LonWorks® to Modbus® Module
VW3A58312PU

Instruction Bulletin
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⚠ DANGER

HAZARDOUS VOLTAGE

- Read and understand this bulletin in its entirety before installing or operating Altivar® 58 *TRX* drive controllers. Installation, adjustment, repair, and maintenance of the drive controllers must be performed by qualified personnel.
- The user is responsible for conforming to all applicable code requirements with respect to grounding all equipment.
- Many parts in this drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.

Before servicing the drive controller:

- Disconnect all power including external control power that may be present before servicing the drive controller.
- Place a “DO NOT TURN ON” label on the drive controller disconnect.
- Lock the disconnect in the open position.
- WAIT TEN MINUTES for the DC bus capacitors to discharge. Then follow the DC bus voltage measurement procedure on page 13 to verify that the DC voltage is less than 45 V. The drive controller LEDs are not accurate indicators 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.

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SECTION 1: INTRODUCTION

PRODUCT OVERVIEW

The Altivar® 58 *TRX* (ATV58 *TRX*) family of adjustable frequency AC drive controllers is used for controlling three-phase asynchronous motors. They range from:

- 1 to 75 hp (0.75 to 55 kW) constant torque, 400/460 V, three-phase input
- 1 to 500 hp (0.75 to 315 kW) variable torque, 400/460 V, three-phase input
- 0.5 to 7.5 hp (0.37 to 5.5 kW) constant torque, 208/230 V, single-phase input
- 0.5 to 30 hp (0.37 to 22 kW) variable torque, 208/230 V, single-phase input
- 2 to 40 hp (1.5 to 30 kW) constant torque (50 hp variable torque), 208/230 V three-phase input

This bulletin explains how to integrate an ATV58 *TRX* drive controller into a LonWorks® network with the LonWorks to Modbus® module. Use this bulletin to install, wire, and configure the LonWorks module.

The VW3A58312PU LonWorks to Modbus module is a protocol converter that allows the ATV58 *TRX* drive controller to be integrated into a new or pre-existing LonWorks network with plug-and-play simplicity. The LonWorks module can be incorporated into a new drive installation or can be incorporated with an installed ATV58 *TRX* drive controller.

The module uses the Echelon® free topology transceiver (FTT-10A). The transceiver connects to the LonWorks network via a single twisted pair cable with a data transmission rate of 78 kbps. The compact module is connected point-to-point through the supplied 29.5 in. (750 mm) cable to either the ATV58 *TRX* integrated keypad Modbus port or to the 9-pin connector on the Modbus option card (part number VW3A58303U). The user must supply 24 Vdc power separately. The module is DIN rail mounted. External Interface files (XIF, versions 4.4, 4.1, 3.1, and 2.0) and Device Resource files are supplied on diskette.

When connected to the LonWorks module, the ATV58 *TRX* drive controller joins other HVAC devices in a low-cost building control network. As a node on the network, the ATV58 *TRX* drive controller provides the following functions:

- Command and setpoint control
- PI process control
- Adjustment and configuration
- Monitoring values such as motor speed, current, and drive status
- Display of kilowatt hours and total run time on drive controllers with ATV58 *TRX* drive controller firmware version 4.0 or later
- Remote fault reset
- Module and drive controller diagnostics

The LonWorks module for the ATV58 *TRX* drive controller complies with LonMark® Interoperability Guidelines Version 3.3 and with the LonMark Functional Profile for Variable Speed Motor Drives 6010 Version 1.1. Information on the LonWorks network is available from www.lonmark.org and www.echelon.com. Information on the ATV58 *TRX* drive controller is available from www.SquareD.com.

⚠ 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.

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

NOTE: 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 ICS7.1 (latest edition), Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable-Speed Drive Systems.

To use the LonWorks module, the installer must supply separate equipment:

- If the ATV58 *TRX* drive controller does not have a keypad display installed, a programming option must be supplied (only one programming option is necessary to configure one or multiple drives):
  - — Keypad display (part number VW3A58101)
  - — PowerSuite Software on CD (part number VW3A8104) and PC connection kit (part number VW3A8106)
- For each drive controller that has a keypad display permanently installed, supply a Modbus option card (part number VW3A58303U).
- A power supply (24 Vdc ± 20%) for the LonWorks module. Each module requires a maximum of 140 mA.
- A 35-mm DIN rail for mounting the module.
- A Local/Off/Remote operator must be installed as shown on page 20.

DRIVE FIRMWARE COMPATIBILITY

The LonWorks to Modbus module is compatible with ATV58 *TRX* drive controllers loaded with firmware version V3.1 IE16 and later. Kilowatt hours and total run time values are available with ATV58 *TRX* drive controller firmware version 4.0 and later. The label indicating the firmware version is located on the main control board just above the keypad Modbus port (see Figure 2 on page 14).

Revision Level

This release is for version 1.1 of the VW3A58312PU LonWorks card.

New Features of Version 1.1 LonWorks to Modbus Gateway.

Version 1.1 features the following enhancements.

Network Variable Documentation Strings

Documentation strings for all network variables are stored directly in the gateway, so you can install the gateway onto a LonWorks system without using the XIF files. This feature provides function-related name strings for all network variables.

Network Variable Aliases

Version 1.1 supports up to 46 network variable aliases, used to circumvent the binding constraints in some installation scenarios. Network variables are used when connecting an output variable on one node to several input variables on another single node, to ensure that each binding gets a unique selector value. Normally, the network management tool (such as LonMaker™ for Windows) handles the use of network variable aliases, making it transparent to the user.

RECEIVING, PRELIMINARY INSPECTION, AND STORAGE

Before installing the LonWorks module, read this manual and follow all precautions.

Before removing the module from its packing material, verify that there is no shipping damage to the packing carton. Damage to the packing carton usually indicates improper handling and the potential for device damage. After removing the module from its packaging, inspect its exterior for shipping damage. If any damage is found, notify the carrier and your local Square D/Schneider Electric representative. Do not install a damaged device.

Ensure that the part number printed on the box label is the same as the number on the packing slip and corresponding purchase order. Verify that the information on the module nameplate matches the box label. Contact your local Square D/Schneider Electric representative if there are any errors.

The package should contain the following four items:

1. LonWorks to Modbus module
2. Interconnecting cable from the module to the drive
3. Diskette with External Interface Files (XIF) and Device Resource Files for the LonWorks installation tool
4. Instruction bulletin

Static Precautions

Observe the following precautions for handling static sensitive components when removing the module from its packaging for installation:

- Keep static producing material (plastic, upholstery, carpeting, etc.) out of the immediate work area.
- Avoid touching conductors with skin or clothing.

To store the module, replace it in its original package (including the antistatic bag) and store it in a clean, dry area where the ambient is between -13 to 158 °F (-25 to 70 °C).

ENVIRONMENTAL SPECIFICATIONS

Enclosure type	IP20 (Standard EN50178)
Resistance to vibration	1.5 mm zero to peak from 3 to 13 Hz 1 g from 13 to 150 Hz (IEC 60068-2-6)
Resistance to shock	15 g for 11 ms (IEC 60068-2-27)
Ambient pollution degree	Pollution degree 2 (IEC 664-1 and UL840)
Relative humidity	95% maximum at +50 °C, non-condensing and without dripping (IEC 60068-2-3)
Ambient temperature	Storage: -13 to 158 °F (-25 to 70 °C) Operation: 32 to 122 °F (0 to 50 °C)
Altitude	9900 ft (3000 m) maximum
EMC immunity and emissions	Complies with IEC 61000-6
Certifications	cULus, CE marked

USING THIS MANUAL

To prepare the ATV58 *TRX* drive controller for connection to a LonWorks network, refer to the following sections:

- “Section 2: Hardware Setup and Wiring” on page 12
- “Section 3: Control Modes” on page 19
- “Section 4: ATV58 TRX Drive Controller Configuration” on page 22
- “Section 5: LonWorks Configuration” on page 26

For startup, refer to “Section 6: Minimum Startup Procedure” on page 44. Refer to “Section 7: Diagnostics” on page 46 for troubleshooting assistance. For information about specific drive controller parameters, see Instruction Bulletin VVDED397047US (latest revision), ATV58 *TRX* Keypad Display. For information on the installation, start-up, wiring, and maintenance of the drive controller, refer to the installation guide delivered with the drive controller.

SECTION 2: HARDWARE SETUP AND WIRING

LONWORKS MODULE LAYOUT

Figure 1 identifies the layout of the LonWorks module: the LonWorks connector (1), the service pin (2), the diagnostic LEDs (3), the Modbus RJ45 female port (4), the power supply connector (5), and the 35-mm DIN-rail connector (6).

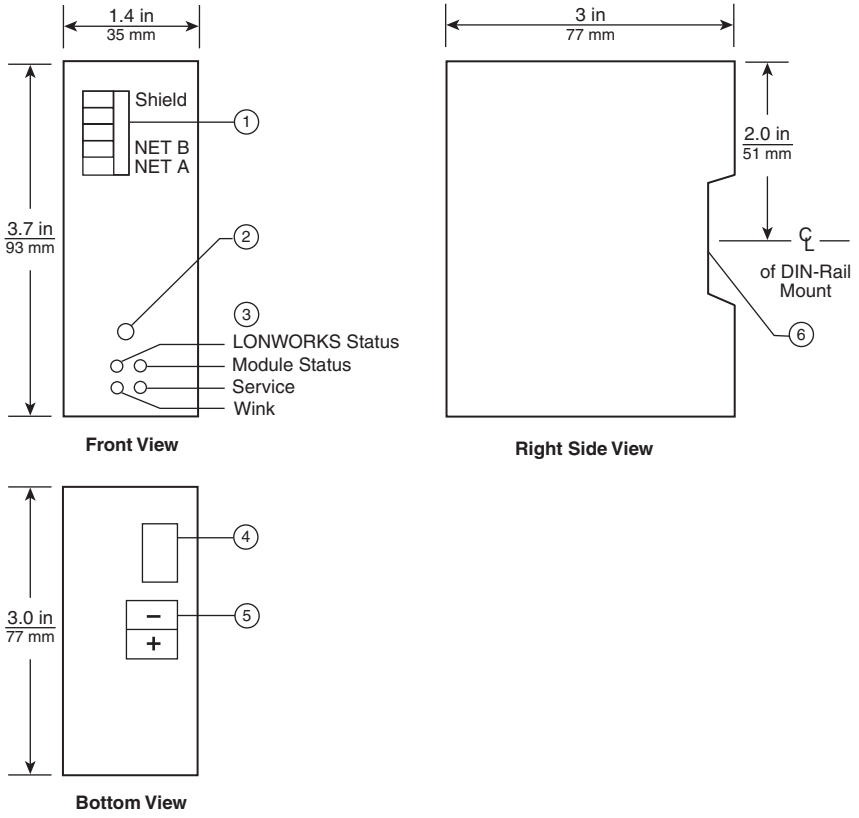


Figure 1: LonWorks Module Layout

BUS VOLTAGE MEASUREMENT PROCEDURE

Verify that all power has been removed from the ATV58 *TRX* drive controller as well as from any other connected equipment on the panel or in the enclosure before installing the LonWorks to Modbus module. Before connecting the module to the ATV58 *TRX* drive controller, measure the bus voltage as described in this section.

⚠ DANGER

HAZARDOUS VOLTAGE

- Read and understand the bus voltage measurement procedure before performing the procedure. Measurement of bus capacitor voltage must be performed by qualified personnel.
- DO NOT short across DC bus capacitors or touch unshielded components or terminal strip screw connections with voltage present.
- Many parts in this drive controller, including printed wiring boards, operate at line voltage. DO NOT TOUCH. Use only electrically insulated tools.

Electrical shock will result in death or serious injury.

The DC bus voltage level is determined by monitoring the (+) and (–) measurement points. Their location varies by drive controller model number as listed in Table 1 and shown in Figure 2 on page 14. The drive controller model number is listed on the nameplate.

Table 1: (+) and (–) Measurement Points

Drive Controller Catalog Number ATV58••••••	(+) Measurement Point		(–) Measurement Point	
	Terminal Block or Connector	Terminal Designation	Terminal Block or Connector	Terminal Designation
U09M2• and U18M2•	J2	(+)	J2	(–)
U29M2• to D12M2•	J2	PA	J18	7
U18N4• to D23N4•				
D16M2• to D46M2•	J2	(+)	J2	(–)
D28N4• to D79N4•				
C10N4X to C33N4X		PA (+)		PC (–)

To measure the DC bus capacitor voltage:

1. Disconnect all power from the drive controller including external control power that may be present on the control board and the option board terminals.
2. Wait 10 minutes for the DC bus capacitors to discharge.

The J18 connector is in the upper left-hand corner of the main control board behind the flexible shield. Use a thin probe to access the connector pin.

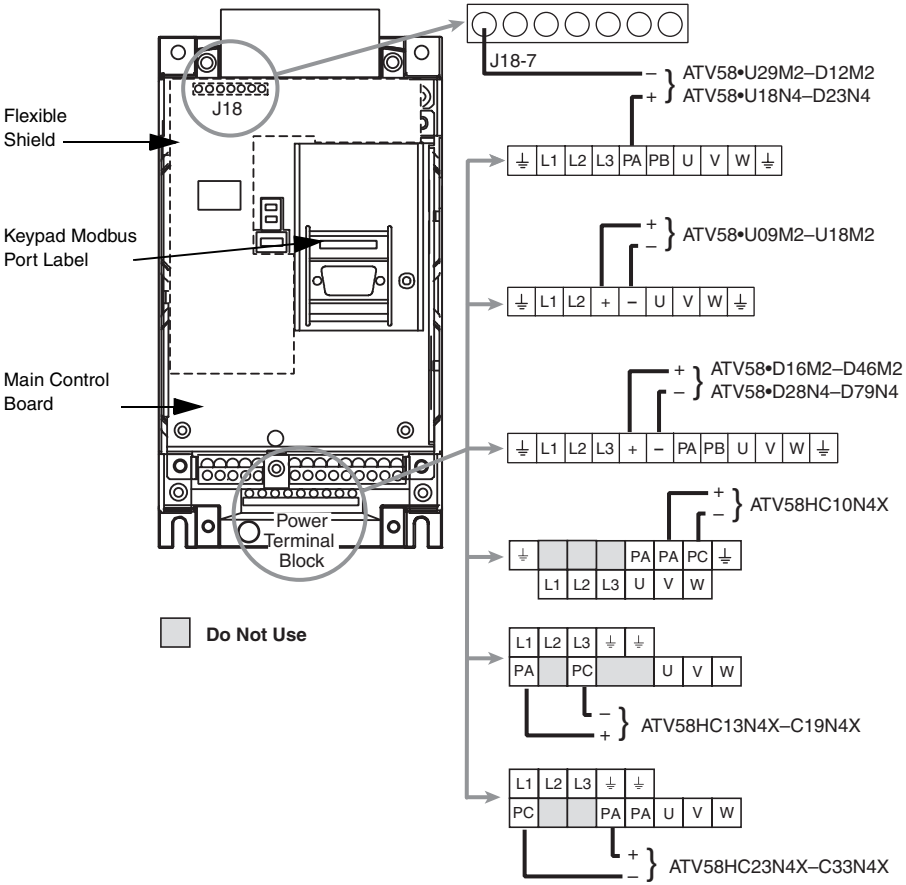


Figure 2: DC Bus Voltage Measurement Point Locations (ATV58HU09M2 shown)

3. Read the model number of the drive controller from the nameplate and identify the corresponding (+) and (–) measurement points from Table 1 and Figure 2.
4. Open the door or cover of the drive controller.
5. Set the voltmeter to the 1000 Vdc scale. Measure the voltage between the (+) and (–) measurement points identified in step 3. Verify that the DC bus voltage has discharged below 45 V before servicing the drive controller.
6. If the DC bus capacitors will not discharge below 45 V, contact your local Square D/Schneider Electric representative. **Do not operate the drive controller.**
7. Replace all covers or doors after servicing the drive controller.

MECHANICAL INSTALLATION

Perform the bus voltage measurement procedure, which begins on page 13, before installing the module.

LonWorks Module

The LonWorks module cannot be mounted internally to the ATV58 *TRX* drive controller.

1. Choose a location on the panel to mount the module.
   - — Mount the module as far as possible from the line and load wiring.
   - — The module should be near enough to the ATV58 *TRX* drive controller that the supplied 29.5 in. (750 mm) Modbus cable can extend from the Modbus port on the module to the Modbus port on the ATV58 *TRX* drive controller. Ensure that there is sufficient slack in the cable to avoid stress on the Modbus port connectors.
   - — Maintain a minimum of 1 in. (25 mm) spacing around the top and sides of the module. Allow 3 in. (75 mm) minimum on the bottom of the module for making the Modbus and 24 Vdc power connection. Maintain minimum spacing from the drive controller as published in the installation guide delivered with the drive controller.
   - — Do not mount the module in the path of the heated air being discharged from the top of the ATV58 *TRX* drive controller.
   - — If the module is mounted below the ATV58 *TRX* drive controller, do not block the airflow circulated through the drive heatsink.

2. Securely fasten to the panel DIN rail of sufficient length to allow the module and any necessary end stops to be attached. The distance from the top of the module to the center of the DIN rail is 2 in. (50 mm).
3. Ensure that the DIN rail is properly grounded.
4. Attach the module to the DIN rail. The metal plate on the module should contact the DIN rail to provide a ground path.

24 Vdc Power Supply

1. The LonWorks module must be supplied with 24 Vdc (± 20%). It draws a maximum current of 140 mA.
2. Follow the manufacturer's instructions when mounting the power supply to the panel.

Modbus Option Card (Part Number VW3A58303U)

1. If a keypad display is regularly installed on the ATV58 *TRX* drive controller, a Modbus option card must be installed into the drive controller to supply a Modbus port connection for the LonWorks module.
2. Follow the instructions in user's manual VVDED397054US, delivered with the Modbus option card, to install the card into the ATV58 *TRX* drive controller.

ELECTRICAL WIRING

1. Route all wiring to the LonWorks module as far as possible from the drive controller line and load power wiring. Avoid parallel cable runs. Follow the recommendations in the section "Cable Routing Practices" on page 17.
2. Modbus connection:
   — Attach the supplied Modbus cable's RJ-45 connector to the Modbus port on the module (see Figure 1 on page 12).
   — If the ATV58 *TRX* drive controller is not supplied with a Modbus option card, connect the 9-pin Sub-D connector on the Modbus cable to the keypad Modbus port on the drive controller. Refer to Figure 2 on page 14 for the location of the keypad Modbus port. Make make this connection after the drive controller configuration has been completed. See "Section 4: ATV58 TRX Drive Controller Configuration" on page 22.

— If the ATV58 *TRX* drive controller is supplied with a Modbus option card, connect the 9-pin Sub-D connector on the Modbus cable to the option card Modbus port. Refer to the user's manual supplied with the Modbus option card for the location of the port.

3. LonWorks connection:
   — The LonWorks module accepts a two-conductor **shielded cable** as recommended for LonWorks networks. The connector accepts wire sizes from 16 AWG (1.3 mm) to 24 AWG (0.5 mm).
   — Secure the two conductors of the LonWorks network cable to terminals "NET A" and "NET B" of the LonWorks pull-apart connector on the front of the module (see Figure 1 on page 12). The connections are polarity insensitive.
   — Secure the cable shield to the "SHIELD" terminal.
   — Torque these connections to 2 lb-in (0.22–0.25 N•m).
4. Power supply connection:
   — Connect the two wires from the 24 Vdc power supply to the pull-apart terminal block on the bottom side of the LonWorks module. **Be sure to observe connection polarity.**
   — Use wire size between 12 AWG (2.5 mm) to 24 AWG (0.5 mm).
   — Torque these connections to 4–5 lb-in (0.5–0.6 N•m).

Cable Routing Practices

When wiring the ATV58 *TRX* drive controllers to a LonWorks network, follow all wiring practices required by national and local electrical codes.

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 for protecting the cable. These structures should be used for signal wiring paths and should not contain power wiring.

Avoid sources of electrical interference that can induce noise into the cable. Use the maximum practical separation from such sources.

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

- Maintain a minimum separation of 3.3 ft (1 m) from the following equipment: air conditioners, elevators, escalators, large blowers, radios, and televisions; intercom and security systems; and fluorescent, incandescent, and neon lighting fixtures.
- Maintain a minimum separation of 10 ft (3 m) from the following equipment: power wiring, transformers, generators, and alternators.

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 drive controller wiring. Do not run control network and power wiring in the same conduit.
- Separate non-metallic conduits or cable trays used to carry power wiring from metallic conduit carrying low-level control network wiring by at least 12 in (305 mm).
- Separate metallic conduits carrying power wiring or low-level control network wiring by at least 3 in (76 mm).
- Cross the metallic conduits and non-metallic conduits at right angles whenever power and control network wiring crosses.
- Attenuate conducted emissions from the drive controller to the line in some installations to prevent interference with telecommunication, radio, and sensitive electronic equipment. Such instances may require RFI filters or line reactors. Consult the Altivar 58 *TRX* AC Drive Catalog (8806CT9901) for selection and application of these filters.

For additional information on wiring guidelines for LonWorks networks and a list of cable vendors, refer to the LonWorks Engineering Bulletin, Junction Box and Wiring Guidelines for Twisted Pair LonWorks Networks, Part No. 005-0023-1. This bulletin is available on the Echelon website at www.echelon.com.

SECTION 3: CONTROL MODES

LOCAL AND REMOTE CONTROL MODES

The ATV58 *TRX* drive controller can be commanded in local and remote control modes. When the ATV58 *TRX* drive controller is powered up, it defaults to local (hand) control. Refer to the discussion of local and remote control on page 20. After the drive controller recovers from a power-up sequence (including such unplanned events as an AC line power disturbance), it immediately responds to local controls that may be active before the LonWorks module initializes and assumes control of the drive controller. **This will result in unintended equipment operation. It is therefore required that all local run and start commands to the drive controller be removed when the system is in the remote (auto) mode.**

It is possible to stop the drive controller in the remote (auto) mode by activating one of the local stop commands (such as the keypad display stop button). Refer to the discussion of forced local on page 21.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

- Commands sent over the LonWorks network can restart the drive controller if the drive controller is not in a forced local condition.
- It is necessary to put the drive controller into the forced local mode when the selector switch is in the local (hand) or off position.

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

The user must provide a 3-position selector switch with the following functionality:

- In local (hand) mode, forced local must be enabled.
- In off mode, all run terminal inputs must be disabled via open circuit and forced local must be enabled.
- In remote (auto) mode, the run terminal inputs must be disabled via open circuit and forced local must be disabled.

See Figures 3 and 4 for assistance in designing Local/Off/Remote control. For the Run Reverse and Forced Local functions, select any unused logic inputs on the main control board. Assign a logic input to the Run Reverse function only if appropriate for the application.

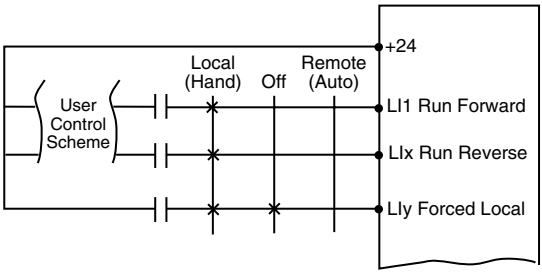


Figure 3: Example 2-Wire Control

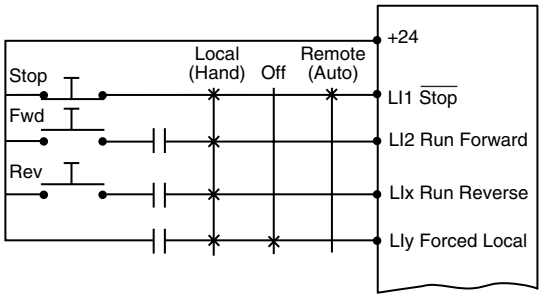


Figure 4: Example 3-Wire Control

NOTE: While the selector switch is in the remote (auto) position, removing the local run forward or run reverse commands will not stop the drive controller.

Local (Hand) Control

There are two modes of local (hand) control:

- The drive controller is managed by operators such as push buttons, switches, and a speed potentiometer that are wired to the drive controller terminal block, or
- The drive controller is managed by the digital keypad display buttons.

Refer to the ATV58 *TRX* Keypad Display Instruction Bulletin, VVDED397047US, for more details on how to select between the two modes of local control.

Remote (Auto) Control

In remote (auto) control mode:

- The drive controller is managed by the LonWorks serial network.
- The speed reference and the start/stop control cannot come from separate sources.

FORCED LOCAL

Switching between local and remote control is achieved by a switch wired to a logic input on the controller terminal block as illustrated in Figures 3 and 4 on page 20. The logic input must be assigned to the function “Forced Local”.

When the logic input assigned to forced local is active (high), all control of the drive controller is assigned to the selected local (hand) control mode. In this case, command requests by the LonWorks network are refused. Command parameters can be monitored. All other adjustment and display parameters can be read/write accessed.

⚠ WARNING

LOSS OF CONTROL

When in forced local mode, all commands from the communication ports are ignored.

Failure to consider the implications of unanticipated operation can result in death, serious injury, or equipment damage.

When the logic input is not active (low), all management of the drive controller is transferred to the LonWorks network if wired as shown in Figures 3 or 4. The only local (hand) controls that are still monitored by the drive controller include the logic input assigned to Forced Local and any input assigned to a drive controller stop function. Examples include the stop button on the keypad display, logic input one (LI1) which is assigned to the function STOP if the ATV58 *TRX* drive controller is configured for 3-wire control, and any logic input assigned to the functions freewheel stop, DC injection braking, and fast stop. See the ATV58 *TRX* Keypad Display Instruction Bulletin, VVDED397047US, for more details.

SECTION 4: ATV58 *TRX* DRIVE CONTROLLER CONFIGURATION

Configuration of the ATV58 *TRX* drive controller is dependant on which port is used for the Modbus connection to the module.

KEYPAD MODBUS PORT

If the cable from the LonWorks module is attached to the drive controller keypad Modbus port, the address of the ATV58 *TRX* drive controller must be set to 1. Using the keypad display or test and commissioning software, set the *Add* parameter (Menu 4) to a value of 1. *Do not change the baud rate of the keypad port;* this renders the keypad inoperable.

MODBUS OPTION CARD

If the Modbus option card (part number VW3A58303U) is installed in the drive controller and the cable from the LonWorks module is attached to the option card port, the following settings must be made.

Switches on the Modbus Card

1. Set the card to an address of 1. Only DIP switch 7 should be up in the “1” position.
2. Set both of the configuration switches to Modbus/JBUS position. This is the rightmost position.

Menu 8 through Keypad Display or Test and Commissioning Software

1. Verify that the address (*AdrC*) is set to 1. This is determined by the address switches on the Modbus card.
2. Verify that the protocol (*Pro*) is set to Modbus/RTU.
3. Set the transmission speed (*bdr*) to a baud rate of 9,600 bps. (It is possible to configure bdr to 19,200 bps. The module will autodetect to 9600 or 19,200 bps.)
4. Set format (*For*) to 8N1 for 8 data bits, no parity, and 1 stop bit.
5. After changing the baud rate setting of the optional Modbus card, **cycle power** to the LonWorks gateway to re-establish communications between the gateway and the drive controller at the new baud rate.

For more information, see Instruction Bulletin VVDED397054US, supplied with the VW3A58303U Modbus option card.

Forced Local Function

As described in the section “Forced Local” on page 21, a logic input must be assigned to the function Forced Local. Using the keypad display or test and commissioning software, enter the I/O Menu (Menu 5 on the keypad display). Select an unused Logic Input (LI) and assign it to the function Forced Local (FLO). Use this logic input for Forced Local when wiring in the selector switch.

Additional ATV58 *TRX* Drive Controller Configuration

Table 2 on page 24 lists the subset of ATV58 *TRX* drive controller configuration parameters that are accessible both through the drive controller's regular programming tools (keypad display or test and commissioning software) *and* over the LonWorks network.

If using the drive controller’s regular programming tools, this configuration should be completed before the LonWorks module is connected to the drive controller and configured for operation on the network. This is necessary as the module will read drive controller configuration values from the ATV58 *TRX* drive controller during its power-up sequence.

The LonWorks module does not read the drive controller's configuration parameters each time the LonWorks master requests a value. Instead, to improve response time for drive controller commands and status data, it reads the drive controller's configuration parameters only during initialization after power-up, and subsequently provides the parameter values from its own internal memory. After the module is initialized, if a drive controller parameter is changed through a programming tool, it is possible that the parameter value stored in the module will not match the value stored in the drive controller and the LonWorks master could read an incorrect value. To avoid this situation, restart the module after changing any drive controller parameter with a programming tool. Also note that for some LonWorks network management tools, it is necessary to synchronize the configuration properties between the management tool and the LonWorks module.

Table 2: Drive Controller Configuration Parameters Accessible through the Network

Parameter Name	Keypad Menu	Keypad Code	Range	Units	Factory Setting	Comments
Low Speed Setpoint	2	LSP	0 to HSP setting	Hz	0	
High Speed Setpoint	2	HSP	LSP setting to tFr setting	Hz	50 or 60 Hz (depends on main control board switch)	tFr is the drive controller's maximum frequency limit which cannot be set over the network
Nominal Motor Speed	3	nSP	0 to 9999	RPM	Depends on drive controller rating	Rated RPM as listed on motor nameplate. This value is used in calculating the drive controller output speed value.
Nominal Motor Frequency	3	FrS	40 to tFr setting	Hz	50 or 60 Hz (depends on main control board switch)	Rated frequency as listed on the motor nameplate. This is set by the position of the 50/60 Hz switch on the main control board. The network can overwrite this value.
Acceleration Time 1	2	ACC	0.05 to 999.9	second	3	
Deceleration Time 1	2	dEC	0.05 to 999.9	second	3	
Energy Saving	3	nLd	No - yes		Yes	Choice valid only if drive controller macro configuration is set for variable torque
Controlled Stop	6	StP	No - NMS - FRP		No	Drive controller action upon loss of an input phase. See keypad manual, VVDED397047US for further description.
Current Limit	3	CLI	0 to 136%	0.1 A	Depends on drive controller rating	Percent of drive controller's constant torque current rating. See drive controller nameplate.

Table 3 is a partial list of other drive controller configuration changes that may also need to be changed before operating the system. These parameters are not accessible over the LonWorks network. They must be changed with a programming tool.

Table 3: Important Drive Controller Configuration Parameters Not Accessible through the Network

Parameter Name	Keypad Menu	Keypad Code	Range	Units	Factory Setting	Comments
Variable Torque Macro Configuration	Macro Configuration	CFG	Hdg, VT, GEn		Hdg	For PI Control and Energy Savings to be available in the drive controller, the setting must be VT.
Motor Thermal Protection Level	2	ItH	25 to 136%	0.1 A	Depends on drive controller rating	Percent of drive controller's constant torque current rating. See drive controller nameplate. Set this to the full load amperage level that appears on the motor nameplate.
Jump Frequency	2	JPF	0 to HSP	Hz	0	Critical avoidance frequencies
Nominal Motor Voltage	3	UnS	200 to 240 V or 380 to 500 V	V	230 or 400/460 V (depends on the main control board switch for 400/ 460 V controllers)	Nominal motor voltage given on the motor nameplate label
Nominal Motor Current	3	nCr	25 to 136%	0.1 A	Depends on drive controller rating	Percent of drive controller's constant torque current rating. See drive controller nameplate. Set this to the full load amperage level that appears on the motor nameplate.
Maximum Frequency	3	tFr	40 to 500	Hz	60 or 72 Hz (depends on the main control board switch)	Drive controller's maximum operating frequency

SECTION 5: LONWORKS CONFIGURATION

OPTIMIZING NETWORK PERFORMANCE

To enhance network performance:

- When structuring the information exchange requirements for a network, consider the speed of the communication required to implement the application properly. Use the communication method that best matches the speed requirements of the information exchange. Communicate information only when required by the application. Minimize network traffic by design. For example, when controlling a simple process requiring only a few control functions, send only those registers. This minimizes network traffic and maintains the best overall network speed.
- For better network security, keep drive controllers and their associated control devices on the same local network. If possible, minimize or eliminate the need for drive controller controls to cross repeaters.
- Use distributed control where possible. The ATV58 *TRX* drive controller has a large number of application functions that can be used in conjunction with network communications. Use these functions to allow local control by the drive controller while using the network to communicate supervisory information. This minimizes the information exchange burden on the network and the controlling device.
- Understand the failure possibilities of the designed network. Provide control redundancies and contingencies appropriate for the intended application.
- Follow the wiring practices described in “Section 2: Hardware Setup and Wiring” on page 12. Improperly installed network wiring can cause noisy or intermittent data transmission with resulting loss of network speed and deterioration of security.

INITIAL POWER-UP

When the LonWorks module is powered up, the following occurs:

- Internal hardware and software tests are performed. Three LEDs (not the service LED) are lit briefly. If the module passes the self-tests, the LonWorks status LED will be lit green after approximately

four seconds. If these self-tests detect a failure, the LonWorks status LED will remain unlit after four seconds, or the module status LED will be lit red continuously.

- After the self-test, the module assumes default values for all network input variables, network output variables, and for network configuration variables.
- The module then attempts to establish communications with the ATV58 *TRX* drive controller. If this is not possible, the red module status LED flashes rapidly (8 flashes per second) to indicate a serial communication problem with the drive. The module will attempt to achieve a connection to the drive. If communication with the drive is established, the module status LED will be set to solid green.
- Once communications have been established with the ATV58 *TRX* drive controller, the module reads initial values from the drive for both drive configuration parameters and for LonWorks network output variables.

LONWORKS MODULE CONFIGURATION

After the ATV58 *TRX* drive controller has been configured and the LonWorks module has established communications with the drive and downloaded the drive specific information, it is ready to be configured and installed as a node on the LonWorks network.

Address assignment, commissioning, network variable bindings, and configuration must be performed with a LonWorks network management tool. The bindings connect network variables on different nodes. Once the commissioning and binding is finished, the network management tool can be removed from the network. At installation each node gets a unique network identity. For more information on installing LonWorks nodes, see the manual provided with your network installation tool. To simplify the installation, a number of files are included on the diskette supplied with the LonWorks module. They include a Readme file, XIF files, and Device Resource files.

NOTE: Some network management tools let the user decide if the initial data configuration properties should be loaded from the node or set from the XIF file at the time of commissioning. The XIF file helps a network management tool define a device before it is connected to the network as a node.

To reduce the time needed to install the node, the XIF files provide:

- Node network variables and configuration properties
- Network variable types
- Documentation
- Hardware information such as the transceiver type and initial communication parameters.

Device Resource Files are included to define the components of an external interface for a LonWorks device. They allow installation tools and operator interface applications to properly interpret and format the data sent to them by the LonWorks master. These files supplement standard resource files available from the LonMark Interoperability Association to define Standard Network Variable Types (SNVT), Standard Configuration Property Types (SCPT), and Standard Functional Profile Types (SFPT).

Network Master Device

The LonWorks network must be configured with only one master. The master controls the speed scaling and speed set point variables. The network master is identified to the module by the nciAcceptAddress variable, described on page 38.

Service Pin

The LonWorks module has a service pin on the front panel. It is used when installing the module as a LonWorks node. Pressing the service pin causes the module/node to send a message that includes the neuron ID. This informs the network or installation tool about the node.

Wink Command

This command can be issued from the network management tool to visually identify a particular node on the network during installation. This causes the LEDs to flash in a sequence. Refer to Table 11 on page 46 for the flash sequence.

THE LONWORKS INTERFACE

A LonMark profile defines a functional profile for a node communicating with other nodes on the network. A LonMark profile specifies which variables are used and provides meaning to the information they communicate.

When a profile is implemented in a node, it is called a LonMark object. A single node may implement multiple objects. The LonWorks module implements two objects: one node object and one drive object. The node object controls the drive object.

Objects within a node communicate with other network objects (in the same or in other nodes) by exchanging network variables. Therefore, to control and monitor the ATV58 *TRX* drive controller, the LonWorks master must be programmed to read and write the network variables supported by the module.

Network Variable Types

A network variable is an object on one node that can be connected to one or more network variables on one or more additional nodes. A node's network variables define its inputs and outputs from a network point of view and allow the sharing of data in a distributed application. When a program writes into one of its output network variables, the new value of the network variable is propagated across the network to all nodes with input network variables connected to that output network variable.

For example, to turn on a light over a LonWorks network, a switch node has its output network variable (nvoSwitch) connected or bound to the input variable (nviSwitch) on the lamp node. When the switch is activated, the network variable is propagated across the network and received by the lamp node which turns on the light. The LonWorks to MODBUS module uses two classes of network variable types: Standard Network Variable Type (SNVT) and Standard Configuration PropertiesType (SCPT).

SNVT (Standard Network Variable Type)

The LonMark organization has approved a number of network variables that represent different types of standard data representation; for example, drive speed, current, and voltage. These network variables are called Standard Network Variable Types (SNVTs) and are listed in the SNVT Master List and Programmers Guide from Echelon Corporation. SNVTs contain information about type, resolution, and range; they may be either nvi (network variable inputs) or nvo (network variable outputs). The LonMark association defines objects that can be described as a group of SNVTs used for a specific application.

SCPT (Standard Configuration PropertiesType)

Configuration properties are used to store parameters that need to be preserved in non-volatile memory. In the LonWorks to Modbus module, Standard Configuration Properties Types (SCPTs) can be implemented only as network variables. The network variables used for parameters are defined to store the information in flash memory onboard the LonWorks to Modbus module.

The specific objects and variables used by the LonWorks to Modbus module are defined on the following pages. For more detail on ATV58 *TRX* drive controller configuration parameters, refer to the ATV58 *TRX* Keypad Display Instruction Bulletin, VVDED397047US.

Node Object

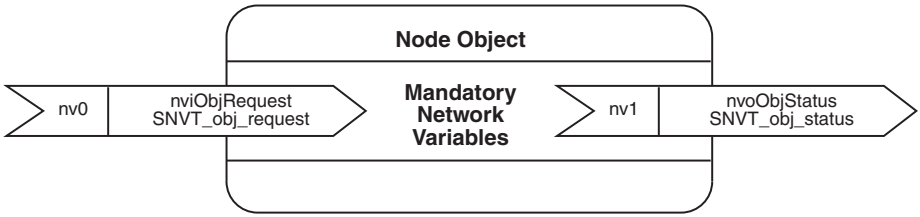


Figure 5: Node Object

Table 4: Node Object

Parameter	Network Variable and Status	Function
Node Object Request	network input SNVT_obj_request nviObjRequest ‡	This input provides a way to request a particular mode for a particular object within a node.
	RQ_NORMAL *	If the object was in the disabled or overridden state, this request cancels that state and returns the object to normal operation.
	RQ_UPDATE_STATUS *	The status of the object is sent to the output network variable nvoObjStatus. The state of the object is unchanged. The LonWorks master should issue this request periodically to monitor the status of the module. If any active status conditions are reported through nvoObjStatus, this request should be followed by RQ_CLEAR_STATUS so that a new status condition can be reported.
	RQ_REPORT_MASK *	The status bits that are supported by the object are sent to the output network variable nvoObjStatus.
	RQ_CLEAR_STATUS *	This input clears all object status bits.
Node Object Status	network output SNVT_obj_status nvoObjStatus ‡	Network variables of type SNVT_obj_status are used to indicate the status of the various objects within a node. This network variable provides the LonWorks master the status of the node.
	comm_failure *	If communication over the Modbus link goes down this is reported by setting this bit in nvoObjStatus.
	out_of_limits *	If a command value from the LonWorks master Control Device is out of range for this register, it is reported by setting this bit in nvoObjStatus.

‡ Variables used by the object.

* Possible values of the variables.

Drive Object

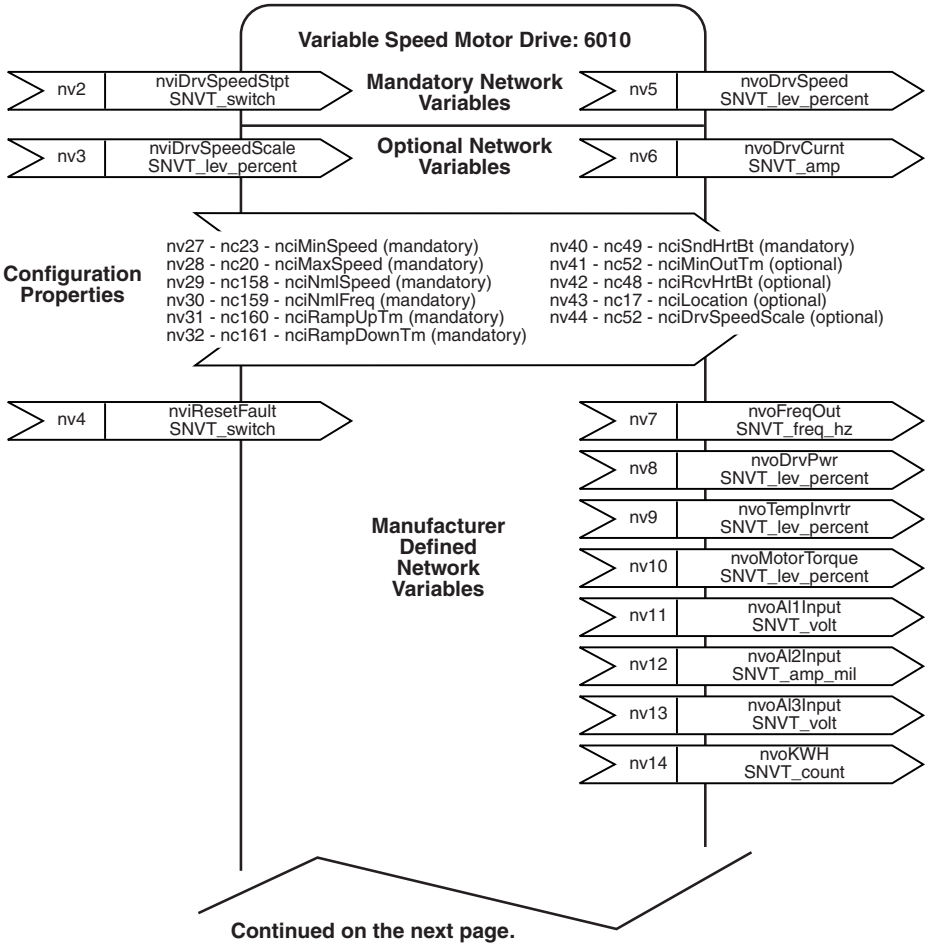
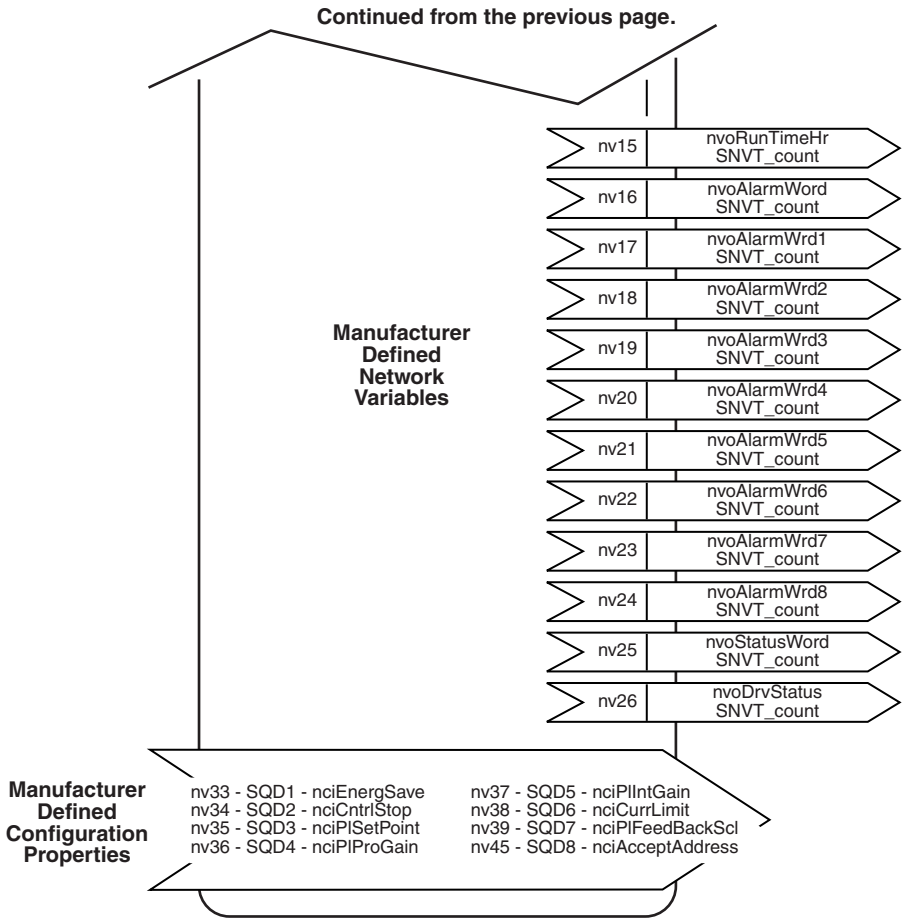


Figure 6: Variables and Configuration Properties in Drive Object



Input Network Variables for Drive Control (nvi's)

Table 5: Drive Control Variables (nvi's)

<table>
<tr><th>Parameter</th><th>Variable Name</th><th>Function</th></tr>
<tr><td rowspan="2">Drive Speed Setpoint</td><td rowspan="2">network input
SNVT_switch
nviDrvSpeedStpt</td><td>This input network variable provides start/stop control and a low-resolution speed setpoint. When nviDrvSpeedStpt.State is set to zero the drive is stopped.
SNVT default value:
Default value is AUTO (state: 0xFF). This value is adopted at power-up and in case of not receiving an update to nviDrvSpeedStpt or nviDrvSpeedScale within receive heartbeat time (if used). This input network variable may use the Receive Heartbeat (nciRcvHrtBt) function depending on if Receive Heartbeat function is set-up for use. The actual value of drive speed does also depend on settings of nviDrvSpeedScale and nciNmlFreq.
Scaling: 0.5 x nviDrvSpeedStpt.Value up to 200 to get percent value. If nviDrvSpeedStpt.Value is larger than 200 the percent value is set to 100%.
nviDrvSpeedStpt.State: 0 = Stop command
nviDrvSpeedStpt.State: 1 = Run command</td></tr>
<tr><td>Valid Range of nviDrvSpeedStpt:
<table>
<tr><th>State</th><th>Value</th><th>Equivalent Percent</th><th>Requested Speed</th></tr>
<tr><td>0</td><td>N/A</td><td>N/A</td><td>STOPPED</td></tr>
<tr><td>1</td><td>0</td><td>0%</td><td>0%</td></tr>
<tr><td>1</td><td>1 to 200</td><td>0.5 to 100%</td><td>0.5 to 100%</td></tr>
<tr><td>1</td><td>201 to 255</td><td>100%</td><td>100%</td></tr>
<tr><td>0xFF</td><td>N/A</td><td>N/A</td><td>AUTO (invalid)</td></tr>
</table></td></tr>
<tr><td>Drive Speed Setpoint Scaling</td><td>network input
SNVT_lev_percent
nviDrvSpeedScale</td><td>This input network variable provides scaling for nviDrvSpeedStpt. For example, if nviDrvSpeedStpt value is 100% and nviDrvSpeedScale value is -150%, then actual speed setpoint value is -150% meaning reverse 1.5 times nominal frequency. This input network variable may use the Receive Heartbeat (nciRcvHrtBt) function depending on if Receive Heartbeat function is set-up for use.
Valid Range: -163.840 to >163.830%
SNVT default value: defined by nciDrvSpeedScale.
If nviDrvSpeedScale ≥ 0: Normal direction
If nviDrvSpeedScale < 0: Reverse direction</td></tr>
<tr><td>Fault Reset</td><td>network input
SNVT_switch
nviResetFault</td><td>This input network variable clears the fault in the drive, if the fault condition is no longer present.
State: 0, Value: 0%, Command: no action
State: 1, Value: 100%, Command: reset fault
On a transition from 0 to 1, this input network variable clears the fault condition in the drive. Following a reset, this variable must be set to 0 and sent to the module to enable the next reset.
SNVT default value: 0
NOTE: Only resettable faults are cleared. See the keypad manual, VVDED397047US, for a list of resettable faults.</td></tr>
</table>

Input Network Configuration Properties for Drive Configuration (nci's)

Table 6: Drive Configuration Properties (nci's)

Parameter	Properties Name	Function
Low Speed Setpoint	network input config SNVT_lev_percent nciMinSpeed	This configuration property is used to define the minimum speed of a motor. Its value is entered as a percent of nominal frequency, as defined by the nominal frequency (nciNmlFreq) configuration value. If nciNmlFreq = 60 Hz and nciMinSpeed = 10%, the minimum speed is 6 Hz. The value of the minimum speed must be validated against the value of the maximum speed as follows: 0% ≤ minimum speed ≤ maximum speed ≤ 163.830% An incoming negative value in nciMinSpeed sets nciMinSpeed to 0 (zero). Scaling: The value sent to the drive = 0.005 x nciMinSpeed x nciNmlFreq. Valid range: 0 to HSP (High Speed Setpoint)
High Speed Setpoint	network input config SNVT_lev_percent nciMaxSpeed	This configuration property is used to define the maximum speed of a motor. It's value is entered as a percent of nominal frequency, as defined by the Nominal frequency (nciNmlFreq) configuration value. If nciNmlFreq = 60 Hz and nciMaxSpeed = 120%, the maximum speed is 72 Hz. The value of the maximum speed must be validated against the value of the minimum speed as follows: 0% ≤ minimum speed ≤ maximum speed ≤ 163.830% Scaling: The value sent to the drive = 0.005 x nciMaxSpeed x nciNmlFreq. Valid range: LSP (Low Speed Setpoint) to TFR (Maximum Frequency)
Nominal Motor Speed	network input config SNVT_rpm nciNmlSpeed	This configuration property is used to enter the nominal speed of the motor in RPM. Enter the value provided on the motor nameplate. Valid range: 0 to 32767
Nominal Motor Frequency	network input config SNVT_freq_hz nciNmlFreq	This configuration property is used to provide the nominal frequency of the motor in Hertz. This value is necessary to determine the minimum and maximum speed for the motor, based on the configuration properties nciMinSpeed, nciMaxSpeed (entered as percent of nominal frequency). Valid range: 10.0 to TFR (Maximum Frequency)
Acceleration Time	network input config SNVT_time_sec nciRampUpTm	This configuration property is used to set the ramp up time. Valid range: 0.05 to 999.9
Deceleration Time	network input config SNVT_time_sec nciRampDownTm	This configuration property is used to set the ramp down time. Valid range: 0.05 to 999.9

Table 6: Drive Configuration Properties (nci's) *(continued)*

Parameter	Properties Name	Function
Energy Saving	network input config SNVT_switch nciEnergSave	This configuration property enables the automatic energy savings function in the drive controller. The drive controller must be set for VT mode in the Macro-Configuration menu. State: 0, Value: 0%, Command: no automatic energy saving function. State: 1, Value: 100%, Command: energy saving function enabled. Valid range: 0 to 1
Controlled Stop	network input config SNVT_count nciCntrStop	This configuration property determines how the drive responds and stops the motor in the event of a power loss. Value: 0, Command: no controlled stop Value: 1, Command: maintain DC bus Value: 2, Command: follow ramp Valid range: 0 to 2
PI Setpoint	network input config SNVT_count nciPISetPoint	Valid range: 0 to 10000 Note: For an adjustment to PI Setpoint to be valid, the ATV58 *TRX* PI Regulator function must be enabled through Menu 5 of the keypad display or the I/O menu in the test and commissioning software. Connect the PI feedback signal to the analog input on the drive controller terminal strip selected when the PI regulator function is enabled.
PI Proportional Gain	network input config SNVT_count nciPIProGain	Valid range: 1 to 10000 Note: For an adjustment to PI Proportional Gain to be valid, the ATV58 *TRX* PI Regulator function must be enabled through Menu 5 of the keypad display or the I/O menu in the test and commissioning software.
PI Integral Gain	network input config SNVT_count nciPIIntGain	Valid range: 1 to 10000 Note: For an adjustment to PI Integral to be valid, the ATV58 *TRX* PI Regulator function must be enabled through Menu 5 of the keypad display or the I/O menu in the test and commissioning software.
PI Feedback Scale Factor	network input config SNVT_lev_percent nciFeedBackScl	Scaling: The value sent to the drive = nciPIFeedBackScale / 20 Valid range: 10 to 1000 Note: For an adjustment to PI Scale Factor to be valid, the ATV58 *TRX* PI Regulator function must be enabled through Menu 5 of the keypad display or the I/O menu in the test and commissioning software.
Current Limit	network input config SNVT_amp nciCurrLimit	Valid range: 10 to 136% of the drive constant torque output current rating shown on the drive nameplate. See Instruction Bulletin VVDED397047US, ATV58 *TRX* Keypad Display, for further details on the drive current limit function.
Send Heartbeat Time	network input config SNVT_time_sec nciSndHrtBt	This input configuration network variable defines the maximum period of time that expires before nvoDrvSpeed automatically updates. If nciSndHrtBt is set to 0, the Send Heartbeat mechanism is disabled. SNVT default value: 0 seconds Valid range: 1–10 seconds

Table 6: Drive Configuration Properties (nci's) *(continued)*

Parameter	Properties Name	Function
Minimum Send Time	network input config SNVT_time_sec nciMinOutTm	This input configuration network variable controls the minimum period of time that expires before the network output variables (nvo's) can be resent. This is good for limiting use of bandwidth on the LonWorks channel. If nciMinOutTm is set to 0, transmission limiting is disabled. SNVT default value: 0
Receive Heartbeat Time	network input config SNVT_time_sec nciRcvHrtBt	This configuration property is used to control the maximum time that elapses between updates to either nviDrvSpeedStpt or nviDrvSpeedScale. If timeout occurs, the LonWorks module stops all communication with the drive and nviDrvSpeedStpt and nviDrvSpeedScale adopts their default values. If nciRcvHrtBt is set to 0, the Receive Heartbeat mechanism is disabled, and the motor will continue to run at its present speed when communication with the LonWorks master is lost. SNVT default value: 7 seconds Minimum value allowed: 1 second
		⚠ WARNING **LOSS OF CONTROL** If the Receive Heartbeat Time feature is disabled, provide another means to control the drive, as recommended on page 19, when communication is lost. **Failure to follow this instruction can result in death, serious injury, or equipment damage.**
Location Label	network input config SNVT_str_asc nciLocation	This configuration property can optionally be used to provide more descriptive physical location information than can be provided by the neuron chip's 6-byte location string. The location relates to the object and not to the node. Maximum number of ascii characters is 30 + NULL terminator. SNVT default value: Filled up with NULL characters ("\0").
Default Value	network input config SNVT_lev_percent nciDrvSpeedScale	This parameter is used for setting default value to nviDrvSpeedScale on every start-up. SNVT default value: 0 Valid range: -163.84 to 163.83%

Table 6: Drive Configuration Properties (nci's) *(continued)*

Parameter	Properties Name	Function

Authorized Network Master	network input config UNVT_address nciAcceptAddress	This parameter is used to identify which network master has control over the drive. When this feature is enabled, the module accepts write commands for nviDrvSpeedStpt and nviDrvSpeedScale only from the specified LonWorks node.
		
		Instead of a standard variable type (SNVT), this variable uses a manufacturer-defined variable type UNVT_address, which is defined as follows:
		
		typedef struct
		{
		short unsigned subnet;
		short unsigned node;
		}
		UNVT_address;
		
		The high byte means SUBNET and the low byte means NODE#. The function is disabled by writing 0 to both SUBNET or NODE. This enables the drive to be controlled by any node on the network. The function is activated when writing values to the nciAcceptAddress variable as seen in this example:
		If the master has address 10.12 (SUBNET = 10 and NODE = 12) then 10 should be written to the first byte (SUBNET) and 12 should be written to the second byte (NODE) in nciAcceptAddress.

⚠ WARNING

LOSS OF CONTROL

Ensure that the module's Authorized Network Master is a valid host control device at all times.

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

While a given LonWorks device is designated as the module's Authorized Network Master, it is possible for another device to be designated as the master. This allows devices such as a LonWorks configuration tool to assume temporary control of the module's operation. When the temporary controller's operations are finished, the user must load the original LonWorks master address back into the Authorized Network Master variable, so that the original master can resume control of the module. If the new master device neither controls the module nor returns control to the original master, the module's response depends on its Receive Heartbeat setting:

- If the Receive Heartbeat feature is enabled, the module will eventually detect a Receive Heartbeat Fault and stop communications with the drive, which will in turn undergo a communications time-out and stop the motor.
- If the Receive Heartbeat feature is disabled, the module will continue to communicate with the drive, which will continue to operate at its current speed and parameters settings.

In either case, when the original master attempts to write the Speed Setpoint and/or Speed Scale parameter to the module, the module will refuse the request, thus informing the original master that it might not be the Authorized Network Master. The original master can verify this by reading the module's Authorized Network Master variable. If appropriate for the application, the original master can reclaim control by writing its own address to the module's Authorized Network Master variable.

To prevent an inappropriate device from being permanently designated as the Authorized Network Master, the master can periodically write its own address to the module's Authorized Network Master variable.

Output Network Variables for Drive Feedback (nvo's)

Table 7: Drive Output Variables (nvo's)

Parameter	Variable Name	Function
Drive Output Speed	network output SNVT_level_percent nvoDrvSpeed	This output network variable provides the speed of the drive controller as a percentage of the nominal speed. This output network variable is also periodically transmitted to the LonWorks master, so that it serves as a heartbeat signal (at the rate specified by nciSndHrtBt) to indicate the health of the LonWorks communication interface. Calculated as the rate in percent between the drive controller output motor frequency and nciNmlFreq. For normal direction, this value is positive; for reverse direction, the value is negative. Value in nvoDrvSpeed = (drive controller output frequency applied to motor ÷ nciNmlFreq) x 20000 to fit SNVT_lev_percent resolution.
Drive Output Current	network output SNVT_amp nvoDrvCurnt	This output network variable provides the drive output current in amperes.
Output Frequency to Motor	network output SNVT_freq_hz nvoFreqOut	Output frequency in Hz. Always positive, i.e. no information about direction of revolution (forward/reverse)
Drive Output Power	network output SNVT_lev_percent nvoDrvPwr	Scaling: the value in nvoDrvPwr = ATV58 *TRX* output power measurement x 200 to fit SNVT_lev_percent resolution.
Drive Thermal State	network output SNVT_lev_percent nvoTempInvrtr	Scaling: the value in nvoTempInvrtr = drive thermal state measurement x 200 to fit SNVT_lev_percent resolution.
Motor Torque	network output SNVT_lev_percent nvoMotorTorque	Scaling: the value in nvoMotorTorque = drive calculated motor torque x 200 to fit SNVT_lev_percent resolution.
Signal AI1 Analog Input	network output SNVT_volt nvoAI1Input	Scaling: the value in nvoAI1Input = (the signal measured at drive analog input 1) / 100 to fit SNVT_volt resolution.
Signal AI2 Analog Input	network output SNVT_amp_mil nvoAI2Input	Scaling: the value in nvoAI2Input = (the signal measured at drive analog input 2) / 50 to fit SNVT_amp_mil resolution.
Signal AI3 Analog Input	network output SNVT_volt nvoAI3Input	Scaling: the value in nvoAI3Input = (the signal measured at drive analog input 3) / 100 to fit SNVT_volt resolution. This function is not compatible with the encoder feedback signal available on the VW3A58202 Digital I/O Extension Card, an option for the drive.
Drive Kilowatt Hour	network output SNVT_count nvoKWH	Total kilowatt hours used since last reset through keypad parameter RPR. This parameter is only available with drives equipped with firmware version 4.0 and later.
Drive Run Time	network output SNVT_count nvoRunTimeHr	Total run time in hours used since last reset through keypad parameter RPR. This parameter is only available with drives equipped with firmware version 4.0 and later.

Table 8: Drive Fault Variables (nvo's)

Fault	Variable Name and Function	Possible Values and Conditions
Current Fault	network output SNVT_count nvoAlarmWord This output register displays the currently active fault. This register may only momentarily show an integer value before the fault is recorded in the past fault register.	0 = : No fault saved 1 = : Internal fault 2 = : EEPROM memory fault 3 = : Configuration (parameters) incorrect (initialization) 4 = : Configuration (parameters) invalid (if writing a configuration) 5 = : Standard communication link fault (link break) 6 = : Fast communication link fault (link break) 7 = : Fast communication "NET" fault 8 = : External fault 9 = : Overcurrent fault (prolonged ICL) 10 = : Precharge relay fault 11 = : Loss of speed feedback fault 12 = : Ramp not followed 13 = : Loss of follower fault 14 = : Thermal sensor fault 15 = : Motor overheating fault (thermal sensor) 16 = : Drive controller overheating fault (on heatsink) 17 = : Motor overload fault (thermal simulation or thermal sensor) 18 = : DC bus overvoltage fault 19 = : Input supply overvoltage fault 20 = : Motor phase failure fault 21 = : Input supply phase failure fault (> 1 s) 22 = : Input supply undervoltage fault (> 200 ms) 23 = : Motor short circuit fault (phase to earth) 24 = : Overspeed fault (with speed feedback: 1.11 x HSP; without feedback: 1.2 x TFR)
Past Fault 1	network output SNVT_count nvoAlarmWrd1 This output register records the most recent fault. ‡	
Past Fault 2	network output SNVT_count nvoAlarmWrd2 This output register records the second most recent fault. ‡	
Past Fault 3	network output SNVT_count nvoAlarmWrd3 This output register records the third most recent fault. ‡	
Past Fault 4	network output SNVT_count nvoAlarmWrd4 This output register records the fourth most recent fault. ‡	
Past Fault 5	network output SNVT_count nvoAlarmWrd5 This output register records the fifth most recent fault. ‡	
Past Fault 6	network output SNVT_count nvoAlarmWrd6 This output register records the sixth most recent fault. ‡	
Past Fault 7	network output SNVT_count nvoAlarmWrd7 This output register records the seventh most recent fault. ‡	
Past Fault 8	network output SNVT_count nvoAlarmWrd8 This output register records the eighth most recent fault. ‡	

‡ The integer value in the register indicates the fault condition.

Table 9: Drive Status 1 Variables (nvo's)

Variable Name and Function	Possible Values and Condition
network output SNVT_count nvoStatusWord This output register indicates various internal drive states.	Bit 0 = 0: Power not ready Bit 0 = 1: Power ready for startup Bit 1 = 0: Drive controller not ready Bit 1 = 1: Drive controller ready Bit 2 = 0: DRIVECOM stop Bit 2 = 1: DRIVECOM run Bit 3 = 0: No fault Bit 3 = 1: Fault present Bit 4 = 0: Power present Bit 4 = 1: Power not present Bit 5 = 0: Fast stop in progress Bit 5 = 1: No fast stop Bit 6 = 0: Status = OUTPUT SWITCHING DISABLED Bit 6 = 1: Status = OUTPUT SWITCHING DISABLED (freewheel stop) Bit 7 = 0: Alarm absent Bit 7 = 1: Alarm present Bit 8 = 1: Reserved Bit 9 = 0: Local forcing in progress Bit 9 = 1: No local forcing Bit 10 = 0: Reference not reached (transient state) Bit 10 = 1: Reference reached (steady state) Bit 11 = 0: LFRD reference normal Bit 11 = 1: LFRD reference exceeded (> HSP or < LSP) Bits 12 and 13: Reserved Bit 14 = 0: No stop from keypad STOP key Bit 14 = 1: Stop from keypad STOP key Bit 15 = 0: Forward direction of rotation (output frequency) Bit 15 = 1: Reverse direction of rotation (output frequency)

Table 10: Drive Status 2 Variables (nvo's)

Variable Name and Function	Possible Values and Condition
network output SNVT_count nvoDrvStatus This output register indicates various internal drive states.	Bit 0 = 0: Write parameters authorized Bit 0 = 1: Write parameters not authorized (EEPROM saving in progress) Bit 1 = 0: No parameter consistency check, drive controller locked at stop Bit 1 = 1: Parameter consistency check Bit 2 = 0: Clear fault not authorized Bit 2 = 1: Clear fault authorized Bit 3: Reserved Bit 4 = 0: Motor stopped Bit 4 = 1: Motor running Bit 5 = 0: No DC injection Bit 5 = 1: DC injection Bit 6 = 0: Drive controller in steady state Bit 6 = 1: Drive controller in transient state Bit 7 = 0: No thermal overload alarm Bit 7 = 1: Thermal overload alarm Bit 8 = 0: No alarm if excessive braking Bit 8 = 1: Alarm if excessive braking Bit 9 = 0: Drive controller not accelerating Bit 9 = 1: Drive controller accelerating Bit 10 = 0: Drive controller not decelerating Bit 10 = 1: Drive controller decelerating Bit 11 = 0: No current limit alarm Bit 11 = 1: Current limit alarm Bit 12: Reserved Bit 14 = 0, Bit 13 = 0: Drive controlled via terminals Bit 14 = 0, Bit 13 = 1: Drive controlled via keypad display Bit 14 = 1, Bit 13 = 0: Drive controlled via keypad Modbus port Bit 14 = 1, Bit 13 = 1: Drive controlled via Modbus option card Bit 15 = 0: Forward direction of rotation requested (reference) Bit 15 = 1: Reverse direction of rotation requested (reference)

SECTION 6: MINIMUM STARTUP PROCEDURE

MINIMUM STARTUP PROCEDURE

The minimum requirements to command the drive controller from the LonWorks network:

1. Ensure that a LonWorks network master is installed and operating and that the network cable has been run out to the ATV58 *TRX* drive controller location.
2. Install the supplied External Interface File (XIF) and Device Resource Files.
3. Mount the LonWorks module to a grounded DIN rail close enough to the ATV58 *TRX* drive to allow the 29.5 in (750 mm) Modbus cable to extend between the Modbus ports on the module and the drive Modbus port without straining either the cable or port connections. Refer to “LonWorks Module” on page 15.
4. Wire an appropriately sized 24 Vdc power supply into the module power supply connector (observe polarity). Refer to “24 Vdc Power Supply” on page 16.
5. Connect the LonWorks network cable to the LonWorks module. Refer to “Electrical Wiring” on page 16.
6. Wire the selector switch to the ATV58 *TRX* drive control terminal block. Refer to Figures 3 and 4 on page 20.
7. Determine if the keypad display will be normally mounted on the drive controller.

   If the keypad display **is not normally mounted** to the drive (see “Keypad Modbus Port” on page 22):

   — Connect an ATV58 *TRX* programming tool to the keypad Modbus port. Apply power to the drive. Make the needed configuration changes to the drive, including communication parameters and the “forced local” function.

   — Remove power from the drive. Follow the Bus Voltage Measurement Procedure to ensure it is safe to remove the ATV58 *TRX* programming tool.

   — Install the interconnecting Modbus cable between the LonWorks module and the keypad port.

   — Reapply power to the drive.

If the keypad display **is normally mounted** on the drive (see "Modbus Option Card" on page 22):

— Install the Modbus option card (VW3A58303U) into the drive. On the Modbus card, set the address switches for an address of 1 and set the configuration switches for Modbus operation.

— Install the interconnecting Modbus cable between the LonWorks module and the port on the Modbus option card.

— With the keypad display installed, apply power to the drive controller. Make the necessary configuration changes to the drive, including communication parameters and the "forced local" function.

8. Apply power to the LonWorks module.
9. Install/Commission the ATV58 *TRX* drive node using a LonWorks network management tool.
10. Configure the ATV58 *TRX* drive node using the LonWorks network management tool. This includes pressing the service pin on the module.
11. Use the Drive Speed Setpoint and Drive Speed Setpoint Scaling SNVT's to start the drive and supply it with a speed reference.

SECTION 7: DIAGNOSTICS

LED STATES

The LonWorks module has four diagnostic LEDs that indicate the status of the module and the communication link with the drive and the LonWorks network (see Figure 1 on page 12). Table 11 shows the LED states, what they indicate, and suggested corrective actions.

Table 11: LED Status Indicators

LED	LED Color	Function	Action
Module Status ○ ● ○ ○	Solid green	Modbus communication okay	No action
	Solid red (or off longer than 4 seconds)	Hardware error	Cycle 24 Vdc power on the module. Replace the module if the LED is still lit after next power-up.
	Flashing red (8 times per second)	Serial communication error (Modbus link to drive not initialized or time-out on Modbus communication.)	Check the connections to the drive controller. The module will continue trying to communicate with the drive controller.
	Flashing red (2 times per second)	Heartbeat variable not detected, no communication with LonWorks master.	Check the connection to the LonWorks network. Ensure that the LonWorks master is operating properly. Ensure that the LonWorks master is sending Drive Speed Setpoint and Drive Speed Scaling in the required amount of time.
Service ○ ○ ○ ●	Flashing green	This node has an application but is not yet installed in a network (unconfigured).	The module is ready to be installed with an installation tool.
	Turned off	This node is configured and installed in a network.	No action
	Solid green	This node is unconfigured and applicationless.	Try to reset the module to configured by unconfiguring with the installation tool. If not possible, there is an internal error in the module.
Wink ○ ○ ● ○	Flashing red (alternates slow and fast for 20 seconds)	The node has received a LonWorks Wink command.	This command is sent from an installation tool when visual identification of the module is desired.
LonWorks Status ● ○ ○ ○	Solid green	Power on	No action
	Flashing red (4 times per second)	Recoverable error	It is possible that module will recover from this error by itself. Check LonWorks network wiring. Cycle 24 Vdc power on the module.
	Solid red	Unrecoverable error	The module will not recover from this error by itself. Cycle 24 Vdc power on the module. Replace the module if the LED continues to be solid red after cycling power.

TROUBLESHOOTING

What will module do if it loses contact with the LonWorks network?

This occurs when the module can no longer detect the heartbeat variable on LonWorks network. When the SNVT specified for receive heartbeat (nciRcvHrtBt) is not updated within the maximum time allowed since the last update, the module will assume a LonWorks network failure. The module will stop all communication with the drive and the error will be indicated by the module status LED flashing red 2 times per second. The module will remain in this state until an update to either nviDrvSpeedStpt or nviDrvSpeedScale is received from the Master Control Device. When LonWorks communication has been reestablished, the module will resume normal operation and the module status LED will be set to solid green.

What will the module do if it loses communication with the ATV58 *TRX* drive?

If there is no response to Modbus messages sent to the drive or if the responses indicate too many errors, the module status LED will indicate the error by flashing red 8 times per second. The module will report the loss of drive controller communication to the LonWorks Master Control Device by use of the SNVT nvoObjStatus. All other nvo values will be set to zero. Communication with the Master Control Device will continue. The module will keep trying to reestablish Modbus communication with the drive. If it succeeds, the module status LED will be set to solid green and the program will resume normal operation.

What will happen if there is an internal problem with the module?

If there is an internal problem in the module, it will suspend all LonWorks and Modbus communication. Depending on the type of internal problem, either the module status LED will be lit red continuously or the LonWorks status LED will be red (either solid or flashing).

What will happen if the 24 Vdc supply goes out of specification?

The module has a specified operating range of 19.2 Vdc to 28.8 Vdc. Above 30 Vdc, a transient diode will start conduct and the module will not work until the power supply is brought within the specified range again. The module's operation is unreliable with an input voltage below 19.2 Vdc.

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