LONWORKSTM MODULE
2-CHANNEL 4-20 MA 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>2-Channel 4-20 mA DC Output Module</td>
<td>27005-9</td>
<td>570L3-701-C1-10-NCR</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.mooreproducts.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>
</thead>
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<tr>
<td>Fax: +1 215 283 6343</td>
<td></td>
</tr>
<tr>
<td>E-mail: <a href="mailto:ticgroup@mpeo.com">ticgroup@mpeo.com</a></td>
<td></td>
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<tr>
<td>FaxRequest: +1 215 646 7400, extension 4842, option 2</td>
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<tr>
<td>Bulletin Board Service: +1 215 283 4968</td>
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<tr>
<td>Hours of Operation: 8 a.m. to 6 p.m. eastern time</td>
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<tr>
<td>E-mail: <a href="mailto:lohho@mpeo.com">lohho@mpeo.com</a></td>
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<tr>
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<td>Fax: +44 1935 706969</td>
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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.
INTRODUCTION:

These instructions cover the model types listed in Table 1 below. Supplementary sheets are attached for units with special options or features.

Table 1: A. Model Number Format

<table>
<thead>
<tr>
<th>Series/Network</th>
<th>Function</th>
<th>Inputs</th>
<th>Power</th>
<th>Cert.</th>
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<tbody>
<tr>
<td>570L1</td>
<td>-701</td>
<td>-C1</td>
<td>-10</td>
<td>-NCR</td>
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<tr>
<td>570L3</td>
<td>-701</td>
<td>-C1</td>
<td>-10</td>
<td>-NCR</td>
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</tbody>
</table>

Notes (Table 1):
1. Consult the factory for current information on agency (e.g. Canadian Standards Association, etc.) approvals.

DESCRIPTION:

The Series 570L is a member of the Acromag SmartPack family. It converts two independent network variables to two corresponding 4-to-20mA output signals. Each analog output has a watchdog timer that can optionally reset the output to 4 mA in the event of a communications failure.

All SmartPack modules are designed for harsh industrial environments. They feature RFI and EMI protection, a wide operating temperature range, and isolation between power, network and I/O. They are DC powered, DIN-rail mountable, and available with either a twisted pair (TP/XF-78) or free topology (TP/FT-10) transceiver. Up to 64 modules can be connected on a single network segment. Multiple segments may be connected using repeaters to increase the number of modules and distance.

SmartPacks are interoperable with LONWORKS products from other manufacturers that use standard network variable types (SNVTs). Module calibration, configuration and network management are performed using a Windows™ configuration program on a PC.
**SPECIFICATIONS:**

**DEFINITION:** This family of isolated, DC-powered, SmartPack modules converts two independent network variables, using standard network variable types (SNVT), to two 4-to-20mA DC current signals. Three-way isolation is provided between the output circuits, the network, and power. The module is DIN-rail mounted.

**MODEL/SERIES:** 570 (Color coded with a Red label)

**NETWORK (Designated by 'LX' of 570LX Model prefix):**

Protocol: LonTalk®

L1: TP/RF-78, Twisted Pair
   Speed: 78.1kb per second.
   Media: Unshielded twisted pair, UL Level IV, No. 22
gauge wire.
   Distance: Up to 6500 feet (2000 meters).
   Nodes per Network Segment: 64 (0 to +70°C), 44 (-25 to +85°C). A LONWORKS router configured as a repeater is required for more than 64 nodes.

L3: TP/FT-10, Free Topology
   Speed: 78.1kb per second.
   Media: See Cable Type in Table 2 below.
   Distance: See Table 2 below.

**Table 2: Free Topology Specifications**

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>Maximum module-to-module distance</th>
<th>Maximum total wire length for SmartPack Modules</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>
</tbody>
</table>

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

**FUNCTION:** Code number used to represent the module's firmware functionality.

-701: See the network variables section for a description of the module's standard network variable types and operation.

**OUTPUT:** This unit has two independent 4-to-20mA outputs. Zero and full-scale calibration of each output is done over the network. Additionally, each analog output has a compliance monitor circuit that detects output compliance problems such as an open load, or too high of a load resistance for the specified output current.

-C1: Two Independent Outputs: 4 to 20mA DC, nominal.
   Actual range: 2 to 22mA DC range. R-Load = 0 to 525Ω

**NOTE:** To prevent false compliance fault indications, the Output (+) and (-) terminals of unused analog outputs should be shorted together or connected to a load resistance of 525Ω or less.

**Isolation:** Three-way isolation is provided between analog outputs, DC power, and the network as follows (the analog outputs share a common return):

**Power-to-Output, Power-to-Network:** Outputs can operate at up to 250V AC, or 354V DC off DC power 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/IEEE-S62.01-1983 for the voltage rating specified.

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

**POWER:** Connect an external DC power supply to the Power [P] and [I] terminals. Currents specified are maximum values with full-scale output current (each output) and the module transmitting on the network. Diode on module provides reverse polarity protection. CAUTION: Do not exceed 36V DC peak, to avoid damage to the module.

-10: +10 to 36V DC, current draw is a function of supply voltage (refer to Table 3 below).

**Table 3: Supply Current**

<table>
<thead>
<tr>
<th>Supply Voltage</th>
<th>L1 Supply Current</th>
<th>L3 Supply Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>10V</td>
<td>200mA</td>
<td>150mA</td>
</tr>
<tr>
<td>12V</td>
<td>135mA</td>
<td>125mA</td>
</tr>
<tr>
<td>15V</td>
<td>110mA</td>
<td>100mA</td>
</tr>
<tr>
<td>24V</td>
<td>75mA</td>
<td>70mA</td>
</tr>
<tr>
<td>36V</td>
<td>55mA</td>
<td>50mA</td>
</tr>
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</table>

**CAUTION:** Do not exceed 36V DC peak, to avoid damage to the module.

**Power Supply Effect:**

*DC Volts:* Less than ±0.001% of output span change per volt DC, for rated power supply variations.

*60/120 Hz ripple:* Less than ±0.01% of output span per volt peak-to-peak of power supply ripple.

**Reference Test Conditions:**

- Output: 4 to 20mA; Network (78kΩ/S); 77°F (25°C); +15V DC supply.

**Reset/Service Toggle Switch:**

- **Reset Position:** Allows the module to be reset to power-up conditions (toggle right).
- **Service Position:** Causes the Neuron® chip inside the node to transmit its unique 48-bit ID and 8-byte program ID string (toggle left).
LED Indicators:

Power LED (Green): Indicates power applied to unit.
Service LED (Red): LED blinks at a 1/2 Hz rate for an unconfigured node. LED OFF for a properly functioning node. LED ON for failed node.
Status LED (Yellow): (See Figure 1) LED remains ON indefinitely upon receiving an "off-line" network management command. LED remains OFF upon receiving an "on-line" network management command (normal operation). LED blinks at a 2.5Hz rate for 10 seconds upon receiving a "wink" network command. LED flashes quickly three times every second to indicate a fault condition as defined by the nvo_wd_status[x] and nvo_comp_fault[x] variables.

Figure 1: Status LED Behavior

1. Off-line/On-line Commands:
   - ON
   - OFF
   - Off-line Command
   - On-line Command

2. Wink Command:
   - ON
   - OFF
   - 10 Seconds
   - 200 | 200 |
   - mS mS

3. Fault Sequence:
   - ON
   - OFF
   - 1 Second
   - Fault Removed
   - mS mS

Accuracy: Better than ±0.05% of calibrated span, typical. This error includes the combined effects of module repeatability, hysteresis, terminal point linearity, and adjustment resolution.

Analog Resolution: 5.87 uA, or 1 part in 2730 (0.037% of 16.0 mA output span).

Ambient Temperature Range: L1 (44 nodes): -13°F to +185°F (-25°C to +85°C), L1 (64 nodes): +32°F to +185°F (0°C to 70°C), L3 (64 nodes): -13°F to +185°F (-25°C to +85°C).

Ambient Temperature Effect: Less than ±0.003% of output span per °F (± 0.005% per °C) over the ambient temperature range for reference test conditions. Specification includes the combined effects of zero and span over temperature.

Response Time: For a network variable update, the output reaches 98% of output span in 250mS, typical.

Noise Rejection:
Common Mode: Better than 100dB at 60 Hz, typical.
Normal Mode: Not applicable.

RFI Resistance: Less than ± 0.5% of input span with RFI field strengths of up to 10V/meter at frequencies of 27MHz, 151MHz, and 467MHz.

EMI Resistance: Less than ±0.25% of input span effect with switching solenoids or commutator motors.

Surge Withstand Capability (SWC): Input/Output termination's rated per ANSI/IEEE C37.90-1978. Unit is tested to a standardized test waveform that is representative of surges (high frequency transient electrical interference), observed in actual installations.

Mounting: General Purpose plastic Housing with integrated DIN-Rail Mount. Supports "G" & "T" rails: "G" Rail (32mm), Type EN50035: "T" Rail (35mm), Type EN50022. Refer to Drawing 4501-327 for outline and clearance dimensions. Shipping Weight: 1 pound (0.45 Kg) packed.

Construction:
- Circuit Boards: Military grade FR-4 epoxy glass circuit boards.
- Circuit Board Coating: Fungus resistant acrylic conformal coat on analog output circuit board only.
- Terminals: Compression type, wire size 14 AWG maximum.
- Case: Self-extinguishing NYLON Type 6,6 polyamide thermoplastic UL94 V-2, color black. General Purpose, NEMA Type 1 enclosure.

CERTIFICATION: Consult the factory for current information on the availability of agency (e.g. Canadian Standards Association, Factory Mutual, etc.) approvals.

-NCR: No Certification Required.

INSTALLATION:

The module is packaged in a general purpose enclosure type. Use an auxiliary enclosure to protect against unfavorable environments and locations. Maximum operating ambient temperatures should be within 32 to 150°C (0 to 70°C) for satisfactory performance. The module is factory calibrated and ready for installation. Connect as shown in Connection Drawing 4501-333.

Mounting: Mount the module assembly - refer to Drawing 4501-327 for mounting and clearance dimensions.

DIN Rail Mounting: Use suitable fastening hardware to secure the DIN rail to the designated mounting surface. A module, can be mounted to either the "T" or "G" Rail. Installation of the module to the rail depends on the type of DIN rail used (see Drawing 4501-327). Units can be mounted side-by-side on 1.6 inch centers, if required.

"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, insert a screwdriver into the lower arm of the connector and pull downward while applying outward pressure to the bottom of the unit.
"G" Rail (32mm), Type EN50035: To attach a module to this style of DIN rail, angle the unit so that the upper groove of the adapter hooks under the top lip of the rail. Firmly push the unit towards the rail until it snaps solidly into place. To remove a module, pull the lower part of the unit outward until it releases from the rail, lift unit from rail.

Electrical Connections:

The wire size used to connect the unit to the control system is not critical. All terminal strips can accommodate wire from 14-26 AWG. Strip back wire insulation 1/4-inch on each lead before installing into the terminal block. Input wiring may be either shielded or unshielded twisted pair. 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 the network and power wiring be separated from the signal wiring for safety, as well as for low noise pickup.

1. Power: Connect DC power supply per Connection Drawing 4501-333. These modules operate from DC power supplies only. Power supply voltage is not critical and normally should be from 10.0V to 36V DC. The supply voltage must not exceed 35 Volts, even momentarily, or damage to the module may occur. Variations in power supply voltage above the minimum required has negligible effect on module accuracy. Refer to "POWER" in the preceding SPECIFICATIONS section for current requirements. This device includes reverse polarity protection.

2. Network: Connect network per Connection Drawing 4501-333. Note: Network circuit is isolated from output and power circuits. See NETWORK specifications for the maximum number of nodes per network segment.

3. Grounding: The module housing is plastic and does not require an earth ground connection.

4. Output: Connect output per connection diagram. Note: The output circuits share a common return. Together they are isolated from the network and power circuits, allowing the outputs to operate up to 250V AC, or 354V DC off ground, on a continuous basis.

NETWORK VARIABLES:

To provide interpretability, standard network variable types are used for all external interface and configuration variables. Figure 2 below illustrates the 570L's network variable types.

![Figure 2: Series 570LX-701-C1-10 SNVT Diagram](image-url)

All network variables are 2-element arrays. Analog output 1's network variables are referenced using an array subscript of 0; analog output 2's by a subscript of 1. All network variables of type SNVT_lev_percent are with respect to a 16 mA output span. For example, if the SNVT_lev_percent value is set to 10000, the corresponding percent of span is 50%, which yields an output value of 12 mA. Figure 3 illustrates the relationship between SNVT_lev_percent input values and mA output values.

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. Network variables within the Configuration Section are intended to be accessed by a network management tool to configure and calibrate the module. These variables are maintained in EEPROM and are limited to 10000 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, toggling the RESET switch, or issuing a "reset" network management command to the module.
Power-up/Reset Value
ST_OFF

nvo_wd_comp_fault[ x ]: Compliance Fault Status

Declaration
network output SNVT_lev_disc nvo_comp_fault[ 2 ];

Description
This output network variable contains the status of the internal compliance fault monitor for the corresponding analog output. Under normal conditions, its value is ST_OFF. Upon an open load condition, or other condition that causes the output circuit to lose regulation, its value becomes ST_ON. In addition, the Status LED flashes its fault sequence. When the compliance problem is corrected, nvo_comp_fault[ x ] returns to ST_OFF and removes the Status LED fault. See Figure 1 for an illustration of Status LED behavior.

NOTE: To prevent false compliance fault indications, the Output (+) and (-) terminals of unused analog outputs should be shorted together or connected to a load resistance of 525 ohms or less.

Power-up/Reset Value
ST_OFF

nci_watchdog[ x ]: Output Watchdog

Declaration
eeprom network input SNVT_time_passed nci_watchdog[ 2 ];

Description
This configuration input network variable specifies the maximum amount of time that can expire between updates of the corresponding nvi_pvin[ x ] variable. Failure to update within the specified time period causes the analog output to reset to 0% (4 mA), the corresponding nvo_wd_status[ x ] variable is updated with ST_ON, and the Status LED to flash its fault sequence. The maximum allowable time expressed in HH:MM:SS.LL format is 17:59:59:00 (64799 seconds). Anything greater will be clipped at 17:59:59:00. The internal resolution of the timer is 1 second. The 10 millisecond (LL) member is ignored. To disable the output watchdog timer function, set HH to 255, or all members to 0. This variable is maintained in EEPROM, and does not take effect until the module is reset.

Initial Factory Value
HH=255, MM=00, SS=00, LL=00: Output watchdog timer disabled.
nci كاليو[ x ]: Calibration Low Variable

Declaration
eeprom network input SNVT_lev_percent nci_cali[ 2 ];

Description
This configuration input network variable contains the value corresponding to the nominal 4 mA or 0% output. See the Calibration section for a complete description of its use. This variable is maintained in EEPROM and does not take effect until the module is reset.

Initial Factory Value
0.0% of span (0), or 4.00 mA.

nci_calhi[ x ]: Calibration High Variable

Declaration
eeprom network input SNVT_lev_percent nci_calhi[ 2 ];

Description
This configuration input network variable contains the value corresponding to the nominal 20 mA or 100% output. See the Calibration section for a complete description of its use. This variable is maintained in EEPROM and does not take effect until the module is reset.

Initial Factory Value
100.0% of span (20000), or 20.00 mA.

CALIBRATION:

All modules are calibrated at the factory and additional calibration is not normally required. However, if it does become necessary to calibrate the module, follow the procedure outlined below for each output. Values in parenthesis indicate the SNVT_lev_percent value. See Figure 3 for the relationship between output current and SNVT_lev_percent value.

Equipment Required
1. DVM capable of accurately measuring 4-20 mA. See drawing 4501-331.
2. Network management tool capable of writing the module’s network variables.

Procedure
1. Write a value of 0% (0) to the nvi_pvin[ x ] variable to cause the output to go to 4 mA, nominal. Note the actual mA value measured by the DVM.
2. Write the SNVT_lev_percent value corresponding to the measured value of the DVM to the nci_cali[ x ] network variable for the input.
3. Write a value of 100% (20000) to the nvi_pvin[ x ] variable to cause the output to go to 20 mA nominal. Note the actual mA value measured by the DVM.
4. Write the SNVT_lev_percent value corresponding to the measured value of the DVM to the nci_calhi[ x ] network variable for the input.
5. (Optional) Write a new value to the nci_watchdog[ x ] variable as required.

6. Reset the module. New internal calibration coefficients are now calculated using the nci_cali[ x ] and nci_calhi[ x ] values.
7. Write a value of 50% (10000) to the nvi_pvin[ x ] variable to cause the output to go to 12 mA. The DVM should indicate a value of 12.00mA ± 0.05% (5 uA) of output span.

Note: If the output will not calibrate after performing the above calibration sequence, write a value of 0 into the nci_calhi[ x ] variable and reset the module. This will cause the initial factory values to be recalled for all configuration variables associated with the analog output. Then carefully repeat the above calibration sequence.

GENERAL MAINTENANCE:

The module contains solid-state components and requires no maintenance, except for periodic cleaning and calibration verification. When a failure is suspected, a convenient method for identifying a faulty module is to exchange it with a known good unit. It is highly recommended that a non-functioning module be returned to Acromag for repair since Acromag makes use of tested and burned-in parts, and in some cases, parts that have been selected for characteristics beyond that specified by the manufacturer. Further, Acromag has automated test equipment that thoroughly checks the performance of each module.
SERIES 570L CURRENT OUTPUT
MODULE ELECTRICAL CONNECTIONS

ENCLOSURE DIMENSIONS
FOR DIN RAIL MOUNTING

NOTE: ALL DIMENSIONS ARE IN INCHES (MILLIMETERS).
SERIES 570L CURRENT OUTPUT MODULE CALIBRATION CONNECTIONS

SERIES 570L CURRENT OUTPUT MODULE APPLICATION AND ELECTRICAL CONNECTIONS