MODEL PAXCDC -DEVICENET™ OUTPUT OPTION CARD

DESCRIPTION

The DeviceNet Option Card (PAXCDC30) is designed for the PAX series of meters. It fits into the Comms slot of any PAX meter and allows the meter to communicate with a DeviceNet 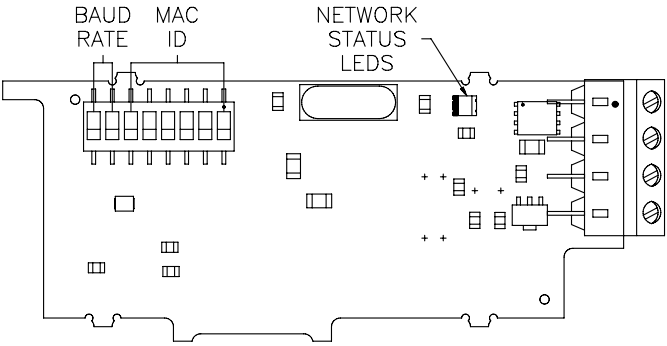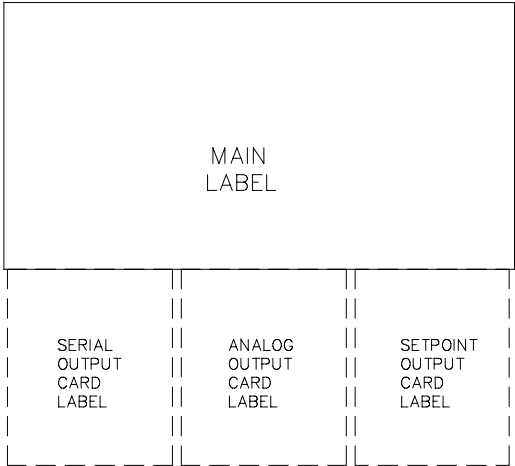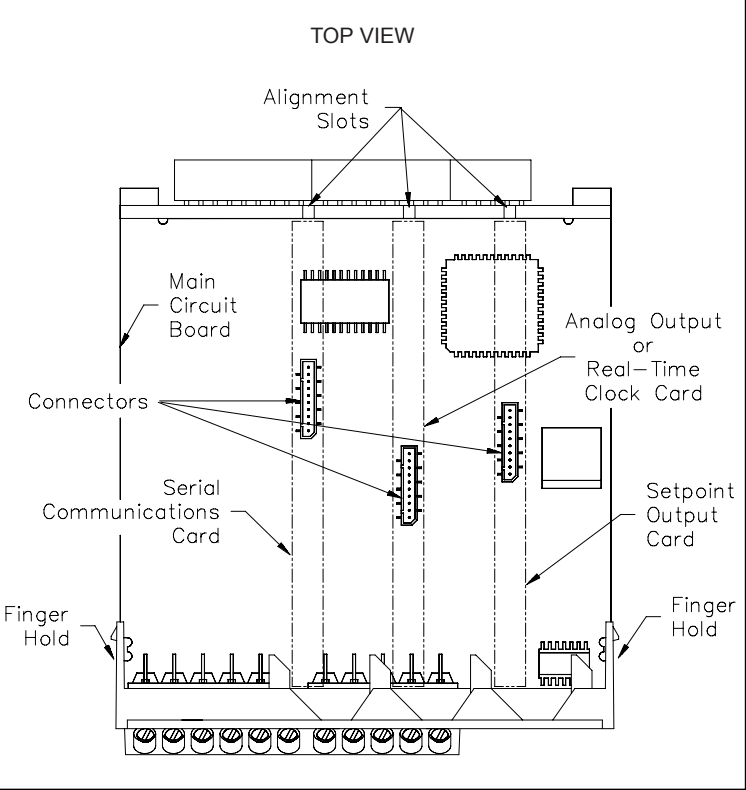bus. The card supports Polling, Bit Strobe, and Explicit Message Commands. The MAC ID and the Baud Rate are switch adjustable via a DIP switch. A bicolor LED is used to indicate the meter's status in relationship to the bus.

INSTALLING AN OPTION CARD

⚠️ *Caution: The option and main circuit cards contain static sensitive components. Before handling the cards, discharge static charges from your body by touching a grounded bare metal object. Ideally, handle the cards at a static controlled clean workstation. Also, only handle the cards by the edges. Dirt, oil or other contaminants that may contact the cards can adversely affect circuit operation.*

⚡ *Warning: Exposed line voltage exists on the circuit boards. Remove all power to the meter AND load circuits before accessing the unit.*

1. Remove the main assembly from the rear of the case. Squeeze the finger holds on the rear cover, or use a small screwdriver to depress the side latches to release it from the case. It is not necessary to separate the rear cover from the main circuit card.
2. Locate the option card connector for the type of option card to be installed. Hold the unit by the rear connector, not the display board, when installing an option card.
3. Install the option card by aligning the option card connector with the slot in the rear cover. The cards are keyed by position with different main board connector locations. Be sure the connector is fully engaged and the tab on the option card rests in the alignment slot on the display board.
4. Slide the assembly back into the case. Be sure the rear cover latches fully into the case.
5. Apply the option card label to the bottom side of the meter. Do not cover the vents on the top surface of the meter. The surface of the case must be clean for the label to adhere properly. Apply the label to the area designated by the large case label.
6. See manual for wiring connections and programming procedures.

TOP VIEW

DIP SWITCHES

Both MAC ID and baud rate are set via DIP switches on the DeviceNet™ option card. See the DIP switch setting table for more details on these DIP switches. Configuration of MAC ID and baud rate is not supported over DeviceNet™.

NETWORK STATUS LEDs

The network status LEDs provide visual indication to the operator of the DeviceNet™ card's current status.

ORDERING INFORMATION

MODEL NO.	DESCRIPTION	PART NUMBER
PAXCDC	PAX DeviceNet™ Output Card	PAXCDC30

DeviceNet™ SPECIFICATIONS

POWER SUPPLY
Source: Supplied by DeviceNet™ bus.
    The bus does not power the host.
Voltage: 11 to 25 VDC.
Current:
    Nominal: 40 mA at 25 VDC.
    Inrush: 550 mA for 5 msec at 25 VDC.
*Power must be applied to the PAX meter before bus power is applied to the card.

NETWORK SPECIFICS
Compatibility: Group 2 Server Only, not UCMM capable.
Baud Rates: 125 Kbaud, 250 Kbaud, and 500 Kbaud.
Bus Interface: Phillips 82C250 or equivalent with mis-wiring protection per DeviceNet™ Volume 1 Section 10.2.2.
Node Isolation: Bus powered, isolated node.
Host Isolation: 500 Vrms for 1 minute (50 V working) between DeviceNet™ and meter input common.
Bus Connection:
    12 V+
    13 CAN_H
    14 CAN_L
    15 V-
    Shield: No Connection

INSTALLATION INFORMATION
Factory Settings:
    Baud rate: 125 KBs.
    MAC ID: 63
    Strobe Register: 07h
    Polling flags: All on.
    Swap data flag: Off.
    Store Flags: All on.

DIP SWITCH SETTING TABLE

SWITCH #	SETTING
1 - 6	MAC ID (all off = 0, all on = 63) Switch 1 is LSB (1), switch 6 is MSB (32).
7 off, 8 off	125 K baud
7 on, 8 off	250 K baud
7 off, 8 on	500 K baud
7 on, 8 on	N/A

CONNECTION SIZES
Device Profile: This product conforms to the DeviceNet™ specification Volumes I and II of version 2.0.
Device Configuration: No DeviceNet™ configuration is supported. However, some meter configuration is supported.

MESSAGE	PRODUCED	CONSUMED
Explicit	4 Bytes	4 Bytes
Polled	4 Bytes	6 Bytes
Bit Strobe	4 Bytes	8 Bytes

NETWORK STATUS LEDs

Flashing Red LED:
This device is the only device on the network (waiting for an acknowledgment to its duplicate MAC ID check), or an I/O connection has timed out, or a recoverable error has occurred.

Flashing Green LED:
The device is functioning correctly and is waiting to be commissioned by a bus master.

Solid Red LED:
The device has encountered a non-recoverable fault, such as a duplicate MAC ID response, and has removed itself from the bus, or the device is in a power up reset state and is attempting to come on line.

Solid Green LED:
The device is on line, functioning correctly and has been commissioned by a bus master.

SUPPORTED CONNECTIONS

Polled Command: The Polled Command consumes 6 bytes of data, and is used to get, set, or reset attributes. The meter attribute is determined by the value in byte 0 of the data field. Refer to the Attribute Identification Chart for the appropriate value. Byte 1 determines the action: 0 = get, 1 = set, 2 = reset. The next 4 bytes are the new attribute value for the set command. For get or reset commands, enter 4 zeros. The data response from the Polled Command is in the format of a 4 byte hexadecimal number. For the get command (0), the response is the attribute value. For the set command (1), the response is an echo of the data input. For the reset command (2), all 0s are returned.

Bit Strobe Command: The Bit Strobe Command consumes eight bytes of data, or less. This is a read only predetermined meter attribute. The data response from the Bit Strobe Command is in the format of a 4 byte hexadecimal number. The register that will be read using the Bit Strobe command is determined by setting Attribute 2, Instance 1, Class 100* (decimal) with a value that represents the desired attribute. Refer to the Attribute Identification Chart for the appropriate value.

Class 100 (decimal) is a vendor specific class.

EXPLICIT MESSAGE COMMAND

Get Attribute: The attribute that will be read using the Get Attribute command is determined by setting Service Code 14, Instance 1, Class 100* (decimal), and the attribute with a value that represents the desired meter attribute. Refer to the Attribute Identification Chart for the appropriate value. The data response from the Get Attribute Command is in the format of a 4 byte hexadecimal number.

Set Attribute: The attribute that will be set using the Set Attribute command is determined by setting Service Code 16, Instance 1, Class 100* (decimal), and the attribute with a value that represents the desired meter attribute. Refer to the Attribute Identification Chart for the appropriate value. The data field for the Set Attribute Command is entered as a 4 byte hexadecimal number.

Reset Attribute: The attribute that will be reset using the Reset Attribute command is determined by setting Service Code 5, Instance 1, Class 100* (decimal), and the attribute with a value that represents the desired meter attribute. Refer to the Attribute Identification Chart for the appropriate value.

Class 100 (decimal) is a vendor specific class.

Note: Not all meter attributes respond to a Set or Reset Attribute command. Refer to the Attribute Identification Chart for details.

Vendor Specific Error Responses

CODE ERROR #	ERROR CODE MEANING
1F (General Code)	Vendor Specific Error
1 (Additional Code)	Meter Response Time-out
2 (Additional Code)	Vendor Service Not Supported
3 (Additional Code)	Command String Syntax Error

Attribute Identification Chart

VALUE	DESCRIPTION				SERVICE CODES SUPPORTED				POLLING	STORE
	PAX	PAXI	PAXCK	PAXDP	PAX	PAXI	PAXCK	PAXDP		
1	Data Swapping Flag ①				G, S	G, S	G, S	G, S	N/A	N/A
2	Bit Strobe Attribute				G, S	G, S	G, S	G, S	N/A	N/A
3	Polling Flags 1 ③				G, S	G, S	G, S	G, S	N/A	N/A
4	Polling Flags 2 ③				G, S	G, S	G, S	G, S	N/A	N/A
5	Polling Flags 3 ③				N/A	G, S	G, S	G, S	N/A	N/A
6	DIP Switch ④				G	G	G	G	N/A	N/A
7	Input	Count A	Timer	Input A (rel)	G	G, S, R	G, S, R	G, R	Attr 3, bit 0	Attr 26, bit 0
8	Total	Count B	Count	Input B (rel)	G, R	G, S, R	G, S, R	G, R	Attr 3, bit 1	Attr 26, bit 1
9	Max	Count C	RTC Time	Calc	G, R	G, S, R	G, S	G	Attr 3, bit 2	Attr 26, bit 2
10	Min	Rate	RTC Date	Total	G, R	G, S	G, S	G, R	Attr 3, bit 3	Attr 26, bit 3
11	SP 1	Min	SP 1	Min Input	G, S, R	G, S, R	G, S, R	G, R	Attr 3, bit 4	Attr 26, bit 4
12	SP 2	Max	SP 2	Max Input	G, S, R	G, S, R	G, S, R	G, R	Attr 3, bit 5	Attr 26, bit 5
13	SP 3	Scale A	SP 3	Input A (abs)	G, S, R	G, S	G, S, R	G	Attr 3, bit 6	Attr 26, bit 6
14	SP 4	Scale B	SP 4	Input B (abs)	G, S, R	G, S	G, S, R	G	Attr 3, bit 7	Attr 26, bit 7
15	AOR ⑥	Scale C	SP 1 Off	Input A (offset)	G, S	G, S	G, S	G, S	Attr 4, bit 0	Attr 27, bit 0
16	CSR ⑥	Load A	SP 2 Off	Input B (offset)	G, S	G, S	G, S	G, S	Attr 4, bit 1	Attr 27, bit 1
17	-----	Load B	SP 3 Off	-----	-----	G, S	G, S	-----	Attr 4, bit 2	Attr 27, bit 2
18	-----	Load C	SP 4 Off	-----	-----	G, S	G, S	-----	Attr 4, bit 3	Attr 27, bit 3
19	-----	SP 1	Timer Start	SP 1	-----	G, S, R	G, S	G, S, R	Attr 4, bit 4	Attr 27, bit 4
20	-----	SP 2	Count Start	SP 2	-----	G, S, R	G, S	G, S, R	Attr 4, bit 5	Attr 27, bit 5
21	-----	SP 3	Timer Stop	SP 3	-----	G, S, R	G, S	G, S, R	Attr 4, bit 6	Attr 27, bit 6
22	-----	SP 4	Count Stop	SP 4	-----	G, S, R	G, S	G, S, R	Attr 4, bit 7	Attr 27, bit 7
23	-----	MMR ⑥	MMR ⑥	MMR ⑥	-----	G, S	G, S	G, S	Attr 5, bit 0	Attr 28, bit 0
24	-----	AOR ⑥	RTC Day	AOR ⑥	-----	G, S	G, S	G, S	Attr 5, bit 1	Attr 28, bit 1
25	-----	SOR ⑥	SOR ⑥	SOR ⑥	-----	G, S	G, S	G, S	Attr 5, bit 2	Attr 28, bit 2
26	Store Flags 1 ⑤				G, S	G, S	G, S	G, S	N/A	N/A
27	Store Flags 2 ⑤				G, S	G, S	G, S	G, S	N/A	N/A
28	Store Flags 3 ⑤				N/A	G, S	G, S	G, S	N/A	N/A

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① Data Swap: (1 byte), Attribute 1, Instance 1, Class 100 (decimal). Data is normally sent and entered as follows: Pax display value = 500000 (7A120h). 4 byte value sent would be 20 A1 07 00. Setting the data swap value to 1 would result in the data being sent as 00 07 A1 20. This attribute can only be set to 0 or 1, all other values are ignored. The factory setting value is 0. Data Byte is saved in EEPROM memory.

④ DIP Switch Values: (1 byte), Attribute 6, Instance 1, Class 100 (decimal). Returns the dip switch setting. Switch 1 = LSB, 1 = on.

③ Polling Flags: (3 bytes) Attribute 3 - 5, Instance 1, Class 100 (decimal). The DeviceNet card is continually requesting values from the PAX unit. The polling flags determine what values are requested during each loop. Setting the flags to "1" enables the card to poll that particular value. A "0" value disables it. Turning polling flags off allows the card to request fewer values and therefore decreases the internal loop time, which allows the values that are polled to be updated more often.

TYPICAL UPDATE TIMES

PAX	PAXI/PAXCK/PAXDP
All values (10) – 1.00 sec	All values (19) – 750 msec
5 values – 500 msec	10 values – 430 msec
1 value – 100 msec	5 values – 230 msec
	1 value – 52 msec

If a Set Attribute is executed for any value, that value is automatically updated to the latest value, regardless of whether the polling flag is on or off. On power up, all values are updated regardless of Polling flag settings. Polling flag values are saved in EEPROM memory. Factory settings is "on" for all Polling flags.
See Meter Attribute Identification Chart for polling flags.

⑤ Store Flags: (3 bytes) Attribute 26 - 28, Instance 1, Class 100 (decimal). This set of flags determines whether the attribute is stored to EEPROM when a Set or Reset service code is executed. If the flag is 0, the value is not saved to EEPROM memory in the PAX. If the flag is 1, the value is saved immediately to EEPROM memory in the PAX. Factory setting is "on" for all Store Flags. The attributes are grouped in blocks. Storing one attribute may cause others to be stored. If an attribute is SET frequently, its store flag should be set to 0 to increase EEPROM life.

MANUAL MODE DESCRIPTION ⑥
(CSR) Control Status Register [16] (PAX)

The Control Status Register is used to directly control the meter's outputs (setpoints and analog output), or view the state of the setpoint outputs and the status of the temperature sensor (PAXT only). The attribute is bit mapped with each bit position within the attribute assigned to a particular control function. The control functions are invoked by writing to each bit position. The bit position definitions are:

bit 0: SP1 Output
bit 1: SP2 Output
bit 2: SP3 Output   0 = output off
bit 3: SP4 Output   1 = output on
bit 4: Manual Mode
    0 = automatic mode
    1 = manual mode

bit 5: Always stays 0, even if 1 is sent.
bit 6: Sensor Status (PAXT only)
    0 = sensor normal
    1 = sensor fail
bit 7: Always stays 0, even if 1 is sent.

In Manual Mode, the setpoint outputs are defined by the values written to bits b0, b1, b2, b3; and the analog output is defined by the value written to the AOR. Internal control of these outputs is then overridden. In automatic mode, the setpoint outputs can only be reset off.

Example:
1. Select manual mode for all outputs:
Value to write to attribute 16: 0010h

MANUAL MODE DESCRIPTION (CONTINUED)

(MMR) Auto/Manual Mode Register [23] (PAXI/PAXCK/PAXDP)

This attribute sets the controlling mode for the outputs. In Auto Mode (0) the meter controls the setpoint output. In Manual Mode (1) the outputs are defined by the attribute SOR. When transferring from auto mode to manual mode, the meter holds the last output value (until the attribute is changed by a write). Each output may be independently changed to auto or manual. Select values to place in manual mode by writing appropriate value to attribute 23. The bit position definitions are:

PAXI/PAXDP

bit 0: Analog Output
bit 1: SP4
bit 2: SP3   0 = Auto Mode
bit 3: SP2   1 = Manual Mode
bit 4: SP1

PAXCK

bit 0: SP4
bit 1: SP3   0 = Auto Mode
bit 2: SP2   1 = Manual Mode
bit 3: SP1

Example:
1. Select manual mode for all outputs and AOR (PAXI, PAXDP):
   Value to write to attribute 23: 001Fh

(SOR) Setpoint Output Register [25] (PAXI/PAXCK/PAXDP)

This attribute is used to view or change the states of the setpoint outputs. Reading from this attribute will show the present state of all the setpoint outputs. A "0" in the setpoint location means the output is inactive and a "1" means the output is active.

In Automatic Mode (See MMR Description), the meter controls the setpoint output state. In Manual Mode, writing to this attribute will change the output state. The bit position definitions are:

bit 0: SP1
bit 1: SP2   0 = Output off
bit 2: SP3   1 = Output on
bit 3: SP4

Examples:
1. Turn all outputs on:
   Value to write to attribute 25 - 000Fh.

2. Turn outputs 1, 3 on:
   Value to write to attribute 25 - 0005h.

3. Turn all outputs off:
   Value to write to attribute 25 - 0000h.

(AOR) Analog Output Register (Not PAXCK)

The Analog Output Register controls the analog output of the meter. The manual mode must first be engaged by setting bit 4 of the CSR (PAX) or bit 0 of the MMR (PAXI). The range of values of this attribute is 0 to 4095, which corresponds to 0 mA, 0 V and 20 mA, 10 V; respectively. If a value larger than 4095 is written to the AOR Attribute, 4095 will be loaded. The table lists correspondence of the output signal with the attribute value.

*Due to the absolute accuracy rating and resolution of the output card, the actual output signal may differ 0.15% FS from the table values. The output signal corresponds to the range selected (20 mA or 10 V).

Attribute Value	Output Signal*	
	I (mA)	V (V)
0	0.000	0.000
1	0.005	0.0025
2047	10.000	5.000
4094	19.995	9.9975
4095	20.000	10.000

Writing to this attribute while the meter is in the manual mode causes the output signal to update immediately. While in the automatic mode, this attribute may be written to, but the output will not update until the meter is placed in manual mode.

Examples:
1. Set output to full scale:
   Value to write to attribute 15 (PAX) or attribute 24 (PAXI) - 0FFFh (4095).
2. Set output to zero scale:
   Value to write to attribute 15 (PAX) or attribute 24 (PAXI) - 0000h (0).

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