LONWORKS™ MODULE
16-CHANNEL ISOLATED OPEN DRAIN OUTPUT

This Instruction contains installation and servicing procedures for the LonWorks module(s) listed in the table below. Acromag, Inc. manufactures the module(s). The table provides the module description, the Moore part number, and the equivalent Acromag model number.

<table>
<thead>
<tr>
<th>MODULE DESCRIPTION</th>
<th>MOORE P/N</th>
<th>ACROMAG MODEL NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-Channel Isolated Open Drain Output Module</td>
<td>16802-4</td>
<td>4926A</td>
</tr>
</tbody>
</table>

Two major sections are found in this Instruction. General information on a LonWorks module ordered from Moore is located in this section. The Acromag User’s Manual for the module is the second section.

Go to the Acromag section of this Instruction to install or calibrate a module. For product support or repair, read the following paragraphs. These statements supersede or amend similar information in the Acromag section.

PRODUCT SUPPORT

Product support can be obtained from a Technical Information Center (TIC). Each regional TIC is a customer service center that provides direct telephone support on technical issues related to the functionality, application, and integration of all products supplied by Moore. Regional TIC contact information is provided in the following table. Your regional TIC is the first place you should call when seeking product support information. When calling, it is helpful to have the following information ready:

- Caller ID number or name and company name - When you call for support for the first time, a personal caller number is assigned. Having the number available when calling for support will allow the TIC representative taking the call to use the central customer database to quickly identify the caller's location and past support needs.

- Product part number or model number and version

- If there is a problem with product operation:
  - Whether or not the problem is intermittent
  - The steps performed before the problem occurred
  - Any error messages or LED indications displayed
  - Installation environment

Customers that have a service agreement (ServiceSuite or Field Service Agreement) are granted access to the secure area of our Web site (www.moorereproducts.com/techservices). This area contains product support information. To log on, you will be prompted to enter your username and password.
TIC North America also offers a free faxback service called FaxRequest. You can dial-in to this service to access documents such as press releases, product information sheets, and training schedules. The service is completely automated and available 24 hours a day. To access this service, call the FaxRequest number listed in the tables below. The first document you should request is the directory (document number 9999). This document is updated as new documents are added. Each document has a number code assigned to it that you enter along with your fax number (area code entry is always required). Upon completing your entry, the FaxRequest computer automatically calls your fax machine and sends the requested documents.

<table>
<thead>
<tr>
<th>TIC NORTH AMERICA</th>
<th>Tel: +1 215 646 7400, extension 4842, option 1</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Fax: +1 215 283 6343</td>
</tr>
<tr>
<td></td>
<td>E-mail: <a href="mailto:tiegrou@mpco.com">tiegrou@mpco.com</a></td>
</tr>
<tr>
<td></td>
<td>FaxRequest: +1 215 646 7400, extension 4842, option 2</td>
</tr>
<tr>
<td></td>
<td>Bulletin Board Service: +1 215 283 4968</td>
</tr>
<tr>
<td></td>
<td>Hours of Operation: 8 a.m. to 6 p.m. eastern time</td>
</tr>
<tr>
<td></td>
<td>Secure Web Site: <a href="http://www.mooreproducts.com/techservices">www.mooreproducts.com/techservices</a></td>
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</tbody>
</table>

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<tr>
<th>TIC ASIA</th>
<th>Tel: +65 299 6454</th>
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<td></td>
<td>Fax: +65 299 6053</td>
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<tr>
<td></td>
<td>E-mail: <a href="mailto:lohho@mpco.com">lohho@mpco.com</a></td>
</tr>
<tr>
<td>Hours of Operation: 9 a.m. to 6 p.m. Singapore time</td>
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<tr>
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<th>TIC EUROPE</th>
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<td></td>
<td>Fax: +44 1935 706969</td>
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<td>E-mail: <a href="mailto:uktic@mpco.com">uktic@mpco.com</a></td>
</tr>
<tr>
<td>Hours of Operation: 8:30 a.m. to 5:15 p.m. GMT/BST</td>
<td></td>
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<tr>
<td>Secure Web Site: <a href="http://www.mooreproducts.com/techservices">www.mooreproducts.com/techservices</a></td>
<td></td>
</tr>
</tbody>
</table>
RETURN FOR REPAIR

This section modifies the General Maintenance section in the Acromag User’s Manual.

During the warranty period, remove a failed instrument from service and proceed as follows to return it to Moore for repair. For out of warranty repair, return the module to either Moore or Acromag.

TO RETURN EQUIPMENT

- Call Moore Products Co. at (215) 646-7400, ext. 4RMA (4762) weekdays between 8:00 a.m. and 4:45 p.m. Eastern Time. If outside of North America go, to www.mooreproducts.com for the address and telephone and FAX numbers of your nearest Moore Products Co. subsidiary. Ask for an RMA (Return Material Authorization) number and be sure to mark the RMA number prominently on the outside of the shipment.

When calling for an RMA number, provide the reason for the return. If returning equipment for repair, failure information (e.g., error code, failure symptom, installation environment) will be requested. A purchase order number will also be needed.

MATERIAL SAFETY DATA SHEET

- A Material Safety Data Sheet (MSDS) must be included with each item being returned that was stored or used anywhere hazardous materials were present.

PACKAGING

- Package assembly in original shipping materials. Otherwise, package it for safe shipment or contact the factory for shipping recommendations.

  An electronic module must be placed inside a static shielding bag to protect it from electrostatic discharge.

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*Procedures in this document have been reviewed for compliance with applicable approval agency requirements and are considered sound practice. Neither Moore Products Co. nor these agencies are responsible for repairs made by the user.*
SmartPack LONWORKS® Module
Model 4926A
16 Isolated Open-Drain Outputs, DC-Powered

USER’S MANUAL

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1.0 INTRODUCTION

These instructions cover Model 4926A output modules. The Series 4926A is another member of the SmartPack family of Neuron® Chip based, LonWorks® network control modules. This model converts sixteen corresponding network variables, into sixteen low-side, 0-42V, open-drain output switches. The sixteen outputs share a common source connection and are isolated as a group from power and the communication network. Associated with each digital output is an input network variable to control the output state. A watchdog timer allows the user to specify the maximum time that may expire between updates of the network variable.

SmartPack models include an isolated, free-topology, network communication transceiver (FTT-10A). This model supports free-topology, polarity insensitive, network installations (bus, star, and/or loop format). Up to 64 modules can be connected on a single network segment. An unpowered module appears as a high-impedance to the network and does not interfere with network communications. Multiple network segments may be connected using repeaters to increase the number of modules and distances. These SmartPacks are interoperable with LonWorks® products from other manufacturers that use standard network variable types (SVNT’s). Module configuration and network management are performed using a Windows® based configuration program running on a personal computer.

All SmartPack modules are designed to withstand harsh industrial environments. They feature RFI, EMI, ESD, EFT, and surge protection, plus low radiated emissions per European Community requirements, wide ambient temperature operation, and isolation from outputs, to power and the network. As a wide-range DC-powered device, the unit may be powered from DC power networks incorporating battery back up. Additionally, the input power terminal is diode-coupled, providing reverse polarity protection. This allows the unit to be connected to redundant power supplies, or several units to safely share a single DC supply.

Units are DIN-rail mounted and removable terminal blocks facilitate the ease of installation or replacement, without having to remove wiring. Connectors are industry standard screw clamp type and accept a wide range of wire sizes.

Key SmartPack 4926A Features

- Convenient Windows® Configuration - Fully configurable via our user friendly Windows® Configuration Program.
- Free-Topology Network Communication - Communicates via the popular LonTalk® protocol at 78K bps. Free-topology supports star, bus, and/or loop network wiring configurations with up to 64 nodes per segment and 500 meter wire lengths.
- Standard Network Variables - Uses only standard network variable types (SVNT’s) to provide interoperability with other LonWorks® products. Outputs may be controlled and monitored as a single word SVNT_state.
Key SmartPack 4926A Features...continued

- **Nonvolatile Reprogrammable Memory** - This module contains an advanced technology Neuron® microcontroller and programmable, nonvolatile EEPROM, for configuration parameter and program storage.
- **Output Polarity & Reset State Configuration Parameters** - Each output includes configuration network variables for output polarity and reset state configuration.
- **Watchdog Timer** - An optional watchdog timer may be configured to reset all outputs upon time-out.
- **Fully Isolated** - Outputs, power, and communication network are isolated from each other. The sixteen outputs of this model share a common and do not provide output-to-output isolation.
- **Output Excitation Supply** - A current-limited excitation supply is provided for output load pullup operation.
- **Reset & Service Push-buttons** - Push-button Reset will reset the module to power-up (default) conditions. A Service Push-button will cause the node to transmit its unique node identification strings over the communication network.
- **High Current/Voltage Open Drain Outputs** - Rugged N-channel MOSFET switches withstand up to 42VDC and may sink up to 500mA of load current without derating over the entire operating temperature range. Each output includes a transient suppression device for added protection.
- **LED Status Indicators** - The green Power LED indicates that power is applied to the unit. The red Service LED provides configuration and operation function information. The yellow Status LED indicates whether the node is “off line.”
- **Wide-Range DC-Powered** - This device receives power over a wide DC supply range and the power terminal is diode-coupled. This makes the alarm useful for systems with redundant supplies, and/or battery backup power.
- **Wide Ambient Operation** - The unit is designed for operation over wide ambient temperatures.
- **Hardened For Harsh Environments** - The unit will operate reliably in harsh industrial environments and includes protection from RFI, EMI, ESD, EFT, and surges, plus low radiated emission levels per CE requirements.
- **Convenient Mounting, Removal, & Replacement** - DIN-rail mounting and plug-in type terminals for input, power, and network wiring make replacement and removal easy.

![CAUTION]

This module is physically protected with packing material and electrically protected with an anti-static bag during shipment. However, it is recommended that the module be visually inspected for evidence of mishandling prior to applying power.

This circuit utilizes static sensitive components and should only be handled at a static-safe workstation.

**INSTALLATION**

The module is packaged in a general purpose type of enclosure. Use an auxiliary enclosure to protect the unit in unfavorable environments or vulnerable locations. Stay within the recommended operating temperatures range of -13 to 185°F (-25 to +85°C) for best performance. Connect the unit as shown in Electrical Connections Drawing 4501-660.

Model 4926A Output Modules have no internal hardware jumpers or switches to configure. All configuration is done through software command.

**Pullup Resistor Installation**

The outputs of this module are the open-drains of N-channel MOSFETs with a common source connection. No drain resistor pullups are provided and these must be wired externally according to your application. A current limited excitation supply (+4V @48mA) is available at the EXC terminals for pulling up externally wired loads, or an external supply may be used. Higher voltage and current switching will require an external drain pullup supply or load excitation.

**Mounting**

Refer to the Enclosure Dimensions Drawing 4501-661 for mounting and clearance dimensions.

**DIN Rail Mounting:** This module can be mounted on "T" type DIN rails. Use suitable fastening hardware to secure the DIN rail to the designated mounting surface. Units may be mounted side-by-side on 1-inch centers for limited space applications.

"T" Rail (35mm), Type EN50022: To attach a module to this style of DIN rail, angle the top of the unit towards the rail and locate the top groove of the adapter over the upper lip of the rail. Firmly push the unit towards the rail until it snaps solidly into place. To remove a module, first separate the output & excitation terminal block(s) from the bottom side of the module to create clearance to the DIN mounting area. Next, insert a screwdriver into the lower arm of the DIN rail connector and use it as a lever to force the connector down until the unit disengages from the DIN rail.

---

**2.0 PREPARATION FOR USE**

**UNPACKING AND INSPECTION**

Upon receipt of this product, inspect the shipping carton for evidence of mishandling during transit. If the shipping carton is badly damaged or water stained, request that the carrier's agent be present when the carton is opened. If the carrier's agent is absent when the carton is opened and the contents of the carton are damaged, keep the carton and packing material for the agent's inspection. For repairs to a product damaged in shipment, refer to the Acromag Service Policy to obtain return instructions. It is suggested that salvageable shipping cartons and packing material be saved for future use in the event the product must be shipped.
Electrical Connections

The wire size used to connect the unit to the control system is not critical. For output wiring, use wire appropriate to the load current. The common terminal wire (one is provided for each bank of 8 channels) must be capable of carrying the total return current for 8 loads (8 x 0.5A = 4A total). All terminal strips can accommodate wire from 14-22 AWG. Strip back wire insulation 1/4-inch on each lead before installing into the terminal block. Output wiring may be shielded or unshielded. Network wires should be twisted pair. Since common mode voltages can exist on signal wiring, adequate wire insulation should be used and proper wiring practices followed. It is recommended that network and power wiring be separated from the output wiring for safety, as well as for low noise pickup. Note that output, power, and network terminal blocks are plug-in type and can be easily removed to facilitate module removal or replacement without removing individual wires. Refer to Electrical Connections Drawing 4501-660 as you make the following connections.

1. Power: Refer to Electrical Connections Drawing 4501-660 to connect power. Variations in power supply voltage within rated limits has negligible effect on module accuracy. The power terminal is diode-coupled for reverse polarity protection. Refer to the SPECIFICATIONS section for current requirements.

2. Network: See the SPECIFICATIONS section for detailed information about wiring, distance, and the maximum number of nodes per network segment. Note that the network circuit is electrically isolated from the output and power circuits. An optional earth ground network connection is available, and its use is required for rated transient protection.

3. Outputs: All outputs are the open-drains of n-channel mosfets whose source terminals share a signal common. Externally wired output pullups may be required. All outputs include transient voltage suppressers, but may require additional protection when switching inductive loads (see below). Refer to the SPECIFICATIONS section for output specifications and see the module side label for terminal designations. Note that these outputs are for current-sinking (low-side switching) applications only. Observe proper polarity when making connections. The output circuit as a group is electrically isolated from the network and power circuits. If necessary an interposing relay can be used to switch higher currents as illustrated in the Electrical Connections Drawing 4501-660.

IMPORTANT Output Protection: When driving relay coils or other inductive loads, diodes should be placed across each load to limit the voltage spike generated when an inductive load is switched off quickly. For DC inductive loads, place a diode across the load (1N4006 or equivalent) with the cathode to (+) and the anode to (-) as illustrated in the Electrical Connections Drawing 4501-660.

4. Shielding & Grounding: The module housing is plastic and does not require an earth ground connection. However, there are mounting positions at each side of the output module to connect an output cable shield, plus earth ground. These connections are isolated from the circuit and are recommended to minimize noise and help protect the unit from output transients. Additionally, the network terminals also include an earth ground connection for noise suppression and transient protection. For rated protection, you must make use of these connections as outlined in Electrical Connections Drawing 4501-660.

3.0 MODULE CONFIGURATION

The SmartPack module must be configured for your application. This is typically accomplished using a Windows® based configuration and network management program running on a personal computer. Use of this software is not covered here. A description of applicable network variables follows.

NETWORK VARIABLES

To provide interoperability, standard network variable types are used for all external interface and configuration variables. Figure 1 on the following page illustrates the network variable types available for Model 4926A.

Network variables are "nvi_instatestateword", "nvo_statebword", and "nvo_wd_status". The network variables "nvi_instatestate" and "nvo_statebword" contain all output channel state information with a single element.

Network variables within the Configuration Section are intended to be accessed by an appropriate network management tool to configure this module. These variables are maintained in EEPROM on the module and are generally limited to 10,000 write cycles. In addition, values written into configuration network variables do not take effect until the module is reset. Reset can occur as the result of powering-up, pushing the RESET button on the front panel of the module, or issuing a "reset" network management command to the module. Network variables within the External Interface Section are intended to be bound, polled, or written by other nodes on the network. These variables are maintained in RAM.
**nvi_instatestate**: State Word Variable Input (ON/OFF)

**Declaration**
```c
network input SNVT_state nvi_instatestate;
```

**Description**
This input network variable in conjunction with nci_op_mode[x] controls the state of all digital output channels in units defined by SNVT_state. Bit 0 corresponds to output 1, and bit 15 corresponds to output 16. See the truth table in Table 2 following. Associated with this network variable is a Watchdog Timer configuration variable. When this module is powered up or reset, all bound nvi_instatestate variables are polled to obtain the most recent values. Table 2 summarizes the function of the configuration bits.

**Power-up/Reset Value** Each bit '0'

**nci_op_mode[x]**: Operating Mode Configuration Variable

**Declaration**
```c
eeprom network input SNVT_state nci_op_mode[16];
```

**Description**
This configuration input network variable configures the input state that turns on the output switch, and the power-up/reset default state of the output switch. Three of the sixteen available bits are currently defined. Bit 0 is the invert bit, which determines the state (0 or 1) of the value written to nvi_instatestate, that causes the output switch to turn on and conduct load current. Bits 8 and 9 determine the reset behavior of the output switch. Tables 2 and 3 follow and summarize the functions of the configuration bits. This variable is maintained in EEPROM, and does not take effect until the module is reset.

**Table 2: Input Network Variable Truth Table**

<table>
<thead>
<tr>
<th>Bit 0 (inver)</th>
<th>nvi_instatestate</th>
<th>Output Switch</th>
<th>nvo_statefbword</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>Off</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>On</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>On</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Off</td>
<td>1</td>
</tr>
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**Table 3: Output Switch Reset Behavior Truth Table**

<table>
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<tr>
<th>Reset Conditions</th>
<th>Configuration Bits</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>nvo_wd_status</td>
<td>Bit 9</td>
</tr>
<tr>
<td>ST_OFF (default)</td>
<td></td>
<td>Enable</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Initial Factory Value**
- bit0: 0 (a "1" written to nvi_instatestate turns "ON" output switch)
- bit8: 0 (reset value 0, output switch resets to "OFF")
- bit9: 0 (default reset used, output switch resets to "OFF")

**nvo_watchdog**: Watchdog Timer Configuration Variable

**Declaration**
```c
eeprom network input SNVT_elapsed_tm nci_watchdog;
```

**Description**
This configuration input network variable allows the user to specify the maximum amount of time that can expire between updates of the nvi_instatestate variable. Failure to update the nvi_instatestate within the specified time period sets the nvo_wd_status variable to ST_ON, and causes the Status LED to flash its fault sequence. The maximum allowable time expressed in DD.HH:MM:SS:LL format is 00:17:59:59:00 (64799 seconds). Anything greater will be clipped at 00:17:59:59:00. The internal resolution of the timer is 1 second. The millisecond (LL) member is ignored. To disable the output watchdog timer function, set all members to 0. This variable is maintained in EEPROM, and does not take effect until the module is reset.

**Initial Factory Value**
- DD=0, HH=0, MM=0, SS=0, LL=0: Output watchdog timer disabled.

**nvo_statefbword**: State Feedback Word Output Variable (ON/OFF)

**Declaration**
```c
network output SNVT_state nvo_statefbword;
```

**Description**
This output network variable is used to determine the present state of all digital output channels in units defined by SNVT_state. Bit 0 corresponds to output 1, and bit 15 corresponds to output 16. A bit value of "1" equates to a switch "ON" output for the corresponding channel, while a bit value of "0" indicates that the switch output is "OFF".

**Power-up/Reset Value** Per input.
4.0 THEORY OF OPERATION

Refer to the Block Diagram of Drawing 4501-663 to gain a better understanding of the circuit. This output module uses 10 I/O lines of the LonWorks neuron chip to alternately control separate octal latches that in turn drive two banks of eight N-channel mosfets. The output channels of this control module are the open-drains of these mosfets. The source leads of the mosfets are connected in common. The neuron chip provides all the key functions necessary to process inputs from sensors and control devices intelligently, and transmit control information across the network. An Echelon FTT-10A free-topology transceiver provides the isolated network interface. The outputs operate as low-side switches and may be wired directly to a load. All outputs include transient suppression devices. A wide input switching regulator (isolated flyback mode) provides isolated +5V power to the circuit.

For simple digital output applications, this module includes an excitation supply (+4V @48mA) available at the EXC terminals for output pullups or loads. Otherwise, an external supply up to 42V DC may be used to provide load excitation.

5.0 SERVICE AND REPAIR

SERVICE AND REPAIR ASSISTANCE

This module contains solid-state components and requires no maintenance, except for periodic cleaning and configuration parameter verification. It is highly recommended that a non-functioning module be returned to Acromag for repair, since Surface Mounted Technology (SMT) boards are generally difficult to repair. The board can be easily damaged unless special SMT repair and service tools are used. Acromag has automated test equipment that thoroughly checks and calibrates the performance of each module.

Please refer to Acromag’s Service Policy Bulletin or contact Acromag for complete details on how to obtain parts and repair.

PRELIMINARY SERVICE PROCEDURE

Before beginning repair, be sure that all installation and configuration procedures have been followed. The unit has three LED’s which can be used to aid fault diagnosis. The green “Power” LED provides a visual indication that power is applied to the unit. The red “Service” LED flashes at a 1/2 Hz rate for an unconfigured node. It is OFF for a properly functioning node, and ON for a failed node. There is also a yellow “Status” LED which remains ON indefinitely upon receiving an “offline” network management command. It remains OFF upon receiving an “online” network management command (normal operation). This LED will also flash at a 2.5 Hz rate for 10 seconds upon receiving a “wink” network command which can be used to identify and verify communication with a specific unit within a group of SmartPacks. Lastly, the “Status” LED will flash quickly three times each second to indicate that the watchdog timer has timed out on at least one of the input state variables.

If the LED's indicate a failure, or if other evidence points to a problem with the unit, an effective and convenient fault diagnosis method is to exchange the questionable module with a known good unit. Acromag's Application Engineers can provide further technical assistance if required. When needed, complete repair services are also available from Acromag.

6.0 SPECIFICATIONS

Final product specifications are contingent upon CSA & FM Hazardous Location approvals.

MODEL/SERIES:

Model: 4926A, 16 Isolated Open-Drain Outputs. Model 4926A output modules are color coded with a red label and DIN-rail mounted. These DC-powered, SmartPack, LonWorks® modules provide control of 16 N-Channel mosfets. The outputs are the open-drains of these mosfets and provide 16 low-side output switches (which share a common return) based upon network variable inputs. Each output switch has configuration network variables to control its operation and watchdog timer. Three-way isolation is provided between the outputs, the communication network, and the power circuit.

NETWORK SPECIFICATIONS:

Protocol: LonTalk®, includes FTT-10A, Free Topology Twisted Pair Transceiver. Supports unrestricted star, bus, or loop network wiring topologies.

Speed: 78K bits per second.

Media: See Cable Type in Table 4 of following page.

Distance: See Table 4 of following page.

Nodes per Network Segment: 64 maximum. A LonWorks® router configured as a repeater is required for more than 64 nodes.

Network Response Time: 20ms, typical from a network variable change of value to the output change of state.
### Table 4B: Free Topology Specifications*

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>Max Module-to-Module Distance</th>
<th>SmartPack Max Total Wire Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belden 85102</td>
<td>1640 ft (500 m)</td>
<td>1640 ft (500 m)</td>
</tr>
<tr>
<td>Belden 8471</td>
<td>1312 ft (400 m)</td>
<td>1640 ft (500 m)</td>
</tr>
<tr>
<td>Level IV, 22 AWG</td>
<td>1312 ft (400 m)</td>
<td>1640 ft (500 m)</td>
</tr>
<tr>
<td>JY (St) Y 2x2x0.8</td>
<td>1050 ft (320 m)</td>
<td>1640 ft (500 m)</td>
</tr>
<tr>
<td>TIA Category 5</td>
<td>820 ft (250 m)</td>
<td>1475 ft (450 m)</td>
</tr>
</tbody>
</table>

### Table 4B: Doubly Terminated Bus Topology*

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>Max Bus Length w/ Free-Topology Transceivers (FTT-10, FTT-0A)</th>
<th>Max Bus Length w/ Free-Topology &amp; Link-Power Transceivers (FTT-10A, LPT-10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belden 85102</td>
<td>8856 ft (2700 m)</td>
<td>7218 ft (2200 m)</td>
</tr>
<tr>
<td>Belden 8471</td>
<td>8856 ft (2700 m)</td>
<td>7218 ft (2200 m)</td>
</tr>
<tr>
<td>Level IV, 22 AWG</td>
<td>4593 ft (1400 m)</td>
<td>3773 ft (1150 m)</td>
</tr>
<tr>
<td>JY (St) Y 2x2x0.8</td>
<td>2953 ft (900 m)</td>
<td>2461 ft (750 m)</td>
</tr>
<tr>
<td>TIA Category 5</td>
<td>2953 ft (900 m)</td>
<td>2461 ft (750 m)</td>
</tr>
</tbody>
</table>


### OUTPUT SPECIFICATIONS:

This module has sixteen, low-side, DC output switches. These switches are controlled and monitored by other modules on the network using the module’s SNVT’s.

**Output Channel Configuration:** 16 independent, open-drain mosfet switches which share a common return (source) connection. For DC voltage and current sinking applications only—observe proper polarity. For control of higher voltages and/or currents, or for controlling AC, an interposing relay may be used (see Electrical Connections Drawing 4501-690).  

**Output “OFF” Voltage Range:** 0 to +42V DC, maximum.  
**Output “OFF” Leakage Current:** 25µA maximum (55°C, 42VDC).  
**Output “ON” Current Range:** 0 to +50mA DC, continuous, for each output switch (one common per each group of 8 outputs). No derating is required at elevated ambient temperatures.  
**Output R<sub>on</sub> ON Resistance:** 0.2Ω Maximum @25°C.  
**Output Response Time:** Output(s) will change states within 20ms, typical, after receipt of a network variable update message.  
**Signal Polarity & Output Reset Polarity:** User programmable on an individual output basis via the nci_op_mode[x] SNVT.  
**Output Watchdog Timer:** Use of this timer is optional. Timer resets all outputs upon time-out and is user-programmable via the nci_watchdog SNVT.  
**Output Excitation Supply:** +4V DC Minimum, limited to 48mA total. Supplies source (pullup/pind) current. The sum of all loads must be less than 48mA. Use an externally mounted resistor, one per input, to “pull up” the open drain outputs with this supply.

### AGENCY APPROVALS:

All units are designed to comply with European Community “CE” requirements, plus CSA & FM Class I, Division 2, Groups A, B, C, and D. Approvals are pending.

### ENCLOSURE/PHYSICAL SPECIFICATIONS:

See Enclosure Dimensions Drawing 4501-681. Units are packaged in a general purpose plastic enclosure that is DIN rail mountable for flexible, high-density (approximately 1” wide per unit) mounting.

**Dimensions:** Width = 1.0 inch, Height = 4.6 inches, Depth = 4.40 inches.  
**DIN Rail Mounting:** DIN rail mount, Type ENS0022, ‘T’ rail (35mm).  
**Connectors:** Removable plug-in type, terminal blocks, color is black (TB1, TB2, TB4) and safety orange (TB3), Current/Voltage Ratings: 10A/300V.  
**Wire Range:** AWG #14-22  
**Case Material:** Self-extinguishing NYLON type 6.6 polyamide thermoplastic UL94 V-2, color beige, general purpose NEMA Type 1 enclosure.  
**Printed Circuit Boards:** Military grade FR-4 epoxy glass circuit board.  
**Shipping Weight:** 1 pound (0.45 Kg) packed.  
**Power Requirements:** +10V DC Minimum to +36V DC.  
**Maximum (+25°C to +70°C):** Above 70°C, the supply voltage is derated 0.8V/°C, to 24VDC maximum at 85°C. Current draw is a fraction of the supply voltage (see Table 5). Currents specified are maximum values with the module transmitting on the network. A series-coupled internal diode provides reverse polarity protection.

**CAUTION:** Do not exceed 36VDC peak supply input, to avoid damage to the module.

### Table 5: Power Supply Current

<table>
<thead>
<tr>
<th>Supply Voltage</th>
<th>Maximum Current Draw (No Excitation)</th>
<th>Maximum Current Draw (w/ Excitation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 VDC</td>
<td>90mA</td>
<td>130mA</td>
</tr>
<tr>
<td>12 VDC</td>
<td>75mA</td>
<td>110mA</td>
</tr>
<tr>
<td>15 VDC</td>
<td>60mA</td>
<td>85mA</td>
</tr>
<tr>
<td>24 VDC</td>
<td>45mA</td>
<td>60mA</td>
</tr>
<tr>
<td>36 VDC</td>
<td>35mA</td>
<td>45mA</td>
</tr>
</tbody>
</table>

**Power Supply Effect:** None.

### ENVIRONMENTAL SPECIFICATIONS:

**Reference Test Conditions:** Switch outputs may be “ON” or “OFF” at 0 to 42VDC; Network (78K bps); Temperature: 25°C; +24V DC supply.  
**Operating Temperature Range:** -25°C to +65°C.  
**Storage Temperature Range:** -40°C to +85°C.  
**Relative Humidity:** 25 to 90% (FTT-10A Transceiver Limitation).  
**Ambient Temperature Effect:** None.
Isolation: Three-way galvanic isolation is provided between the digital output circuits, DC power, and the communication network as follows:

Outputs-to-Power and Network-to-Power: The digital outputs, as a group, can operate at up to 250V AC or 354V DC off ground, on a continuous basis (will withstand 1500V AC dielectric strength test for one minute without breakdown). This complies with test requirements outlined in ANSI/ISA-S82.01-1988 for the voltage rating specified.

Network-to-Outputs: The network can operate at up to 277V AC off DC power ground, on a continuous basis (will withstand 1000V AC dielectric strength test for one minute without breakdown).

Output-to-Output isolation: Digital outputs share a circuit common and are NOT isolated from each other.

Installation Category: Designed to operate in an Installation Category (Overvoltage Category) II environment per IEC 1010-1 (1990).

Radiated Field Immunity (RFI): Designed to comply with IEC1000-4-3 Level 3 (10V/m, 27 to 500MHz) and European Norm EN50082-1.

Electromagnetic Interference Immunity (EMI): Unit operates without error under the influence of EMI from switching solenoids, commutator motors, and drill motors.

Electrical Fast Transient Immunity (EFT): Complies with IEC1000-4-4 Level 2 (1KV power, 0.5KV signal lines) and European Norm EN50082-1.

Surge Immunity: Complies with IEC1000-4-5 Level 2 (1.5KV) and European Norm EN50082-1.

Electrostatic Discharge (ESD) Immunity: Complies with IEC1000-4-2 Level 3 (8KV air discharge) and European Norm EN50082-1.

Radiated Emissions: Meets or exceeds European Norm EN50081-1 for Class A equipment.

Warning: This is a Class A rated product. In a domestic environment, this product may cause radio interference in which the user may be required to take adequate measures.

Conducted Emissions: Not applicable; these units are not AC powered.

MISCELLANEOUS:

Interoperability: SmartPacks are interoperable with LonWorks® products from other manufacturers that use standard network variable types (SNVT's).

Module Configuration and Network Management: Performed using a Windows® based configuration program on a PC.

Nonvolatile Reprogrammable Memory: The Neuron® microcontroller has integrated, programmable, nonvolatile EEPROM (10K programming cycles) for configuration parameter storage. Additional external EEPROM is included for program storage.

Reset/Service Buttons (See Drawing 4501-660 for Location):

- Reset Button: Allows the module to be reset to power-up conditions.
- Service Button: Causes the Neuron® chip inside the node to transmit its unique 48-bit ID and 8-byte program ID strings.

LED indicators (See Drawing 4501-660 for Location):

- Power LED (Green): Indicates power is applied to unit.
- Service LED (Red): LED is OFF for a properly functioning node, and ON for a failed node. LED flashes at a 1/2 Hz rate for an unconfigured node.
- Status LED (Yellow): See Figure 2. LED remains ON indefinitely upon receiving an "offline" network management command. LED remains OFF upon receiving an "online" network management command (normal operation). The LED will also flash at a 2.5Hz rate for 10 seconds upon receiving a "wink" network command. LED flashes quickly 3 times each second to indicate that the watchdog timer has timed out on one of the channel input variables.

Figure 2: Status LED Behavior

1. Offline/Online Commands:

   ON
   OFF

   Offline Command

   Online Command

2. Wink Command:

   ON
   OFF

   200 mS

   200 mS

   10 Seconds

3. Fault Sequence:

   ON
   OFF

   1 Second

   Fault Removed

   continues until

   Fault Removed

   1606d

   mS mS
NOTE: ALL DIMENSION ARE IN INCHES (MILLIMETERS)

MODEL 4925/4926
ENCLOSURE DIMENSIONS

4501-661