



DISCRETE INPUT/ OUTPUT (I/O) MODULE

GENERAL DESCRIPTION

The Caterpillar Discrete Input/Output (I/O) module serves to provide expandable Input and Output capability for your package generator set. The Discrete I/O Module is capable of reading 12 discrete inputs and setting eight (8) relay outputs.

The Caterpillar Service Tool ET is used to configure the Discrete I/O module, while all monitored Input and Output status conditions are viewable on the EMCP 3 control panel.

The Discrete I/O Module can be Package or Remote mounted (up to 800 feet) and features rugged packaging and watertight Deutsch IPD connectors.

These features all add to the sense of value and dependability that comes with your purchase of Caterpillar products.

OPERATOR INTERFACE

- All Discrete I/O status conditions are available for viewing with the EMCP 3.2 & 3.3 Controllers.

FEATURES/BENEFITS

- Capable of reading twelve (12) discrete inputs and setting eight (8) relay outputs
- J1939 communication network eliminates the need for multiple relays, which translates to less wiring and fewer opportunities for mechanical failures.
- Remote customer communications are supported by MODBUS protocol using RS-485 (via EMCP 3.2 & 3.3), which easily interfaces with existing plant systems and equipment.
- Set points are stored in nonvolatile memory, preventing loss during a power outage.

COMMUNICATION

- Single, standard 40-pin connector
- J1939 #2 (Accessory Data Link)
- MODBUS RS-485 (Customer Communication) via the EMCP 3.2 & 3.3 controllers

GENERAL SPECIFICATIONS

- Reads twelve (12) discrete inputs and sets eight (8) Form C relay outputs rated for rated resistive loads of:
 - 2A @ 30 VDC for Normally Closed (NC) relays
 - 2A @ 125 VAC for Normally Closed (NC) relays
 - 2A @ 277 VAC for Normally Closed (NC) relays
 - 2A @ 30 VDC for Normally Open (NO) relays
 - 2A @ 125 VAC for Normally Open (NO) relays
 - 2A @ 277 VAC for Normally Open (NO) relays.
- For inductive loads, the ratings are:
 - 0.5A @ 250 VAC $\cos \phi = 0.4$
 - 1A @ 250 VAC $\cos \phi = 0.8$
 - 0.8A @ 250 VAC $\cos \phi = 0.9$

GENERAL SPECIFICATIONS (CONT'D)

- Encapsulated in a rugged aluminum housing with watertight connectors (IP67 rating)
- Suitable for moist, high shock and vibration environments
- Modules are designed for package mounting on power generator sets or remotely, up to 800 ft.
- Configuration is accomplished with Caterpillar ET Service Tool.
- Multiple Discrete I/O modules can be used on a J1939 communications network.
- Protected against 95% humidity non-condensing, 30° C to 60° C.
- Operating temperature range of -40° C to 85° C (-40° F to 185° F) – for ambient temperatures exceeding 85° C, the temperature scanner may deviate in accuracy an additional $\pm 1^\circ$ C.
- Storable temperature range is -50° C to +120° C.
- Designed to meet relevant European standards for EMI/RFI/Immunity without the use of external filtering.
- Maximum level of current draw of 400 mA + 50 mA per energized relay @ 12 VDC
- Isolation voltage: 4000 VAC (RMS), 50/60 Hz for 1 min. between coil and contacts, 750 VAC, 50/60 Hz for 1 min. between contacts of the same polarity
- System throughput: All channels are scanned in 100 mSec.
- Input level characteristics:
 - Low-Level input voltage: 0 to 0.8V
 - High-Level input voltage: 3.75 to 24V
 - Inputs have internal pull-up resistors.
- Inputs that generate a warning message auto-reset whenever the input returns to non-active state.
- Inputs that generate a shutdown message continue to broadcast that message until the input returns to non-active state and a reset message is received from the EMCP 3.2 or 3.3.
- Each output is configured to activate based upon the message that is received on the J1939 Data Link and can be configured to activate on Alarm, Shutdown or Diagnostic condition – or a combination of all three.
- Optical isolation is provided for the CAN line
- Retains current date and time relative to synchronization every 24 hours (or upon boot up) with equipment system time via an explicit command from the EMCP 3.2 & 3.3 – synchronization time is accurate to within 1 sec.
- Converts between physical I/O and CAN (SAE J1939) data link commands.
- Monitored parameters and diagnostics as well as setpoints are customizable to customer specification
- Module operates normally with loss of communication link, retaining configured values in non-volatile memory.
- Remains energized during engine cranking.
- For J1939 compliance, all modules comply with the applicable portions of the following:
 - SAE J1939-21, July 1998, Data Link Layer
 - SAE J1939-71, January 2002, Application Layer.

Discrete I/O Module Configuration Parameters:

The Discrete I/O Module is configurable to display the following parameters for each of the available Inputs:

- Active State (Active High or Active Low)
- Input Time Delay (0-120 seconds).

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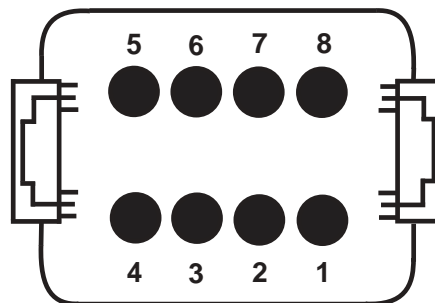


Available Inputs/Outputs:

The Discrete I/O Module is configured to accept inputs for the following conditions, with the listed condition displayed at the EMCP 3 controller:

Description	Input	Output
Fuel Level Secondary Tank	X	X
Starting Air Pressure		X
Fuel Pressure		X
Fuel Filter Differential Pressure		X
Fuel Level (Primary Tank)	X	X
Engine Oil Level		X
Oil Filter Differential Pressure		X
Engine Oil Pressure		X
Crankcase Pressure		X
Air Filter Differential Pressure		X
Engine Coolant Temperature		X
Engine Coolant Level	X	X
Extinguisher System Pressure	X	X
Battery Voltage		X
Ambient Air Temperature		X
Inlet Air Temperature		X
Exhaust Temperature		X
Fuel Temperature		X
Engine Oil Temperature		X
Engine Overspeed		X
Emergency Stop Shutdown		X
Gen. Bearing Temperature #1		X
Gen. Winding Temperature (1-3)		X
Ruptured Fuel Basin-Primary Tank	X	X
Engine Failure to Start Shutdown		X
Generator Frequency		X
Generator Voltage		X
Generator Reactive Power (VAR)		X
Generator AC Current		X
Generator Reverse Power (kW)		X
Voltage Regulator Failure		X
Service Interval Warning		X
Air Shutoff Damper Close	X	X
Gen. Supplying Load	X	X
Battery Charger Failure	X	X
Gen. Breaker Closed	X	X
Utility Breaker Closed	X	X
Engine in Cooldown		X
Generator Control Not in Auto		X
Unexpected Engine Shutdown		X
User Defined Input (1-12)	X	

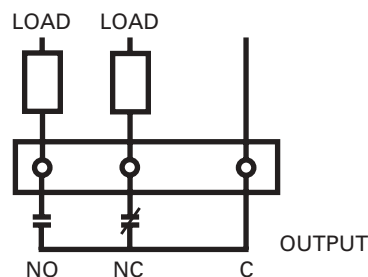
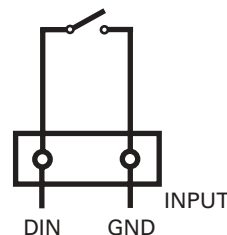
TYPICAL CONNECTIONS – POWER AND CAN BUS:



FRONT VIEW
MODULE MOUNTED CONNECTOR
DEUTSCH P/N: DT13-08PA

- 1 = PWR+
- 2 = CAN-H
- 3 = CAN-L
- 4 = PWR-
- 5 = SHIELD
- 6,7,8 = NOT USED

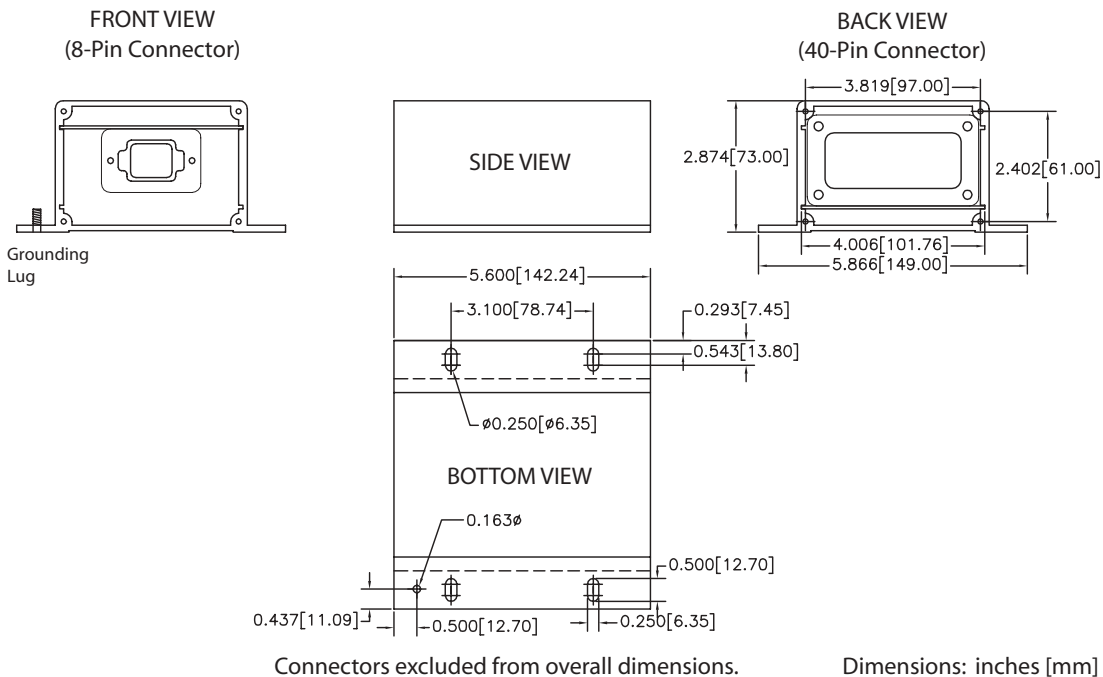
TYPICAL CONNECTIONS – DISCRETE I/O MODULE:



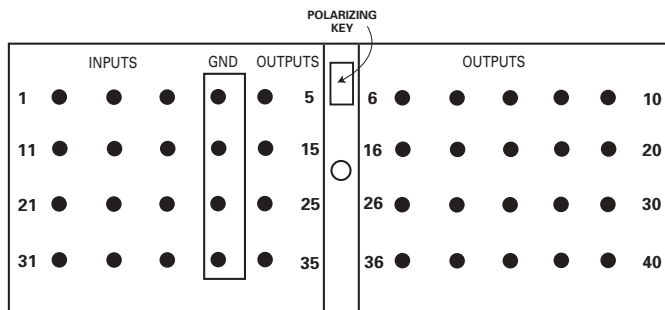
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DIMENSIONS



FRONT VIEW OF
MODULE MOUNTED CONNECTOR
DEUTSCH P/N: DRC13-40PB



NO - Normally Open
NC - Normally Closed
C - Common

INPUTS	Pin	OUTPUTS	Pin
DIN1	1	NC_1	5
DIN2	11	C_1	6
DIN3	21	NO_1	7
DIN4	31	NC_2	15
DIN5	2	C_2	16
DIN6	12	NO_2	17
DIN7	22	NC_3	25
DIN8	32	C_3	26
DIN9	3	NO_3	27
DIN10	13	NC_4	35
DIN11	23	C_4	36
DIN12	33	NO_4	37
GND	4	NC_5	8
GND	14	C_5	9
GND	24	NO_5	10
GND	34	NC_6	18
		C_6	19
		NO_6	20
		NC_7	28
		C_7	29
		NO_7	30
		NC_8	38
		C_8	39
		NO_8	40