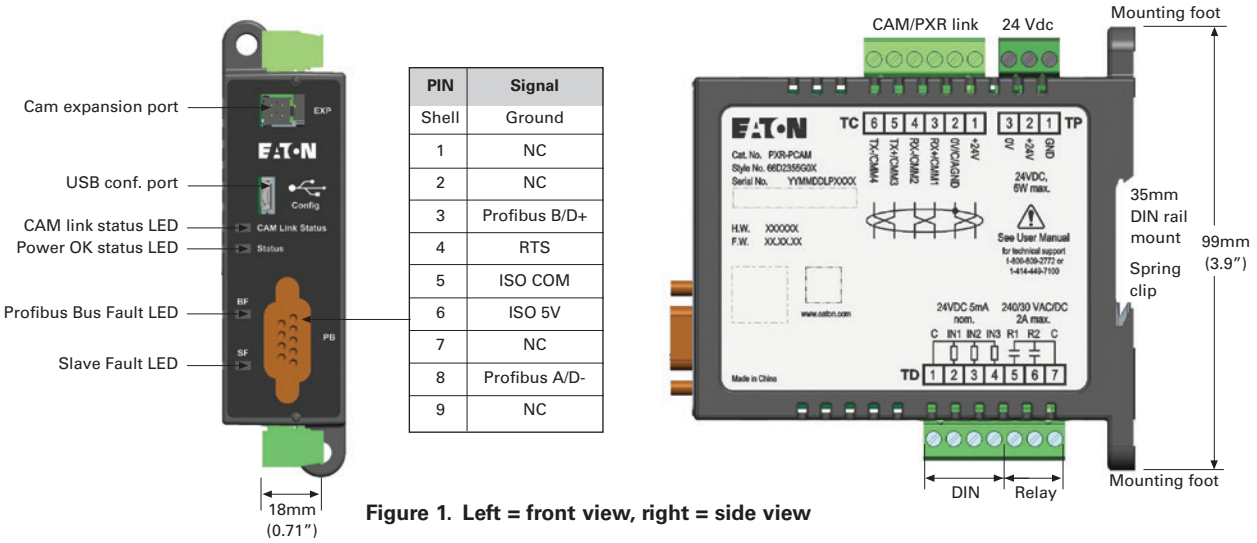
Profibus (DP) communication adapter module



PIN	Signal
Shell	Ground
1	NC
2	NC
3	Profibus B/D+
4	RTS
5	ISO COM
6	ISO 5V
7	NC
8	Profibus A/D-
9	NC

Figure 1. Left = front view, right = side view

For use with PXR 20/25 electronic trip units (ETUs). The PXR-PCAM is designed to connect with a circuit breaker's CAM-PXR link and expand the communication capabilities into a slave Profibus DP interface.

The module also provides limited discrete I/O, circuit breaker control capability, and data storage relevant to the breaker. The module is mounted local to the breaker to keep the CAM-PXR link limited to 3m maximum

WARNING

Be sure that all distribution power is off when commissioning a PXR-PCAM with a circuit breaker system. The module can be powered temporarily via the USB configuration port or permanently with the 24 Vdc power supply input.

IMPORTANT

Download the GSD file for the PXR-PCAM on the Eaton website. www.eaton.com/CAM

PXR –PCAM adapter module specifications

- Weight: 0.36 lb.
- Housing width, height, length (30 x 111 x 111mm)
- Housing NEMA 1, IP20
- Pollution degree 3, pcb is conformally coated
- Operational/storage temperature: -20 to +70ºC / -45 to + 85ºC
- Elevation: 0 - 2000m, humidity 5 - 95% noncondensing
- CE mark, RoHS compliant
- Safety: IEC/EN/UL61010-1, UL file # E185559
  - CNL evaluation to CAN/C22.2 No 1010.1.92
- EMC EN61326 - IEC61000-4-X level 3
- Emmisions: conducted and radiated
  - FCC part 15 & CISPR 11/22 class B

All terminal blocks are removable, 5.08 mm (0.200") and support wires of 0.2-2.03 mm^2 (24-14 AWG). Ferrules recommended for wire termination.

Power supply 24 Vdc +/- 20%, 6W maximum isolated CAM input power with common/0V clamped 300V to GND. terminal identification "TP.1-.3." Connect TP1 near CAM to assembly enclosure ground as a functional ground.

DIN Three 24 Vdc +/-20% inputs externally wetted, shared common with ~5.0k ohm input impedance, 5mA draw. Terminal identification TD.1-.4, shared with relay terminal.

DOUT – Two form A relays externally sourced, shared common hot 240 Vac/30 Vdc 2A CAT II max. Terminal identification TD.5-.7. In breaker mode (command format 0), relay 1 (TD5) is used to close the breaker when Profibus control is enabled, and relay 2 (TD6) is used to open the breaker when Profibus control is enabled. In general mode (command format 1), relay 1 and relay 2 are used for general purposes, and may be independently opened and closed.

PB - DB9 Profibus DP interface, shell grounded through TP1. (**see Figure 1**)

Catalog number	Ethernet protocol	Style #
PXR-PCAM	Profibus DP slave	66D2355G01

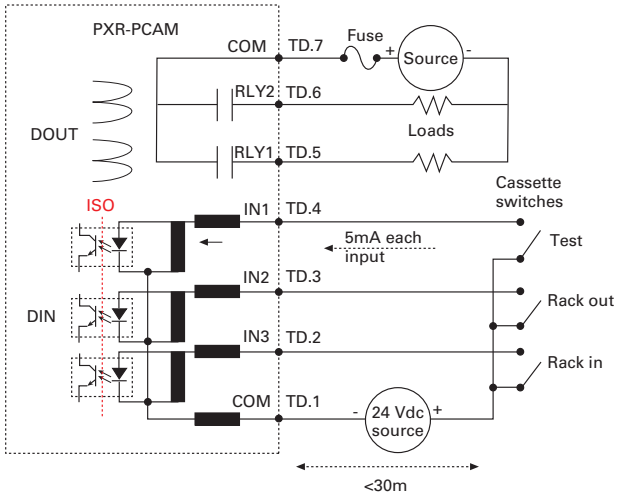


Figure 2. Discrete input and output connections

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User interface

USB – Device interface full speed micro B serial port. USB host power will temporarily run the module for configuration purposes.

Status RED/GREEN LED

- Green on – power ok, 1Hz blink – normal mode
- Red on – application alarm active

CAM-PXR LINK RED/GREEN LED

- Green on – active communications with ETU
- Red on – communication alarm

Profibus DP bicolor LEDs

BF (bus fault)

- Red – physical interface issues (reflections)
- Green – ok

SF (slave fault)

- Red – initialization system error
- Green – ok

Mounting – 35 mm DIN rail blade style or alternative panel mount with #8 or #10 screw. (**see figure 1**)

CAM Expansion port – future use only, do not connect.

CAM-PXR Link – RS422 interface dedicated to interfacing with circuit breaker electronic trip units (ETU). Isolated to CAM logic but common clamped at 300 Vdc to GND and electrically common with 24V return. Terminal identification I TC.1-.6). Distance between ETU and module limited to 3m maximum, use shielded twisted pair cable. Shield should be an aluminized mylar with drain wire that doubles as the RS422 return/common. In ACB applications the ETU's Vaux power common (AGND) doubles as the RS422 return. The PCAM makes this connection internally and can bus power to the ETU as a third twisted pair via TC.1 & TC.2.

NOTE

The ETU and CAM power supply returns are electrically common.

The PCAM supports the Profibus DP profile for low voltage switchgear devices (LVSG): Circuit breaker device classification. This classification provides cyclic data exchange structures for one command (outputs from the Profibus master to the PCAM slave) format (Format 0) and four monitoring (inputs from the PCAM to the Profibus master) formats (Format 0 – Format 3).

The PCAM also supports two additional monitoring formats, and one additional command format. Monitoring formats 4 and 5 are similar to format 3, except the active energy value is provided with a higher resolution, and the on-board digital inputs are provided. In command format 0, the relays are dedicated to opening and closing the breaker. Command format 1 is similar to command format 0, except that the on-board relays are general-purpose and can be independently opened and closed. The General Station Description file is EATON03F.GSD, which will be used by the Profibus master to retrieve the PCAM characteristics. This can be downloaded from www.eaton.com/cam. **Table 1** shows the communication formats.

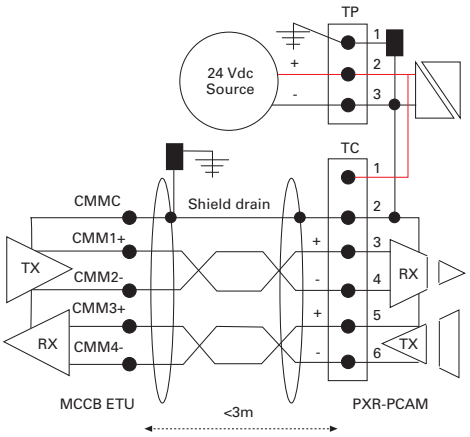

Figure 3. MCCB CAM-PXR link connections

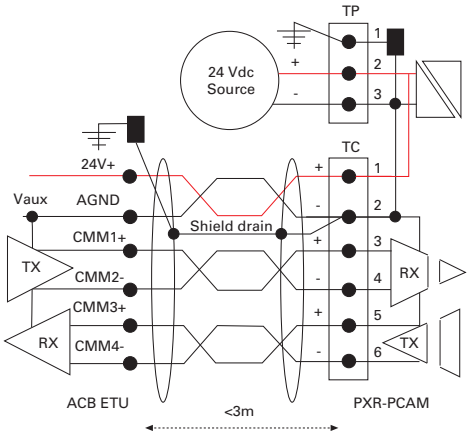

Figure 4. ACB CAM-PXR link connections

Table 1. Communication formats and profiles

Profile type	Cyclic module	Command format	Monitoring format
1	1	0	0
2	1 + 2	0	1
3	1 + 3	0	2
4	1 + 4	0	3
5	1 + 5 + 6	0	4
6	1 + 5 + 6 + 7	0	5
7	1 + 5 + 6 + 8	1	5

Command structure format 0 is described in **Table 2**.

Table 2. Cyclic data exchange command format 0

Byte	Bits	Description	Implementation
0	1.0	Circuit breaker: 00 = no charge 01 = switch off 10 = switch on 11 = no change	Open breaker if remote enabled Close breaker if remote enabled
	2	Clear last trip	"Reset trip" issued to trip unit
	7..3	Output 4..0	Not implemented
1	9.8	Test mode: 00 = no test 01 = w/o release 10 = w/ release 11 = w/ warning	 No-trip phase current self-test at 3.0pu Not implemented Not implemented
	10	Delete history	Not implemented
	11	1 = reset min/max	"Reset all min/max values" issued to trip unit
	12	1 = reset temp. min/max	Not implemented
	13	Output 5	Not implemented
	14	1 = reset maint. info.	"Reset trip unit health buffer" issued to trip unit
	15	Clock synch	Not implemented

Command structure format 1 is described in **Table 3**.

Table 3. Cyclic data exchange command format 1

Byte	Bits	Description	Implementation
0	0	Relay 1 output: 0 = open relay 1 1 = close relay 1	
	1	Relay 2 output: 0 = open relay 2 1 = close relay 2	
	2	Clear last trip	"Reset trip" issued to trip unit
	7..3	Output 4..0	Not implemented
1	9.8	Test mode: 00 = no test 01 = w/o release 10 = w/ release 11 = w/ warning	 No-trip phase current self-test at 3.0pu Not implemented Not implemented
	10	Delete history	Not implemented
	11	1 = reset min/max	"Reset all min/max values" issued to trip unit
	12	1 = reset temp. min/max	Not implemented
	13	Output 5	Not implemented
	14	1 = reset maint. info.	"Reset trip unit health buffer" issued to trip unit
	15	Clock synch	Not implemented

Monitoring structure formats 0-5 are described in **Table 4** through **Table 9**.

Table 4. Cyclic data exchange monitoring format 0

Byte	Bits	Definition	Description
0	1.0	Position of breaker: 00 = disconnected 01 = operational 10 = test 11 = not present	 No comm. with trip unit Comm. w/trip unit
	3.2	State of breaker: 00 = Init 01 = off 10 = on 11 = tripped	 No comm. with trip unit Open Closed Tripped
	4	Ready to switch on	1 = not implemented
	5	Undervoltage release	1 = tripped, cause = 12
	6	Spring loaded	1 = not implemented
	7	Overload warning	1 = pickup or alarm, cause = 61
1	8	Setpoint activated	1 = alarm, cause = 11, 12, 15-18, 26, 27
	9	Warning	1 = alarm, cause = all except 61
	10	Write protection activated	1 = remote breaker control disabled
	11	Input 0	0 = not implemented
	14..12	Release reason: 000 = no release 001 = L(ongtime) 010 = I(nstantaneous) 011 = S(hort) 100 = Earth fault 101 = Extended prot. 110 = Neutral overcurrent 111 = no device info	 Not tripped Tripped, cause = 61 and not in Tripped, cause = 3, 66, 76 Tripped, cause = 62 Tripped, cause = 84, 85 Tripped, cause = other Tripped, cause = 80 No comm. with trip unit
	15	Load rejection	Alarm, cause = 26

Table 5. Cyclic data exchange monitoring format 1

Byte(s)	Data type	Description	Resolution
0	Uint8	State 0 (byte 0 of monitoring format 0, **Table 4**)	
1	Uint8	State 1 (byte 0 of monitoring format 0, **Table 4**)	
3..2	Uint16	I_{L1} (phase A current)	Amps
5..4	Uint16	I_{L2} (phase B current)	Amps
7..6	Uint16	I_{L3} (phase C current)	Amps
9..8	Uint16	I_{Lmax} (maximum value of I_{L1}, I_{L2}, I_{L3}	Amps

Table 6. Cyclic data exchange monitoring format 2

Byte(s)	Data type	Description	Resolution
0	Uint8	State 0 (byte 0 of monitoring format 0, **Table 4**)	
1	Uint8	State 1 (byte 0 of monitoring format 0, **Table 4**)	
3..2	Uint16	I_{L1} (phase A current)	Amps
5..4	Uint16	I_{L2} (phase B current)	Amps
7..6	Uint16	I_{L3} (phase C current)	Amps
9..8	Uint16	I_{Lmax} (maximum value of I_{L1}, I_{L2}, I_{L3}	Amps
11..10	Uint16	I_N (neutral current)	Amps
13..12	Uint16	$V_{LL\ avg}$ (average line-to-line voltage	Volts
15..14	Int16	cos phi (avg apparent PF)	0.1%
17..16	Uint16	Energy	MWh

Table 7. Cyclic data exchange monitoring format 3

Byte(s)	Data type	Description	Resolution
0	Uint8	State 0 (byte 0 of monitoring format 0, **Table 4**)	
1	Uint8	State 1 (byte 0 of monitoring format 0, **Table 4**)	
3..2	Uint16	I_{L1} (phase A current)	Amps
5..4	Uint16	I_{L2} (phase B current)	Amps
7..6	Uint16	I_{L3} (phase C current)	Amps
9..8	Uint16	I_{Lmax} (maximum value of I_{L1}, I_{L2}, I_{L3})	Amps
11..10	Uint16	I_N (neutral current)	Amps
13..12	Uint16	V_{L1-L2} (V_{AB})	Volts
15..14	Uint16	V_{L2-L3} (V_{BC})	Volts
17..16	Uint16	V_{L3-L1} (V_{CA})	Volts
19..18	Uint16	V_{L1-N} (V_{AN})	Volts
21..20	Uint16	V_{L2-N} (V_{BN})	Volts
23..22	Uint16	V_{L3-N} (V_{CN})	Volts
25..24	Int16	cos phi (avg apparent PF)	0.1%
27..26	Uint16	Energy	MWh
29..28	Uint16	S_{total} (total apparent PF)	kVA

Table 8. Cyclic data exchange monitoring format 4

Byte(s)	Data type	Description	Resolution
0	Uint8	State 0 (byte 0 of monitoring format 0, **Table 4**)	
1	Uint8	State 1 (byte 0 of monitoring format 0, **Table 4**)	
3..2	Uint16	I_{L1} (phase A current)	Amps
5..4	Uint16	I_{L2} (phase B current)	Amps
7..6	Uint16	I_{L3} (phase C current)	Amps
9..8	Uint16	I_{Lmax} (maximum value of I_{L1}, I_{L2}, I_{L3}	Amps
11..10	Uint16	I_N (neutral current)	Amps
13..12	Uint16	V_{L1-L2} (V_{AB})	Volts
15..14	Uint16	V_{L2-L3} (V_{BC})	Volts

Table 8. Cyclic data exchange monitoring format 4

Byte(s)	Data type	Description	Resolution
17..16	Uint16	V_{L3-L1} (V_{CA})	Volts
19..18	Uint16	V_{L1-N} (V_{AN})	Volts
21..20	Uint16	V_{L2-N} (V_{BN})	Volts
23..22	Uint16	V_{L3-N} (V_{CN})	Volts
25..24	Int16	cos phi (avg apparent PF)	0.1%
29..26	Uint 32	Energy	kWh
31..30	Uint16	S_{total} (total apparent PF)	kVA

Table 9. Cyclic data exchange monitoring format 5

Byte(s)	Data type	Description	Resolution
0	Uint8	State 0 (byte 0 of monitoring format 0, **Table 4**)	
1	Uint8	State 1 (byte 0 of monitoring format 0, **Table 4**)	
3..2	Uint16	I_{L1} (phase A current)	Amps
5..4	Uint16	I_{L2} (phase B current)	Amps

Cyclic data exchange monitoring format 4

Byte(s)	Data type	Description	Resolution
7..6	Uint16	I_{L3} (phase C current)	Amps
9..8	Uint16	I_{Lmax} (maximum value of I_{L1}, I_{L2}, I_{L3})	Amps
11..10	Uint16	I_N (neutral current)	Amps
13..12	Uint16	V_{L1-L2} (V_{AB})	Volts
15..14	Uint16	V_{L2-L3} (V_{BC})	Volts
17..16	Uint16	V_{L3-L1} (V_{CA})	Volts
19..18	Uint16	V_{L1-N} (V_{AN})	Volts
21..20	Uint16	V_{L2-N} (V_{BN})	Volts
23..22	Uint16	V_{L3-N} (V_{CN})	Volts
25..24	Int16	cos phi (avg apparent PF)	0.1%
29..26	Uint 32	Energy	kWh
31..30	Uint16	S_{total} (total apparent PF)	kVA
33..32	Uint16	Digital inputs bit 0 = DIN0 bit 1 = DIN1 bit 2 = DIN2 bit 3..15 = 0 (not used)	

Profibus DP-VO diagnostics

Until the PCAM is parameterized and configured by the Profibus master, a request for diagnostics by the master will result in the PCAM returning only the mandatory 6-byte Profibus diagnostics information. Once successfully parameterized and configured, the PCAM will append additional device-related diagnostics information to the mandatory Profibus diagnostics, as described by **Table 10**.

Table 10. DP-VO unit diagnostics definitions

Byte	Bits	Value	Description
7		08H	Header: device-related diagnostics, length = 8 bytes
8	7.0	81H	Type: status message
9	15..8		Slot
10	23..16	00H	Specifier
11	24	1	No communications with trip unit
	25	1	Data object 1 invalid
	26	1	Data object 2 invalid
	27	1	Data object 3 invalid
	28	1	Data object 4 invalid
	29	1	Data object 5 invalid
	30	1	Data object 6 invalid
	31	1	Data object 7 invalid
12	32	1	Data object 8 invalid
	33	1	Data object 9 invalid
	34	1	Data object 10 invalid
	35	1	Data object 11 invalid
	36	1	Data object 12 invalid
	37	1	Data object 13 invalid
	38	1	Data object 14 invalid
	39	1	Remote open/closed not enabled
13	40	1	EEPROM error alarm
	41	1	RAM error alarm
	42	1	Setpoints error alarm
	43	1	Watchdog alarm
	44	1	Check aux. switch alarm
	45	1	Breaker mechanism fault
	46	1	Breaker shunt trip problem
	47	1	Operations count alarm
14	48	1	Earth fault alarm
	49	1	Low power factor alarm
	50	1	Total harmonic distortion alarm
	51	1	Frequency out of bounds alarm
	52	1	Historic trip occured
	53	1	Breaker in maintenance mode

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