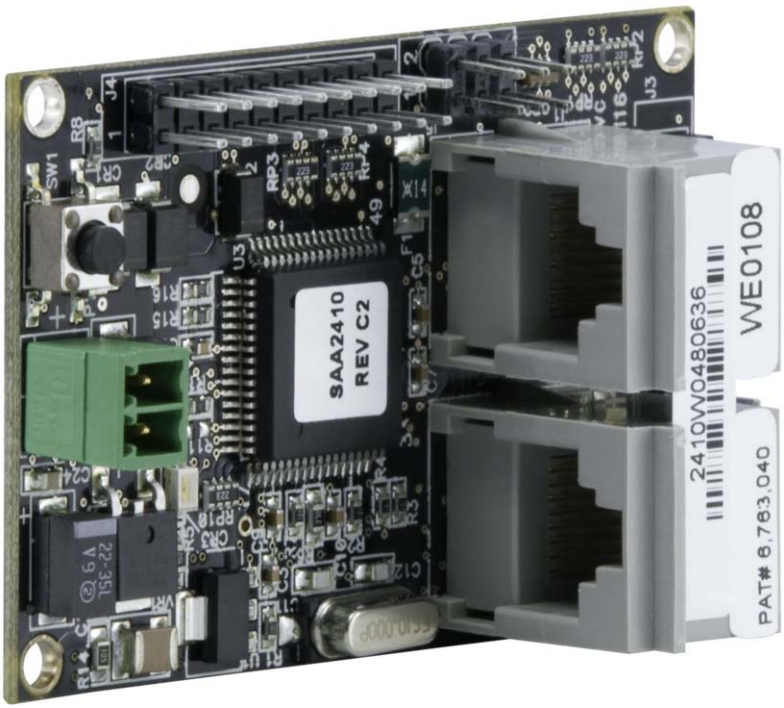
INSTRUCTION MANUAL

NXP-CPI16
NETLINX® CUSTOM PANEL INTERFACE



AV FOR AN IT WORLD

IMPORTANT SAFETY INSTRUCTIONS

1. READ these instructions.
2. KEEP these instructions.
3. HEED all warnings.
4. FOLLOW all instructions.
5. DO NOT use this apparatus near water.
6. CLEAN ONLY with dry cloth.
7. DO NOT block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. DO NOT install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. DO NOT defeat the safety purpose of the polarized or grounding type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wider blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. PROTECT the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
11. ONLY USE attachments/accessories specified by the manufacturer.

12. USE ONLY with a cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
13. UNPLUG this apparatus during lightning storms or when unused for long periods of time.
14. REFER all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
15. DO NOT expose this apparatus to dripping or splashing and ensure that no objects filled with liquids, such as vases, are placed on the apparatus.
16. To completely disconnect this apparatus from the AC Mains, disconnect the power supply cord plug from the AC receptacle.
17. Where the mains plug or an appliance coupler is used as the disconnect device, the disconnect device shall remain readily operable.
18. DO NOT overload wall outlets or extension cords beyond their rated capacity as this can cause electric shock or fire.

The exclamation point, within an equilateral triangle, is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electrical shock to persons.

ESD Warning: The icon to the left indicates text regarding potential danger associated with the discharge of static electricity from an outside source (such as human hands) into an integrated circuit, often resulting in damage to the circuit.

WARNING: To reduce the risk of fire or electrical shock, do not expose this apparatus to rain or moisture.

WARNING: No naked flame sources - such as lighted candles - should be placed on the product.

WARNING: Equipment shall be connected to a MAINS socket outlet with a protective earthing connection.

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LIABILITY NOTICE

No patent liability is assumed with respect to the use of information contained herein. While every precaution has been taken in the preparation of this publication, AMX assumes no responsibility for error or omissions. No liability is assumed for damages resulting from the use of the information contained herein. Further, this publication and features described herein are subject to change without notice.

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The AMX Warranty and Return Policy and related documents can be viewed/downloaded at www.amx.com.

ESD WARNING

To avoid ESD (Electrostatic Discharge) damage to sensitive components, make sure you are properly grounded before touching any internal materials.

When working with any equipment manufactured with electronic devices, proper ESD grounding procedures must be followed to make sure people, products, and tools are as free of static charges as possible. Grounding straps, conductive smocks, and conductive work mats are specifically designed for this purpose.

Anyone performing field maintenance on AMX equipment should use an appropriate ESD field service kit complete with at least a dissipative work mat with a ground cord and a UL listed adjustable wrist strap with another ground cord

WARNING: Do Not Open! Risk of Electrical Shock. Voltages in this equipment are hazardous to life. No user-serviceable parts inside. Refer all servicing to qualified service personnel.

Place the equipment near a main power supply outlet and make sure that you can easily access the power breaker switch.

WARNING: This product is intended to be operated ONLY from the voltages listed on the back panel or the recommended, or included, power supply of the product. Operation from other voltages other than those indicated may cause irreversible damage to the product and void the products warranty. The use of AC Plug Adapters is cautioned because it can allow the product to be plugged into voltages in which the product was not designed to operate. If the product is equipped with a detachable power cord, use only the type provided with your product or by your local distributor and/or retailer. If you are unsure of the correct operational voltage, please contact your local distributor and/or retailer.

FCC AND CANADA EMC COMPLIANCE INFORMATION:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- •Reorient or relocate the receiving antenna.
- •Increase the separation between the equipment and receiver.
- •Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- •Consult the dealer or an experienced radio/TV technician for help.

Approved under the verification provision of FCC Part 15 as a Class B Digital Device.

Caution: Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this device.

CAN ICES-3 (B)/NMB-3(B)

EU COMPLIANCE INFORMATION:

Eligible to bear the CE mark; Conforms to European Union Low Voltage Directive 2006/95/EC; European Union EMC Directive 2004/108/EC; European Union Restriction of Hazardous Substances Recast (RoHS2) Directive 2011/65/EU; European Union WEEE (recast) Directive 2012/19/EU; European Union Registration, Evaluation, Authorization and Restriction of Chemicals (REACH) Directive 2006/121/EC.

You may obtain a free copy of the Declaration of Conformity by visiting http://www.amx.com/techcenter/certifications.asp.

WEEE NOTICE:

This appliance is labeled in accordance with European Directive 2012/19/EU concerning waste of electrical and electronic equipment (WEEE). This label indicates that this product should not be disposed of with household waste. It should be deposited at an appropriate facility to enable recovery and recycling.

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NXP-CPI16 NetLinx® Custom Panel Interface

Overview

The NXP-CPI16 NetLinx Custom Panel Interface provides a direct ICSNet connection to custom control panels. It's pin-for-pin compatible with devices that were designed for use with the AXP-CPI16 card (designed for integration with an Axcess Control System). Two 20-pin headers provide ribbon cable wiring or direct-connect insertion to circuit boards, providing inputs for up to 16 closures and 16 feedback outputs for LEDs. Under software control, the LED outputs can act as drivers to 8-segment bargraphs or as discrete outputs for feedback. In addition, the NXC-CPI16 also includes two quadrature inputs for mechanical or optical rotary encoders, used to control variable levels such as volume and lights, or lens focus and zoom (FIG. 1):

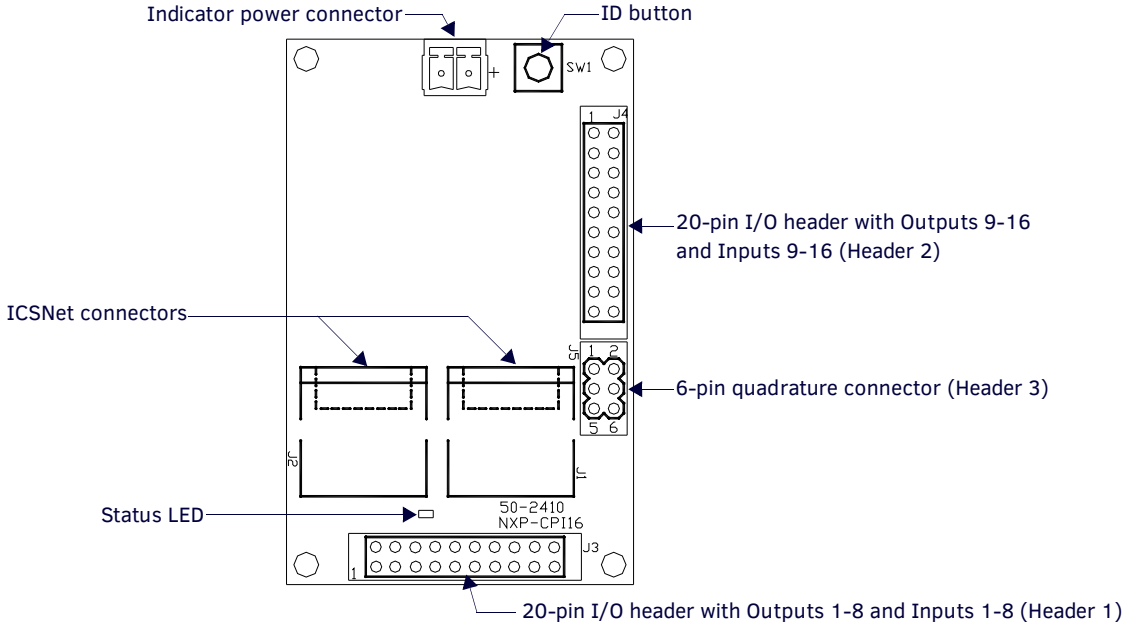


FIG. 1 NXP-CPI16

Specifications

The table below lists the NXP-CPI16 specifications.

NXP-CPI16 Specifications	
Power Requirement	12 VDC (300 mA max.)
Input Connectors:	
Indicator Power	Two-pin 3.5 mm captive-wire. This connector is used to supply a higher voltage and more current to the power pins of Header 1 and Header 2. The external supply connected to the two-pin captive-wire must be greater than +12 V. If the external supply voltage is less than that, the ICSNet supply (+12 V) will be used for the Power pin of the I/O connectors (not the external supply).
Closure Inputs	16 closure inputs activated with a GND or TTL Low (< 0.8 V). Inputs are sampled approximately every 10 msec and are debounced in software.
Rotary Encoder Inputs	2 quadrature inputs on a 2 x 3 header with a +5 V supply pin (supplying up to 100 mA) and a GND pin.
ICSNet	2 RJ-45 connectors for ICSNet connection
ID Button	Generates an event from the CPI16 to allow you to assign new Device numbers, using ID mode in the NetLinx Studio software program.
LED	ICSP status indicator (green)
Open Collector Outputs	16 open-collector outputs, acting as a switch to ground, up to 100 mA. Outputs can be connected to voltages ranging between 0 V and +28 V. Each output is updated approximately every 10 msec.
Dimensions (HWD)	2.75" x 1.75" x 0.062" (69.85 mm x 44.45 mm x 1.557 mm)
Weight	8.10 oz (229.6 g)
Accessories	• 6-pin header with 3 feet (0.91 m) of ribbon cable • Two mating 20-pin headers, each with 3 feet of ribbon cable attached • One green 2-pin 3.5 mm pitch captive wire connector for external indicator power.

NOTE: *The maximum voltage supported by the input contact is 5V.*

Installation

Input and Output Connectors

To install the NXP-CPI16, connect ribbon cables or a PC board to one or more of the headers. The table below shows the pinouts for the two 20-pin headers.

I/O Connector Pinouts					
Header 1			Header 2		
Pin	Signal	Function	Pin	Signal	Function
1	Output 1	OC to Ground	1	Output 9	OC to Ground
2	Output 2	OC to Ground	2	Output10	OC to Ground
3	Output 3	OC to Ground	3	Output 11	OC to Ground
4	Output 4	OC to Ground	4	Output 12	OC to Ground
5	Output 5	OC to Ground	5	Output 13	OC to Ground
6	Output 6	OC to Ground	6	Output 14	OC to Ground
7	Output 7	OC to Ground	7	Output 15	OC to Ground
8	Output 8	OC to Ground	8	Output 16	OC to Ground
9	Ground	Signal Ground	9	Ground	Signal Ground
10	Power	Power Supply	10	Power	Power Supply
11	Ground	Signal Ground	11	Ground	Signal Ground
12	Ground	Signal Ground	12	Ground	Signal Ground
13	Input 1	Logic Input	13	Input 9	Logic Input
14	Input 2	Logic Input	14	Input 10	Logic Input
15	Input 3	Logic Input	15	Input 11	Logic Input
16	Input 4	Logic Input	16	Input 12	Logic Input
17	Input 5	Logic Input	17	Input 13	Logic Input
18	Input 6	Logic Input	18	Input 14	Logic Input
19	Input 7	Logic Input	19	Input 15	Logic Input
20	Input 8	Logic Input	20	Input 16	Logic Input

Quadrature Connectors

The table below lists the connector pinouts for the quadrature connector.

Quadrature Connector Pinouts		
Header 3		
Pin	**Signal**	**Function**
1	Ground	Signal ground
2	1A	Encoder # 1, Input A
3	1B	Encoder # 1, Input B
4	2A	Encoder # 2, Input A
5	2B	Encoder # 2, Input B
6	+5 V	Encoder power

Quadrature Inputs

By default, the quadrature inputs expect the phase relationship, shown in FIG. 2, for a clockwise rotation of the encoder to generate a positive level change. If the phase relationship does not match the example, a clockwise rotation will generate a negative level change. This can be corrected in two ways:

- Inputs A and B can be wired in reverse so the phase relationship is obtained at the quadrature encoder input pins.
- Insert a QDIR Send_Command in the NetLinx program.

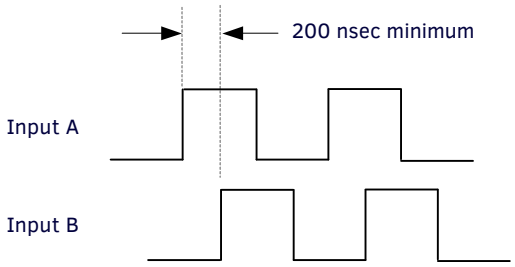


FIG. 2 Quadrature inputs phase relationship for clockwise rotation

Programming

Overview

There are two modes of Channel Assignments: Discrete Output and Default Mode. Both modes are set using the 'STATUS-ON' and 'STATUS-OFF' commands. Discrete Output mode should be used if channel status feedback for the outputs needs to be separate from the inputs. The tables below provide channel assignment information on both modes.

Status ON Mode Channel Assignment	
I/O	**Corresponding Channel Assignment**
Inputs 1 - 8	Channels 1 - 8 (On/Push/Off/Release)
Outputs 1 - 8	Channels 9 - 16 (On/Off only)
Inputs 9 - 16	Channels 17 - 24 (On/Push/Off/Release)
Outputs 9 - 16	Channels 25 - 32 (On/Off only)

Status OFF Mode Channel Assignment	
I/O	**Corresponding Channel Assignment**
Inputs 1 - 8	Channels 1 - 8 (Push/Release only)
Outputs 1 - 8	Channels 1 - 8 (On/Off only)
Inputs 9 - 16	Channels 9 - 16 (Push/Release only)
Outputs 9 - 16	Channels 9 - 16 (On/Off only)

For more information, refer to the *SEND_COMMANDs* section on page 10.

Levels

By default all levels have a data type of byte (8-bits), which gives a range of 0-255 for the Level Value. The 'LVL_SZ' SEND_COMMAND sets the size of the value for levels 1 - 4. It is important that the variable in any SEND_LEVEL command and CREATE_LEVEL statement in the NetLinx program match the data type selected by the 'LVL_SZ' SEND_COMMAND. Incorrect levels may occur if the data types do not match.

NOTE: *The input and output Level values will not be sent until a 'LEVON' command message is received by the CPI16. A transmission of levels will cease after the receipt of a 'LEVOFF' command.*

The values of Levels 1 and 2 (quadrature inputs) will be sent whenever the input changes.

Levels	
Level	**Function**
1	Quadrature Input 1
2	Quadrature Input 2
3	Bargraph 1 (Outputs 1 - 8) - if configured for bargraph mode
4	Bargraph 2 (Outputs 9 - 16) - if configured for bargraph mode

SEND_COMMANDs

The following SEND_COMMANDs are supported by the NXP-CPI16.

SEND_COMMANDs	

BMODE	Configures either set of 8 outputs as an 8-segment bargraph display.
	
	Syntax:
	`'BMODE <bargraph #> <bargraph mode>'`
	Variables:
	Where <bargraph #>
	1 - Selects bargraph 1 (outputs 1 - 8)
	2 - Selects bargraph 2 (outputs 9 - 16)
	Where <bargraph mode>
	0 - normal bar mode
	1 - normal dot mode (only one peak LED on at a time)
	2 - special bar mode (a level of 1 - 15 still has the first LED on)
	3 - special dot mode (a level of 1 -15 still has the first LED on)
	4 - inverse normal bar mode
	5 - inverse normal dot mode
	6 - inverse special bar mode
	7 - inverse special dot mode
	8 - individual element, discrete mode
	9 - inverse individual element, discrete mode
	OFF - disables bargraph mode [default]
	The command is used to configure either set of 8 outputs as an 8-segment bargraph display. By default, Bargraph mode is OFF and all outputs are discrete outputs that are controlled via CHANNEL ON/OFF messages. If this command is received, the selected bank of 8 outputs will respond according to the selected mode.
	In modes 8 and 9, the discrete LEDs that are ON correspond to the bit mask sent via a SEND_LEVEL command. For Example:
	`SEND_LEVEL CPI16, 3, $5A`
	Turns on LEDs 2, 4, 5, and 7 of bargraph #1.
	Example:
	`SEND_COMMAND 'BMODE 1 0'`
	Reconfigures Outputs 1 - 8 such that they now act as an 8-segment bargraph.

LEVOFF	Keeps any level value from transmitting. Syntax: `'LEVOFF'` The NXP-CPI16 will not transmit any level value messages after the receipt of this command until the receipt of another LEVON command.
LEVON	Syntax: `'LEVON'` The NXP-CPI16 transmits level value messages after the receipt of this command.

LVL_SZ	Sets the size (data type) of the value that will be used by the NXP-CPI16 when receiving and sending LEVEL messages. The default is byte (8-bits), which yields a range of 0 - 255 for the level value.
	Syntax:
	`'LVL_SZ <level #> <data type of level value>'`
	Variables:
	Where <level #>
	1 - Quadrature Input 1
	2 - Quadrature Input 2
	3 - Bargraph 1 (using outputs 1 - 8)
	4 - Bargraph 2 (using outputs 9 - 16) and <data type of level value>
	B - Byte (8-bits); range of 0 - 255 [default level data type]
	I - Integer (16 bits); range of 0 - 65,535
	S - Signed Integer (signed 16-bits); range of -32,768 to 32,767
	Example:
	`SEND_COMMAND 'LVL_SZ 2 S'`
	Quadrature Input 2's data type is now Signed Integer.

SEND_COMMANDs (Cont.)	
STATUS-OFF	Puts the NXP-CPI16 in Default Mode (non-Discrete Output Mode). Syntax: 'STATUS-OFF' The CPI16 remembers the last Mode it was set for. Therefore, once a 'STATUS-OFF' SEND_COMMAND is received, Default Mode becomes the power-up mode of the CPI16. It is not necessary to send a 'STATUS-OFF' SEND_COMMAND each time the device is powered. Once the CPI16 is programmed for Default Mode, it remains in that mode until a 'STATUS-ON' SEND_COMMAND received; see chart below. Inputs 1 - 8 ⟷ Channels 1 - 8 (Push/Release only) Outputs 1 - 8 ⟷ Channels 1 - 8 (On/Off only) Inputs 9 - 16 ⟷ Channels 9 - 16 (Push/Release only) Outputs 9 -16 ⟷ Channels 9 - 16 (On/Off only) It is not necessary to send a 'STATUS-OFF' SEND_COMMAND each time the device is powered. Once the CPI16 is programmed for Default Mode, it will remain in Default Mode until a 'STATUS-ON' SEND_COMMAND is received.
STATUS-ON	Puts the NXP-CPI16 in Discrete Output Mode. Syntax: 'STATUS-ON' The CPI16 remembers the last Mode it was set for. Therefore, once a 'STATUS-ON' SEND_COMMAND is received, Discrete Output Mode becomes the power-up mode of the CPI16. It is not necessary to send a 'STATUS-ON' SEND_COMMAND each time the device is powered. Once the CPI16 is programmed for Discrete Output Mode, it remains in that mode until a 'STATUS-OFF' SEND_COMMAND is received.; see chart below. Inputs 1 - 8 ⟷ Channels 1 - 8 (On/Push/Off/Release) Outputs 1 - 8 ⟷ Channels 9 - 16 (On/Off only) Inputs 9 - 16 ⟷ Channels 17 - 24 (On/Push/Off/Release) Outputs 9 -16 ⟷ Channels 25 - 32 (On/Off only)
QDIR	Controls the direction of rotation that will correspond to a positive level increase on the quadrature inputs. The default rotation for both quadrature inputs is CW (clockwise). Please note that the actual direction of rotation for a positive level change will depend upon the phase relationship of the outputs on the quadrature encoder selected. If the correct phase relationship is not met, it may be necessary to send a CCW (counter-clockwise) QDIR command to get a positive level change for a *clockwise* rotation of the encoder. Syntax: 'QDIR <input #> <direction or rotation for a positive level change>' Variables: Where <input#> 1 - Quadrature Input 1 2 - Quadrature Input 2 and <direction of rotation for a positive level change> CW - Clockwise rotation CCW - Counter-Clockwise rotation Example: SEND_COMMAND 'QDIR 2 CCW' The quadrature input 2 is set for counter-clockwise rotation.

SEND_COMMANDs (Cont.)	

QRATE	Sets the number of pulses that must be seen on the quadrature input in a given direction in order to reach the maximum attainable level.
	Syntax:
	`'QRATE <input #> <# of pulses that represent the maximum level allowed>'`
	Variables:
	Where <input #>
	1 - Quadrature Input 1
	2 - Quadrature Input 2
	and <# of pulses that represent the maximum level allowed> 0-32,767
	This number should be calculated as follows:
	Pulses = <pulses/rotation> x <# of rotations to reach maximum level>
	The default for Pulses is 24.
	Example:
	Pulses/rotation = 50 (get from encoder data sheet)
	# of rotations desired to reach max. level = 2
	Therefore, the equation reads: 50 x 2 = 100.
	This value will be used to scale the level reported to the NetLinx master as follows:
	level change = (<maximum level> / <Pulses>) x <current pulse count>
	Example:
	`SEND_COMMAND 'QRATE 1 100'`
	The full range of quadrature input 1 is set for 100 pulses from the encoder.

The NXP-CPI16 uses input channels to report user input on the contacts or switches attached to the input terminals. Output channels are used to turn on the lamp or LED display devices to indicate the button status to the user.

The NXP-CPI16 default mode is STATUS-OFF, and in this mode the programmer cannot poll the NXP-CPI16 to determine the state of the output channel. This is because in this mode the output and input channels use the same number assignments. Inputs are sent by the NXP-CPI16 only as input changes.

When set for STATUS-ON mode the output channels are assigned a different channel number than the input channels. This allows the programmer to monitor the status of an output channel. However the channel offset must be accommodated in the programming code.

Statements such as this example can be used in a program.

```
IF[CPI16,25] (* output channel assigned to input channel 9 on P3 connector *)
```

Each of the two 20-pin connectors is assigned a group of 8 input and output channels. The table below shows the relation of input and output channels in the STATUS modes.

Input/Output STATUS Mode

Mode	Connector	STATUS-OFF (default)	STATUS-ON
Inputs	J3	Chan 1-8	Chan 1-8
	J4	Chan 9-16	Chan 17-24
Outputs	J3	Chan 1-8	Chan 9-16
	J4	Chan 9-16	Chan 25-32

The NXP-CPI16 may be configured to default to STATUS-ON mode using the following method. The commands can force a change to the mode no matter what default mode is configured for the device.

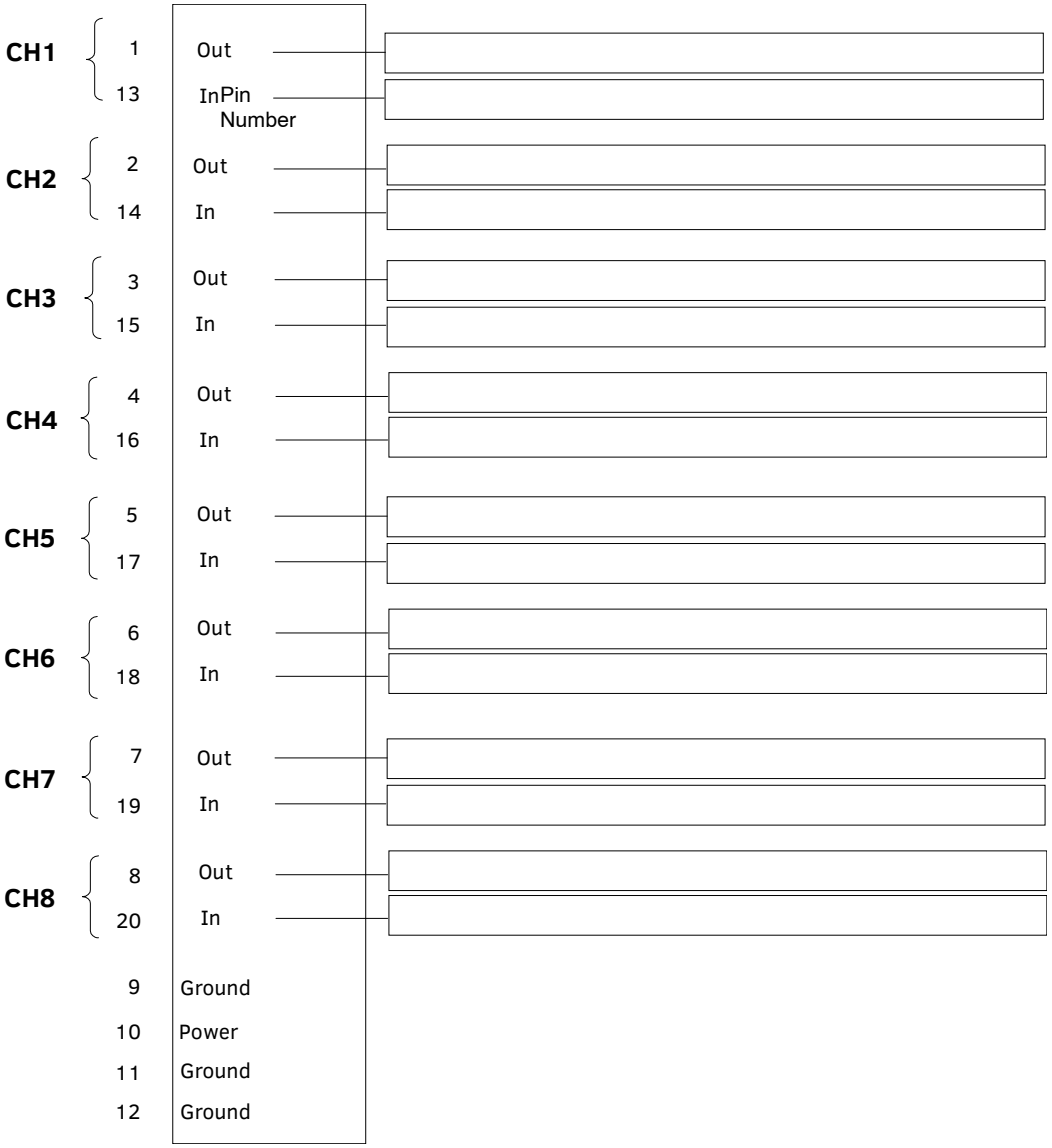
STATUS-ON Mode:

Remove R7 (1K ohm) resistor OR short across R8 for STATUS-ON mode. Firmware remains the same for standard and STATUS-ON mode NXP-CPI16 units.

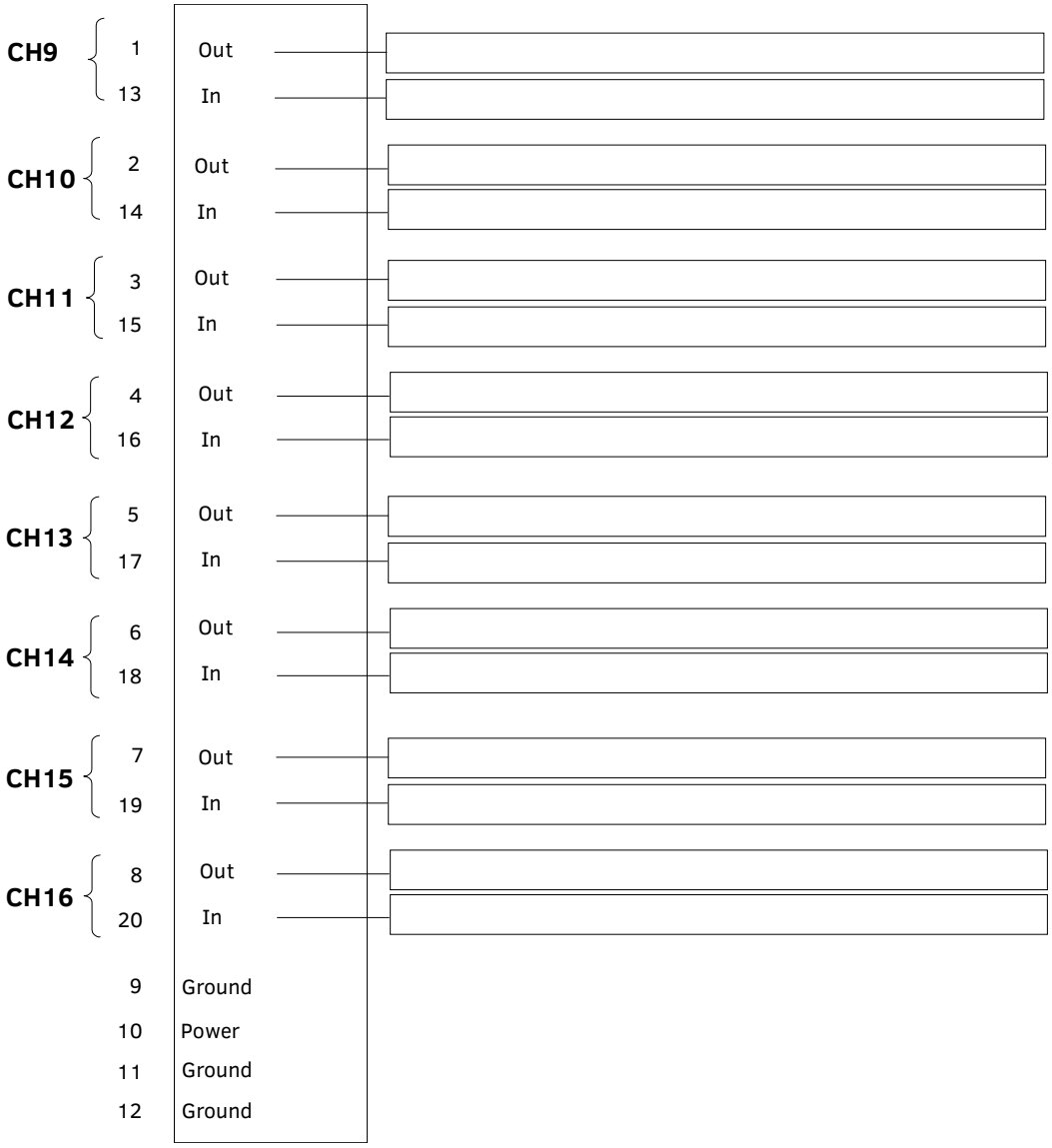
System Worksheets

Dealer ID		**Date**	
Dealer		**PO Number**	
Job		**SO Number**	
Description		**Serial Number**	
Rev Number		**Device Number**	

Header 1



Header 2


CH9
1
Out
13
In
CH10
2
Out
14
In
CH11
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Out
15
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CH12
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CH13
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CH14
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18
In
CH15
7
Out
19
In
CH16
8
Out
20
In
9
Ground
10
Power
11
Ground
12
Ground

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