MCN Monitoring and Control Network

GPIO-CVT
General Purpose I/O Converter Module
Hardware Reference Manual

S2-61469-106

Note:
Switch settings vary
depending upon the system.

Be sure to verify switch settings
before installation

Be sure to set the rotary address switches to the
proper addresses before installing the system.

CTI
products

FCC Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

DOC Statement

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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Manual Revisions:

S2-61469-100	Original Release.
S2-61469-105	Updated Opto Input voltage range and I/O connector pins 25 & 50.
S2-61469-106	Removed erroneous note on Page 17.

1. Introduction

The GPIO-CVT General Purpose Input/Output Converter Modules are part of CTI Products' MCN™ Monitoring and Control Network. They are versions of the GPIO family modules with standard hardware and special firmware for custom purposes.

Versions are available with combinations of opto-isolated inputs and either SSR (Solid-State Relay) or mechanical relay outputs. Versions are available to provide the following functions:

- Converting voltage inputs to SSR outputs
- Converting N.O. to N.C. circuits
- Providing Opto-isolation for level conversion or inversion
- Converting from voltage inputs to Form A or Form B SSR outputs
- Converting from voltage inputs to Form C electromechanical contacts

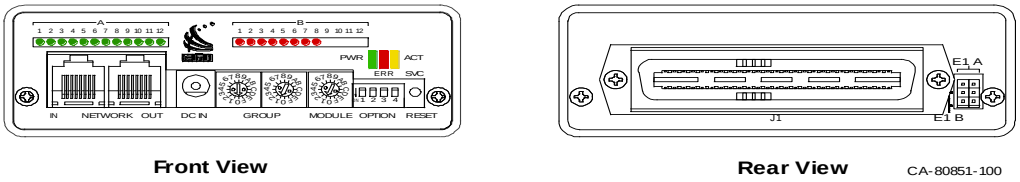

Figure 1 – GPIO-1208-CVT Module

1.1 Models

GPIO-CVT Modules are available in standard configurations listed in the following Models table. Contact CTI Products for additional variations.

CTI Part Number	Model	Opto-Isolated Inputs	SSR Outputs (Form A)	E-M Relay Outputs (Form C)	Function
S2-61418	GPIO-1212-CVT	12	12		Normal or Inverted
S2-61467	GPIO-1208-CVT	12		8	Normal or Inverted

Table 1 – Standard Models

Inputs are optically isolated, accept voltage inputs of 12 - 24 VAC/VDC (nominal). Although the GPIO-1208-CVT module actually has 12 inputs, only the first 8 are functional in driving the outputs.

Inputs & Outputs can be monitored from a PC running the MCNRCD Software. The outputs are controlled strictly based on the inputs of the module and thus no control of the outputs of the GPIO-CVT modules is available from the MCNRCD. (If full monitoring and control on General Purpose I/O modules is required, use the standard GPIO modules.)

1.2 Block Diagram

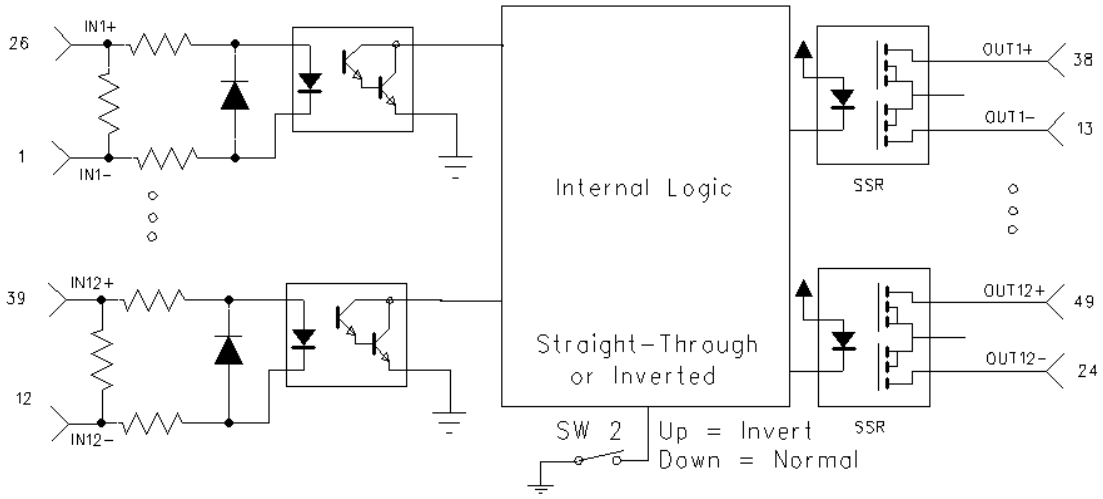

Figure 2 – GPIO-1212-CVT Module

1.3 Module Usage – Stand-Alone

If you do not need to monitor the GPIO-CVT modules on a PC, you can operate them in a stand-alone mode.

1.4 Module Usage in a System

This section describes the operation of the GPIO module in an MCN display system.

Input Monitoring and Output Control

Off/on status from devices connected to inputs of the GPIO is sent to a MCN User Interface Module over the MCN network. The User Interface Module (such as the HIB-IP) then transfers the status to the PC running MCNRCD Software. The MCNRCD Software displays the device status information on the PC monitor.

Likewise, off/on states of devices connected to GPIO outputs can be controlled from the MCNRCD Software.

System Example

Figure 2 shows an example system to monitor equipment using GPIO-CVT modules. In this system, HIB-IP modules are used to "tunnel" these I/O signals over an IP network, for display on a PC.

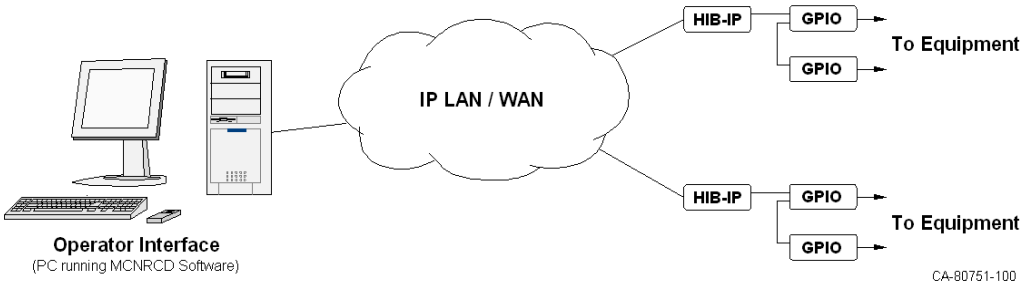

Figure 3 – GPIO in an MCN System

1.5 Reference Documents

1. Monitoring and Control Network System Manual
   Part Number S2-60425

2.Specifications

Size	MCN Size A 5.5" x 4.2" x 1.5" (140 x 107 x 38 mm)
Weight	19 oz (540 gm)
Temperature	0 – 50 ºC
Humidity	10 - 95% non-condensing
Module Power	+12 to +30 VDC +18 to +30 VDC for MCN Daisy-Chain power output
Inputs	Optically Isolated DC : On: 5 to 48 V (Nominal) (56V maximum) Off: 0.5V maximum AC: On: 12 – 24V (Nominal) (40V maximum) Off: 0.35V maximum RMS 0.50V maximum peak Input Impedance: 5K Ohms nominal
Output Options **Solid State Relay** **Electro-Mechanical Relay**	 SPST (Form A) Optically Isolated 24 VAC/VDC Max 1 A Max. Resistive SPDT (Form C) 48 VDC, (60VDC max) 1 A Max. Resistive 24 VAC, (40VAC max) 1 A Max. Resistive
Inputs and Outputs per Module	See Table 1, section 1.1
Indicators	One LED for each input & output
Equipment Connector	50 Pin Telco style, female
Network Connectors	(2) RJ-45 (1 in, 1 out)
Maximum Network Segment	4000 ft. without repeaters
Maximum Interface Modules	16 per network segment (Larger, multi-segment systems can be custom-configured.)
Network Cabling	4 Pair, CAT-5 UTP

Table 2 – GPIO Module Specifications

3. Inputs & Outputs

Figure 4 shows the equivalent input and output circuits of the GPIO-CVT modules. The output type will depend upon which module you have ordered..

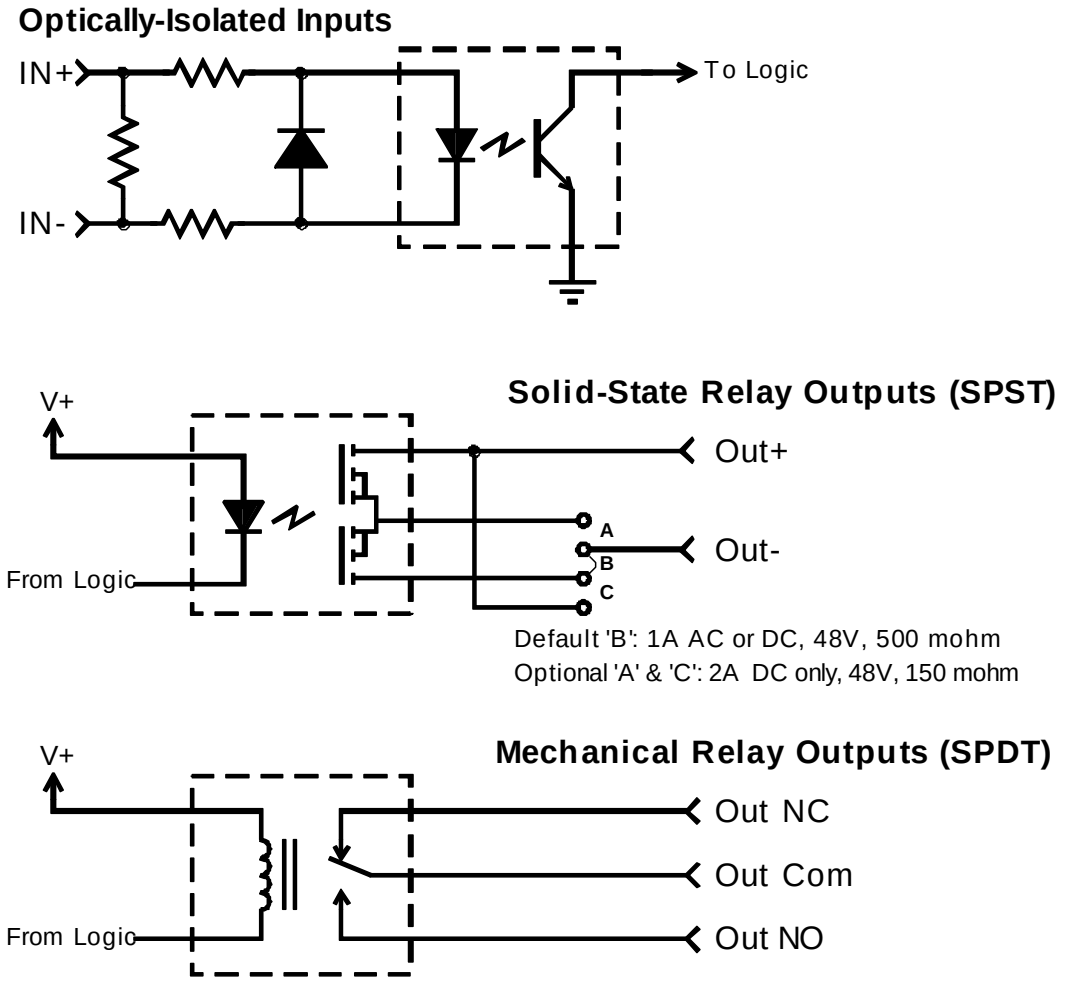

Figure 4 - I/O Equivalent Circuits

3.1 Solid State Relay Option

The default setting for Solid State Relay output current is 1 A maximum, resistive. For this setting, the relay on-resistance is 500 m-ohms. For DC loads only, an internal jumper setting is available to allow 1.5 A maximum, with an on-resistance of 150 m-ohms.

The maximum current stated above is for resistive loads only. For inductive loads, the maximum current must be de-rated.

Jumper settings for Solid State Relay maximum load selection are listed in the following table.

Load Type	Voltage (max.)	Current (max.)	On-Resistance	Jumper(s)
AC or DC	24V	1 A	500 m-ohms	B
Hi DC	24V	1.5 A	150 m-ohms	A & C

Table 3 – Loading Selection for Solid State Relay Option

3.2 Mechanical Relay Option

The Maximum Current rating of 1A listed in Table 2 is for resistive loads only. For inductive loads, the maximum current must be de-rated.

4. Indicators

4.1 Input and Output LEDs

The GPIO-CVT Module has LEDs to display the status of all installed inputs and outputs. Status LEDs for inputs are green. Status LEDs for outputs are red. The following shows a GPIO-1208-CVT module. It has 12 inputs (on the left) and eight outputs (on the right). LEDs will be lit when the input or output is active. In this module, the first 8 inputs will drive the 8 outputs. The last 4 inputs (9-12) will be displayed on the MCNRCD PC (if used), but will not have any effect on the outputs.

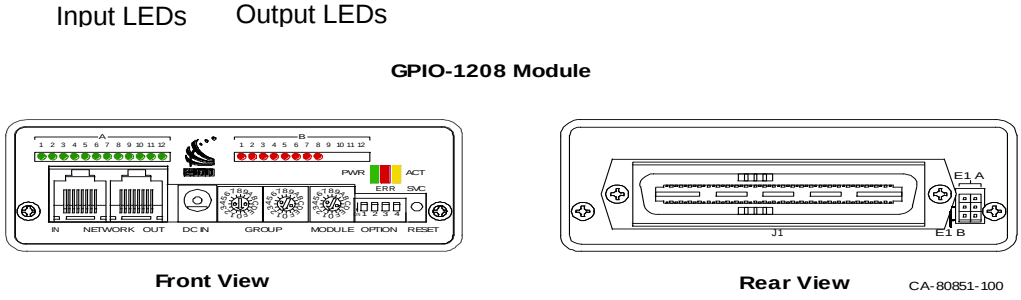

Figure 5 – Location of Indicators and Setup Switches

4.2 PWR, ERR, ACT LEDs

The GPIO-CVT modules have three additional LED indicators on the front panel.

PWR	Continuously lit:	Sufficient power is present.
	Blinking:	Voltage is low.
ERR	1 Blink:	Group:Module set to FF:F (Invalid address)
	Continuously lit:	Other error (hardware or software)
ACT	Lit:	Connected to a PC running MCNRCD software

5. Option Switches & Jumpers

Addressing and option switches are provided for module configuration. The module must be power cycled or reset after these switches are set so that the options will take effect. Press the Reset toggle switch down to reset the module.

5.1 Group & Module Switches

The Group and Module rotary selector switches are used to set the node address during module installation. Each module must have a unique Group:Module address. Refer to the *Monitor and Control Network System Manual*, S2-60425, for details about address planning or the *Custom System Configuration* documentation for pre-assigned addresses if your system is a Custom Engineered system.

SWITCH	DESCRIPTION	DEFAULT
GROUP	Unit Address setting (00-FE) refer to the MCN System Manual	00
MODULE	Unit Address setting (0-F) refer to the MCN System Manual	0

Table 4 – Group & Module Switches

5.2 Option Switches

The option switches allow the selection of Normal or Inverted logic.

OPTION SWITCH	DESCRIPTION	Down	Up	Default
1	Not used			Down
2	Normal/Invert	Normal	Invert	Down
3	Not used			Down
4	Not used			Down

Table 5 - Option Switches

5.3 Logic Truth Table

The following truth table applies to the following GPIO-CVT Modules:

Part Number	Model
S2-61418	GPIO-1212-CVT
S2-61467	GPIO-1208-CVT

SW2	Logic	Input	Output
Down	Normal	Inactive (No Voltage)	Off
Down	Normal	Active (Voltage applied)	On
Up	Invert	Inactive (No Voltage)	On
UP	Invert	Active (Voltage applied)	Off

Table 6 – Logic Truth Table

5.4 Jumper Options

Figure 6 shows the jumper options on the rear of the unit. Note that neither of these jumpers is connected internally on the GPIO, and therefore, has no usage.

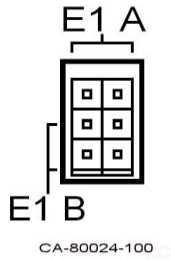

Figure 6 - Jumper Options

6. Connectors

6.1 Network Connectors

The **NETWORK IN/OUT** ports on the front of the GPIO are used to connect the GPIO with other MCN modules. These ports carry both the network data signals as well as DC power for power distribution with other modules. Table 7 gives the pinout for these connectors. Figure 7 shows the location of pin 1 for each port.

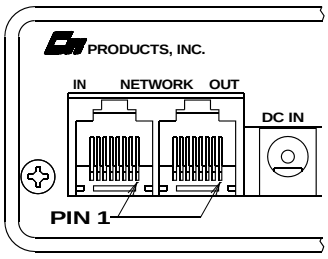

Figure 7 - Network IN/OUT Ports

Pin	Function
1	DATA +
2	DATA -
3	+ POWER
4	No Connect
5	No Connect
6	- POWER
7	- POWER
8	+ POWER

Table 7 - Network Connector Pinout

6.2 DC IN Connector

The **DC IN** port provides the primary power connection to the module. Power is distributed through the **NETWORK OUT** connector to provide power to the **NETWORK IN** connector of a subsequent MCN unit. Each power supply can power one to four units. See *Monitoring and Control Network System Manual S2-60425* for complete details of connections to the network and DC IN connectors.

6.3 J1 50-Pin Connector Pinout

Connector J1 provides access to the discrete I/O signals. The following tables show the connector pinout in Punch-Block order.

6.3.1 GPIO-1212-CVT Pinouts (Solid State Relays Form A)

J1 Pin	Option Position	Signal	Front Panel LED
26	A	In A1 +	A1
1	A	In A1 -	
27	A	In A2 +	A2
2	A	In A2 -	
28	A	In A3 +	A3
3	A	In A3 -	
29	A	In A4 +	A4
4	A	In A4 -	
30	A	In A5 +	A5
5	A	In A5 -	
31	A	In A6 +	A6
6	A	In A6 -	
32	A	In A7 +	A7
7	A	In A7 -	
33	A	In A8 +	A8
8	A	In A8 -	
34	A	In A9 +	A9
9	A	In A9 -	
35	A	In A10 +	A10
10	A	In A10 -	
36	A	In A11 +	A11
11	A	In A11 -	
37	A	In A12 +	A12
12	A	In A12 -	
38	B	Out B1 +	B1
13	B	Out B1 -	
39	B	Out B2 +	B2
14	B	Out B2 -	
40	B	Out B3 +	B3
15	B	Out B3 -	
41	B	Out B4 +	B4
16	B	Out B4 -	
42	B	Out B5 +	B5
17	B	Out B5 -	
43	B	Out B6 +	B6
18	B	Out B6 -	
44	B	Out B7 +	B7
19	B	Out B7 -	
45	B	Out B8 +	B8
20	B	Out B8 -	
46	B	Out B9 +	B9
21	B	Out B9 -	
47	B	Out B10 +	B10
22	B	Out B10 -	
48	B	Out B11 +	B11
23	B	Out B11 -	
49	B	Out B12 +	B12
24	B	Out B12 -	
50		Chassis Gnd	
25		Chassis Gnd	

Output polarities apply for DC output jumpering.

6.3.2 GPIO-1208-CVT Pinouts (Electromechanical Form-C Relays)

J1 Pin	Option Position	Signal	Front Panel LED
26	A	In A1 +	A1
1	A	In A1 -	
27	A	In A2 +	A2
2	A	In A2 -	
28	A	In A3 +	A3
3	A	In A3 -	
29	A	In A4 +	A4
4	A	In A4 -	
30	A	In A5 +	A5
5	A	In A5 -	
31	A	In A6 +	A6
6	A	In A6 -	
32	A	In A7 +	A7
7	A	In A7 -	
33	A	In A8 +	A8
8	A	In A8 -	
34	A	In A9 + **	A9
9	A	In A9 - **	
35	A	In A10 + **	A10
10	A	In A10 - **	
36	A	In A11 + **	A11
11	A	In A11 - **	
37	A	In A12 + **	A12
12	A	In A12 - **	
38	B	RY B1	B1
13	B	RY B2	
39	B	RY B1 NO	B2
14	B	RY B2 NO	
40	B	RY B1 NC	B3
15	B	RY B2 NC	
41	B	RY B3	B4
16	B	RY B4	
42	B	RY B3 NO	B5
17	B	RY B4 NO	
43	B	RY B3 NC	B6
18	B	RY B4 NC	
44	B	RY B5	B7
19	B	RY B6	
45	B	RY B5 NO	B8
20	B	RY B6 NO	
46	B	RY B5 NC	B9
21	B	RY B6 NC	
47	B	RY B7	B10
22	B	RY B8	
48	B	RY B7 NO	B11
23	B	RY B8 NO	
49	B	RY B7 NC	B12
24	B	RY B8 NC	
50		Chassis Gnd	
25		Chassis Gnd	

** Inputs A9-A12 do not drive any outputs, although they can be used as general purpose inputs when used with the MCNRCD software on a PC.

7. Mounting

Various mounting kits are available to mount the GPIO module.

Mounting Kits	
Rack Mount - 4 A size modules 1 Rack Unit (1.75") High	S2-60435
Rack Mount - 2 A size modules plus 1 B size module 1 Rack Unit (1.75") High (Used to mount 2 GPIOs and 1 EXB module.)	S2-60443

Refer to *Monitoring and Control Network System Manual S2-60425, Mounting Options* section, for physical details about mounting the GPIO module.

8. Troubleshooting

This table is a list of troubleshooting tips specific to the GPIO module. For additional troubleshooting tips, refer to the troubleshooting section found in the *Monitoring and Control Network System Manual S2-60425*.

Due to the high percentage of surface-mount components, the GPIO is treated as a field replaceable unit. If any system problems are the result of a malfunctioning GPIO module, the entire unit must be replaced and returned for repair.

PROBLEM	**CAUSE**
The PWR LED flashes	The input DC voltage is low. There may be too many modules in line. There is a voltage drop in each module and the downstream modules will each see a lower DC voltage.
The ERR LED flashes once	The Group & Module switches are set to FF:F. This is an invalid address. Set the Group & Module switches to the proper address for your system and press the Reset switch down.
The ERR LED is on continuously	Internal hardware or firmware error. Call the factory for an RMA.
Input LEDs are stuck on	An input may be stuck active. Remove the 50-pin I/O connector. If the input LED goes off, the problem is external to the GPIO. If the input LED remains stuck on, there is an internal problem in the unit. Call the factory for an RMA.

PROBLEM	**CAUSE**
The PC shows the receivers from this GPIO module as "Offline".	Check the MCN cabling. Also, check that the GPIO address and the address listed for the module in the PC database match. In an engineered system (with routers and/or EXB modules) the PC may have an improper address or the module might be installed on the wrong MCN sub-network. Check the custom system documentation for the proper settings and connections.
The ACT LED is off	This is an indication that a PC is not communicating with this module. See the "Offline" problem above.

9. Warranty

Standard Limited Hardware Warranty

LIMITED WARRANTY. Equipment manufactured by CTI Products, Inc. is warranted to be free from defects in material and workmanship for a period of ONE (1) YEAR from date of shipment to original purchaser. Under this warranty, our obligation is limited to repairing or replacing any equipment proved to be defective by our inspection within one year of sale to the original purchaser. This warranty shall not apply to equipment which has been repaired outside our plant in any way, so as to, in the judgment of CTI Products, Inc. affect its stability or reliability, nor which has been operated in a manner exceeding its specifications, nor which has been altered, defaced, or damaged by lightning.

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