

Altivar® 21

Adjustable Speed Drive Controllers

BACnet Card VW3A21315

Instruction Bulletin

30072-451-97A

Retain for future use.

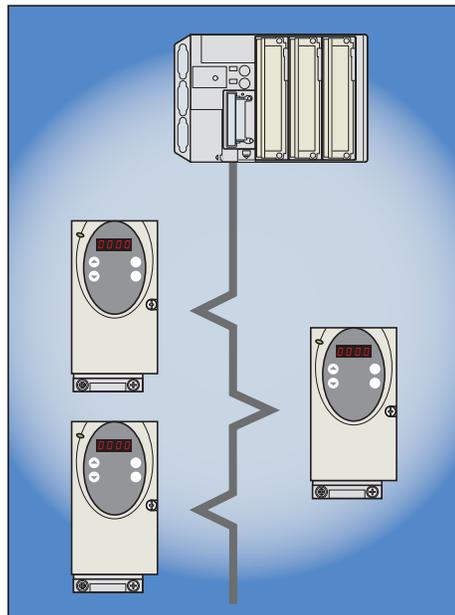


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Hazard Categories and Special Symbols

The following symbols and special messages may appear in this manual or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

A lightning bolt or ANSI man symbol in a “Danger” or “Warning” safety label on the equipment indicates an electrical hazard which, as indicated below, can or will result in personal injury if the instructions are not followed.

The exclamation point symbol in a safety message in a manual indicates potential personal injury hazards. Obey all safety messages introduced by this symbol to avoid possible injury or death.

Symbol	Name
	Lightning Bolt
	ANSI Man
	Exclamation Point

DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** property damage.

Product Support

For support and assistance, contact the Product Support Group. The Product Support Group is staffed from 8:00 am until 6:00 pm Eastern time to assist with product selection, start-up, and diagnosis of product or application problems. Emergency phone support is available 24 hours a day, 365 days a year.

Toll free: 888-SquareD (888-778-2733)
 E-Mail: drive.products.support@us.schneider-electric.com
 Fax: 919-217-6508

Before You Begin

Read and follow these precautions before performing any procedure with this drive controller.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Read and understand this manual before installing or operating the Altivar 21(ATV21) drive controller. Installation, adjustment, repair, and maintenance must be performed by qualified personnel.
- The user is responsible for compliance with all international and national electrical code requirements with respect to grounding of all equipment.
- Many parts of this drive controller, including the printed circuit boards, operate at the line voltage. **DO NOT TOUCH.** Use only electrically insulated tools.
- **DO NOT** touch unshielded components or terminal strip screw connections with voltage present.
- **DO NOT** short across terminals PA/+ and PC/- or across the DC bus capacitors.
- Before servicing the drive controller:
 - Disconnect all power, including external control power that may be present.
 - Place a “DO NOT TURN ON” label on all power disconnects.
 - Lock all power disconnects in the open position.
 - **WAIT 15 MINUTES** to allow the DC bus capacitors to discharge. Then follow the “Bus Voltage Measurement Procedure” on page 9 to verify that the DC voltage is less than 45 V. The drive LED is not an indicator of the absence of DC bus voltage.
- Install and close all covers before applying power or starting and stopping the drive controller.

Failure to follow these instructions will result in death or serious injury.

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- Test and ensure that any changes made to the parameter settings do not present any danger to personnel and equipment during drive operation.
- Do not use this BACnet option card with ATV21 drive controller firmware earlier than Version 1.6IE04. These versions will not detect an inoperative card.

Failure to follow these instructions will result in death or serious injury.

⚠ WARNING

DAMAGED DRIVE CONTROLLER EQUIPMENT

Do not operate or install any drive controller that appears damaged.

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

WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel 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 the implications of unanticipated transmission delays or failures of the link.¹
- Each implementation of an ATV21 BACnet option card must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

¹ For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems."

Introduction

This manual describes how to install the BACnet option card VW3A21315 into an ATV21 drive controller and connect it to a network. It describes how to configure communication parameters and network variables for network operation, and describes communication diagnostics.

The BACnet option card mounts directly onto the drive controller and connects to a host computer or network via a terminal connector. The following commands and drive parameters can be accessed using BACnet protocol:

- Control (start, stop, reset, speed reference)
- Monitoring (status, current, voltage, thermal state)
- Diagnostics (alarms)

The drive controller's integrated keypad display can be used to access the various control, monitoring, and diagnostic functions.

Related Documentation

In addition to this bulletin, the following documentation is provided on a CD-ROM that ships with the ATV21 drive controller.

- The *Altivar[®] 21 Installation Guide*, 30072-451-61, contains complete installation instructions for ATV21 drive controllers. Included are technical specifications, ratings, dimensions and weights, mounting instructions, and wiring instructions.
- The *Altivar[®] 21 Programming and Operation Guide*, 30072-451-63, contains detailed parameter descriptions and programming instructions for ATV21 drive controllers.
- The *Altivar[®] 21 Quick Start Guide*, 30072-451-90, describes the minimum steps necessary for bringing an ATV21 drive controller into service with the factory settings.

For more information visit our Web site at www.us.Telemecanique.com.

Receiving the BACnet Card

Electrostatic Precautions

⚠ CAUTION

STATIC SENSITIVE COMPONENTS

The BACnet option card can be damaged by static electricity. Observe the electrostatic precautions below when handling controller circuit boards or testing components.

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

Observe the following precautions for handling static-sensitive components:

- Keep static-producing material such as plastic, upholstery, and carpeting out of the immediate work area.
- Store the BACnet card in its protective packaging when it is not installed in the drive controller.
- When handling the BACnet card, wear a conductive wrist strap connected to the card through a minimum of 1 megohm resistance.
- Avoid touching exposed conductors and component leads with skin or clothing.

Inspecting the BACnet Card

After receiving the BACnet card:

- Ensure that the catalog number printed on the BACnet card label is the same as that on the packing slip and corresponding purchase order. Contact your Schneider Electric representative if there are any errors.
- Remove the card from its packaging and inspect it for damage. If any damage is found, notify the carrier and your Schneider Electric representative.
- To store the card, replace it in its protective packaging and store it at -25 to +70 °C (-13 to +158 °F).

Bus Voltage Measurement Procedure

Before working on the drive controller, remove all power and wait 15 minutes to allow the DC bus to discharge. Then measure the DC bus voltage between the PA/+ and PC/- terminals.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

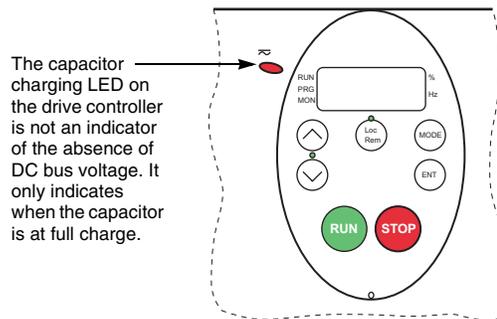
Read and understand the precautions in "Before You Begin" starting on page 5 before performing this procedure.

Failure to follow this instruction will result in death or serious injury.

The DC bus voltage can exceed 1,000 Vdc. Use a properly rated voltage-sensing device when performing this procedure. To measure the DC bus voltage:

1. Disconnect all power.
2. Wait 15 minutes to allow the DC bus to discharge.
3. Measure the voltage of the DC bus between the PA/+ and PC/- terminals to ensure that the voltage is less than 45 Vdc.
4. If the DC bus capacitors do not discharge completely, contact your local Schneider Electric representative. Do not repair or operate the drive controller.

Figure 1: Capacitor Charging LED



Installing the BACnet Card

⚠ DANGER

HAZARD OF ELECTRIC, SHOCK, EXPLOSION, OR ARC FLASH

Read and understand the precautions in "Before you begin" on page 5 before performing this procedure.

Failure to follow this instruction will result in death or serious injury.

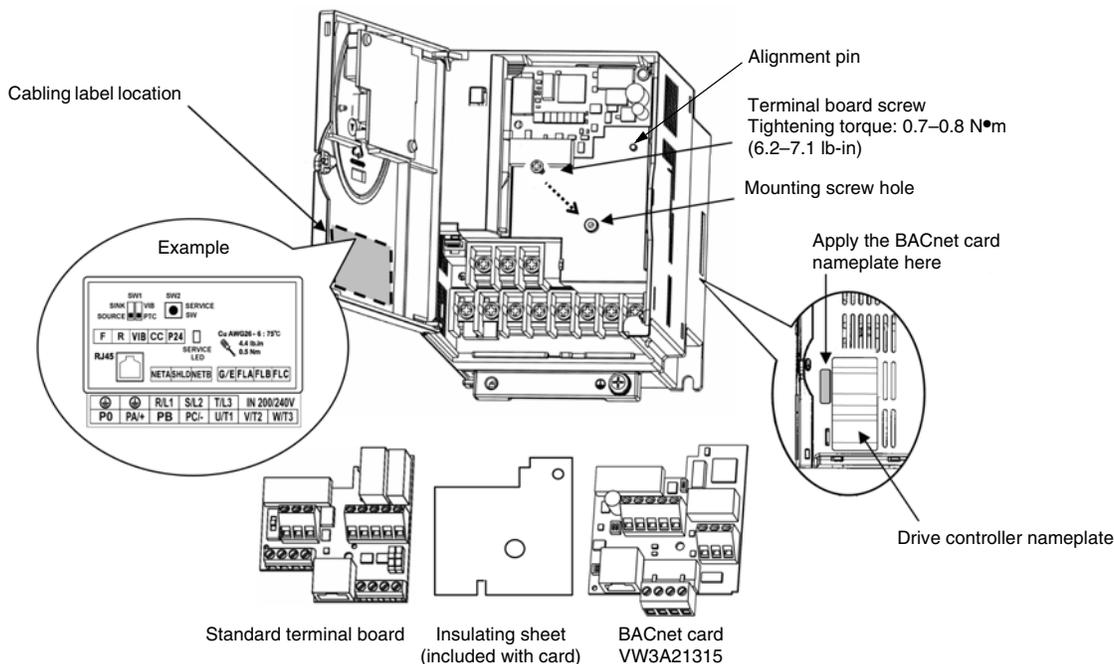
Referring to Figure 2 on page 10, install the BACnet card into the ATV21 drive controller as follows:

1. Remove power from the drive controller and wait 15 minutes to allow the DC bus to discharge.
2. Perform the "Bus Voltage Measurement Procedure" on page 9.
3. Open the drive controller's front cover, then remove the terminal board screw and the controller's standard terminal board (see Figure 2). Keep the terminal board parallel with its mounting surface when removing it from the drive controller.

NOTE: Retain the terminal board screw for securing the BACnet card once installed. Discard the standard terminal board or save it for future use.

4. Make the power and control wiring connections to the drive controller before installing the BACnet card. Refer to the *Altivar® 21 Installation Guide*, 30072-451-61, for wiring instructions.
5. Install the insulating sheet into the drive controller, aligning it with the terminal board screw hole and the drive controller's alignment pin.
6. Keeping the BACnet card parallel to the mounting surface, install the BACnet card over the insulating sheet and secure it with the M3 screw removed in Step 3. Torque the screw to 0.7 to 0.8 N•m (6.2–7.1 lb-in).
7. Place the cabling label for the BACnet card over the standard cabling label on the inside front cover of the drive controller.
8. Place the BACnet card nameplate near the drive controller nameplate. Be careful not to cover the vents on the drive controller's enclosure.

Figure 2: Installing the BACnet Card



Wiring the BACnet Card Network Terminal

Observe the following recommendations for wiring the BACnet card network terminal to the network:

- Connections: 2-wire differential, common, and shield
- Maximum devices per segment: 32
- Maximum cable length: 1200 m (3637 ft)
- Line terminators: install line terminators at both ends of the line

Refer to Figure 4 for the pinout of the BACnet network terminal. When wiring the terminal:

1. Strip the cable sheath back approximately 10 mm (0.40 in.).
2. Use a flat blade screwdriver with a 0.6 mm (0.02 in.) thick and 3.5 mm (0.14 in.) wide blade for making the connections to the terminals.
3. Use a torque wrench to tighten the terminals to 0.5 to 0.6 N•m (4.4–5.3 lb-in.).

Figure 4: Network Terminal Pinout

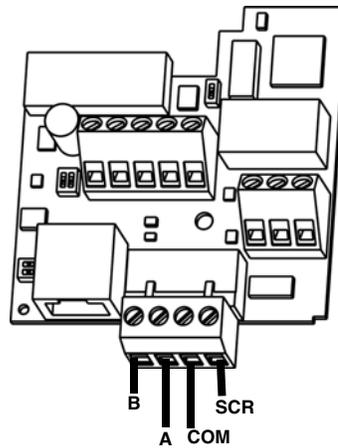


Table 1: Network Terminal Contacts and Signals

Contact	Signal
B	+
A	-
COM	Common
SCR	Shield

Terminal Descriptions

⚠ DANGER

ELECTRIC SHOCK

Do not change switch settings while the power is on. This may result in electric shock or damage to the drive controller and other equipment.

Failure to follow this instruction will result in death or serious injury.

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- When setting the VIB function, remove the motor cables before setting the parameter. Otherwise, the motor may unexpectedly start.
- Prevent accidental grounding of logic inputs configured for sink logic. Accidental grounding can result in unintended activation of drive controller functions.
- Protect the signal conductors against damage that could result in unintentional conductor grounding.
- Follow NFPA 79 and EN 60204 guidelines for proper control circuit grounding practices.

Failure to follow these instructions will result in death or serious injury.

Table 2: Terminal Descriptions

Terminal Symbol	Function	Electrical Specifications	Internal Circuits
F	Multifunctional programmable logic input On: forward rotation (default setting) Off: slow down and stop	Input for voltage-free contact 24 Vdc, 5 mA, or less Sink/Source can be selected with SW2.	
R	Multifunctional programmable logic input On: reverse rotation (default setting) Off: slow down and stop		
VIB	Multifunctional programmable analog input. In the default setting, it controls the speed setpoint function (0 to 60 Hz frequency with 0 to 10 Vdc input). In addition, this terminal can be used as a PTC input by setting SW2 and parameters F645 and F646.	10 Vdc Internal impedance: 30 kΩ	
CC	Control circuit common terminal	—	—
P24	24 Vdc power supply output	24 Vdc / 50 mA	
FLA FLB FLC	Multifunctional programmable relay contact outputs Contains one normally open and one normally closed contact. Refer to the <i>Altivar® 21 Programming and Operation Guide</i> , 30072-451-63, for function details.	30 Vdc / 0.5 A 250 Vac / 1 A (cos φ = 1) 250 Vac / 0.5 A (cos φ = 0.4)	
B A GND	BACnet communication terminals	RS-485 transmission data, reception data	—
SCR	—	BACnet communication shield terminal This terminal is not connected to other circuits in the board. Ground this terminal in a location separated from the ground of the power line.	—

Connecting the BACnet Card to the Field Bus

⚠ WARNING

IMPROPER WIRING PRACTICES

- Follow the wiring practices described in this document in addition to those already required by the National Electrical Code and local electrical codes.
- Check the power connections before energizing the drive controller.
- If replacing another drive controller, verify that all wiring connections to the ATV21 drive controller comply with all wiring instructions in this manual.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Cable Routing Practices

When wiring ATV21 drive controllers to the field bus, follow all wiring practices required by national and local electrical codes. Also observe the following guidelines:

- Avoid areas of high temperature, moisture, vibration, or other mechanical stress.
- Secure the cable where necessary to prevent its weight and the weight of other cables from pulling or twisting the cable.
- Use cable ducts, raceways, or other structures to protect the cable. These structures must not contain power wiring.
- Avoid sources of electrical interference that could induce noise into the cable. Use the maximum practical separation from such sources.

Routing Cable in a Building

When planning cable routing within a building, follow these guidelines:

- Maintain a minimum separation of 1 m (3.3 ft) from the following equipment:
 - air conditioners and large blowers
 - elevators and escalators
 - radios and televisions
 - intercom and security systems
 - fluorescent, incandescent, and neon lighting fixtures
- Maintain a minimum separation of 3 m (9.8 ft) from the following equipment:
 - line and motor power wiring
 - transformers
 - generators
 - alternators

Routing Cable in Electrical Equipment Rooms

When wiring in electrical equipment rooms or large electrical equipment line-ups, observe the following guidelines for cable segregation and separation of circuits:

- Use metallic conduit for all drive controller wiring. Do not run control, network, and power wiring in the same conduit.
- Separate non-metallic conduits or cable trays carrying power wiring from metallic conduits carrying low-level control network wiring by at least 305 mm (12 in.).
- Separate metallic conduits carrying power wiring from those carrying low-level control network wiring by at least 76 mm (3 in.).
- Whenever power and control wiring cross, the metallic conduits and non-metallic conduits or trays must cross at right angles.
- If necessary, use filters to attenuate conducted emissions from the drive controller to the line to prevent interference with telecommunication, radio, and sensitive electronic equipment. Contact your Schneider Electric representative for selection and application of electromagnetic interference (EMI) filters.

Configuration

⚠ WARNING

LOSS OF CONTROL

- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and overtravel 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 the implications of unanticipated transmission delays or failures of the link.¹
- Each implementation of an ATV21 BACnet option card must be individually and thoroughly tested for proper operation before being placed into service.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

¹ For additional information, refer to NEMA ICS 1.1 (latest edition), "Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control" and to NEMA ICS 7.1 (latest edition), "Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems."

Selecting Local or Remote Mode

⚠ DANGER

UNINTENDED EQUIPMENT OPERATION

- Know the state of the frequency and run commands from the remote source before exiting the local mode.
- Upon entering the remote mode, the drive controller will respond to the most recent command from the remote source, even if it was received before entering or while in the local mode.

Failure to follow these instructions will result in death or serious injury.

Use the LOC/REM key on the drive controller's keypad to switch between local and remote mode.

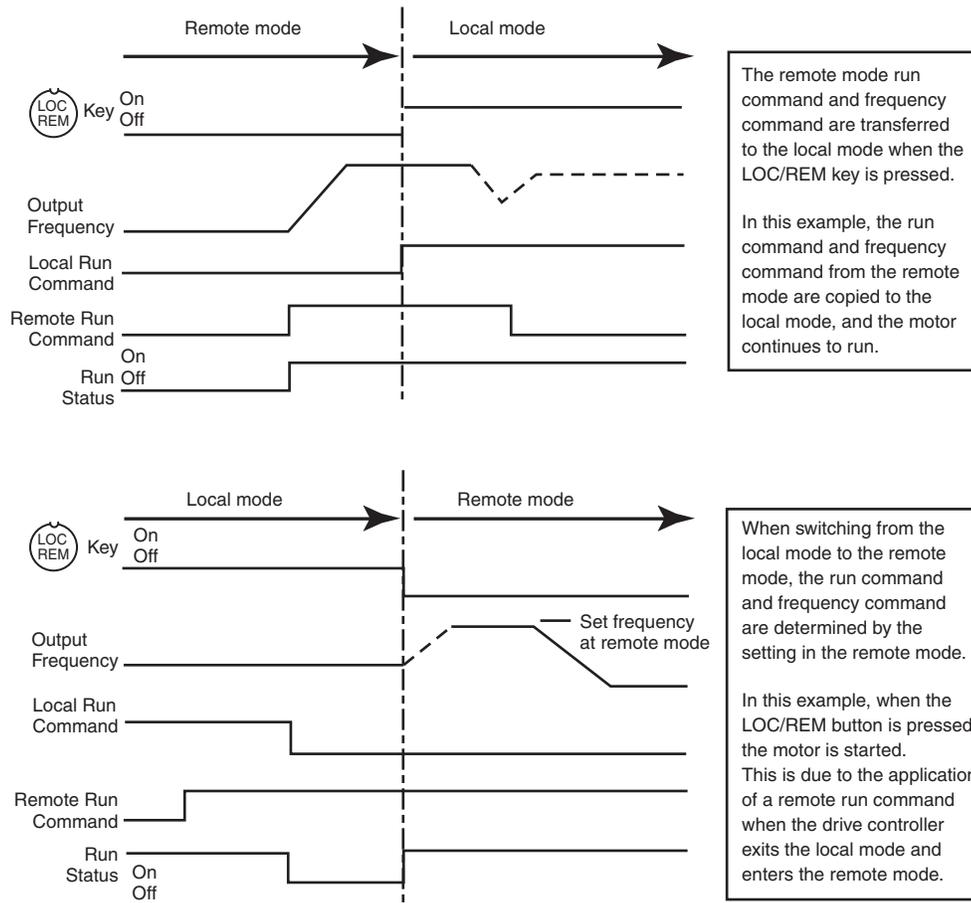
The LOC/REM key can be disabled by setting parameter F732 to 1.

When parameter F295 is set to 1 (factory setting), a bumpless transfer of motor operation is achieved when switching from remote to local mode. For example, if the bumpless transfer feature is active and if the motor is running at full speed with the drive controller in remote mode, the motor will still run at full speed after the drive controller is transferred to local mode.

Conversely, when switching from local to remote mode, the run and speed command is not transferred to the remote mode. Upon entering the remote mode, the drive will operate on the run and speed command set by the remote source even if it was received before entering or while in the local mode.

Refer to Figure 5 on page 17 for an example timing diagram.

Figure 5: Switching Between Local and Remote Mode



The remote mode run command and frequency command are transferred to the local mode when the LOC/REM key is pressed.

In this example, the run command and frequency command from the remote mode are copied to the local mode, and the motor continues to run.

When switching from the local mode to the remote mode, the run command and frequency command are determined by the setting in the remote mode.

In this example, when the LOC/REM button is pressed, the motor is started. This is due to the application of a remote run command when the drive controller exits the local mode and enters the remote mode.

Configuring the Response to a Communication Interruption

⚠ WARNING

LOSS OF CONTROL

Refer to “Serial Communication Parameters” in the *Altivar® 21 Programming and Operation Guide*, 30072-451-63, for more information on how to set the serial communication parameters to stop the drive controller when the option card is deactivated by an unusual event such as tripping, an operating error, a power outage, or a failure.

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

Parameters F803, F851, and F892 determine how the drive controller responds to a communication interruption. A communication interruption may cause unpredictable operation if these parameters are not set properly. Refer to Table 3.

A communication error (Err 5) is triggered within the time period defined by parameter F803 if the BACnet card is deactivated by an event such as a disconnected cable or a power outage. A network error (Err 8) is triggered if the network does not receive a BACnet message of any type within the time period defined by parameter F892.

The setting of parameter F851 defines how the drive controller responds to a communication interruption.

Table 3: Communication Loss Parameters

Parameter	Function	Possible Values	Recommended Setting	
F803	Communication error trip time	1–100 seconds	Application dependent	
F851	Drive controller behavior after a communication interruption	0	Controller ramps to a stop. Serial control is relinquished to sources defined by FMOD and CMOD.	Application dependent
		1	Last commanded operation continues.	
		2	Drive controller ramps to a stop. Serial control is maintained.	
		3	Drive controller removes power from the motor which coasts to a stop. Serial control is maintained.	
		4	Drive controller ramps to a stop. An Err 5 (communication error) or Err 8 (network error) is displayed. Restarting the drive controller requires a reset by one of the following means: <ul style="list-style-type: none"> • Cycling drive controller power • Initiating a reset command signal to a user-programmed logic input through terminals F, R, or RES • Pressing the Stop button on the keypad, if the Stop button is configured as a reset. See the <i>Altivar® 21 Programming and Operation Guide</i> , 30072-451-63, for configuring reset options.	
F892	Network communication error trip time	Calculated as seconds (1–60 s) x 0.1	Application dependent	

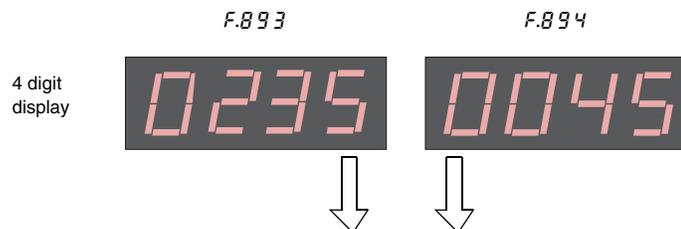
Configuring the Other Communication Parameters

Configure the communication parameters described in Table 5. These parameters can be modified only when the motor is stopped. Modifications take effect after the power is cycled.

Table 4: Communication Parameters

Parameter	Description	Possible Values	Default Value	Recommended Setting
CMOd	Remote mode start/stop control source	0: Control terminal logic inputs 1: Drive controller keypad 2: Serial communication	0	2
FMOd	Remote mode primary speed reference source	1: VIA 2: VIB 3: Drive controller keypad 4: Serial communication 5: +/- speed from external contact	1	4
F800	Communication speed	0: 9600 1: 19200	1	1
F829	Communication protocol	0: Do not use 1: Modbus® RTU/LonWorks 2: Metasys® N2 3: Apogee® P1 FLN 4: BACnet	1	4
F890	Address	0 to 127	0	Application dependent
F891	Bit rate	0: AUTO 1: 9600 bit/s 2: 19200 bit/s 3: 38400 bit/s 4: 76800 bit/s 5 and higher: AUTO	5	5
F892	Communication time-out	Calculated as seconds (1–60 s) x 0.1	10	10
F893 F894	Device instance number. See Figure 6.	F893: 0 to 4194 F894: 0 to 999	—	Application dependent
F895	Master device address on the MS/TP subnet	0 to 127	0	Application dependent
F896	The maximum number of frames that can be sent before passing the token to the next device.	1 to 100	0	Application dependent
F856	Number of motor poles. Used for calculating motor speed (rpm) from network feedback.	1: 2 poles 5: 10 poles 2: 4 poles 6: 12 pole 3: 6 poles 7: 14 poles 4: 8 poles 8: 16 poles	2	Application dependent

Figure 6: Instance Number



02350045 is the value of the Instance number. On the drive controller keypad, parameter F893 will display as 0235 and parameter F894 will display as 0045.

Control Configurations

There are three means of controlling the drive controller with the option card installed:

- The drive controller keypad
- The BACnet network
- The drive controller terminals

The keypad has priority when the LOC/REM key is in the LOC (local) position. To switch to network or terminal control, set the LOC/REM key to the REM (remote) position. See “Selecting Local or Remote Mode” on page 16.

To allow switching between network and terminal control, assign the forced local function to:

- Logic input F by setting parameter F111 to 48, or
- Logic input R by setting parameter or F112 to 48

In addition, you must set binary output points 11 (SPTSEL) and 12 (CMDSEL) according to Table 6 to define the switching behavior of the speed reference and command channels.

Table 5: Reference and Command Channel Switching

SPTSEL Value	CMDSEL Value	Switching Behavior
0	0	The source of the start/stop commands and speed reference cannot be switched with the forced local command.
0	1	The source of the start/stop commands switches when the logic input assigned to forced local is on, but the speed reference is not affected.
1	0	The source of the speed reference switches when the logic input assigned to forced local is on, but the start/stop commands are not affected.
1	1	The source of the start/stop commands and the speed reference switches when the logic input assigned to forced local is on.

The following sections discuss the various control configurations.

Control by the Network

In this configuration:

- The start/stop commands and speed reference come from the BACnet network.
- The signals from the drive controller terminals are ignored.
- The LOC/REM key is active.

To use this configuration, set parameters CMOD and FMOD to the values shown in Table 7. This is the default control configuration.

Figure 7: Control by the BACnet Network

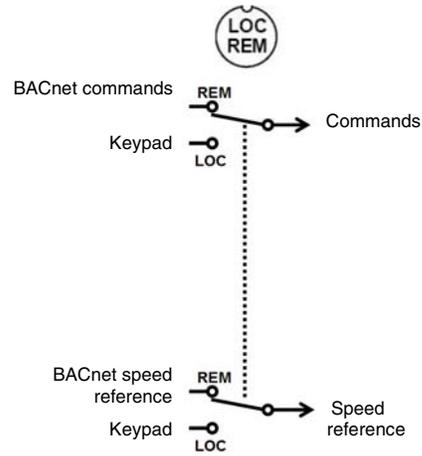


Table 6: Parameter Settings

Parameter	Setting	Description
CMOD	2	Commands from BACnet network
FMOD	4	Speed reference from BACnet network

Control by the Terminals

In this configuration, when the logic input (F or R) assigned to forced local is **on**:

- The start/stop commands and speed reference come from the drive controller terminals.
- The BACnet network has monitoring access to the drive controller.
- The LOC/REM key is active.

To use this configuration, set parameters CMOD, FMOd, and F111 (logic input F) or F112 (logic input R) to the values shown in Table 8. Set SPTSEL and CMDSEL to the values shown in Table 9.

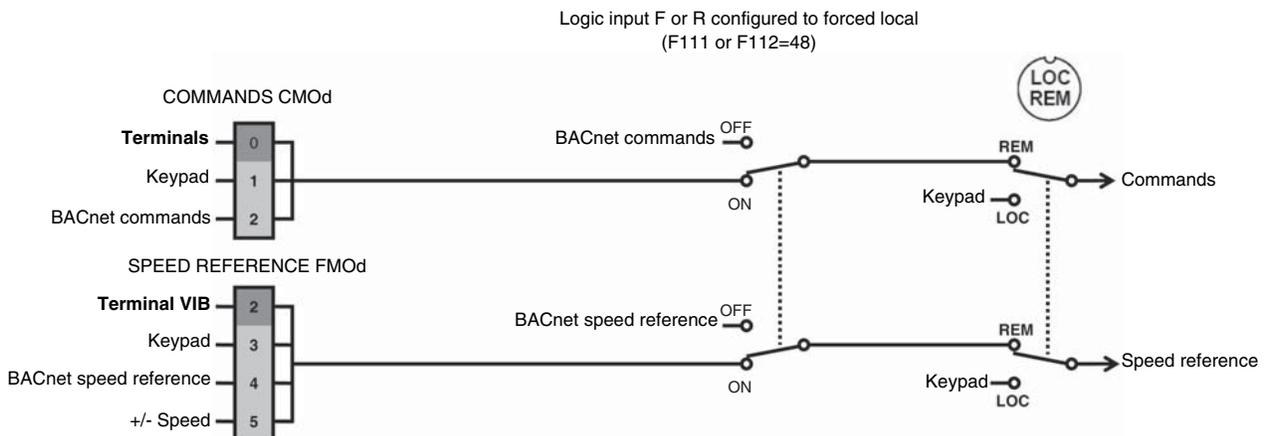
Table 7: Parameter Settings

Parameter	Setting	Description
CMOD	0	Commands from drive controller terminals
FMOd	2	Speed reference from terminal VIB
F111 (logic input F) or F112 (logic input R)	48	Logic input F configured to forced local or Logic input R configured to forced local

Table 8: SPTSEL and CMDSEL Settings

SPTSEL Value	CMDSEL Value	Switching Behavior
0	0	The source of the start/stop commands and speed reference cannot be switched with the forced local command.

Figure 8: Control by Terminals, Monitoring by the BACnet Network



Switching Control from the Network to the Terminals

In this configuration:

- The start/stop commands and speed reference come from the BACnet network if the logic input (F or R) assigned to forced local is **off**.
- The start/stop commands and speed reference come from the drive controller terminals if the logic input (F or R) assigned to forced local is **on**.
- The LOC/REM key is active.

To use this configuration, set parameters CMOD, FMOd, and F111 (for logic input F) or F112 (for logic input R) to the settings shown in Table 10. Set SPTSEL and CMDSEL to the values shown in Table 11.

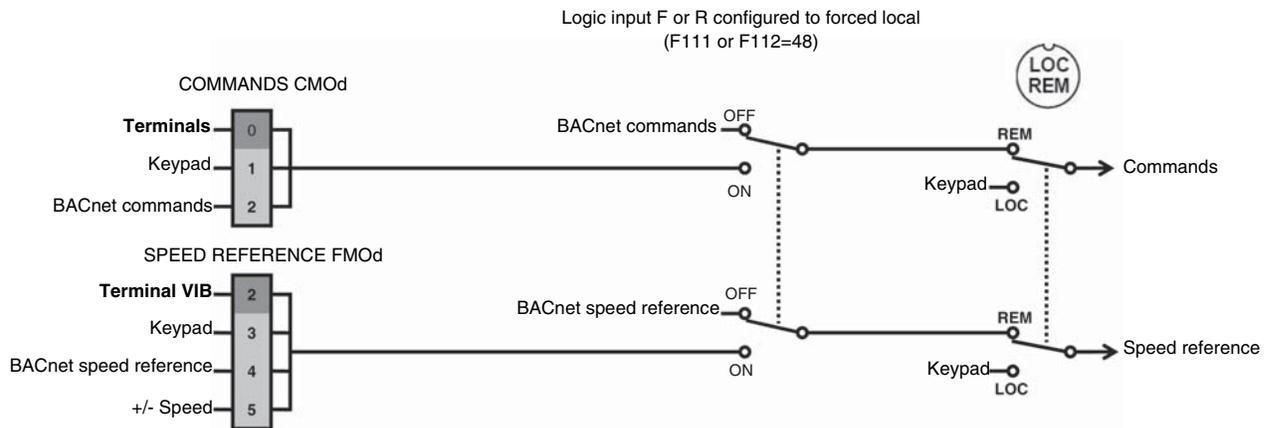
Table 9: Parameter Settings

Parameter	Setting	Description
CMOD	0	Commands from drive controller terminals
FMOd	2	Speed reference from terminal VIB
F111 (logic input F) or F112 (logic input R)	48	Logic input F configured to forced local or Logic input R configured to forced local

Table 10: SPTSEL and CMDSEL Settings

SPTSEL Value	CMDSEL Value	Switching Behavior
1	1	The source of the start/stop commands and speed reference switches when the logic input assigned to forced local is on.

Figure 9: Switching Control from the Network to the Terminals



**Start/Stop Commands from the Network;
Switching Speed Reference from the
Network to the Terminals**

In this configuration:

- The start/stop commands always come from the BACnet network.
- The speed reference comes from the BACnet network if the logic input (F or R) assigned to forced local is **off**.
- The speed reference comes from the drive controller terminals if the logic input (F or R) assigned to forced local is **on**.
- The LOC/REM key is active.

To use this configuration, set parameters CMOd, FMOd, and F111 (for logic input F) or F112 (for logic input R) to the settings shown in Table 12. Set SPTSEL and CMDSEL to the values shown in Table 13.

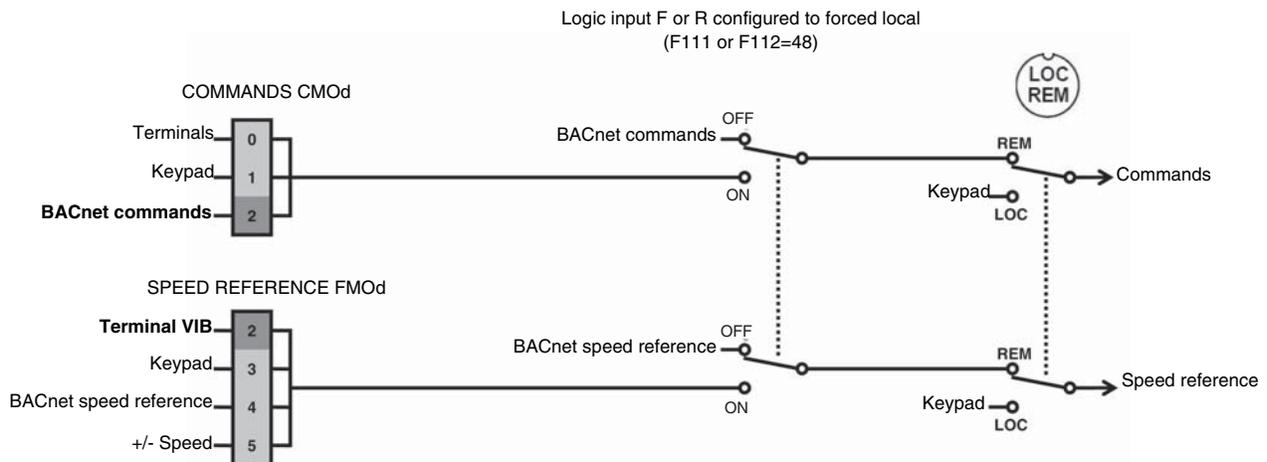
Table 11: Parameter Settings

Parameter	Setting	Description
CMOd	2	Commands from BACnet network
FMOd	2	Speed reference from terminal VIB
F111 (logic input F) or F112 (logic input R)	48	Logic input F configured to forced local or Logic input R configured to forced local

Table 12: SPTSEL and CMDSEL Settings

SPTSEL Value	CMDSEL Value	Switching Behavior
1	0	The source of the speed reference switches when the logic input assigned to forced local is on, but the start/stop commands are not affected.

Figure 10: Start/Stop Commands from the Network; Switching Speed Reference from the Network to the Terminals



**Speed Reference from the Network;
Switching Start/Stop Commands from
the Network to the Terminals**

In this configuration:

- The speed reference always comes from the BACnet network.
- The start/stop commands come from the BACnet network if the logic input (F or R) assigned to forced local is **off**.
- The start/stop commands come from the drive controller terminals if the logic input (F or R) assigned to forced local is **on**.
- The LOC/REM key is active.

To use this configuration, set parameters CMOd, FMOd, and F111 (for logic input F) or F112 (for logic input R) to the settings shown in Table 14. Set SPTSEL and CMDSEL to the values shown in Table 15.

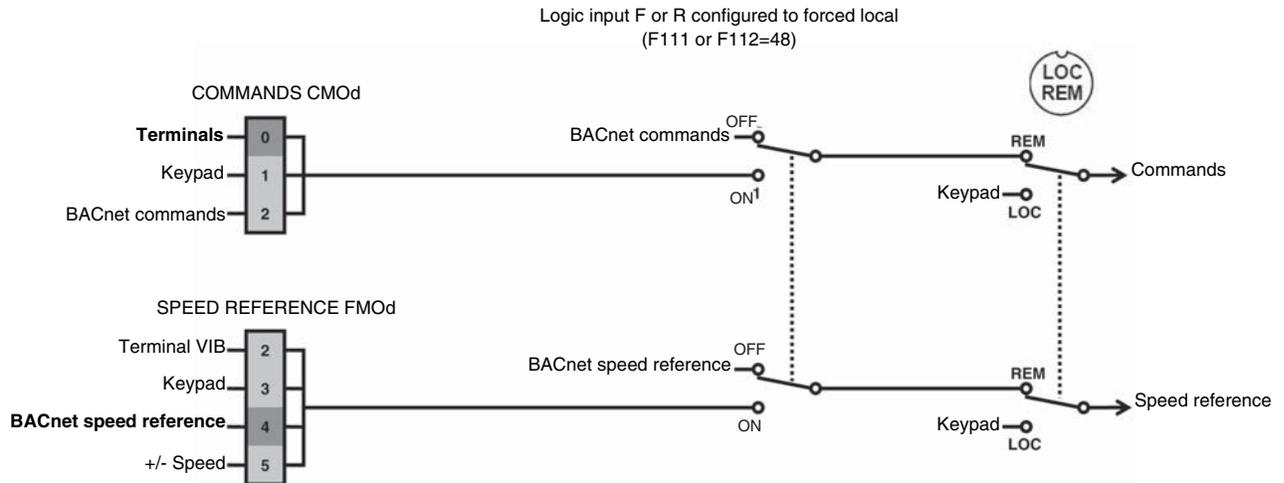
Table 13: Parameter Settings

Parameter	Function	Description
CMOd	0	Commands from drive controller terminals
FMOd	4	Speed reference from BACnet network
F111 (logic input F) or F112 (logic input R)	48	Logic input F configured to forced local or Logic input R configured to forced local

Table 14: SPTSEL and CMDSEL Settings

SPTSEL Value	CMDSEL Value	Switching Behavior
0	1	The source of the start/stop commands switches when the logic input assigned to forced local is on, but the speed reference is not affected.

Figure 11: Speed Reference from the Network; Switching Start/Stop Commands from the Network to the Terminals



Diagnostics

LEDs

The BACnet card has two LEDs, COM and ERR, as illustrated in Figure 12. Table 16 describes the LED states.

Figure 12: BACnet Card LEDs

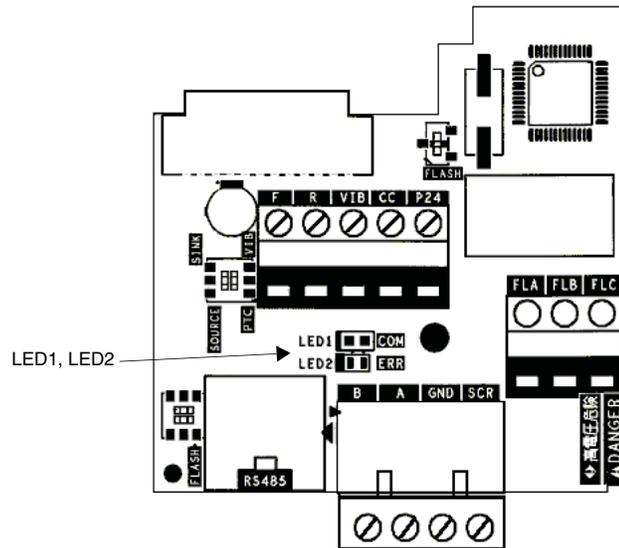


Table 15: LED Description

COM Green LED	ERR Red LED	Description
Off	Flashing 3 times in 2 s, Off for 1 s	Communication loss detected
On	Flashing Off for 0.5 s, On for 0.5 s	Invalid configuration detected
Flashing 3 times in 2 s, Off for 1 s	Off	Waiting for auto baud rate detection
Flashing	Off	Valid message received
Off	Flashing	Invalid message received

Network Communication Interruptions

Refer to “Configuring the Response to a Communication Interruption” on page 18 for information on configuring the drive controller response to a network communication interruption.

Figure 13 illustrates drive controller behavior after a communication interruption with logic input R set to forced local (F112=48), and Figure 14 illustrates drive controller behavior after a communication interruption without the forced local function.

Figure 13: BACnet Communication Interruption (F851 = 0: Communication Release) with Logic Input R Set to Forced Local

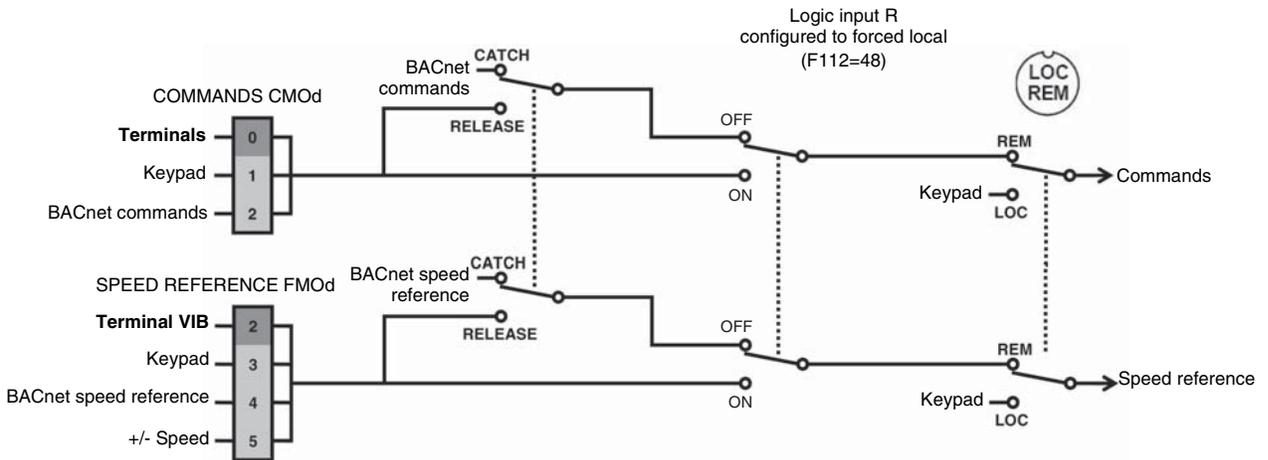
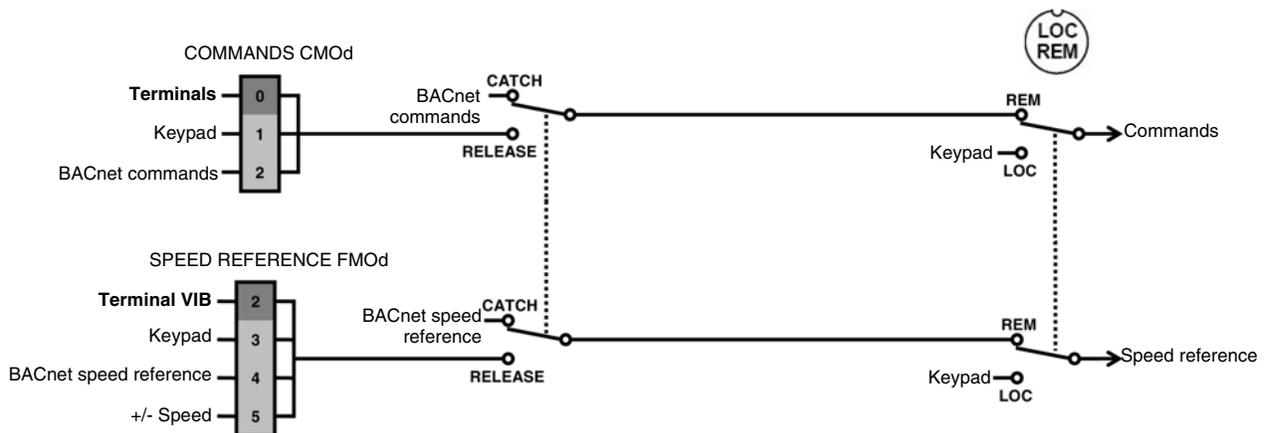


Figure 14: BACnet Communication Interruption (F851 = 0: Communication Release)



Network Objects

The following object types are supported by ATV21 drive controllers:

- Drive I/O
- Control
- Parameter access
- Identification

Drive I/O

Binary Inputs

Table 17 summarizes the binary input (BI) objects supported.

Table 16: Binary Input (BI) Object Instance Summary

ID	Object name	Description	Active/Inactive Text	Access ¹
Binary input #0	RO 1 ACT	Indicates status of relay R1	On/Off	R
Binary input #1	RO 2 ACT	Indicates status of relay RY	On/Off	R
Binary input #6	DI 1 ACT	Value of F	On/Off	R
Binary input #7	DI 2 ACT	Value of R	On/Off	R

¹ R: read only; W: writable; C: commandable.

Binary Outputs

Table 18 summarizes the binary output (BO) objects supported.

Table 17: Binary Output (BO) Object Instance Summary

ID	Object Name	Description	Active/Inactive Text	Access ¹
Binary output #0	RO1 CMD	Control of the FL relay is only possible when the relay is not assigned to an output function.	On/Off	C

¹ R: read only; W: writable; C: commandable.

Analog Inputs

Table 19 summarizes the analog input (AI) object supported.

Table 18: Analog Input (AI) Object Instance Summary

ID	Object Name	Description	Units	Access ¹
Analog input #1	ANALOG INPUT 2	VIB analog	%	R

¹ R: read only; W: writable; C: commandable.

Control Objects

Binary Values

Table 20 summarizes the binary value (BV) objects supported.

Table 19: Binary Value (BV) Object Instance Summary

ID	Object Name	Description	Active/Inactive Text	Access ¹
Binary value #0	RUN/STOP ACT	Indicates drive controller status	RUN/READY	R
Binary value #1	FWD/REV ACT	Indicates motor rotation direction	REV/FWD	R
Binary value #2	FAULT ACT	Indicates the drive controller's fault status	FAULTED/NONE	R
Binary value #4	HAND/AUTO ACT	Indicates whether the drive controller is locally controlled or not	HAND/AUTO	R
Binary value #6	MAIN REQ	Cumulative operation hours alarm	YES/NO	R
Binary value #7	DRIVE READY	The drive controller is ready and waiting for a start command.	READY/NOT READY	R
Binary value #8	AT SETPOINT	The drive controller has reached the target speed.	REACHED/NO	R
Binary value #10	RUN/STOP CMD	Commands the drive controller to start	START/STOP	C
Binary value #11	FWD/REV CMD	Commands the motor to change direction	REV/FWD	C
Binary value #14	FAULT RESET	Resets faults	RESET/NO	C
Binary value #15	MBOX READ	Command to read parameter	READ/RESET	C
Binary value #16	MBOX WRITE	Command to write parameter	WRITE/RESET	C
Binary value #18	SP1PRESET	Preset speed operation frequencies 1	SP1/NONE	C
Binary value #19	SP2PRESET	Preset speed operation frequencies 2	SP2/NONE	C
Binary value #20	SP3PRESET	Preset speed operation frequencies 3	SP3/NONE	C
Binary value #21	SPTSEL	Frequency priority selection	ENABLED/OFF	C
Binary value #22	CMDSEL	Command priority selection	ENABLED/OFF	C

¹ R: read only; W: writable; C: commandable

Analog Values

Table 21 summarizes the analog value (AV) objects supported.

Table 20: Analog Value (AV) Object Instance Summary

ID	Object name	Description (Code)	Units	Access ¹
Analog value #0	OUTPUT SPEED	Output speed	rpm	R
Analog value #1	OUTPUT FREQ	Output frequency	Hz	R
Analog value #2	DC BUS VOLT	DC bus voltage	V	R
Analog value #3	OUTPUT VOLT	Motor voltage	V	R
Analog value #4	CURRENT	Motor current	A	R
Analog value #5	TORQUE	Motor torque	%	R
Analog value #6	POWER	Motor power	%	R
Analog value #7	DRIVE TEMP	Drive thermal state	%	R
Analog value #8	KWH (R)	Energy counter (resettable)	kWh	R
Analog value #10	PRC PID FBCK	PID feedback value	%	R
Analog value #14	RUN TIME (R)	Operating time	H	R
Analog value #16	INPUT REF 1	Velocity / frequency setpoint from BACnet	%	C
Analog value #18	LAST FLT	Error code	—	R
Analog value #19	PREV FLT 1	Previous fault (occurred before LASTFLT)	—	R
Analog value #20	PREV FLT 2	Previous fault (occurred before PREVFLT1)	—	R
Analog value #23	ACCEL1 TIME	Acceleration time	S	W
Analog value #24	DECEL1 TIME	Deceleration time	S	W
Analog value #25	MBOX PARAM	Parameter number ²	—	W
Analog value #26	MBOX DATA	Parameter value	—	W

¹ R: read only; W: writable; C: commandable

² Internal Modbus address for desired parameter

Network Services

Table 21: List of Services

	Drive I/O		Operating Mode		Parameters Access		Identification	
	BACnet service (BIBB)	Objects type	BACnet service (BIBB)	Objects type	BACnet service (BIBB)	Objects type	BACnet service (BIBB)	Objects type
BACnet Environment 	ReadProperty (DS-RP-B) ReadProperty Multiple (DS-RPM-B) WriteProperty (DS-WP-B) WriteProperty Multiple (DS-WPM-B)	BI BO AI AO	ReadProperty (DS-RP-B) ReadProperty Multiple (DS-RPM-B) WriteProperty (DS-WP-B) WriteProperty Multiple (DS-WPM-B)	BV AV	ReadProperty (DS-RP-B) ReadPropertyMultiple (DS-RPM-B) WriteProperty (DS-WP-B) WriteProperty Multiple (DS-WPM-B)	BV AV	ReadProperty (DS-RP-B) ReadProperty Multiple (DS-RPM-B) WriteProperty (DS-WP-B) WriteProperty Multiple (DS-WPM-B)	Device Object
					Reinitialize Device (DM-RD-B)	NA		
Drive Controller's Environment	Access to all drive controller wired I/Os		Controls the drive controller in normal operation		Enables access to drive controller's parameters		Delivers information relative to the drive controller	

Table 22: List of Available BACnet Services

BACnet Service	BIBB	Family	Action
ReadProperty	(DS-RP-B)	Data Sharing	The drive controller provides the current value of a drive controller object property.
WriteProperty	(DS-WP-B)	Data Sharing	Modifies the current value of a drive controller object property
WritePropertyMultiple	(DS-WPM-B)	Data Sharing	Writes several properties of several objects
ReadPropertyMultiple	(DS-RPM-B)	Data Sharing	Reads several properties of several objects
Who-Is	(DM-DDB-B)	Device and Network Management	The drive controller provides information about its attributes and responds to requests to identify itself.
I-Am	(DM-DDB-B)	Device and Network Management	
Who-Has	(DM-DOB-B)	Device and Network Management	The drive controller provides address information about its objects.
I-Have	(DM-DOB-B)	Device and Network Management	
DeviceCommunication Control	(DM-DCC-B)	Device and Network Management	The drive controller responds to communication control exercised by the external device.
ReinitializeDevice	(DM-RD-B)	Device and Network Management	The drive controller performs reinitialization requests from the master device.

Access to the Drive Controller Objects Collection

To control the drive controller, the external application must modify the values of binary and analog objects using the following services:

- ReadProperty
- WriteProperty
- ReadPropertyMultiple
- WritePropertyMultiple

These services allow reading or writing of all drive controller objects. For the list of objects, refer to the *Altivar® 21 Programming and Operation Guide*, 30072-451-63.

Additional Functions

The BACnet card provides the additional functions described in this section.

Full Parameter Access

With indirect access, it is possible to read or write to any of the internal drive controller parameters using the following four objects:

- MBOX DATA
- MBOX PARAM
- MBOX READ
- MBOX WRITE.

To read the value of a parameter:

1. Write the logic address of the parameter to the present value property of the object MBOX PARAM.
2. Set the present value property of the object MBOX READ to "read".

The current value of the parameter can be read in the present value property of MBOX DATA.

To **write** a value to a parameter:

1. Write the logic address of the parameter to the present value property of the object MBOX PARAM.
2. Write the new value in the present value property of the object MBOX DATA.
3. Set the present value property of the object MBOX WRITE to "write".

NOTE: MBOX READ and MBOX WRITE automatically become inactive once a command is sent. They always return a "0" when read.

Drive Controller Identification

Information about the drive controller is stored in a unique object called ATV21 (Device object type). Table 24 lists the properties of this object. These properties are formatted as a character string.

Table 23: Object ATV21—Drive Controller Identification

Property (Member of ATV21)	Description
VendorName	Brand label
ModelName	Drive controller catalog number
Firmware_Revision	Communication card software version
Application_Software_Version	Control card software version
Location	Not supported
Description	Not supported

Altivar® 21 BACnet Card VW3A21315
Instruction Bulletin

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