDRESS
004E	:AW	AND MASK WITH DATA.
004F	:T FW 202	TRANSFER RESULT INTO FW202
0050	:T FW 206	AND FW206

ADDRESS	COMMAND		DESCRIPTION
0051	:DO	DW 4	GET THE DB # AND
0052	:C	DB 0	CALL THE DB #.
0053	:L	FY 202	LOAD BIT AND WORD ADDR.
0054	:L	KM 00000000 00000111	LOAD THE MASK TO RETRIEVE THE BIT ADDR.
0056	:>F		IS THE BIT ADDR. BETWEEN 0-7.
0057	:JC	=M004	IF SO JUMP TO M004 (LO BYTE DATA BIT)
0058	:L	KB 209	ELSE SET UP FY207'S LO DATA
0059	:T	FY 207	
005A	:JU	=M005	JUMP OVER HI DATA BIT SETUP.
005B M004	:L	KB 208	SET UP FY207'S HI DATA BIT.
005C	:T	FY 207	
005D M005	:L	FW 202	LOAD BIT AND ADDRESS.
005E	:L	KM 00000000 11111111	MASK OUT ADDRESS.
0060	:AW		
0061	:T	FW 202	TRANSFER TO FW202 FOR SPEED.
0062	:D0	FW 202	SET UP FOR LW TO GET THE DATA WORD.
0063	:L	DW 0	LOAD THE DATA WORD INTO ACCUM1.
0064	:T	FW 208	TRANSFER THE CURRENT VALUE TO FW208.
0065	:=	F 210.0	RESET FIRST OPERATION BIT.
0066	:A	F 200.4	CHECK TO SEE IF SET OR RESET IS
0067	:DO	FW 206	PREFORMED AND SET OR RESET THE.
0068	:=	F 0.0	CORRESPONDING BIT.
0069	:L	FW 208	LOAD FW W/ BIT CHANGED
006A	:DO	FW 202	AND TRANSFER IT BACK TO ITS
006B	:T	DW	ORIGINAL DW.
006C	:C	DB 230	CALL ORIGINAL DATA BLOCK.
006D	:L	KH 0000	ZERO OUT DW3 IN DB230 SO ANOTHER
006F	:T	DW 3	BIT WRITE CAN BE PREFORMED.
0070	:		
0071	:		
0072	:		
0073	:		DATA BYTE HI WRITE ROUTINE.
0074 M003	:		*****
0075	:L	KM 00000000 00000000	LOAD MASK.
0077	:L	DW 6	CHECK TO SEE IF DATA BYTE HI WRITE

ADDRESS	COMMAND		DESCRIPTION
0078	:I=F		WRITE WAS REQUESTED CONTINUE IF YES
0079	:JC	=M006	ELSE JUMP OVER SUBROUTINE.
007A	:L	DW 5	LOAD THE DATA BYTE ADDR.
007B	:T	FW 200	TRANSFER IT TO FW200 FOR SPEED.
007C	:DO	DW 6	SET UP TO CALL THE DB.
007D	:C	DB 0	CALL THE DB.
007E	:L	FY 201	LOAD THE WORD ADDR.
007F	:T	FW 202	SET UP TO LOAD THE DATA WORD.
0080	:DO	FW 202	
0081	:L	DW 0	LOAD THE DATA WORD.
0082	:L	KM 00000000 11111111	MASK OUT THE HI BYTE.
0084	:AW		
0085	:L	FY 200	LOAD THE DATA BYTE.
0086	:SLW	8	ROTATE IT INTO POSITION.
0087	:OW		MERGE OLD LO AND NEW HI BYTES.
0088	:DO	FY 202	TRANSFER THE WORD BACK TO ITS
0089	:T	DW 0	ORIGINAL LOCATION.
008A	:C	DB 230	CALL BACK DB23.
008B	:L	KH 0000	ZERO OUT DW6 IN DB230 SO ANOTHER
008D	:T	DW 6	DATA BYTE HI WRITE CAN BE PERFORMED.
008E	:		
008F	:		
0090	:		
0091	:		DATA BYTE LO WRITE ROUTINE.
0092 M006	:		*****
0093	:L	KM 00000000 00000000	LOAD MASK.
0095	:L	DW 8	CHECK TO SEE IF DATA BYTE LO WRITE
0096	:I=F		WRITE WAS REQUESTED CONTINUE IF YES
0097	:JC	=M007	ELSE JUMP OVER SUBROUTINE.
0098	:L	DW 7	LOAD THE DATA BYTE ADDR.
0099	:T	FW 200	TRANSFER IT TO FW200 FOR SPEED.
009A	:DO	DW 8	SET UP TO CALL THE DB.
009B	:C	DB 0	CALL THE DB.
009C	:L	FY 201	LOAD THE WORD ADDR.
009D	:T	FW 202	SET UP TO LOAD THE DATA WORD.

ADDRESS	COMMAND		DESCRIPTION
009E	:DO	FW 202	
009F	:L	DW 0	LOAD THE DATA WORD.
00A0	:L	KM 11111111 00000000	MASK OUT THE LO BYTE.
00A2	:AW		
00A3	:L	FY 200	LOAD THE DATA BYTE.
00A4	:OW		ROTATE IT INTO POSITION.
00A5	:DO	FW 202	MERGE OLD HI AND NEW LO BYTES.
00A6	:T	DW 0	TRANSFER THE WORD BACK TO ITS
00A7	:C	DB 230	ORIGINAL LOCATION.
00A8	:L	KH 0000	CALL BACK DB230.
00AA	:T	DW 8	ZERO OUT DW6 IN DB230 SO ANOTHER
00AB M007	:BE		DATA BYTE LO WRITE CAN BE PERFORMED.

S7 Word Referencing Method

The general word referencing method is:

[plcname,dataType element#format]

The "plcname" is the name of the designated PLC as listed in the PLC Name and Port Table. The "dataType" is the memory area to be accessed. The "element#" is the reference offset of the data to be read or written. The "#format" is a code which specifies the format of the data being read or written. The "plcname" and "#format" are optional.

The general bit referencing method is:

[plcname,dataType element.bit]

The "plcname" is the designated PLC as listed in the PLC Name and Port Table. The "dataType" is the memory area to be accessed. The "element" is the reference offset (byte) of the data to be read or written. The "bit" is the bit within the element. The "plcname" is optional.

See the "Word and Bit References" topic in the Configuration Software Online Help for a more detailed explanation of word and bit references, including format descriptions.

Double Word, Word, Byte, and Bit References for the S7 Driver

The Siemens S7 driver supports the S7-300 and S7-400 models. These models use data block numbers, register addresses and bit offsets.

Note that there is a prefix that identifies the type of variable being referenced followed by the specific number of the variable. The following list contains the memory types supported by the Siemens driver.

I	Input Bit
IB	Input Byte
IW	Input Word
ID	Input Double Word
Q	Output Bit
QB	Output Byte
QW	Output Word
QD	Output Double Word
M	Memory Bit
MB	Memory Byte
MW	Memory Word
MD	Memory Double Word
T	Timer Value (Word)
C	Counter Value (Word)
DBn.DBX	Data Block Bit
DBn.DBB	Data Block Byte
DBn.DBW	Data Block Word
DBn.DBD	Data Block Double Word

Note: The prefixes are used to identify the usage of the variable to the Siemens PLC.

Data Formats

S7 PLCs support two formats for representing data when displayed as decimal: unsigned (WORD/DWORD) and signed (INT/DINT). When examining data in an S7 PLC using the S7 programming tool, the default for the data being displayed is signed. When displaying data with a PanelMate, the default data display type is unsigned. To display data as a signed type, use the “#S16” or “#S32” typecasting operators.

Double Word References

Double Word references are 32 bit data types and can be cast as 32 or 16 bit data types. The default data type is U32. The following is the format for a double word reference in Data Block memory.

[DBdddd.DBD bbbbb]

DB	Data block memory type symbol.
dddd	Data block number, 5-digit maximum, leading zeroes allowed.
.	Data block number / memory type separator (decimal point).
DBD	Data block double word memory type designator.
	Data block / offset separator (space).
bbbb	Byte offset within data block, 5-digit maximum, leading zeroes allowed.

The following is the format for a double word reference to I, Q, and M memory.

[tD bbbbb]

t	Memory type symbol (i.e., I, Q, M).
D	Double Word reference designator.
	Offset separator (space).
bbbb	Byte offset, 5-digit maximum, leading zeroes allowed.

Double word referencing of Timer and Counter memory is not supported.

Word References

Word references are 16 bit data types and can only be cast as 16 bit types. The default data type is U16. The following is the format for a word reference in Data Block memory.

[DBdddd.DBW bbbbb]

DB	Data block memory type symbol.
dddd	Data block number, 5-digit maximum, leading zeroes allowed.
.	Data block number / memory type separator (decimal point).
DBW	Data block word memory type designator.
	Data block / offset separator (space).
bbbb	Byte offset within data block, 5-digit maximum, leading zeroes allowed.

The following is the format for a word reference to I, Q, and M memory.

[tW bbbbb]

t	Memory type symbol (i.e., I, Q, M).
W	Word reference designator.
	Offset separator (space).
bbbbb	Byte offset, 5-digit maximum, leading zeroes allowed.

The following is the format for a reference to timer and counter memory. The default data type is BCD3.

[t bbbbb]

t	Memory type symbol (i.e., T, C).
	Offset separator (space).
bbbbb	Timer/counter number, 5-digit maximum, leading zeroes allowed.

Byte References

Byte references are 8 bit data types and cannot be cast. The following is the format for a byte reference in Data Block memory.

[DBdddd.DBB bbbbb]

DB	Data block memory type symbol.
dddd	Data block number, 5-digit maximum, leading zeroes allowed.
.	Data block number / memory type separator (decimal point).
DBB	Data block byte memory type designator.
	Data block / offset separator (space).
bbbbb	Byte offset within data block, 5-digit maximum, leading zeroes allowed.

The following is the format for a byte reference to I, Q, and M memory.

[tW bbbbb]

t	Memory type symbol (i.e., I, Q, M).
B	Byte reference designator.
	Offset separator (space).
bbbbb	Byte offset, 5-digit maximum, leading zeroes allowed.

Byte referencing of Timer and Counter memory is not supported.

Bit References

Bit references are single bit data types and cannot be cast. The following is the format for a bit reference in Data Block memory.

[DBdddd.DBX bbbb.x]

DB	Data block memory type symbol.
dddd	Data block number, 5-digit maximum, leading zeroes allowed.
.	Data block number / memory type separator (decimal point).
BDX	Data block bit memory type designator.
	Data block / offset separator (space).
bbbb	Byte offset within data block, 5-digit maximum, leading zeroes allowed.
.	Byte offset / bit offset separator (decimal point).
x	Bit within the byte.

The following is the format for a bit reference in I, Q, and M memory.

[t bbbb.x]

t	Memory type symbol (i.e., I, Q, M).
	Offset separator (space).
bbbb	Byte offset, 5-digit maximum, leading zeroes allowed.
.	Byte offset / bit separator (decimal point).
x	Bit within the byte.

Bit referencing of Timer and Counter memory is not supported.

Typecasting

The guidelines listed below should be followed when casting data types.

- Typecasting to smaller or equal sized data types is acceptable.
- Typecasting to larger data types is allowed in the editor but will result in invalid data for the references and should therefore be avoided.

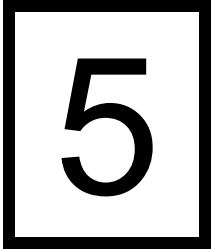
Bit Writes

The AS511 and S7 Protocols do not support direct bit data writes; therefore the Operator Station uses a Read-Modify-Write (RMW) algorithm.

CAUTION: WHEN USING THE AS511 OR S7 DRIVER, THE CONFIGURATOR MUST ENSURE THAT THE DATA BEING WRITTEN BY THE OPERATOR STATION IS NOT MODIFIED BY THE PLC PROGRAM DURING THE RMW CYCLE. MODIFICATION OF THE PLC WRITE DESTINATION DURING THE RMW CYCLE WILL RESULT IN INCORRECT DATA BEING PLACED IN THE PLC AND THE CONTROLLED MACHINERY BEING IN A POTENTIALLY HAZARDOUS STATE.

CAUTION: WHEN USING THE AS511 OR S7 DRIVER, DO NOT PROGRAM THE PLC WHILE THE OPERATOR STATION IS CONNECTED. PROGRAMMING THE PLC WITH THE OPERATOR STATION ATTACHED MAY RESULT IN THE OPERATOR STATION ACCESSING INVALID MEMORY LOCATIONS AND COULD RESULT IN ERRONEOUS OPERATION OF THE PLC PROGRAMMING LOGIC.

Maintenance Access



In this chapter, you will learn:

- *How to use the Maintenance Template*

Maintenance Access

The Maintenance Template will access all memory locations supported by the PLC driver as defined in this manual. When running online, you may change the PLC reference. The Maintenance Template is designed to assist you in specifying the PLC reference by scrolling through a list of mnemonics that are used to enter the PLC word reference. When online in the PLC reference change mode, the following list is available.

S5 PLC References

“I”, “Q”, “F”, “D”, “T”, “C”, “DW”, “IW”, “QW”, “FW”,
“DL”, “DR”, “IB”, “QB”, “FY”, “.”, and “.”

S7 PLC References

“I”, “IB”, “IW”, “Q”, “QB”, “QW”, “M”, “MB”, “MW”,
“DB”, “DBX”, “DBB”, “DBW”, and “.”

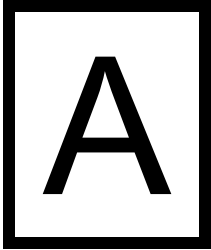
You must enter the correct mnemonics and numeric values and create a legal reference to change a PLC reference.

Note: When a new reference is entered on an Operator Station, the Maintenance Template will remain in a paused state until the **Start Monitor** control button or the **Chng** soft function key is pressed. When the **Start Monitor** control button or the **Chng** soft function key is pressed, the Operator Station will parse the reference. (Parsing means checking the syntax and range of the reference to ensure that it is supported by the driver.)

Note: The Maintenance Template does not support Double Words (32 bit) references.

Note: A Maintenance Template cannot be used to monitor unsolicited references.

PLC Cabling Cross-Reference List



In this chapter, you will learn:

- *The catalog numbers for PLC cables*

PLC Cabling Cross-Reference List

Cable for the 3964R Driver

Use the following catalog number:

SI21	Siemens PLC cable (RS232C)
------	----------------------------

Cables for the AS511 Driver

If you are communicating with the Siemens PLC via the programming port, the programming port supports 20 mA current loop communication. A 20 mA to RS232C converter (such as the PC-converter cable Siemens PN 6ES5 734-1BD20, or Westinghouse programming cable, PN NLCC-3100) is required for communications between the Operator Station and the Siemens S5 PLCs. Refer to the Cabling for the AS511 Driver section for more specific AS511 cabling information.

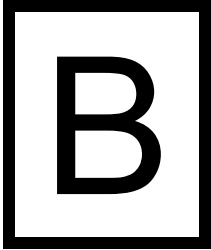
Cables for the S7 Driver

If you have a PanelMate and you wish to order a communication cable from Cutler-Hammer, use the following catalog number:

SI22	Siemens PLC cable (RS232C) including gender changer
------	---

In addition to the Siemens PLC Cable, a converter (HMI Adapter cable Siemens PN 6ES7 972-0CA11-0XA0) is required for communications between the Operator Station and the Siemens S7 PLCs.

Error Codes



In this chapter, you will learn:

- *About Siemens AS511 communication errors*
- *About remote errors*
- *About S7 parsing errors*

Communication Errors

The following are the unique communication errors that are detected specifically by the Siemens AS511 driver.

Note: When using the AS511 protocol, the Operator Station will take from 30 to 60 seconds upon completion of the configuration file load and display of data. The same delay will also be experienced following any communications error. The delay is due to the AS511 driver reading the system and block header information from the PLC.

Error	Error Name	Error Description
1750	Memory type <type> does not exist	Could not find memory <type> in PLC memory. Note that this error should never occur since all memory types by default must exist in the Siemens PLC.
1751	Data block <block> does not exist.	The block is not marked as a valid data block in PLC RAM.
1752	Data block <block> is not large enough.	The word offset for the write request or read request (either read block start or end offset) is larger than then what is configured on the PLC for the data block.
1753	Memory type <type> not large enough.	The word offset for the write request or read request (either read block start or end offset) is larger than then what exists on the PLC for the memory type.
1754	CPU could not be determined.	The CPU on the PLC is not supported by the Siemens AS511 driver (could not identify the CPU type).
1755	System parameters could not be read.	When the Operator Station initially comes up or after a communications problem with the PLC, the Operator Station attempts to read the system parameters of the PLC as part of the initialization. This information could not be obtained from the PLC.
1756	AS511 driver not initialized.	Data request failed since initialization information could not be obtained from the PLC. Either the CPU type could not be identified or the Operator Station cannot communicate with the PLC.
1757	CPU921 is not supported.	The A511 driver does not support the CPU921.
1758	Actual CPU type is incompatible.	The software configured CPU type and the type of CPU that is physically connected to the Operator Station are not compatible with each other. For example, an S5-90U PLC was software configured as an S5-155U PLC.

Remote Errors

AS511

The following are the remote errors that may be returned by the Siemens PLC in response to data requests from the Operator Station that would appear in the “Remote Error <dec number> (hex number) occurred during request” message.

Error	Error Description
0x01	PLC indicates that data follows in its responses to a write request that is invalid (i.e., conversion of error 0x00).
0x03	Function code is not valid.
0x04	Not enough PLC memory to perform the required operation; memory compression required.
0x05	Block already exists in RAM.
0x06	Block already exists in EPROM.
0x09	Block cannot be created.
0x0D	Wrong operating mode.
0x10	The PLC has started a communication function.
0x11	The PLC has stopped a communication function.
0x14	Block is not existing.

Note: It is expected that the Operator Station should not receive most of the above remote errors since the errors are associated with PLC programming.

S7 (MPI)

The following are the remote errors that may be returned by the Siemens HMI adapter. For these errors to be displayed by the Operator Station, serial communication must already be established between the Operator Station and the HMI adapter. An example of an error code displayed by the Operator Station is: “Rem: 0 (0h) on plc 1 via S7 CPU comm fault (0x205) MW10”.

Error	Error Description
0x0101	Communication link not available.
0x010A	Negative acknowledge / time out error.
0x010C	Data does not exist or is locked.
0x0200	Unknown error.
0x0201	Wrong interface specified.
0x0202	Too many interfaces.
0x0203	Interface already initialized.
0x0204	Interface already initialized with another connection.
0x0205	Interface not initialized. This may be due to an invalid MPI address (local or remote ID) or the PLC is not communicating on the MPI network.
0x0206	Can't set handle.
0x0207	Data segment isn't locked.
0x0209	Data field incorrect.
0x0302	Block size is too small.
0x0303	Block boundary exceeded.
0x0313	Wrong MPI baud rate selected.
0x0314	Highest MPI address is wrong.
0x0315	Address already exists.
0x031A	Not connected to MPI network.
0x031B	-
0x0320	Hardware error.
0x0381	Hardware error.
0x4001	Communication link unknown.
0x4002	Communication link not available.
0x4003	MPI communication in progress.
0x4004	MPI connection down. This may be due to an invalid MPI address (local or remote ID) or the PLC is not communicating on the MPI network.

Error	Error Description
0x8000	Interface is busy.
0x8001	Not permitted in this mode.
0x8101	Hardware error.
0x8103	Access to object not permitted.
0x8104	Context not supported.
0x8105	Address invalid. This may be due to a memory address that is not valid for the PLC.
0x8106	Data type not supported.
0x8107	Data type not consistent.
0x810A	Object doesn't exist. This may be due to a data block that doesn't exist in the PLC.
0x8301	Not enough memory on CPU.
0x8404	Serious error.
0x8500	Wrong PDU (response data) size.
0x8702	Address not valid.
0xD201	Syntax error: block name.
0xD202	Syntax error: function parameter.
0xD203	Syntax error: block type.
0xD204	No linked data block in CPU.
0xD205	Object already exists.
0xD206	Object already exists.
0xD207	Data block in EPROM.
0xD209	Block doesn't exist.
0xD20E	No block available.
0xD210	Block number too large.
0xD241	Protection level too low.
0xD406	Information doesn't exist.
0xD802	This job does not exist.
0xEF01	Wrong ID2, cyclic job handle.
0xFFCF	API function called with an invalid parameter.
0xFFFF	Timeout, check RS232 interface.

Note: If an error occurs, verify that the communication configuration is correct, the hardware is properly connected, and the Operator Station's reference is valid for that PLC model. Consult your Siemens documentation for more information regarding Siemens error codes.

S7 Parsing Errors

The following are the parsing errors that may be returned by the Siemens PLC while verifying an S7 reference.

Error Name	Error Description
Not a valid memory type	The reference contains an invalid memory type.
Bad or missing memory type	The memory type contains invalid characters or is missing from the reference.
Too many characters in memory type	The memory type in the reference contains more than 2 characters.
Bad or missing block number	There is no data block value specified after the separator character in the reference.
Too many characters in block number	The number contains more than 5 characters.
Invalid block number/word offset separator	The separator character between the data block number and data block memory type is not a "." character.
Not a valid memory type	The reference contains an invalid data block memory type.
Bad or missing memory type	The data block memory type contains invalid characters or is missing from the reference.
Too many characters in data block memory type	The data block memory type in the reference does not contain 3 characters.
Invalid memory type/number separator	The separator character between the memory type and offset is not a space (0x20).
Bad or missing reference offset	There is no offset value specified after the separator character in the reference.
Too many characters in reference offset	The offset contains more than 5 characters.
Invalid bit separator	The separator character between the offset and bit value is not a "." character.
Bit specified is out of range	The bit value specified must be 0-7.
Bad or missing bit value	There is no bit value after the separator character.
Too many characters in bit value	The bit value contains more than 1 character.
Invalid character after address	Characters exist after the valid reference, that are not expected.
Typecast invalid	The typecast was invalid for the reference.
Reference is read only	The reference specified to be written is read only.

Note: In Run Mode the Operator Station does not perform data typecast checks as is done in the Configuration Editor.

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