Instruction Bulletin

VD0C32S303A
October 1998
Raleigh, NC, USA

ALTISTART ® 46

Communication Option

**MODBUS® RTU, MODBUS ASCII,
UNI-TELWAY™
ASCII Protocol for PC
VW3G46301**

User's Manual

Telemecanique

SQUARE D

⚠ DANGER

HAZARDOUS VOLTAGE

- Read and understand this bulletin in its entirety before installing or operating ALTISTART controllers. Installation, adjustment, repair and maintenance of controllers must be performed by qualified personnel.
- Disconnect all power before servicing the controller.
- **Do not touch** unshielded components or terminal strip screw connections with voltage present.
- Install all covers before applying power or starting and stopping the controller.
- User is responsible for conforming to all applicable code requirements with respect to grounding all equipment.
- Many parts in the controller, including printed wiring boards, operate at line voltage. **Do not touch**. Use only electrically insulated tools while making adjustments.

Before installing the controller:

- Disconnect all power.
- Place a **"Do not turn on"** label on the controller disconnect.
- Lock the disconnect in the open position.

Electric shock will result in death or serious injury.

CHAPTER 1: INSTALLATION AND CONFIGURATION

INTRODUCTION

The VW3G46301 Communication Option (also referred to as C1 in this document) is designed for use with the ALTISTART 46 (ATS46) controller, allowing it to be connected to multi-drop networks using MODBUS RTU, MODBUS ASCII, or UNI-TELWAY protocols.

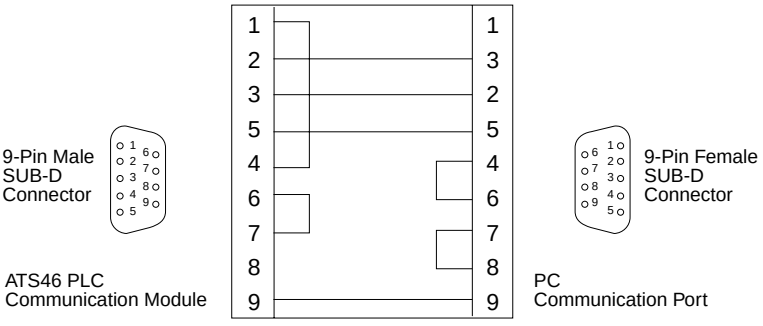
As a node on a network, the ATS46 controller can receive and respond to data messages. The communication option provides access to the following ATS46 functions:

- configuration of communication parameters
- configuration of controller parameters
- downloading of settings
- control and supervision
- monitoring and diagnostics

The VW3G46301 is supplied with a 118 in. (3 m) RS-485 connection cable fitted with a 9-pin, male/female SUB-D connector.

During the process of commissioning the ATS46 controller for MODBUS or UNI-TELWAY communications, four ATS46 parameters must be set via a PC Terminal Emulation Program. The parameters are outlined in Table 1 on page 12.

You must connect the PC's serial COM port to the PLC communication module (Figure 1 on page 2) with a cable. Order the PC cable, catalog no. VY1G461510, from a Square D distributor or construct a PC cable using the pin-out illustrated below.



System Safety

⚠ WARNING

LOSS OF CONTROL

- Control system designers must consider potential failure modes of control paths and, for certain critical control functions, provide a means of achieving a safe state during and after a path failure. An example of a critical control function is emergency stop. Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to implications associated with unanticipated transmission delays or failures of the link.

Failure to follow this instruction can result in death, serious injury, or equipment damage. [1]

[1] For additional information, refer to NEMA ICS 1.1-1984 (latest revision), *Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control.*

INSTALLING THE COMMUNICATION OPTION

Before performing any work on the controller, disconnect the power supply by using the safety switch disconnect or circuit breaker.

To install the communication option:

1. Ensure that the controller is connected to earth.
2. Mount the VW3G46301 communication option on the controller, as shown in Figure 1.

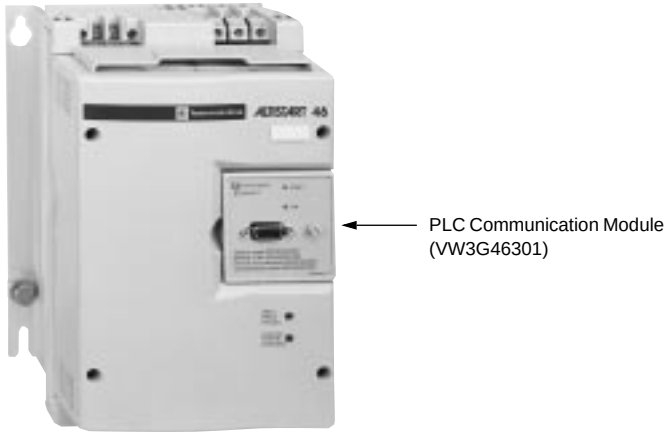


Figure 1: Mounting the PLC Communication Module

3. Connect the PC's serial COM port to the ATS46 PLC Communication Module. Use the optional PC cable, catalog no. VY1G461510 (ordered separately), or construct a cable using the pin-out illustrated on page 1.
4. With power applied to the ATS46 controller, set up the controller communication parameters (Table 1 on page 12) via the PC Terminal Emulation Program. If you are using Microsoft® Windows® version 3.11 and earlier, see page 11 for instructions. If you are using Windows 95 or a later version, refer to Appendix C for configuration instructions.
5. When configuration is complete, remove power from the ATS46 controller, remove the PC cable, and connect the cable supplied with this kit to the ATS46 Communications Module. Refer to "Wiring Recommendations" on page 6 for more information about wiring.

CONNECTING TO A MULTI-DROP BUS

SUB-D Connector Pin Configuration

The transmission interface is electrically isolated from the controller in accordance with the RS-485 and RS-422 (RS-232C compatible) standard, and is available on a 9-pin female SUB-D connector.

When using the ASCII protocol for PC, leave the TER/ input unconnected. When using a bus protocol, connect the TER/ input to the +5 V input.

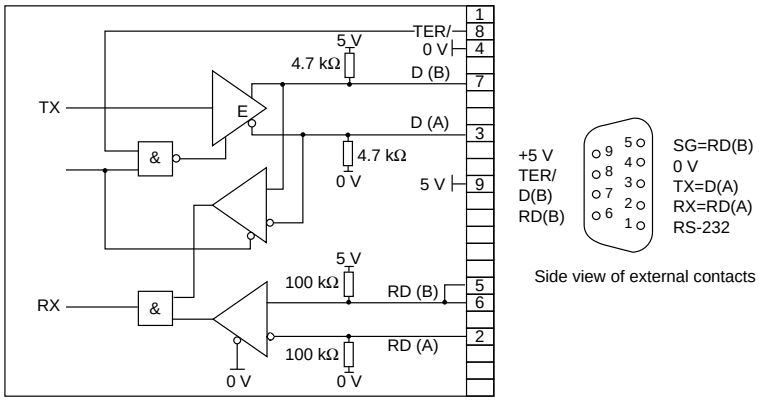


Figure 2: Electrical Interface

Connecting to a Standard RS-485 Bus

Cable with a 9- to 15-pin SUB-D connector is supplied with the option.

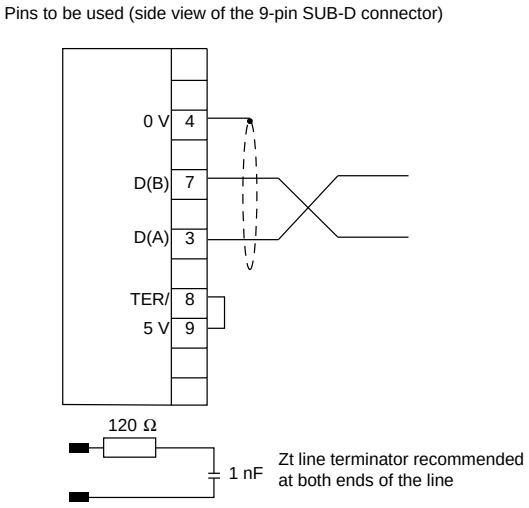


Figure 3: RS-485 Interface

Connecting to a Standard RS-422 Bus

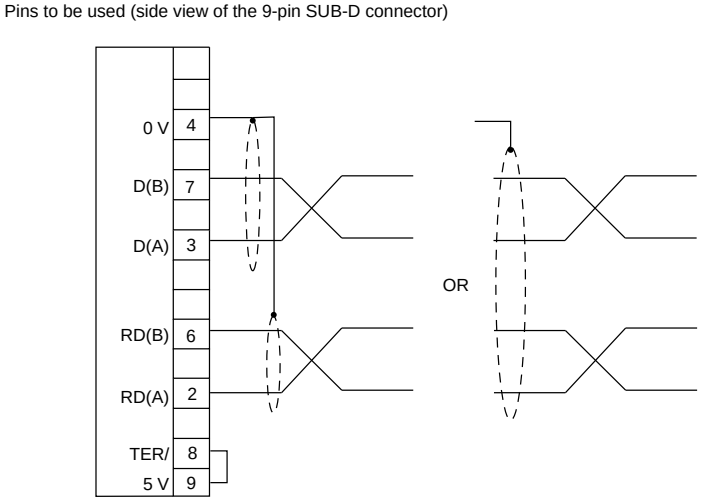
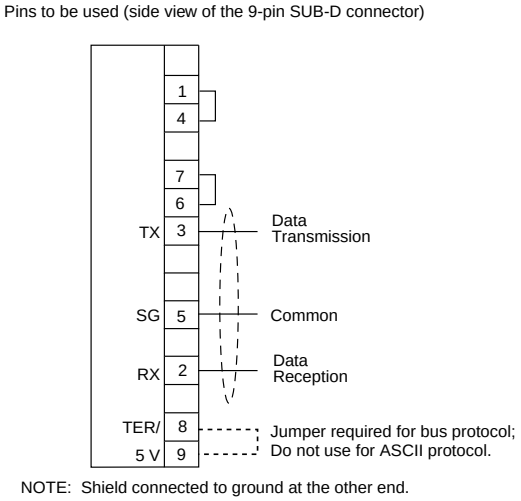


Figure 4: RS-422 Interface

Connecting to a Standard RS-232C Bus



NOTE: Shield connected to ground at the other end.

Figure 5: RS-232C Interface

When connecting to a PC, use the interconnection cable with a 9-pin SUB-D connector and the 9- to 25-pin adaptor.

Do **not** use the TER/ to 5 V jumper for ASCII protocol communication with a PC. However, the jumper is necessary for communications using the other protocols.

WIRING RECOMMENDATIONS

Follow the wiring practices required by national and local electrical codes in addition to the following:

- Use metallic conduit for all controller wiring. Do not run multidrop cable and power wiring in the same conduit.
- Metallic conduit carrying power wiring must be separated from metallic conduit containing the multidrop cable by at least 8 cm (3 in).
- Non-metallic conduit or cable trays used to carry power wiring must be separated from metallic conduit containing multidrop cable by at least 30.5 cm (12 in).
- Whenever power wiring and multidrop cable cross, the metallic conduit and non-metallic conduit or trays must cross at right angles.
- For the multidrop cable, use shielded cable with two pairs of twisted conductors. Use the cable recommended for each multidrop bus system shown.
- To equalize the voltage potential, connect the multidrop cable shield as shown in Figures 3, 4, or 5.

Connecting to a UNI-TELWAY Bus with Telemecanique PLC

Apply the following rules when constructing a UNI-TELWAY multidrop network:

- Limit the number of nodes on the network to 28.
- Limit the stub cable length at each junction to 20 m (66 ft).
- Terminate each end of each twisted pair of the multidrop cable as shown in Figure 6.

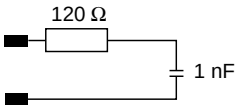


Figure 6: Termination Device

Connection Accessories

To facilitate connecting the controller to the multidrop bus, the following cable (available in three lengths) is recommended:

- TSX-CSA 100: length 100 m (328 ft)
- TSX-CSA 200: length 200 m (656 ft)
- TSX-CSA 500: length 500 m (1,640 ft)

The TSX-SCA62 terminal block (Figure 7) is a passive unit that features a printed circuit board fitted with screw terminals, enabling two pieces of equipment to be connected to the bus. There is a jumper in the box which can be used to connect the end-of-line terminator. Code the PLC address by setting the microswitches on the printed circuit board inside the box. These switch settings cannot be used to set the address of the ALTISTART 46 controller. For more information, refer to the documentation shipped with the TSX-SCA62.

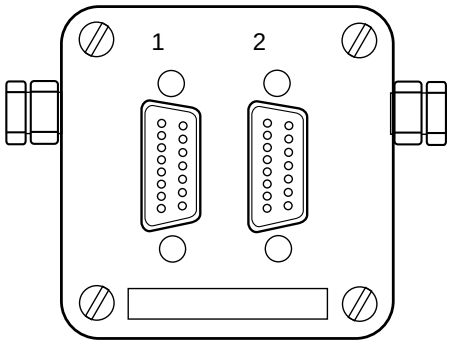


Figure 7: TSX-SCA62 Connector

Sample Network Layout

Figure 8 illustrates one possible system configuration involving multiple ALTISTART 46 controllers, connected to a UNI-TELWAY bus.

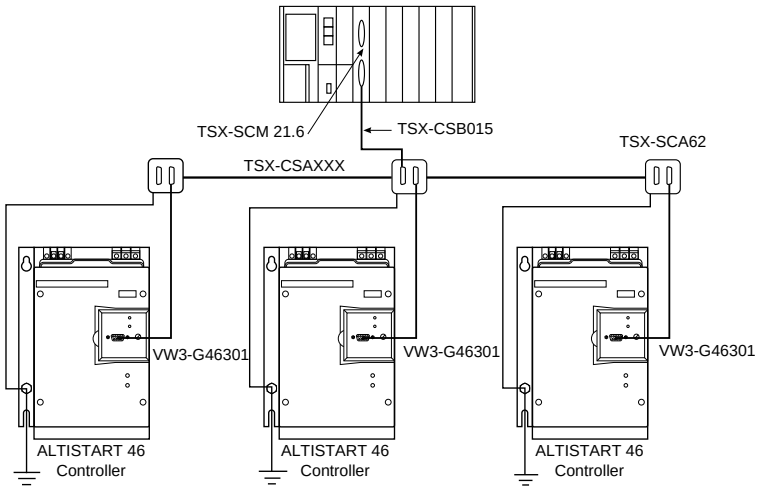


Figure 8: Example of Connection to UNI-TELWAY Bus

NOTE: The ground connections between the TSX-SCA62 box and the ALTISTART 46 controller must be made for good system operation. Connections should be as short as possible.

Connecting to a MODBUS Bus with MODICON™ PLC

Apply the following rules when constructing a MODBUS multidrop network:

- Limit the number of nodes on the network to 32, including the master node.
- Daisy-chain the multidrop cable as illustrated in Figure 9. Do not use stub connections.

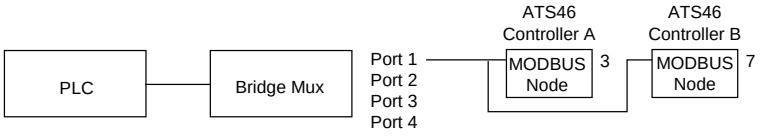
Connection Accessories

Many MODICON PLCs cannot initiate messages from a MODBUS port because they were intended to be used as slave devices only. Therefore, when using a MODICON PLC, the MODICON BM85 bridge/multiplexer (bridge mux) must be connected to the MODBUS Plus port. For multiple controllers, a data-enabled, RS-232C to RS-485 converter must be used. Figure 9 shows system configuration involving multiple ALTISTART 46 controllers connected to a MODBUS bus, using a MODICON PLC.

NOTE: Your MODBUS device or PLC may be capable of initiating a message directly from a MODBUS port (it must be a master port). Consult Schneider Automation for more information (1-800-468-5342).

If the bridge mux is configured as a slave port, only one ALTISTART controller can be connected to each port. For the bridge mux, the MODBUS address of the ATS46 controller is used as a slave device address in configuration setup screen V1. Remember to go to setup screen V4 to save changes before powering down the bridge mux.

If the bridge mux is configured as a master port, up to 31 ALTISTART controllers or other devices can be connected to each port.



MSTR Block Address routing talking to ATS46 Controller A:

Address first device 12
Address second device 1 (Port 1)
Address third device 3

MSTR Block Address routing talking to ATS46 Controller B:

Address first device 12
Address second device 1 (Port 1)
Address third device 7

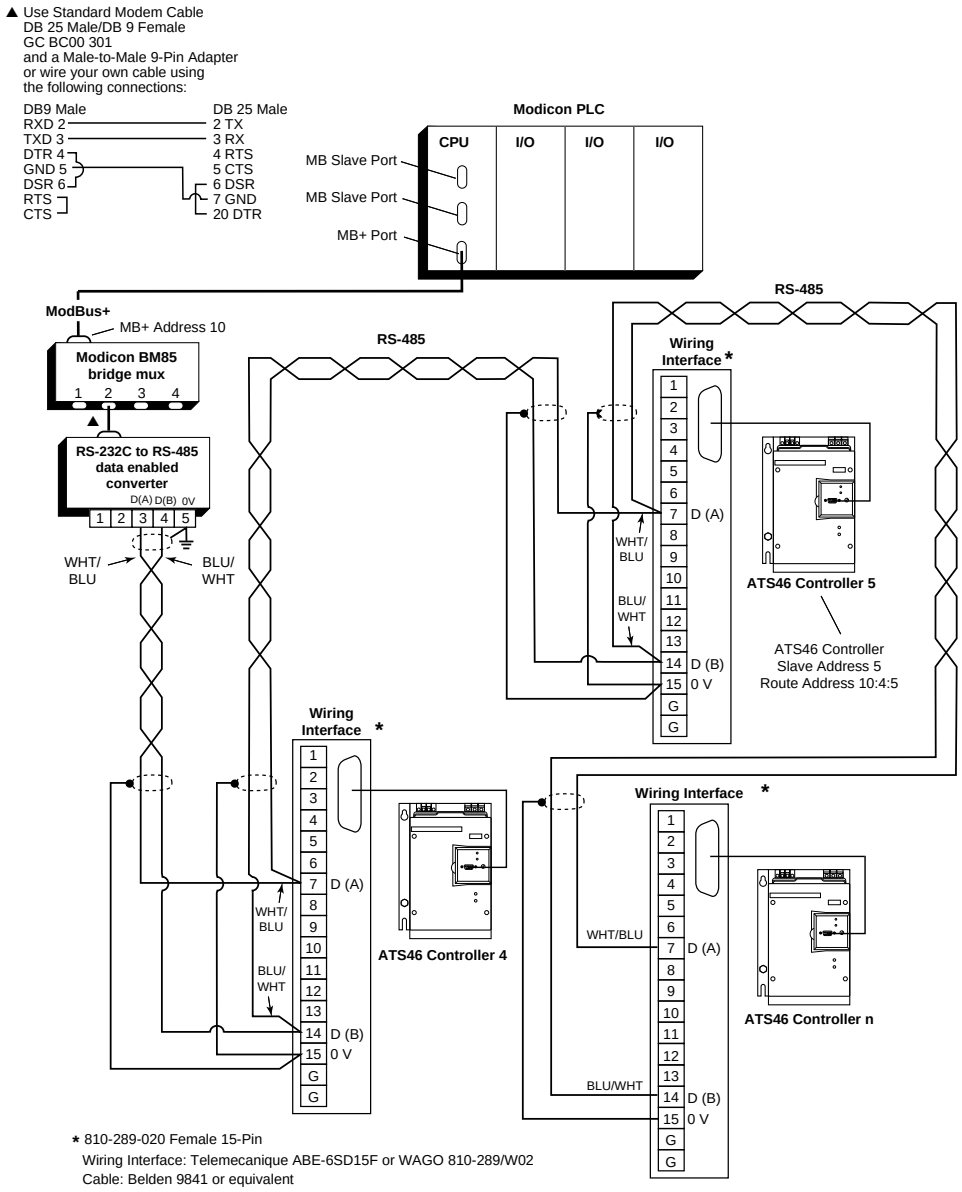
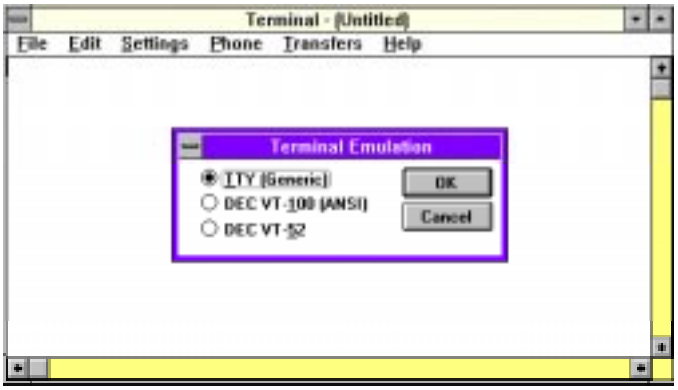


Figure 9: MODBUS Network Diagram

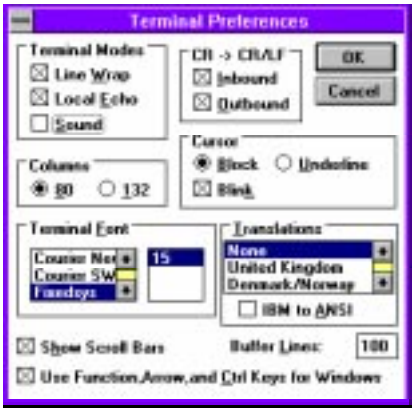
CONFIGURATION

To configure the Windows Terminal program:

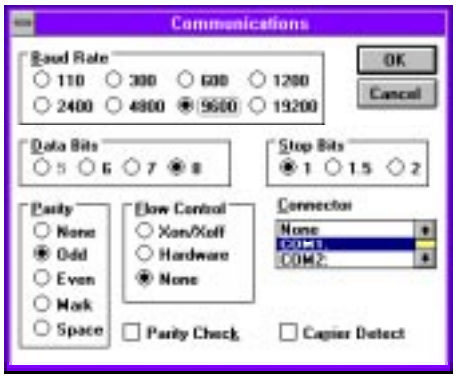
1. Access the Terminal menu by selecting the Accessories and Terminal icons.
2. As shown below, select «Settings», «Terminal Emulation», and TTY (Generic) from the Terminal menu.



3. From the Terminal menu, select «Settings» and «Terminal Preferences». Set the Terminal Preferences to the values shown below.



4. From the Terminal menu, select «Parameters» and «Configuration». Set Communications to the values shown below.



*NOTE: When you select the parity bit, the number of data bits changes to 7. In this case, change the number of stop bits to 2 to restore the number of data bits to 8. Then set the number of stop bits back to 1. Saving the terminal configuration to a *.trm file is recommended.*

Configuring the Bus Communication

The configuration parameters for the communication option can be read using any protocol, but can only be written in ASCII protocol. To select ASCII protocol, install a cable with no jumper strap between TER/ and 5 V. To use the configured protocol, install a jumper between TER/ and 5 V.

Table 1: Configuration Parameter Values

Address	Parameter	Selected Protocol	Permitted Values	ASCII	Default	Comments
W2290	Product Address (ADR)			ADR	0	
			0	NO		Address not configured
			1-31	Value		Station address
W2291	Protocol (PRO)			PRO	2	
		UNI-TELWAY	2	UTW		
			3	Reserved		
		MODBUS RTU	4	RTU		
		MODBUS ASCII	5	ASC		

Table 1: Configuration Parameter Values (Continued)

Address	Parameter	Selected Protocol	Permitted Values	ASCII	Default	Comments
W2292	Speed (SPD)			SPD	7	
			2	300		300 bits/s
			3	600		600 bits/s
			4	1200		1200 bits/s
			5	2400		2400 bits/s
			6	4800		4800 bits/s
			7	9600		9600 bits/s
			8	19200		19200 bits/s
W2293	Format (FOR)			FOR	2	
			2	8O1 [1]		8 bits/odd parity/1 stop bit
			3	8E1		
			4	8N1		
			5	8N2		
			6	7O1		
			7	7E1		
			8	7O2		
			9	7E2		
		UTW	2	8O1		Cannot be modified for UNI-TELWAY
		MODBUS RTU	2-5			
		MODBUS ASCII	2-9			

[1] Read as number of bits, parity (O=odd, E= even, N= none), number of stop bits
Example: 8O1 = 8 odd bits, 1 stop bit.

ASCII Message Format

The format of ASCII messages using Terminal is shown below.

PC (Master) question: ?{Data}{End}
ATS46 (Slave) answer: >{Data}{CR LF}

where:
Data = question or response data in ASCII format
End = one or two end characters (CR or LF or CR LF or LF CR)
CR = carriage return (H'OD')
LF = line feed (H'OA')

NOTES:

- *End characters are not shown in the remainder of this chapter.*
- *The Windows Terminal program does not use the backspace key (deleting the last character entered). If the backspace key is used, the echo of your message on the screen may seem correct, but it will be refused.*
- *If the question or a requested value is not correct, the response is >N.*

Reading the Configuration

question:	?CONF
response: (factory configuration)	>CONF:PRO:UTW ADR:NO SPD:9600 FOR:8O1

The above sample configuration reads: UNI-TELWAY protocol, address not configured, speed 9600 bits/s, 8-bit format, odd parity, one stop bit.

Response parameter descriptions are provided in the ASCII column of Table 1 on page 12.

Modifying the Configuration

Changes made to the communication configuration are saved in ATS46 memory. The response format when modifying the configuration is identical to that when entering the configuration. The parameters are listed in Table 1 on page 12, and they can be modified one at a time (Example 1) or several in one question (Example 2). The mnemonics are provided in the ASCII column and the possible protocol values in the Permitted Values column of Table 1.

Example 1

address 1	?ADR=1
UNI-TELWAY protocol	?PRO=UTW
speed 19200 bits/s	?SPD=19200
8-bit format, odd parity,1 stop bit	?FOR=8O1

Example 2

MODBUS RTU protocol, address 1, speed 4800 bits/s, 8-bit format, no parity, 1 stop bit	?CONF=PRO=RTU ADR=1 SPD=4800 FOR=8N1
UNI-TELWAY protocol, speed 19200 bits/s (format is fixed, address not modified)	?CONF=PRO=UTW SPD=19200

Any parameters that are not modified retain their previous values (ensure that these values are correct).

Modifying the Configuration by Sending a File

It is possible to enter the configuration in a text file, prepared using a text editor (Windows Notepad type), to avoid typing the same command line repeatedly.

Enter the configuration you wish to send (e.g., ?CONF=PRO=UTW ADR=1 SPD=9600) in the notepad and save the file. The file must end with a CR or LF. Press Enter at the end of the configuration line.

In the Windows Terminal «Transfer» menu, select «Send a text file», then select the file previously saved. The file is immediately transmitted via the Serial Link. A message confirming the transfer is displayed.

Configuration Help

Help is provided for the mnemonics used. For example:

To access Help:	?HELP
Response:	?HELP PRO ADR SPD FOR
To access parameter Help:	?HELP PRO
Response:	>HELP PRO: PRO=UTW or RTU, ASC

Information Requests

To identify the ATS46 controller type and option being used, send the following request:

Information request:	?INFO
Response:	>INFO:C1:V:1.0 IE01H TYPE:01H CS9B5AH ATS46D32:V1.1

In the above example, the communication option C1 (=VWG46301) has software version V1.0 IE01 (E= version index), a standard type with a program that contains H'9B5A' as checksum. The ATS46 controller type is ATS46D32 with software version V1.1.

NOTE: The checksum listed above is not an exact value for V1.0 software, but is provided to illustrate the Response format.

DIAGNOSTICS

Two indicator lamps are on the front panel of the option:

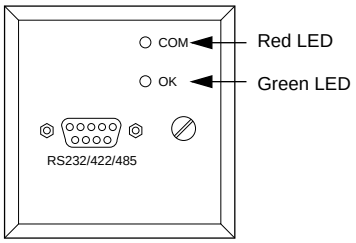


Figure 10: Communication Interface

Table 2: Communication Diagnostics

OK Lamp Green	COM Lamp Red	Probable Cause	Corrective Action
1	0	Normal operation, bus and controller present	OK
0	0	Switched off, powered off	Check the interface or the communication option.
0	1	Bus communication fault	Check the communication bus and the connections. Check the switches on the subscriber sockets.
0	1/10 [1] (6x)	Character error	Check the communication configuration or the TER/-5 V strap (absent in ASCII protocol/present in bus protocol).
1/10	0	Communication option not configured	Configure the communication option.
1/2	0	Communication fault between the communication option and the ATS46 controller (bus cable connected to option)	Check the 6-pin connector between the option and the ATS46 controller.
1/2	1	Communication fault between the communication option and the ATS46 controller (PC cable connected to option)	Check the 6-pin connector between the option and the ATS46 controller.

Lamp status: 0 = off 1 = on 1/2 = slow flashing (500 ms) 1/10 = fast flashing (100 ms)

[1] This display flashes for 600 ms (3x on and 3x off) if an incorrect character has been received. The short flashing is repeated after a period of five seconds if an incorrect character is received. This only occurs when the communication option is set for communication fault (no message received for 10 s in bus communication or 1 s in ASCII protocol).

If the option never changes to normal operation, this display indicates that the wiring is correct (except, perhaps, for the TER/–5 V strap), but that the configuration speed or format is not suitable.

Additional Diagnostics

For an explanation of fault code registers, refer to Table 9 on page 27.

CHAPTER 2: CONNECTIONS AND REGISTER DEFINITIONS

COMMUNICATION PRINCIPLES

Power Connections

The power wiring to the ALTISTART 46 (ATS46) controller can be connected in accordance with the diagrams shown in the ATS46 user guide, part number VD0C32S301.

Control Connections

The connection from STOP to PL must be made at all times for the controller to run. As shown in Figure 11 on page 18, the control connection scheme depends on whether the start command is to be issued via the terminal strip (LOCAL mode) or through the PLC (LINK mode). The control scheme also depends on the setting of the DLI bit (W4060,1), as shown in Table 3.

Table 3: Setting the DLI Bit

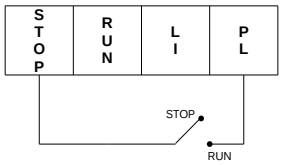
	LOCAL Mode (DLI = 0)	LINK Mode (DLI = 1)
LI–PL connection = 0 (not connected)	Standard operation — can configure LI for all available options	Start command only by PLC. LI ignored unless configured for local control.
LI–PL connection = 1 (connected)	Cannot switch to LINK mode if LI is configured for local control. Other LI configurations can be used but will not prevent switching to LINK mode.	Start command only by terminal input

⚠ WARNING

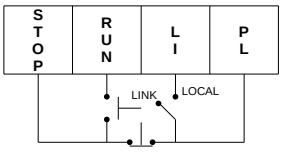
UNINTENDED EQUIPMENT OPERATION

If DLI = 1, the logic input (LI) is ignored unless configured for Force to Local Control (W4022=4). All other functions of the logic input must be actuated through the PLC command (W4060).

Failure to follow this instruction can result in death, serious injury, or equipment damage.



Only connect from STOP to PL when starting solely from a PLC.



Use 3-wire control to start from the terminal or from a PLC.

Figure 11: Control Connections

ATS46 States

If automatic restart is not used, the controller state is either no fault (ready/run) or fault. Figure 12 shows the four controller states which exist if automatic restart is selected (W4035,1).

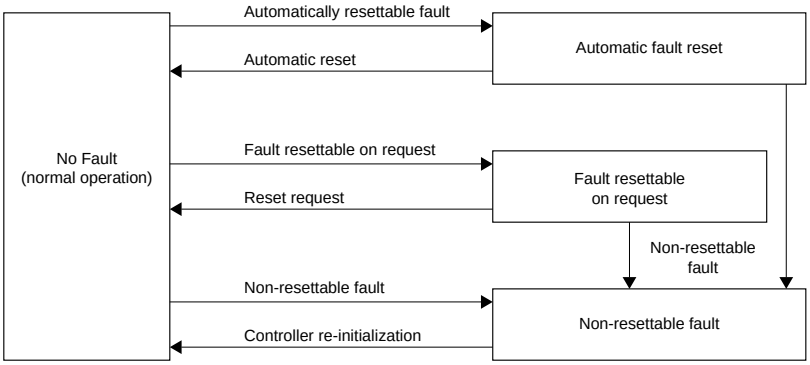


Figure 12: ATS46 Controller States

⚠ WARNING

UNINTENDED EQUIPMENT ACTION

- Automatic restart can only be used for machines or installations that present no danger to personnel or equipment in the event of automatic restarting.
- Equipment operation must conform with national and local safety regulations.

Failure to follow this instruction can result in death, serious injury, or equipment damage.

Descriptions of each ATS46 state are provided below.

	State	**Standard Mode** (W4035,1 = 0)	**Auto Reset Mode** (W4035,1 = 1)
1	No Fault	Controller is ready or running with no fault condition detected.	Controller is ready or running with no fault condition detected.
2	Automatic Reset Fault	Not taken into account.	This state follows a fault that can be reset without further intervention. If R1 is configured as a fault relay, this type of fault does not cause the R1 relay to change state. If R1 is configured for control of an isolation contactor, this type of fault causes the R1 relay to change state.
3	Fault Reset on Request	Causes the R1 relay to change state. Relay will re-energize when a new run command is issued and the fault has cleared.	When a fault is encountered, the drive will check to see if (W4035,1=1) is set. If true, the drive will reset once the fault is cleared. This will occur only if the fault is an auto restart type. Refer to the *Soft Start Controller User's Manual,* part number VD0C32S301, for more information on faults.
4	Non-resettable Fault	Requires cycling of control power to reset.	Requires cycling of control power to reset.

Data Structure

The adjustment, control, supervision, and monitoring of ATS46 controllers are performed using data (or objects) that are specific to this product.

The data consists of:

- **Bits** that execute logic commands and are designated Bi, where i = Bit number. For example, B1 = Starter reset (request for online reset).
- **Words** (of 16 bits) are designated Wx, where x is a word number. Words are used to save either integer values (0 to 65535) or 16 independent logic states that are called registers.

Example: W4028 = Boost level (digital value)
W4061 = Controller status register (16 status bits)

NOTE: Bit numbers are displayed as 0 to 9, then A to F. For example, W4061,1 designates Bit 1 of register 4061. W4061,F designates Bit F of register 4061.

Accessing Data

The tables at the end of this chapter list the parameters that can be accessed via the communication link. The exact function of each parameter and its effect on the behavior of the controller are described in the ATS46 user guide, part number VD0C32S301.

Data including fault and monitoring information can only be read. Any attempt to write to this data will be refused. The bits and words corresponding to the adjustment, configuration and command parameters can be written to as well as read.

Units

Words are expressed as unsigned integer values (0 to 65535), using the units defined in the tables at the end of this chapter. For values that are listed as decimal units in the register definition tables, the decimal point is implied.

Example: W4037 = Initial torque as a percentage of Tn (e.g., 50 = 50% of Tn)

Ranges

The range permitted by the controller is specified for each parameter. Where noted, 0 in the range column indicates that when the parameter is set to 0, the function is disabled.

Example: When W4036 = 0, no maximum torque limit is specified; otherwise, the adjustment range is from 10 to 200 (as a percentage of Tn).

Power-Up Values

Each time the ATS46 controller is powered up, it is initialized with the configuration and adjustments stored in EEPROM memory (in LINK mode, store adjustments with W4060,E or return to factory settings with W4060,D).

The controller is systematically set to LOCAL control mode (commands are expected on the terminal block). To control the ATS46 controller from a multi-drop bus, it is necessary to assign the commands to LINK mode by setting W4060,1 to 1.

LINK/LOCAL Management

Two control modes are provided for ATS46 controller operation:

- LOCAL mode via 2- or 3-wire terminal block control
- LINK mode via a PC or a PLC

ATS46 operating modes are only effective for accessing the command parameters and have no effect on the configuration, adjustment, or monitoring parameters.

Table 4: LINK/LOCAL Transition Parameters

Parameter	Description
Command bit B2 (DLI)	Assigns commands to LINK/LOCAL mode
Command word W4060,1 (DLI)	Same as command bit B2 (DLI)
Command bit B4 (NTO)	No time out
Command word W4060,4 (NTO)	Same as command bit B4 (NTO)
Configuration word W4022 (LI)	Assigns LI to LOCAL mode
Configuration word W4029 (STY)	Selects stop type via LI_STOP
Monitoring word W4061,0 (LOC)	LOCAL mode = 1, LINK mode = 0
Monitoring word W4061,5 (FLO)	LOCAL mode = 1, not LOCAL mode = 0
Monitoring word W4066,0 (LIO)	State of LI (0=low, 1=high)

Operation

In LOCAL mode, the terminal block is active and must be used to start and stop the ATS46 controller.

In LINK mode, the serial link has write access to the commands. Only the STOP terminal is active and will override all other commands.

If the controller is configured for LOCAL mode and LI is configured for local control, activating LI will prevent the controller from switching to LINK mode.

When the controller is switched out of LINK mode, the controller will run if there is a RUN command present at the terminal strip.

In LINK mode, messages must be sent to the controller regularly (at least one message every 10 seconds with UNI-TELWAY, MODBUS ASCII, and MODBUS RTU protocol and every second in ASCII protocol). If a message is not received, a controller serial link fault (SLF) occurs. The communication check can be inhibited by setting bit NTO to 1, which prevents the SLF fault from displaying. This is useful in setup and troubleshooting; however, NTO should be set to 0 for normal serial link command operation.

⚠ WARNING

LOSS OF CONTROL

Setting B4 or W4060,4 (NTO) to 1 disables serial link fault protection. Provide alternate control paths when disabling serial link fault protection.

Failure to follow this instruction can result in death, serious injury or equipment damage.

ATS46 CONTROLLER REGISTER DESCRIPTIONS

NOTE: When using the MSTR block (refer to "MSTR Block" on page 40), add 1 to the register number. Bit 0 is always the right-most or least-significant bit. Bit F is always the left-most or most-significant bit.

Table 5: Command Bits (read and write)

Bit	Name	Description	Function	Address
B0	RST	Controller reset command	Acknowledges a correctable fault and resets the fault relay.	W4060,0
B1	DLI	Command assigned to LINK/LOCAL mode	LINK = 1, LOCAL = 0 The controller can only be controlled via the serial link (bus or PC) or via its terminal block.	W4060,1
B2	EXT	External fault	The controller triggers an EtF fault.	W4060,2
B3	—	Reserved	—	—
B4	NTO	No Time Out	The controller does not trigger an SLF fault if messages are not received within 10 s.	W4060,4
B5	RUN	Start command	0=inactive; 1=active	W4060,5
B6	CAF	Braked stop command	0=inactive; 1=active	W4060,6
B7	CAD	Decelerated stop command	0=inactive; 1=active	W4060,7
B8	CAL	Freewheel stop command	0=inactive; 1=active	W4060,8
B9	—	Reserved	—	—

The bit designations in Table 5 follow UNI-TELWAY protocol. When using MODBUS protocol, observe the following bit order designation.

UNI-TELWAY	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
MODBUS	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

There is a shift of 1 between the address in UNI-TELWAY and MODBUS protocols. When using MODBUS protocol, add 1 to each address listed in the following tables.

Failure to follow this instruction can result in death, serious injury, or equipment damage.

Table 6: Adjustment Words (read and write)

Address [1]	Name	Range	Unit	Description	Possible Values
W4036	TLI	0 [2] 10–200	% of Tn	Max torque during acceleration	0 = off (CLP must be on for value to be used)
W4037	TQ0	0–100	% of Tn	Initial torque during acceleration	
W4038	EDC	0–100	% of Tn	End of deceleration ramp threshold	
W4039	ILT	150–700 max 500% I_{CL}	% of In	Current limit	0 = off
W4040	OIL	0 [2] 50–300	% of In	Current limit alarm	0 = off
W4041	BRC	0–100	—	Braking current	
W4042	EBA	20–100	% of braking time	Adjustment of braking time	
W4043	ACC	1–60	S	Acceleration ramp time	
W4044	DEC	1–60	S	Deceleration ramp time	
W4045				Reserved	
W4046				Reserved	
W4047	RGC	0–100	—	Adjustment of deceleration gain	

[1] When using MODBUS protocol, add 1 to the address.
[2] When the parameter is set to 0, the function is disabled.

Table 7: Configuration Words (read and write)

Address [1]	Name	Range	Unit	Description	Possible Values
W4018–4019				Reserved	Read at 8000 H
W4022	LI	0–8		Logic input LI assigned	0=not assigned 1=force freewheel 2=external fault [2] 3=reserved 4=local control 5=cascading motor control 6=reserved 7=motor overload reset 8=fault reset
W4023	LO1	0–2		Logic output LO1 assigned	0=not assigned 1=motor thermal alarm 2=motor powered
W4024	AO	0–5		Analog output AO assigned	0=not assigned 1=motor current (A) 2=motor torque (% Tn) 3=motor thermal state 4=power factor 5=active power

[1] When using MODBUS protocol, add 1 to the address.
[2] In LINK mode, an external fault must be indicated by the PLC. Do not connect the external fault indication device to the logic input on the ATS46 controller, as the signal will be ignored.
[3] When the parameter is set to 0, the function is disabled.

Table 7: Configuration Words (read and write) (Continued)

Address [1]	Name	Range	Unit	Description	Possible Values
W4025	ASC	50–500	%	Analog output scale	
W4026	IN	50–130% ICL	0.1 A	Motor nominal current	
W4027	LSC	20–90	% losses	Stator loss compensation	
W4028	BST	0 [3], 50–100	% of V	Voltage boost level	
W4029	STY	0–2		Stop type selection via logic input LI_STOP	0=freewheel 1=deceleration ramp 2=braking
W4030	PHR	0–2		Default assigned to phase rotation	0=off 1=direct rotation direction 2=reverse rotation direction
W4031	ULL	0 [3] or 20–100	% of Tn	Underload trip threshold	
W4032	TBS	0–999	seconds	Time adjustment before starting	
W4033	TLS	0 [3], 10–999	seconds	Start time too long	
W4034	THP	0–7		Motor thermal protection	0=protection inhibited 1=sub-class 2 2= class 10A 3=class 10 4=sub-class 15 5=class 20 6=sub-class 25 7=class 30
W4035	CNF			Configuration register	
	CLP	0–1		Torque control	4035,0 = 0 off 4035,0 = 1 on
	ARS	0–1		Automatic reset	4035,1 = 0 manual reset 4035,1 = 1 auto reset
	R1	0–1		Relay R1 assignment	4035,2 = 0 fault relay 4035,2 = 1 isolating relay (Bit 4060,0 controller reset function clears fault when this relay is used as a fault relay.)
	LO2	0–1		Logic output LO2 assignment	4035,3 = 0 not assigned 4035,3 = 1 current threshold alarm
	AO1	0–1		Analog output range	4035,4 = 0 0–20 mA 4035,4 = 1 4–20 mA
	SST	0–1		Select test operation on a low power motor	4035,5 = 0 not assigned 4035,5 = 1 test function
	CSC	0–1		Cascading motor	4035,6 = 0 not active 4035,6 = 1 active
				Reserved	4035,7–F

[1] When using MODBUS protocol, add 1 to the address.
[2] In LINK mode, an external fault must be indicated by the PLC. Do not connect the external fault indication device to the logic input on the ATS46 controller, as the signal will be ignored.
[3] When the parameter is set to 0, the function is disabled.

Table 8: Command Word (read and write)

Address [1]	Name	Range	Unit	Description	Possible Values
W4060	CMD			Command register	
	RST			Controller reset command	W4060,0 = 0 inactive W4060,0 = 1 active
	DLI			Commands assigned over link	W4060,1 = 0 commands not assigned over link W4060,1 = 1 commands assigned over link
	EXT			External fault command	W4060,2 = 0 inactive W4060,2 = 1 active on positive edge [2]
	DMC			Motor deceleration control in cascade	W4060,3 = inactive W4060,3 = 1 active
	NTO			No time out (no SLF fault)	W4060,4 = 0 enable W4060,4 = 1 disable
	RUN			Start command	W4060,5 = 0 inactive W4060,5 = 1 active
	CAF			Braked stop command	W4060,6 = 0 inactive W4060,6 = 1 active
	CAD			Decelerated stop command	W4060,7 = 0 inactive W4060,7 = 1 active
	CAL			Freewheel stop command	W4060,8 = 0 inactive W4060,8 = 1 active
	RTH			Reset motor thermal state	W4060,A = 0 no W4060,A = 1 yes/reset
	TRE			Reset elapsed time	W4060,C = 0 inactive W4060,C = 1 active on positive edge
	INT			Recall factory setting	W4060,D = 0 inactive W4060,D = 1 active on positive edge [2]
	MRE			Store adjustments in EEPROM	W4060,E = 0 inactive W4060,E = 1 active on positive edge [2]
	RRE			Recall adjustments in EEPROM	W4060,F = 0 inactive W4060,F = 1 active on positive edge [2]

[1] When using MODBUS protocol, add 1 to the address.

[2] Bit returns to 0 after operation.

Table 9: Monitoring Words (read only)

Address [1]	Name	Range	Unit	Description	Possible Values
W4061	ETA			Controller status register	
	LOC			Local/Link mode	W4061,0 = 0 local W4061,0 = 1 link
	RDY			Controller status	W4061,1 = 0 not ready W4061,1 = 1 ready
	FAI			Controller faulted	W4061,2 = 0 normal operation W4061,2 = 1 faulted
				Stopped after request via terminal block	W4061,3 = 0 false W4061,3 = 1 true
	FLO			Local control	W4061,5 = 0 false W4061,5 = 1 true
	NTO			Communication check inhibited	W4061,6 = 0 false W4061,6 = 1 true
				Current alarm threshold	W4061,7 = 0 false W4061,7 = 1 true
	SST			Steady state	W4061,8 = 0 false W4061,8 = 1 true
				Short-circuit	W4061,9 = 0 false W4061,9 = 1 true
				Stop phase	W4061,A = 0 false W4061,A = 1 true
				Acceleration phase	W4061,B = 0 false W4061,B = 1 true
	OVL			Motor thermal alarm	W4061, C = 0 false W4061,C = 1 true
	LIM			Current limited	W4061,D = 0 false W4061,D= 1 true
	NLP			No mains supply	W4061,E = 0 false W4061,E = 1 true
				Mains supply frequency	W4061,F = 0 50 Hz W4061,F = 1 60 Hz
W4062	LCR	0–999	A/10	Motor current	
W4063	LTR	0–255	% of Tn	Motor load state	
W4064	LTH	0–250	%	Motor thermal state	

[1] When using MODBUS protocol, add 1 to the address.

[2] Bit returns to 0 after operation.

Table 9: Monitoring Words (read only) (Continued)

Address [1]	Name	Range	Unit	Description	Possible Values
W4065	PHR	0–2		Phase rotation state	0=off 1=direct rotation direction 2=reverse rotation direction
W4066	LIO			State of logic I/O	
				Logic input LI	W4066,0 = 0 low W4066,0 = 1 high
				Logic output LO1	W4066,1 = 0 low W4066,1 = 1 high
				Logic output LO2	W4066,2 = 0 low W4066,2 = 1 high
				Relay R1	W4066,3 = 0 open W4066,3 = 1 closed
				Relay R2	W4066,4 = 0 open W4066,4 = 1 closed
				Vigithem	W4066,5 = 0 thermal overshoot W4066,5 = 1 closed
				Logic input LI_RUN	W4066,6 = 0 low W4066,6 = 1 high
				Logic input LI_STOP	W4066,7 = 0 low W4066,7 = 1 high
				Operating duty switch	W4066,8 = 0 standard W4066,8 = 1 severe
				Reserved	W4066,9–W4066,F
W4067	COS	1–100	%	Cos motor power factor	0.01 to 1 displayed as %; ÷ by 100 for actual value
W4068	TFR	10–65535	Hours	Elapsed time	

[1] When using MODBUS protocol, add 1 to the address.

[2] Bit returns to 0 after operation.

Table 9: Monitoring Words (read only) (Continued)

Address [1]	Name	Range	Unit	Description	Possible Values
W4069	DFT			Fault register	
				Reserved	W4069,0
	INF			Internal fault	W4069,1
	OCF			Overcurrent fault	W4069,2
	PIF			Phase inversion	W4069,3
				Reserved	W4069,4
	SLF			Serial link	W4069,5
	ETF			External fault	W4069,6
	STF			Start too long	W4069,7
	USF			Mains failure and start request	W4069,8
	PHF			Phase failure	W4069,9
	OHF			Controller thermal fault	W4069,A
	LRF			Rotor locked in steady state	W4069,B
	OLF			Motor thermal overload	W4069,C
	FRF				W4069,D
				Reserved	W4069,E
	ULF			Underload	W4069,F
W4070	SAO			Value of analog output AO	
W4071	—			Time before starting alarm	W4071,0 = 0 inactive W4071,0 = 1 active
W4072	LPR			Active power	0=inactive 1=active
W4090	PTR			Fault order	
W4091	DFT			Fault register repetition	
W4092				Time counter repetition (W4068)	

[1] When using MODBUS protocol, add 1 to the address.

[2] Bit returns to 0 after operation.

CHAPTER 3: UNI-TELWAY PROTOCOL

LIST OF REQUESTS

Table 10 describes the UNI-TELWAY requests accepted by the ALTISTART 46 (ATS46) controller, and their limits. Detailed information on coding the requests is given in the UNI-TELWAY reference manual, TSX D24 004.

Table 10: List of Requests

Request	Code (Hexadecimal Format)	Accepted by ATS46 Controller
Identification	H'0F'	Yes
Protocol version	H'30'	Yes
Status	H'31'	Yes
Mirror	H'FA'	Yes
Read error counter	H'A2'	Yes
Counter reset	H'A4'	Yes
Read one bit	H'00'	Yes
Write one bit	H'10'	Yes
Read one word	H'04'	Yes
Write one word	H'14'	Yes
Read objects	H'36'	63 Words max. [1]
Write objects	H'37'	60 Words max.
Event data	—	Yes
	—	2 Words
Specific	H'F2'	See Table 12

[1] The ATS46 controller uses only 27 words.

Identification Request

Table 11: Identification Request

Request	Code (Hexadecimal Format)
Answer code	H'3F'
Product type	H'16' for ATS46 controller
Sub-type	H'46' for ATS46 controller
Product version	H'xx' [1]
ASCII string [2]	Catalog number (e.g. ATS46D17N)

[1] xx = software version. For example, enter H'21' for V2.1.
[2] The first byte of an ASCII string always corresponds to the length of the string.

Status Request

Table 12: Status Request

Request	Code (Hexadecimal Format)
Answer code	H'61'
Current state	H'xx' [1] Bit 0, internal fault Bit 1, resettable fault Bit 2, non-resettable fault Bit 3, not used Bit 4, not used Bit 5, not used Bit 6, controller at a standstill (RDY, SLC, or fault) Bit 7, controller in Local control mode
State mask	H'C7' indicates the significant bits for the current state

[1] xx = software version. For example, enter H'21' for V2.1.

Read and Write Objects Requests

Read and write requests allow access to several words within the request limits described in Table 10. They may be coded as shown in Table 13.

Table 13: Read and Write Objects Requests

Request	Code (Hexadecimal Format)
Question code (TxTi,C)	H'36' (Read) or H'37' (Write)
Category	0 to 7
Segment	H'68' (internal word)
Object type	H'06' for reading a byte (8 bits) or H'07' for reading or writing a word (16 bits)
Object address	H'xxxx'

The answer to the “write objects” request is accepted if at least one word is written. Reserved or unused words are read at 0 unless noted, and writing them has no effect.

The following examples give typical read requests for the TSX7 programmable controller using a text block. The examples read words W4022 to W4025 of the ATS46 controller, first using word object types (Example 1), then using byte object types (Example 2).

Example 1: Word Object Type

The transmission text block in Figure 13 illustrates a read request using the word object type (H'07'). In the example:

- TxTi,C=H'0736' (category + request)
- TxTi,L=6
- + Transmission Table

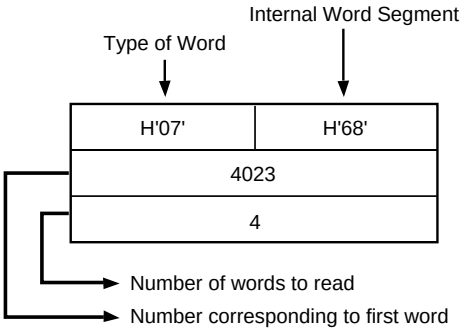


Figure 13: Reading Words W4023 to W4026: Transmission Text Block

Figure 14 illustrates the reception text block associated with the read request in Figure 13. In the example:

- TxTi,V=H'66' (report)
- TxTi,S=9 (9 bytes received)
- + Reception Table

The data received in the reception table is offset by one byte. The application program must correct the data (by successive offsets, for example) before it is used.

W4023 (least sig.)	H'07'
W4024 (least sig.)	W4023 (most sig.)
W4025 (least sig.)	W4024 (most sig.)
W4026 (least sig.)	W4025 (most sig.)
	W4026 (most sig.)

Figure 14: Reading Words W4023 to W4026: Reception Text Block

Example 2: Byte Object Type

The transmission text block in Figure 15 illustrates a read request using the byte object type (H'06'). In the example:

- TxTi,C=H'0736' (category + request)
- TxTi,L=6
- + Transmission Table

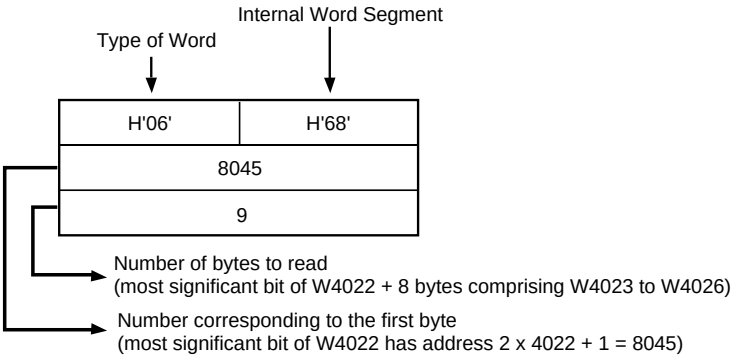


Figure 15: Reading Words W4023 to W4026: Transmission Text Block

Figure 16 illustrates the reception text block associated with the read request in Figure 15. In the example:

- TxTi,V=H'66' (report)
- TxTi,S=10 (10 bytes received)
- + Reception Table
- The programming in Figure 15 enables the words to be correctly registered in the reception table.

W4022 (most sig.)	H'06'
W4023	
W4024	
W4025	
W4026	

Figure 16: Reading Words W4023 to W4026: Reception Text Block

Event Data

The ATS46 controller transmits event data on its own initiative to the UNI-TELWAY link master, without having first received a question. This data is sent via the “unrequested data” request and does not require an answer from the receiver.

Event data is sent in the following two cases:

- When a fault appears or disappears (change of state of W4061, bit 2 of status register).
- When the controller is forced to local control by one of its logic inputs (change of state of the input), if an input has been assigned to this function via word W4022.

Event data consists of two 16-bit words, transmitted in the following order:

- ETA status register (W4061)
- DFT fault register (W4069)

Using event data with the TSX programmable controller requires the following:

- Correct configuration of the master coupler for the UNI-TELWAY link
- Regular monitoring of the indicators which display changes in the value of the data
- Assignment of the data via the read request of the event data

REGISTER UPDATE TIMES

Table 14 lists the maximum register update times for a single ATS46 controller using UNI-TELWAY protocol. These times assume a baud rate of 9600 and no communication errors.

Table 14: Maximum Register Update Times

Number of Registers Transferred	Read Time [1] (msec)	Write Time [2] (msec)
1	44.7	43.5
10	65.3	64.2
20	88.2	87.1
50	157.0	155.8

[1] Read is by “read object” (36H) request. Values shown include query time, master processing time, and acknowledge (ACK) time.
[2] Write is by “write object” (37H) request. Values shown include query time, master processing time, and acknowledge (ACK) time.

CHAPTER 4: MODBUS PROTOCOL

PRINCIPLE OF COMMUNICATION

MODBUS is a dialog protocol which creates a hierarchical structure between a master device and one or several slave devices. The ALTISTART 46 (ATS46) controller is always a slave device. MODBUS protocol enables the master device to interrogate one or more intelligent slaves. A multi-drop link connects the master device and slaves to one another.

Two types of dialog are possible between master device and slave:

- The master device communicates to the slave and waits for a response.
- The master device talks to a group of slaves without waiting for a response (broadcast messages).

The slave number can be between 1 and 31. The number 0 is reserved for a broadcast message.

In either type of dialog, the master device initiates and controls all exchanges with the slaves. If an incorrect exchange occurs, the master device reiterates the exchange and declares the slave absent if no answer is received after a given time has elapsed. Only one device may transmit on line at any time. A slave cannot initiate an exchange, nor is lateral communication (i.e., slave to slave) possible. The master device's programming must therefore be designed to interrogate a slave and send the data received to another slave.

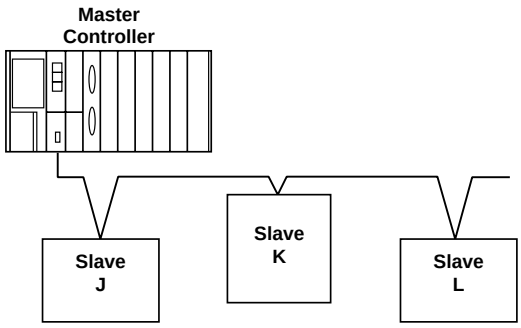


Figure 17: MODBUS Protocol

NOTE: Register structures in the ALTISTART controller are of UNI-TELWAY designation. When using MODBUS protocol, note the following differences:

1. Reverse bit order—UNI-TELWAY protocol is hexadecimal, 0 to F, where MODBUS protocol is from 16 to 1.

UNI-TELWAY	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
MODBUS	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

2. Address offset by 1—Add 1 to the UNI-TELWAY address to get the proper MODBUS address.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

There is a shift of 1 between the address in UNI-TELWAY and MODBUS protocols. When using MODBUS protocol, add 1 to each address listed in the parameter tables throughout this manual.

Failure to follow this instruction can result in death, serious injury or equipment damage.

Accessible Data

The MODBUS protocol enables data (bits and words) to be exchanged between the master device and several slaves. In each slave unit, bit areas are defined for the master device to use when reading or writing data. Input objects may only be read, whereas output objects may be read or written.

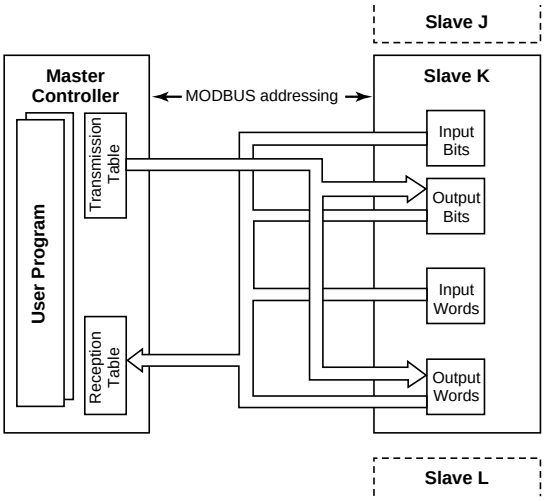


Figure 18: Input and Output Data Objects

Exchanges

The master device always initiates data exchanges. The master device waits for the slave's answer before transmitting the next message, thus avoiding any conflict on the line. Operation in half-duplex is therefore authorized.

Checking and Supervision

When two entities are communicating via asynchronous serial link, control of exchanges between them must naturally include exception messages, should exchange faults occur. A slave receiving an incoherent message will report an exchange fault to the master device, which in turn will determine whether to repeat the exchange.

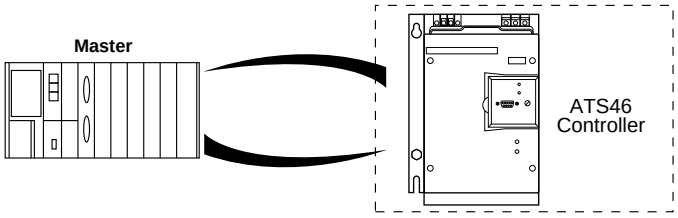


Figure 19: Communicating Exchange Faults

MSTR BLOCK

Overview

When using a bridge multiplexer as shown in Figure 9 on page 10, the Master (MSTR) function block can be used. The BM85 bridge/multiplexer (bridge mux) operates as a MODBUS Plus node and provides four serial ports that can be configured separately for the serial devices in your application. BM85 models are available for RS-232, RS-485 or MODICON MODBUS serial devices.

If you are not using a bridge mux but would like to use MODBUS commands, consult the *MODICON MODBUS Protocol Reference Guide*, part number PI-MBUS-300. (This document is available by fax-on-demand from Schneider Automation at 1-800-468-5342. Select option 3, documents 3001 and 3002.)

PLCs that support MODBUS Plus communications have a special MSTR instruction with which nodes on the network can initiate message transactions. The MSTR function allows you to initiate one of nine possible network communications operations over MODBUS Plus. Each operation is designated by a code, as described in Table 15.

Table 15: MODBUS Operations Codes

Operation	Code	Operation	Code
Write data	1	Read global database	6
Read data	2	Get remote statistics	7
Get local statistics	3	Clear remote statistics	8
Clear local statistics	4	Monitor peer cop status	9
Write global database	5		

The read and write MSTR instruction blocks are discussed on page 42. For more information, refer to the user guide, *MODICON Ladder Logic Block Library,* part number 840 USE 101 00.

Inputs

The MSTR block has two control inputs (see Figure 20). When the input to the top node is ON, it enables the instruction. When the input to the middle node is ON, it terminates the active operation.

Outputs

The MSTR block can produce three possible outputs (see Figure 20). The output from the top node echoes the state of the top input; i.e., it goes ON while the instruction is active. The output from the middle node echoes the state of the middle input; i.e., it goes ON if the MSTR operation is terminated prior to completion. The output from the bottom node goes ON when an MSTR operation has been completed successfully.

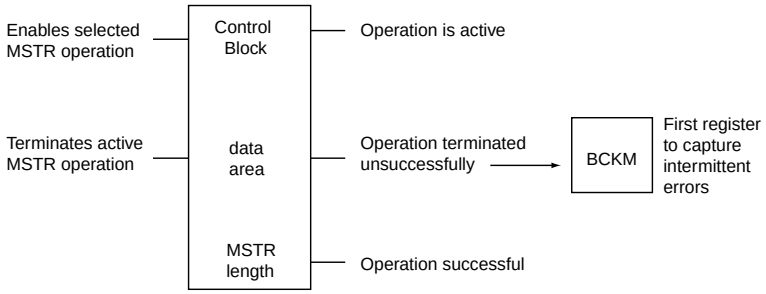


Figure 20: Block Structure

Top Node Content

The 4x register entered in the top node is the first of nine contiguous holding registers that comprise the control block.

Table 16: Control Block Registers

Register	Content
Displayed	Identifies one of the nine MSTR operations
First implied	Displays error status
Second implied	Displays length
Third implied	Displays MSTR operation-dependent information
Fourth implied	Routing 1 register (used to designate the address of the destination node for a network message transaction)
Fifth implied	Routing 2 register
Sixth implied	Routing 3 register
Seventh implied	Routing 4 register
Eighth implied	Routing 5 register

NOTE: Before programming an MSTR instruction, an understanding of routing path structures is required. For information about routing path structures, refer to the user guide, MODBUS Plus Network Planning and Installation, *part number 890 USE 100 00.*

Middle Node Content

The 4x register entered in the middle node is the first in a group of contiguous holding registers that comprise the data area. This data area is the source of data in operations providing the communications processor with data (e.g., a write operation). The data area is the destination of the data in operations acquiring data from the communications processor (e.g., a read operation).

Bottom Node Content

The integer value entered in the bottom node specifies length; i.e., the maximum number of registers in the data area. The length must be in a range between 1 and 100.

Read/Write Operations

An MSTR write operation transfers data from a controlling device to the drive controller. An MSTR read operation transfers data from the drive controller to a controlling device on the network.

Control Block

The registers in the MSTR control block (the top node) contain the following information in a read or write operation.

Table 17: Control Block Registers

Register	Function	Content
Displayed	Operation type	1=Write; 2=Read
First implied	Error status	Displays a hex value indicating an MSTR error, when relevant.
Second implied	Length	Write = number of registers to be sent to slave Read = number of registers to be read from slave
Third implied	Slave device data area	Specifies starting register in the ATS46 controller to be read from or written to. Note that 1 must be added to starting register. For example, to start with W4062, current, 4063 would be placed in the third implied register.
Fourth–Eighth implied	Routing 1–5	Designates the first through fifth routing path addresses, respectively. The last nonzero byte in the routing path is the destination device.

Refer to the user guide, *MODICON Ladder Logic Block Library,* part number 840 USE 101 00, for more information.

Register Update Times

Table 18 lists the maximum register update times for a single ALTISTART controller using MODBUS protocol. These times assume a baud rate of 9600 and no communication errors.

Table 18: Maximum Register Update Times

Number of Registers Transferred	MODBUS ASCII		MODBUS RTU	
	Read Time [1] (msec)	Write Time [1] (msec)	Read Time [1] (msec)	Write Time [1] (msec)
1	68	59	61	52
10	106	97	82	73
20	148	138	105	96
50	273	263	174	165

[1] Values include query time, master processing time, and acknowledge (ACK) time.

APPENDIX A

Table 19: Function Index Table

Description	Type	Characteristics	Code	Address [1]	Page
Return to factory settings	C	Active on positive edge	CMD, INT	W4060,D	26
Control loop	F	Select closed loop (torque control) open loop (voltage regulation)	CLP	W4035,0	25
Start	C	Run command	CMD, RUN	W4060,5	26
	A	Acceleration ramp time	ACC	W4043	24
	A	Initial torque during acceleration	TQ0	W4037	24
	A	Maximum torque during acceleration	TLI	W4036	24
	A	Limit current	ILT	W4039	24
	A	Boost level	BST	W4028	25
	A	Start time too long	TLS	W4033	25
	A	Stator loss compensation	LSC	W4027	25
	D	Controller ready	ETA, RDY	W4061,1	27
	D	Steady state	ETA, 8	W4061,8	27
	D	Short-circuited	ETA, 9	W4061,9	27
	D	Current limited	ETA, LIM	W4061,D	27
	D	Acceleration phase	ETA, B	W4061,B	27
Stop	C	Freewheel stop command	CMD, CAL	W4060,8	26
	C	Decelerated stop command	CMD, CAD	W4060,7	26
	C	Braked stop command	CMD, CAF	W4060,6	26
	C	Control motor deceleration in cascade	DMC	W4060,3	26
	A	Decel: deceleration ramp slope	DEC	W4044	24
	A	final torque during deceleration	EDC	W4038	24
	A	Braking: braking current	BRC	W4041	24
	A	adjustment of braking time	EBA	W4042	24
	D	Stop phase	ETA, A	W4061,A	27
Motor protection	C	Reset thermal state	CMD, RTH	W4060,A	26
	A	Trip threshold (underload)	TLS	W4031	25
	A	Motor nominal current	In	W4026	25
	F	Motor thermal protection	THP	W4034	25
	D	Motor thermal state	LTH	W4064	27
Controller protection	F, A	Trip current threshold	OIL	W4040	24
Mains supply	F	Default assignment of phase rotation	PHR	W4032	25
	D	Phase rotation state	PHE	W4065	28
	D	No mains supply	ETA, E	W4061,E	27
	D	Mains supply frequency	ETA, F	W4061,F	27
Measurements	D	Current	LCR	W4062	27
	D	Cos (φ) motor power factor	COS	W4067	28
	D	Torque	LTR	W4063	27
	D	Elapsed time meter	TFR	W4068	28
	D	Reset elapsed time meter	TRE	W4060,C	26
Special operation	F	Test on low power motors	SST	W4035,5	25
	C	Cascade motor operation	CSC	W4035,6	25

Types: C = Command F = Configuration A = Adjustment D = Display

[1] When using MODBUS protocol, add 1 to the address.

Table 19: Function Index Table (Continued)

Description	Type	Characteristics	Code	Address [1]	Page
I/O management	F	Assignment of logic input LI	LI	W4022	24
	F	Assignment of logic output LO1	LO1	W4023	24
	F	Assignment of logic output LO2	LO2	W4035,3	25
	F	Assignment of analog output AO	AO	W4024	24
	A	Analog output scale	ASC	W4025	25
	F	Analog output range	AO1	W4035,4	25
	F	Assignment of relay R1	R1	W4035,2	25
	D	State of I/O: Logic input LI	LIO	W4066	28
	D	Logic output LO1		W4066,1	28
	D	Logic output LO2		W4066,2	28
	D	Relay R1		W4066,3	28
	D	Relay R2		W4066,4	28
	D	Vigithem		W4066,5	28
	D	Logic input LI_RUN		W4066,6	28
	D	Logic input LI_STOP		W4066,7	28
	D	Operating duty switch		W4066,8	28
	D	Value of analog output AO	SAO	W4070	29
Communication & terminal block management	C	Assignment of online commands	DLI	W4060,1	26
	C	Store adjustments in EEPROM	MRE	W4060,E	26
	C	Recall adjustments from EEPROM	RRE	W4060,F	26
	F	Product address	ADR	W2290	12
	F	Protocol	PRO	W2291	12
	F	Transmission speed	SPD	W2292	13
	F	Character format	FOR	W2293	13
	D	In local/line mode	LOC	W4061,0	27
	D	Stopped after request via terminal block	ETA, 3	W4061,3	27
	D	Local control	FLO	W4061,5	27
Fault and alarm management	C	External fault command	EFL	W4060,2	26
	C	Controller reset command	RST	W4060,0	26
	C	No time out SLF	NTO	W4060,4	26
	F	Automatic reset	ARS	W4035,1	25
	D	Controller faulted	FAI	W4061,2	27
	D	Communication check inhibited	NTO	W4061	27
	D	Current threshold alarm		W4061,7	27
	D	Motor thermal alarm	OVL	W4061,C	27
	D	Internal fault	INF	W4069,1	29
	D	Short-circuit fault	OCF	W4069,2	29
	D	Phase inversion fault	PIF	W4069,3	29
	D	Serial link fault	SLF	W4069,5	29
	D	External fault	ETF	W4069,6	29
	D	Start too long fault	STF	W4069,7	29
	D	Mains failure and start request fault	USF	W4069,8	29
	D	Phase fault	PHF	W4069,9	29
	D	Controller thermal fault	OHF	W4069,A	29
	D	Locked rotor in steady state fault	LRF	W4069,B	29
	D	Motor thermal overload fault	OLF	W4069,C	29
	D	Mains frequency fault	FRF	W4069,D	29
	D	Underload fault	ULF	W4069,F	29
	D	Time before starting alarm	TBS	W4071,0	29
Fault history	D	Fault order	PTR	W4090	29
	D	Fault register repetition	DFT	W4091	29
	D	Time counter repetition		W4092	29

Types: C = Command F = Configuration A = Adjustment D = Display

[1] When using MODBUS protocol, add 1 to the address.

APPENDIX B

Table 20: Function Index Table by Address

Address [1]	Description	Type	Characteristics	Code	Page
W2290	Communication & terminal block management	F	Product address	ADR	12
W2291	Communication & terminal block management	F	Protocol	PRO	12
W2292	Communication & terminal block management	F	Transmission speed	SPD	13
W2293	Communication & terminal block management	F	Character format	FOR	13
W4022	I/O management	F	Assignment of logic input LI	LI	24
W4023	I/O management	F	Assignment of logic output LO1	LO1	24
W4024	I/O management	F	Assignment of analog output AO	AO	24
W4025	I/O management	A	Analog output scale	ASC	25
W4026	Motor protection	A	Motor nominal current	In	25
W4027	Start	A	Stator loss compensation	LSC	25
W4028	Start	A	Boost level	BST	25
W4031	Motor protection	A	Trip threshold (underload)	TLS	25
W4032	Mains supply	F	Default assignment of phase rotation	PHR	25
W4033	Start	A	Start time too long	TLS	25
W4034	Motor protection	F	Motor thermal protection	THP	25
W4035,0	Control loop	F	Select closed loop (torque control) open loop (voltage regulation)	CLP	25
W4035,1	Fault & alarm management	F	Automatic reset	ARS	25
W4035,2	I/O management	F	Assignment of relay R1	R1	25
W4035,3	I/O management	F	Assignment of logic output LO2	LO2	25
W4035,4	I/O management	F	Analog output range	AO1	25
W4035,5	Special operation	F	Test on low power motors	SST	25
W4035,6	Special operation	C	Cascade motor operation	CSC	25
W4036	Start	A	Maximum torque during acceleration	TLI	24
W4037	Start	A	Initial torque during acceleration	TQ0	24
W4038	Stop	A	Decel: final torque during deceleration	EDC	24
W4039	Start	A	Limit current	ILT	24
W4040	Controller protection	F, A	Trip current threshold	OIL	24
W4041	Stop	A	Braking: braking current	BRC	24
W4042	Stop	A	Braking: adjustment of braking time	EBA	24

Types: C = Command F = Configuration A = Adjustment D = Display

[1] When using MODBUS protocol, add 1 to the address.

Table 20: Function Index Table by Address (Continued)

Address [1]	Description	Type	Characteristics	Code	Page
W4043	Start	A	Acceleration ramp time	ACC	24
W4044	Stop	A	Decel: deceleration ramp slope	DEC	24
W4060,0	Fault & alarm management	C	Controller reset command	RST	26
W4060,1	Communication & terminal block management	C	Assignment of online commands	DLI	26
W4060,2	Fault & alarm management	C	External fault command	EFL	26
W4060,3	Stop	C	Control motor deceleration in cascade	DMC	26
W4060,4	Fault & alarm management	C	No time out SLF	NTO	26
W4060,5	Start	C	Run command	CMD, RUN	26
W4060,6	Stop	C	Braked stop command	CMD, CAF	26
W4060,7	Stop	C	Decelerated stop command	CMD, CAD	26
W4060,8	Stop	C	Freewheel stop command	CMD, CAL	26
W4060,A	Motor protection	C	Reset thermal state	CMD, RTH	26
W4060,C	Measurements	D	Reset elapsed time meter	TRE	26
W4060,D	Return to factory settings	C	Active on positive edge	CMD, INT	26
W4060,E	Communication & terminal block management	C	Store adjustments in EEPROM	MRE	26
W4060,F	Communication & terminal block management	C	Recall adjustments from EEPROM	RRE	26
W4061	Fault & alarm management	D	Communication check inhibited	NTO	27
W4061,0	Communication & terminal block management	D	In local/line mode	LOC	27
W4061,1	Start	D	Controller ready	ETA, RDY	27
W4061,2	Fault & alarm management	D	Controller faulted	FAI	27
W4061,3	Communication & terminal block management	D	Stopped after request via terminal block	ETA, 3	27
W4061,5	Communication & terminal block management	D	Local control	FLO	27
W4061,7	Fault & alarm management	D	Current threshold alarm		27
W4061,8	Start	D	Steady state	ETA, 8	27
W4061,9	Start	D	Short-circuited	ETA, 9	27
W4061,A	Stop	D	Stop phase	ETA, A	27
W4061,B	Start	D	Acceleration phase	ETA, B	27
W4061,C	Fault & alarm management	D	Motor thermal alarm	OVL	27
W4061,D	Start	D	Current limited	ETA, LIM	27
W4061,E	Mains supply	D	No mains supply	ETA, E	27

Types: C = Command F = Configuration A = Adjustment D = Display

[1] When using MODBUS protocol, add 1 to the address.

Table 20: Function Index Table by Address (Continued)

Address [1]	Description	Type	Characteristics	Code	Page
W4061,F	Mains supply	D	Mains supply frequency	ETA, F	27
W4062	Measurements	D	Current	LCR	27
W4063	Measurements	D	Torque	LTR	27
W4064	Motor protection	D	Motor thermal state	LTH	27
W4065	Mains supply	D	Phase rotation state	PHE	28
W4066	I/O management	D	State of I/O: Logic input LI	LIO	28
W4066,1	I/O management	D	Logic output LO1		28
W4066,2	I/O management	D	Logic output LO2		28
W4066,3	I/O management	D	Relay R1		28
W4066,4	I/O management	D	Relay R2		28
W4066,5	I/O management	D	Vigithem		28
W4066,6	I/O management	D	Logic input LI_RUN		28
W4066,7	I/O management	D	Logic input LI_STOP		28
W4066,8	I/O management	D	Operating duty switch		28
W4067	Measurements	D	Cos (φ) motor power factor	COS	28
W4068	Measurements	D	Elapsed time meter	TFR	28
W4069,1	Fault & alarm management	D	Internal fault	INF	29
W4069,2	Fault & alarm management	D	Short-circuit fault	OCF	29
W4069,3	Fault & alarm management	D	Phase inversion fault	PIF	29
W4069,5	Fault & alarm management	D	Serial link fault	SLF	29
W4069,6	Fault & alarm management	D	External fault	ETF	29
W4069,7	Fault & alarm management	D	Start too long fault	STF	29
W4069,8	Fault & alarm management	D	Mains failure and start request fault	USF	29
W4069,9	Fault & alarm management	D	Phase fault	PHF	29
W4069,A	Fault & alarm management	D	Controller thermal fault	OHF	29
W4069,B	Fault & alarm management	D	Locked rotor in steady state fault	LRF	29
W4069,C	Fault & alarm management	D	Motor thermal overload fault	OLF	29
W4069,D	Fault & alarm management	D	Mains frequency fault	FRF	29
W4069,F	Fault & alarm management	D	Underload fault	ULF	29
W4070	I/O management	D	Value of analog output AO	SAO	29
W4071,0	Fault & alarm management	D	Time before starting alarm	TBS	29
W4090	Fault history	D	Fault order	PTR	29
W4091	Fault history	D	Fault register repetition	DFT	29
W4092	Fault history	D	Time counter repetition		29

Types: C = Command F = Configuration A = Adjustment D = Display

[1] When using MODBUS protocol, add 1 to the address.

APPENDIX C

If you have Windows 95, or a later version, to configure the ATS46 controller for MODBUS or UNI-TELWAY communications, first access the HyperTerminal utility or a comparable Terminal Emulation Program. Configure the COM port, terminal properties, and ASCII set-up as illustrated in Figures 21 through 22.

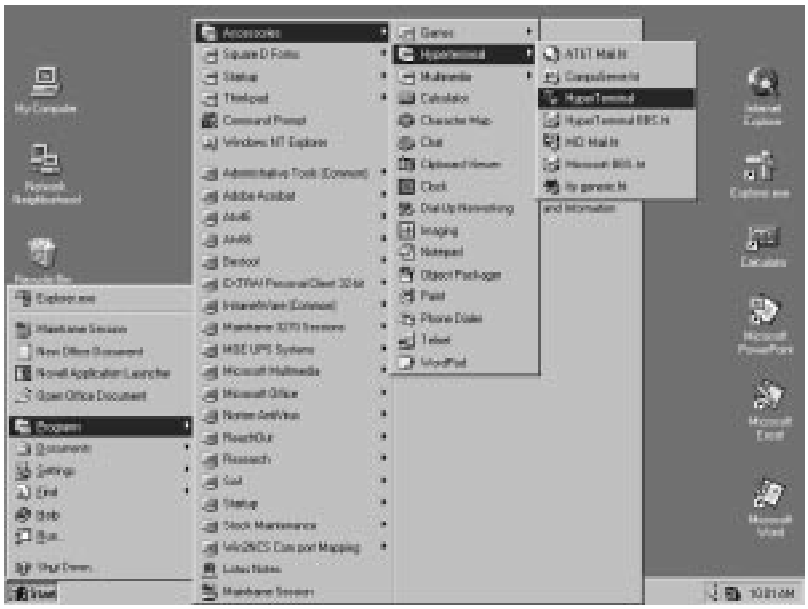


Figure 21: Accessing HyperTerminal (Windows NT Example)

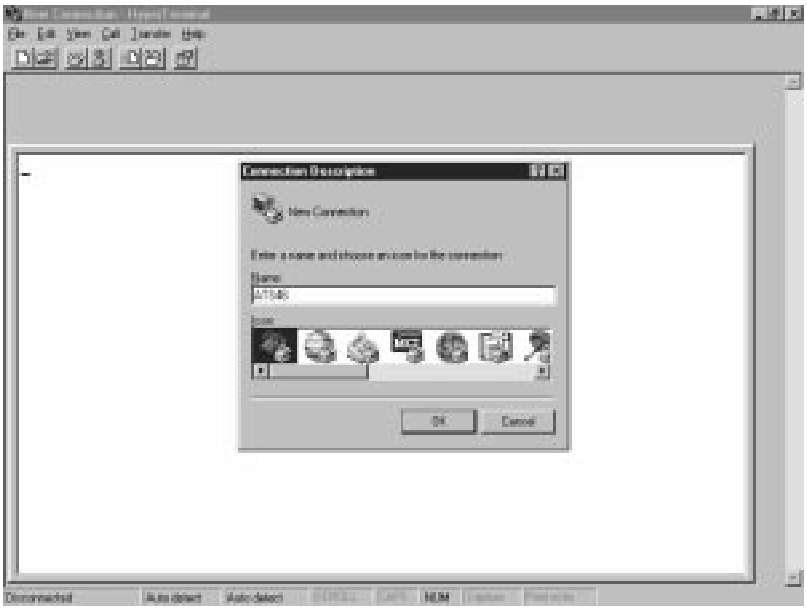


Figure 22: Creating a New Connection

Figure 23: Selecting a COM Port

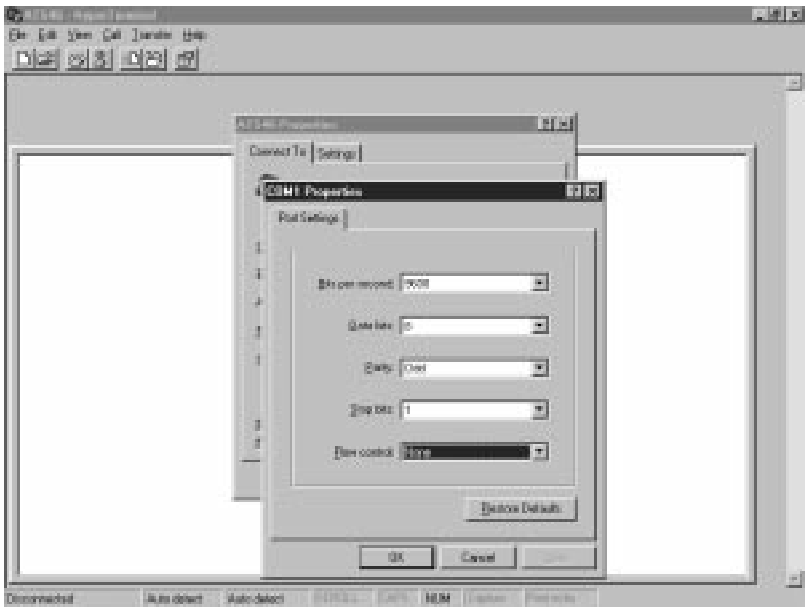


Figure 24: Setting COM Port Properties

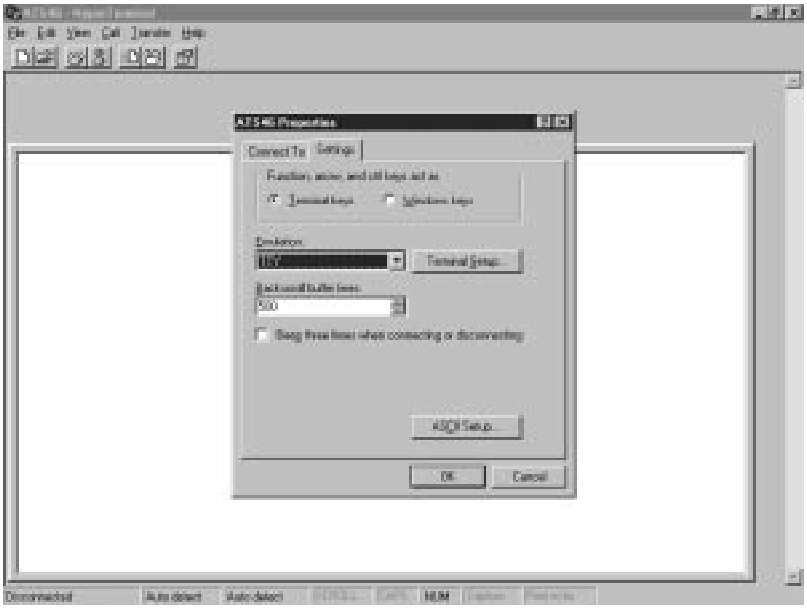


Figure 25: Selecting Emulation Type

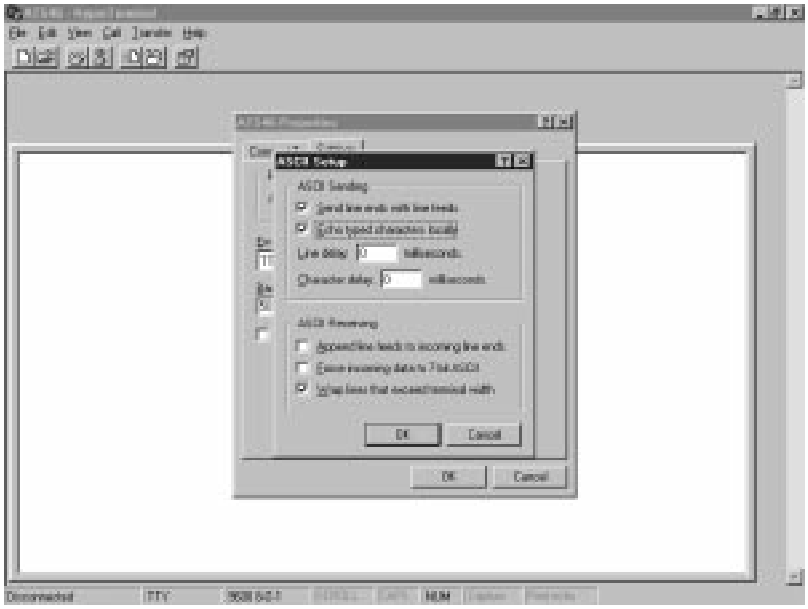


Figure 26: ASCII Set-Up

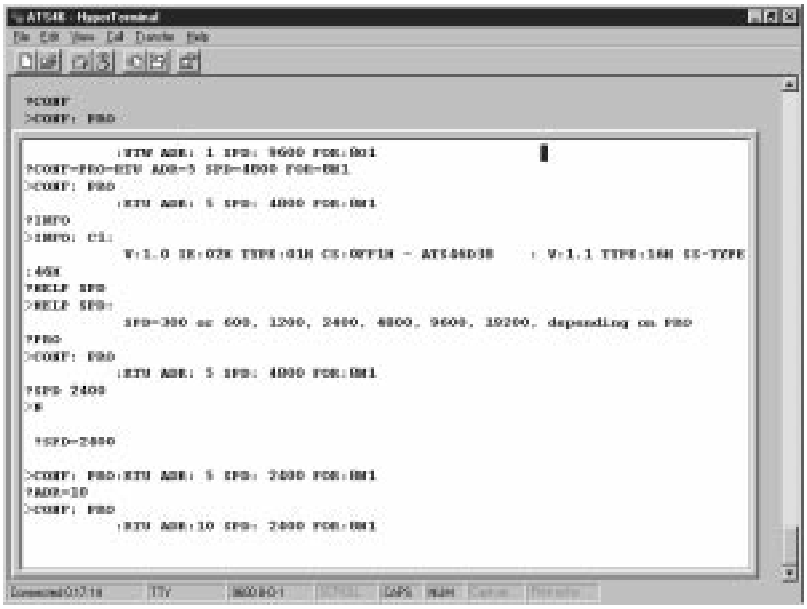


Figure 27: Sample Terminal Commands and ATS46 Responses

For MODICON/MODBUS support, please contact Schneider Automation at 1-800-468-5342.

Square D Company
8001 Hwy 64 East
Knightdale, NC 27545
(919) 266-3671

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