Instructions for DNP MINT Translator Module Installation and Use

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Figure 1: The DNP MINT Module

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1.0   GENERAL DESCRIPTION

The DNP MINT (DNP Master INCOM Network Translator) Module, as seen in **Figure 1**, is a Eaton Electrical accessory product that will provide communication between a DNP 3.0 network master and an INCOM (INdustrial COMmunications) network of MPCV Relays (see **Figure 2**). The module is transparent to the DNP network master. It communicates to a master on the DNP network using the DNP 3.0 protocol. It communicates to slave devices on the INCOM network using the IMPACC (Integrated Monitoring, Protection, And Control Communication) protocol.

2.0   FEATURES

The DNP MINT module is a slave device on the DNP network and as such requires a master that will poll/accept DNP objects from the DNP MINT module.

- DNP communications data transfer rates of 1200, 9600, or 19200 baud with 1 start bit, 8 data bits, no parity and either one or two stop bits.

- Up to 16 devices such as the MPCV Relay connected to the INCOM network port.

- Flashing Status LED to indicate an active module.

- LED indicators for DNP RS-485 transmit and receive communications exchanges.

- LED indicators for INCOM transmit and receive communications exchanges.

- Input power for the module from either 120 VAC or 24 to 125 VDC.

- DIN rail mount package.

- -40ºC to 85ºC ambient operation.

3.0   INSTALLATION

The DNP MINT module is designed to be installed, operated and maintained by adequately trained personnel. These instructions do not cover all of the details or variations of the equipment for its storage, delivery, installation, checkout, safe operation or maintenance. When mounting the DNP MINT verify that a "C" Shape **32mm** or Standard **35/7.5mm DIN Rail** is used and that it is within an enclosed space.

WARNING

DO NOT ATTEMPT TO INSTALL OR PERFORM MAINTENANCE ON EQUIPMENT WHILE IT IS ENERGIZED. DEATH OR SEVERE PERSONAL INJURY CAN RESULT FROM CONTACT WITH ENERGIZED EQUIPMENT. ALWAYS VERIFY THAT NO VOLTAGE IS PRESENT BEFORE PROCEEDING. ALWAYS FOLLOW SAFETY PROCEDURES. EATON ELECTRICAL INC. IS NOT LIABLE FOR THE MISAPPLICATION OR MISINSTALLATION OF ITS PRODUCTS.

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          VENT/GRATING                    STREET LEVEL
─────────────  ─ ─ ─ ─ ─ ──────────────────────────────────────────
                                                    UNDERGROUND

DNP3.0
RS-485                          INCOM Network
                    ┌──────────────────────┬──────────┬──────────··· ──────┐
                  ┌─┴─┐      ┌─┴─┐       ┌─┴─┐      ┌─┴─┐
         ┌─────┐  │   │      │   │       │   │      │   │
    ↑    │ DNP │  │MPCV│      │MPCV│       │MPCV│ ──── │MPCV│
    └───→│MINT │□ │   │      │   │       │   │      │   │
         └─────┘  └────┘      └────┘       └────┘      └────┘
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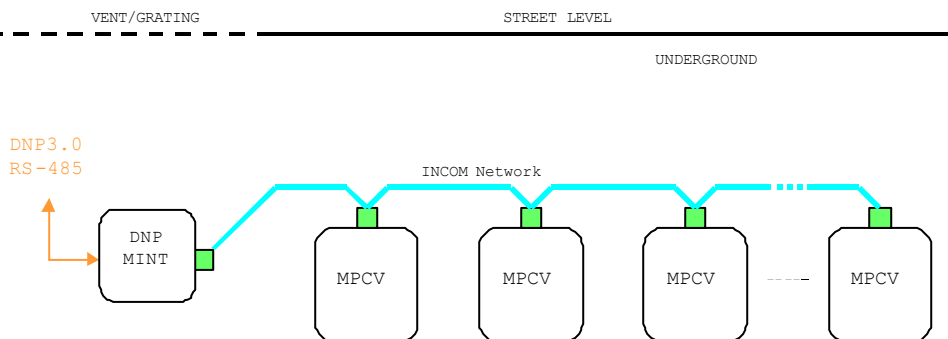
Figure 2: DNP MINT in a Communications Network

3.1 INCOM Network

The following simplified rules apply to a given system consisting of a single daisy chained main cable link between master and slave devices (see **Figure 2**). For more complex considerations including star configurations, please refer to the IMPACC wiring specification T.D. 17513.

- Recommended INCOM cable styles are Belden 3073F or C-H style 2A957805G01.

- The maximum system capacity is 8,000 feet of communications cable and 16 slave devices such as the MPCV Relay on the INCOM network under the DNP MINT.

- Non-terminated taps, up to 200 feet in length, off the main link are permitted, but add to the total cable length.

Make sure that there is twisted-pair wire that is recommended for IMPACC network use. Use shielded twisted-pair wire to connect each slave to the INCOM network, daisy-chain style. **The polarity of the twisted pair is <u>not</u> important.**

3.2 DNP RS-485 Network

The following simplified rules apply to a given system consisting of a cable link between master and slave devices (see **Figure 2**).

- The recommended DNP cable has twisted-pair wires (24 AWG stranded 7x32 conductors with PVC insulation) having an aluminum/mylar foil shield with drain wire.

- Make sure that there is twisted-pair wire that is recommended for serial DNP RS-485 network use. Use shielded twisted-pair wire to connect each slave to the DNP network, daisy-chain style. **The polarity of the twisted pair is <u>critically</u> important.**

4.0 DNP MINT CONNECTIONS

Refer to **Figure 3** and the following three pin out tables for installation specifics.
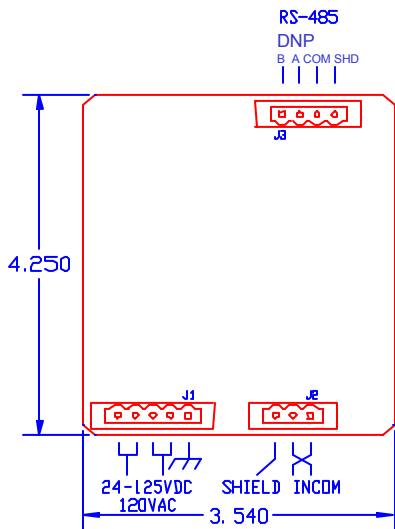
Figure 3: Connections

4.1 Power Connections

Power Connector: Module power uses a 5-pin input connector (see **Figure 3**). Power requirements are 120 VAC, 60 Hz or 24-125VDC. Refer to **Table 1**.

Pin #	Input Power
1	Chassis Ground
2 & 3	VAC Neut. / VDC Common
4 & 5	VAC Line / 24-125 VDC+

Table 1: Power Connector Pin Outs

4.2 INCOM Connections

INCOM Connector: This 3-pin connector provides the interface to the INCOM network. Refer to **Table 2**.

Pin #	Input / Output Signal
1	INCOM Carrier Network
2	INCOM Carrier Network
3	Shield

Table 2: INCOM Connector Pin Outs

Connect the shield wire to ground at master device end only. Interconnect shielding where devices are daisy chained.

4.3 RS-485 Connections

DNP RS-485 Connector: This 4-pin connector provides the interface to the DNP network. The polarity is "critically" important. Refer to **Table 3**.

Pin #	Input / Output Signal
1	RS485 Network-B (non-inverting)
2	RS485 Network-A (inverting)
3	Common
4	Shield

Table 3: DNP RS485 Connector Pin Outs

RS-485 Network-A is the inverting differential connection for the DNP network. RS-485 Network-B is the non-inverting differential connection for the DNP network.

5.0 SWITCHES AND INDICATOR LEDS
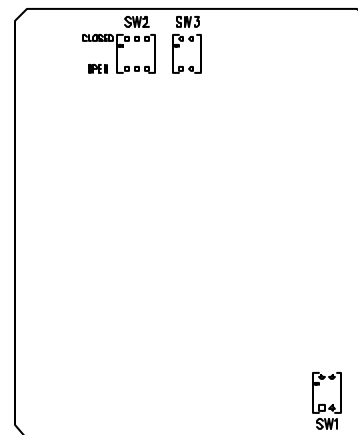
Figure 4: Switches

Refer to **Figure 1** to locate the Status LED for the DNP MINT. **Figure 4** shows the location of the configuration switches.

5.1 DNP RS-485 Network Rx LED [Green]

The LED will be illuminated whenever the DNP MINT is receiving content from activity on the DNP network.

5.2 DNP RS-485 Network Tx LED [Green]

The LED will be illuminated whenever the DNP MINT is transmitting on the DNP network.

5.3 INCOM Network Rx LED [Green]

The LED will be illuminated whenever the DNP MINT is receiving messages from the INCOM network.

5.4 INCOM Network Tx LED [Green]

The LED will be illuminated whenever the DNP MINT is transmitting messages on the INCOM network.

5.5 Status LED [Green]

This indicator will begin flashing after the module has powered up, its processor has performed its RAM tests and the microcontroller is executing instructions. The flashing rate is approximately 1 second ON / 1 second OFF.

This indicator will flash at a rate of approximately 5 times a second during an auto learn dip switch detection sequence (see **Section 7.0**).

After accepting a configuration request, the DNP MINT will hold this LED ON for approximately 2.5 seconds.

5.6 INCOM 100 Termination DIP Switch (SW1)

This switch should be moved to the "ON" position only when it is the last unit in a chain of units or if it is a single unit.

5.7 DNP RS-485 Baud Rate DIP Switch (SW2)

To set the data transfer rate for the DNP network, two switches in dip switch SW2 (SW2-2 and SW2-3) should be moved to either the "CLOSE" or the "OPEN" position based on the rate required. Refer to **Table 4**. SW2-1 is for DNP MINT configuration.

Baud	SW2-1	SW2-2	SW2-3
1200	X	CLOSE	CLOSE
9600	X	OPEN	CLOSE
19200	X	CLOSE	OPEN

Table 4: RS-485 Baud Rate Switches

5.8 DNP Diagnostics Enable (Configuration Mode) Switch (SW2)

To configure the DNP access settings and the INCOM device access settings within the DNP MINT, the SW2-1 dip switch must be moved to the "OPEN" position. Refer to **Table 5**. Normally, this switch is in the "CLOSE" position. Changing this dip switch automatically forces a reset of the DNP MINT.

Baud	SW2-1	SW2-2	SW2-3
Configure	OPEN	X	X
Normal	CLOSE	X	X

Table 5: RS-485 Diagnostics Enable (Configuration Mode) Switch

5.9 DNP/RS-485 121 Termination DIP Switch (SW3)

This switch should be set to the "ON" position only when it is the last unit in a chain or if it is the only outstation device on the DNP Network.

6.0 DNP V3.00 DEVICE PROFILE

The DNP V3.00 device profile for the DNP MINT is listed in **Appendix A**.
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7.0 DNP MINT CONFIGURATION USING AUTO LEARN

Settings in the DNP MINT can be configured automatically to allow it to operate with a DNP Master and up to 16 INCOM devices such as the MPCV Relay. To ensure this auto learn feature is not accidentally initiated, the baud rate dip switches (SW2-2 and SW2-3, see **Section 5.7** and **Table 4**) must be sequenced in a particular pattern with the diagnostics enable switch SW2-1 set in the enabled "OPEN" position (see **Section 5.8** and **Table 5**).

If the DNP MINT is power up with all of the SW2 dip switch settings in the OPEN position, detection to enter the auto learn mode begins. This is indicated by the STATUS LED flashing at 5 times a second for the duration of the auto learn detection sequence. If the sequence of state changes:

STATE1	SW2-3 changed to CLOSED
STATE2	SW2-2 changed to CLOSED
STATE3	SW2-3 changed to OPEN
STATE4	SW2-2 changed to OPEN

completes within 20 seconds (note: to avoid debounce conditions on the dip switches, intermediate states are ignored), the DNP MINT enter the auto learn mode. The DNP MINT Summary Table is initialized to its default state (see **Table 8**) and all 16 devices are removed.

This initializes the "DNP Master Address" at 12402 (3072_{16}) and disables a DNP MINT "DNP Address". The STATUS LED will remain ON while this initialization process (writing to non-volatile EEPROM) is being performed. When completed, the STATUS LED will flash at the rate of 1 second ON / 1 second OFF. The INCOM network is then searched for devices from address 001_{16} through FFF_{16} (indicated by activity on the INCOM Network Tx LED). If a device listed in **Table 6** is found, the device's "INCOM Address" is also assigned to its "DNP Address" and the listed default "Configuration Tag" information is entered. It is extremely important that the INCOM network is properly terminated during this procedure.

The DNP MINT will exit the auto learn mode if:
    (1) 16 device are configured,
    (2) the search completes (INCOM address FFF_{16} is reached), or
    (3) the operator changes any SW2 dip switch.

Since searching all INCOM addresses can take approximately 5 minutes, the operator may want to exit sooner using the dip switches if it is certain that all the addresses on the INCOM network have been accessed.

Note that DNP communications in the DNP MINT is disabled during the auto learn sequence and process.

INCOM Device	Default Configuration Tag
MPCV Relay	1
DigiTrip RMS (810, 910)	12, 13
DigiTrip OPTIM	17
DigiTrip 520MC	19, 20, 21
DigiTrip 1150 CommVer 0	28, 29, 30
DigiTrip 1150 >= CommVer 1	32, 33, 34
DigiTrip 3000, MV or 3200	22
DP4000	23
DIM	25
Addressable Relay	26

Table 6: Auto Learn INCOM Devices

8.0 DNP MINT CONFIGURATION USING DNP COMMUNICATIONS

Settings in the DNP MINT must be configured to allow it to operate with a DNP Master and up to 16 INCOM devices such as the MPCV Relay. To enable the configuration mode, set switch SW2-1 to the enabled "OPEN" position (see **Section 5.8** and **Table 5**).

There are three configuration levels allowed with the DNP MINT. All levels use a particular subset of the DNP V3.00 transfer protocol, with each level increasing in both complexity and functionality. Each level is described in the sections below. While in the configuration mode, the DNP MINT will accept the DNP transfer requests using either the DNP source and destination addresses:

(1) both set at self address 65532 ($FFFC_{16}$), or
(2) each set at a previously configured source "Master Station DNP address" and destination DNP MINT's "DNP address".

While in the configuration mode, the DNP MINT will transfer information to the DNP Master using the UNCONFIRMED_USER_DATA data link function code and with the application confirmation request, CON bit, reset.

8.1 Configuration With Pre-Defined Tables

The DNP MINT contains pre-configured tables that can be selected by a Write (Function Code 02) Counter (Group 20) Object request using Variation 6 (16-bit Binary Counter without Flag), Qualifier 00 or 01 (no Preindex, 8-bit or 16-bit start and stop ranges). These counter object points are defined in **Table 7**. Points 0 through 5 are "Read Only" DNP MINT variables. Points 6 through 56 are read/write counters. The DNP MINT will only accept a write configuration request when content of information in the request message includes, as a minimum:

(1) the "Master Station DNP address" (Point 6), and/or
(2) the DNP MINT's "DNP address" *and* "DNP MINT Configuration Tag" (Points 7 *and* 8), and/or
(3) one or multiple INCOM device's "DNP Address", "INCOM Address" *and* "Configuration Tag" (Points 9, 10, *and* 11 for Device #1, for example).

A valid "DNP Address" is a value in the range of 0000_{16} through $FFEF_{16}$ that is unique to any other device "DNP Address" on the DNP link. The setting of an invalid DNP MINT's "DNP Address" will only allow access to the DNP MINT with the self address 65532 ($FFFC_{16}$) in the configuration mode. Normal (run-time) access of these DNP MINT counters will, therefore, not be available. Setting an invalid device's "DNP Address" will not allow normal (run-time) DNP access to the device.

A valid "INCOM Address" is a value in the range 0001_{16} through $0FFF_{16}$. Setting an invalid device's "INCOM Address" will disable INCOM communications between the DNP MINT and the device. This will result in all of the device's points being off-line during normal (run-time) access.

All "Configuration Tag" values must be within the valid range of tags for the write request to be accepted. A configuration tag request value set to 0 will leave the current tag value and it's corresponding information unmodified and only update the associated DNP MINT "DNP address" or device's "DNP Address" and "INCOM Address". If non-zero, the DNP MINT's tag must be 1 (only one pre-defined DNP MINT summary table exists in the DNP MINT, as listed in **Table 8**). A device's tag must be 1 through the value listed in the "Number Of Pre-Defined Device Configuration Tags" (Point 5, = 34) to configure the pre-defined device settings corresponding to the tag's Point List assignments listed in **Appendix B**. (Refer to IL 17384 for the INCOM Communication Protocol definitions for all INCOM devices. For devices which have pre-assigned configurations as defined in the

Point		Definition
0	DNP MINT	Firmware Year (Read Only)
1		Firmware Month (Read Only)
2		Firmware Day (Read Only)
3		Firmware Version (Read Only)
4		Firmware Revision (Read Only)
5		Number Of Pre-Defined Device Configuration Tags (= 34) (Read Only)
6		Master Station DNP Address
7		DNP Address
8		Configuration Tag (= 1)
9	Device #1	DNP Address
10		INCOM Address
11		Configuration Tag (= 1 through < Point 5 value>, $FFFF_{16}$ to remove)
12	Device #2	DNP Address
13		INCOM Address
14		Configuration Tag (= 1 through < Point 5 value>, $FFFF_{16}$ to remove)
15	Device #3	DNP Address
16		INCOM Address
17		Configuration Tag (= 1 through < Point 5 value >, $FFFF_{16}$ to remove)
18	Device #4	DNP Address
19		INCOM Address
20		Configuration Tag (= 1 through < Point 5 value >, $FFFF_{16}$ to remove)
21	Device #5	DNP Address
22		INCOM Address
23		Configuration Tag (= 1 through < Point 5 value >, $FFFF_{16}$ to remove)
24	Device #6	DNP Address
25		INCOM Address
26		Configuration Tag (= 1 through < Point 5 value >, $FFFF_{16}$ to remove)
27	Device #7	DNP Address
28		INCOM Address
29		Configuration Tag (= 1 through < Point 5 value >, $FFFF_{16}$ to remove)
30	Device #8	DNP Address
31		INCOM Address
32		Configuration Tag (= 1 through < Point 5 value >, $FFFF_{16}$ to remove)
33	Device #9	DNP Address
34		INCOM Address
35		Configuration Tag (= 1 through < Point 5 value >, $FFFF_{16}$ to remove)
36	Device #10	DNP Address
37		INCOM Address
38		Configuration Tag (= 1 through < Point 5 value >, $FFFF_{16}$ to remove)
39	Device #11	DNP Address
40		INCOM Address
41		Configuration Tag (= 1 through < Point 5 value >, $FFFF_{16}$ to remove)
42	Device #12	DNP Address
43		INCOM Address
44		Configuration Tag (= 1 through < Point 5 value >, $FFFF_{16}$ to remove)
45	Device #13	DNP Address
46		INCOM Address
47		Configuration Tag (= 1 through < Point 5 value >, $FFFF_{16}$ to remove)
48	Device #14	DNP Address
49		INCOM Address
50		Configuration Tag (= 1 through < Point 5 value >, FFFF to remove)
51	Device #15	DNP Address
52		INCOM Address
53		Configuration Tag (= 1 through < Point 5 value >, $FFFF_{16}$ to remove)
54	Device #16	DNP Address
55		INCOM Address
56		Configuration Tag (= 1 through < Point 5 value >, $FFFF_{16}$ to remove)

Table 7: Pre-Configured Counter Assignments

Appendix B configuration tables, enter the respective Configuration Tag for that selection. For INCOM devices without a specific pre-defined configuration, select the most appropriate Generic Device or Generic Trip Unit configuration after review of IL 17384.)

A device's tag value of $FFFF_{16}$ will remove the device from the DNP MINT, which will also force the device's "DNP Address" and "INCOM Address" settings to $FFFF_{16}$, an unused/non-configured virtual DNP slave device state.

These DNP MINT counter object points (**Table 7**) are returned to the DNP master in response to a Read (Function Code 01) Counter (Group 20) Object request using Variations 2 or 6 (16-bit Binary Counter with or without Flag), Qualifier 00, 01 or 06 (no Preindex, 8-bit, 16-bit start and stop ranges or no ranges) during both configuration and normal (run-time) modes, with normal mode dependent on a valid DNP MINT's "DNP Address" setting. Note that points 0 through 5 are read only DNP MINT variables.

8.2 Configuration Of Summary Table Settings

The DNP MINT contains a summary table (see **Table 8**) providing various configuration settings for overall DNP MINT operation. It also contains a summary table (see **Table 9**) for each INCOM device providing various configuration settings required by the DNP MINT for interaction pertaining to/with the device. This information can only be read and written from a DNP master device when the DNP MINT is placed in the configuration mode (see **Section 5.8**). The information is returned from the DNP MINT in response to a Read (Function Code 01) Counter (Group 20) Object request using Variations 2 or 6 (16-bit Binary Counter with or without Flag), Qualifier 01 (no

Preindex, 16-bit start and stop ranges or no ranges). The most significant byte of the range fields is used to distinguish which summary table is being accessed, 0 (00_{16}) pertaining to the DNP MINT summary table and 1 (01_{16}) through 16 (10_{16}) pertaining to each of the 16 devices. The least significant byte of the range fields defines the counters being accessed and start at 128 (80_{16}) so that the DNP MINT summary table does not overlap the pre-defined table described in **Section 8.1**. Also note that these counters will not be returned along with the pre-defined table counters with a Qualifier 06 (no Preindex, no ranges) read request.

Summary information is entered into the DNP MINT using a Write (Function Code 02) Counter (Group 20) Object request using Variation 6 (16-bit Binary Counter without Flag), Qualifier 01 (no Preindex, 16-bit start and stop ranges or no ranges). The DNP MINT will only accept the request when the counter range field pertains to one and only one DNP MINT or device summary table. Also, when selecting the DNP MINT summary table counters, the request cannot be intermixed with the pre-defined counters described in **Section 8.1**.

8.2.1 DNP Master Station Address

The DNP Master Station Address setting is the DNP source address value the DNP MINT will accept in a request message and thus return as the destination address in the corresponding response message. It is also applied as the destination address in a generated unsolicited message. A valid setting is 0000_{16} through $FFEF_{16}$. The DNP MINT will not accept a write request with an invalid setting. This value is set in the DNP MINT summary table and applies to all DNP MINT messages (DNP MINT counters and its 16 devices).

Counter	Definition		Tag Defaults
0080_{16}	DNP Master Station Address	(equivalent to **Section 8.1**, Counter 6)	3072_{16}
0081_{16}	DNP MINT's DNP Address	(equivalent to **Section 8.1**, Counter 7)	$FFFF_{16}$
0082_{16}	DNP MINT's Configuration Tag	(equivalent to **Section 8.1**, Counter 8)	0001_{16}
0083_{16}	DNP MINT's DNP transfer protocol:		0000_{16}
	Low Byte = Outstation Confirmation Request Enable Bits:		
	3-0　　Data Link Confirmation Retry Count		0
	4　　Enable Unsolicited Event Data Link Confirm		0
	5　　Enable Solicited Static/Event Data Link Confirm		0
	6　　Enable Solicited Static Application Confirm		0
	High Byte = Unsolicited Event Generation Bits:		
	9　　Enable Unsolicited Class 1 Events		0
	10　　Enable Unsolicited Class 2 Events		0
	11　　Enable Unsolicited Class 3 Events		0
0084_{16}	DNP network idle time to initiate unsolicited transmission	(1 count = 10ms)	50 = 500ms
0085_{16}	DNP network unsolicited retry random time increment mask	(1 count = 10ms)	$007F_{16}$ = 1.27s
0086_{16}	DNP Data Link Confirmation Wait Timeout	(1 count = 10ms)	50 = 500ms
0087_{16}	DNP Application Confirmation Wait Timeout	(1 count = 10ms)	500 = 5s
0088_{16}	INCOM Scan Level Count To Generate Point Off-Line:		
	Low Byte　　Scan Level 0 (Poll) Count	(0 – 15)	3
	High Byte　　Scan Level 1 (Interleaved) Count	(0 – 15)	3
0089_{16}	Low Byte　　Scan Level 2 (Timer2) Count	(0 – 15)	3
	High Byte　　Scan Level 3 (Timer3) Count	(0 – 15)	3
$008A_{16}$	INCOM Level 2 Scan Timer	(1 count = 1s)	300 = 5 min
$008B_{16}$	INCOM Level 3 Scan Timer	(1 count = 1s)	900 = 15 min

Table 8: DNP MINT Summary Table Definitions

8.2.2　DNP Address

The DNP Address setting is the DNP destination address value the DNP MINT will accept in a request message for one of its DNP MINT or 16 configured devices and thus return as the source address in the corresponding response message. It is also applied as the source address in a generated unsolicited message. A valid setting is 0000_{16} through $FFEF_{16}$. A write request with an invalid setting will disable access to the selected DNP MINT objects or device objects on the DNP network.

8.2.3　Configuration Tag

The Configuration Tag setting provides a label for the existing configuration table in the DNP MINT. A request containing a tag setting corresponding to any of the pre-defined tables (DNP MINT summary table 01 or device summary tables 01 through 34) will initialize all summary settings to the selected pre-defined values before modifying (over-writing) any of the other requested counter changes determined by the write request message.

Acceptance of a write message without the tag counter request included or with a tag value outside this pre-defined range will require an already existing configuration to be resident. A tag value request of 0 will leave the current tag value present. A DNP MINT tag value of $FFFF_{16}$ will not be accepted. A device tag value of $FFFF_{16}$ will remove that device from the DNP MINT. All other tag values will simply be written as the new tag value.

8.2.4 DNP Transfer Protocol

The DNP Transfer Protocol settings modify the DNP MINT interface procedures to the DNP network. These settings are only used when the DNP MINT is functioning in the run (non configuration) mode.

A DNP MINT or device setting with the "Enable Solicited Static/Event Data Link Confirm" bit reset / set will return solicited data to the master device using the UNCONFIRMED_USER_DATA / CONFIRMED_USER_DATA data link function code, respectively. If set, data link transfers that do not receive a confirmed response will be retried depending on the "Data Link Confirmation Retry Count" setting.

A device setting with the "Enable Unsolicited Event Data Link Confirm" bit reset / set will send unsolicited data to the master device using the UNCONFIRMED_USER_DATA / CONFIRMED_USER_DATA data link function code, respectively. If set, data link transfers that do not receive a confirmed response will be retried depending on the "Data Link Confirmation Retry Count" setting.

A DNP MINT or device setting with the "Enable Solicited Static Application Confirm" bit set will return solicited data to the master device with the CON bit set (requesting a confirmation). Note that all event data being returned are required to set this CON bit.

A device setting with an "Enable Unsolicited Class 1/2/3 Events" bit set will send unsolicited data to the master device after the occurrence of an event for that enabled class.

The DNP MINT binary counter objects cannot be enabled for unsolicited messaging (i.e., set to Class 1, 2 or 3). Thus setting the "Enable Unsolicited Event Data Link Confirm" or "Enable Unsolicited Class 1/2/3 Events" bits for the DNP MINT summary would provide no functionality.

8.2.5 DNP Network Idle Time To Initiate Unsolicited Transmission

The DNP Network Idle Time To Initiate Unsolicited Transmission setting is the number of 10 ms increments the DNP MINT will wait for the DNP network to be silent (inactive) before it will attempt to transfer a pending unsolicited message. This value is set in the DNP MINT summary table and applies to all DNP MINT messages (DNP MINT counters and its 16 devices).

8.2.6 DNP Network Unsolicited Retry Random Time Increment Mask

The DNP Network Unsolicited Retry Random Time Increment Mask setting is used to mask a random number generated by the DNP MINT which will be added (in 10 ms increments) to the DNP MINT to retry an unsuccessful (unconfirmed) unsolicited message transfer attempt. The additional time increment is added to the DNP Network Idle Time if a message different from the expected confirmation is received. It is added to the DNP Application Confirmation Wait Timeout if no response is received. This value is set in the DNP MINT summary table and applies to all DNP MINT messages (DNP MINT counters and its 16 devices).

8.2.7 DNP Data Link Confirmation Wait Timeout

The DNP Data Link Confirmation Wait Timeout setting is the number of 10 ms increments the DNP MINT will wait for a Data Link confirmation from the master device, providing data link confirmations are enabled (see **Section 8.2.4**). This value is set in the DNP MINT summary table and applies to all DNP MINT messages (DNP MINT counters and its 16 devices).

8.2.8 DNP Application Confirmation Wait Timeout

The DNP Application Confirmation Wait Timeout setting is the number of 10 ms increments the DNP MINT will wait for an application confirmation from the master device. This value is set in the DNP MINT summary table and applies to all DNP MINT messages (DNP MINT counters and its 16 devices).

8.2.9 INCOM Scan Level Settings

Configuration of each of the 16 virtual INCOM devices requires information such as an INCOM command scan list and various object point lists that the device will support. (This information is automatically generated when, for instance, a pre-defined configuration tag is selected.) In run mode, the DNP MINT will continually scan the 16 devices and enter the obtained information in a database. The scan sequence for the devices can be configured with a priority scheme to allow more important information to be refreshed in the database more often. The DNP MINT will sequence through all the Scan Level 1 (Poll) commands for all 16 devices. Upon completion the DNP MINT will then obtain all Scan Level 2 (Interleaved) commands for one of the devices. If the device has any Scan Level 2/3 (Timer2/Timer3) commands and the corresponding "INCOM Level 2/3 Scan Timer" has expired, the command will be included in the Interleaved command list. These "INCOM Level 2/3 Scan Timer" settings are the number of 1 second increments the DNP MINT will wait to insert the command into the Interleaved sequence.

Associated with each Scan Level is an "INCOM Scan Level Count To Generate Point Off-Line" setting. This setting is the number of consecutive times an object's data is not received from the INCOM device to flag a DNP "off-line" state. Note that each object (point) has an associated Scan Level. These settings have a count range of 0 to 15. A setting of 0 will force the "off-line" flag state. Any attempt to set a count to a value greater than 15 will force the setting to 15.

8.2.10 DNP Object Variation Default Settings

A Read (Function Code 01) request using Variation 0 from the master device allows the outstation to select the object variation of the response data. For the DNP MINT counter objects, the Variation will default to 6 (16-bit Binary Counter without Flag). For the 16 devices, the default Variation for each Group can be set, as listed in **Table 9**. If a setting contains a value not defined by DNP, that value will be indicated but the default value shown in the table will be used.

8.2.11 INCOM Address Settings

In order for one of the 16 virtual devices to be enabled and communicate to an INCOM device, a valid INCOM address must be configured. The "INCOM Main Address" setting must match the selected device's INCOM address. An invalid "INCOM Main Address" setting will disable communications on the INCOM network for that virtual device. Note that valid INCOM addresses range from 1 through 4095 ($0FFF_{16}$). The "INCOM Sub-Network Address" is reserved for future sub-network device access and cannot be changed from its 0 setting.

Counter (Device YY)	Definition		Tag Defaults
YY80$_{16}$	DNP Address	(equivalent to device's Counter of **Section 8.1**)	FFFF$_{16}$
YY81$_{16}$	Configuration Tag	(equivalent to device's Counter of **Section 8.1**)	1 - 34
YY82$_{16}$	DNP transfer protocol:		0000$_{16}$
	Low Byte = Outstation Confirmation Request Enable Bits:		
	3-0	Data Link Confirmation Retry Count	0
	4	Enable Unsolicited Event Data Link Confirm	0
	5	Enable Solicited Static/Event Data Link Confirm	0
	6	Enable Solicited Static Application Confirm	0
	High Byte = Unsolicited Event Generation Bits:		
	9	Enable Unsolicited Class 1 Events	0
	10	Enable Unsolicited Class 2 Events	0
	11	Enable Unsolicited Class 3 Events	0
	DNP Object Variation Defaults:		
YY83$_{16}$	Low Byte: Group 01 (Binary Input) Object Variation Default		1
	High Byte: Group 02 (Binary Input Change) Object Variation Default		1
YY84$_{16}$	Low Byte: Group 20 (Binary Counter) Object Variation Default		1
	High Byte: Group 21 (Frozen Counter) Object Variation Default		1
YY85$_{16}$	Low Byte: Group 22 (Binary Counter Change) Object Variation Default		1
	High Byte: Group 23 (Frozen Counter Change) Object Variation Default		1
YY86$_{16}$	Low Byte: Group 30 (Analog Input) Object Variation Default		1
	High Byte: Group 31 (Frozen Analog Input) Object Variation Default		1
YY87$_{16}$	Low Byte: Group 32 (Analog Input Change) Object Variation Default		1
	High Byte: Group 33 (Frozen Analog Input Change) Object Variation Default		1
YY88$_{16}$	Low Byte: Group 34 (Analog Input Deadband) Object Variation Default		2
	High Byte: (reserved)		0
YY89$_{16}$	INCOM Main Address	(equivalent to device's Counter of **Section 8.1**)	FFFF$_{16}$
YY8A$_{16}$	INCOM Sub-Network Address	(reserved)	0000$_{16}$
YY8B$_{16}$	INCOM Scan List Index:		
	Low Byte: INCOM Write Setpoints Enable / Command Scan Index		FF$_{16}$
	High Byte: INCOM Number of Commands to Scan		N

Table 9: Device Summary Table Definitions

8.2.12 INCOM Scan List Index Settings

Configuration of each of the 16 virtual INCOM devices requires information such as an INCOM command scan list and various object point lists that the device will support. (This information is automatically generated when, for instance, a pre-defined configuration tag is selected.) The "INCOM Scan List Index" setting provides two bytes associated with the INCOM command scan list. The high byte provides the number of commands in the scan list. After initial configuration, this byte value may be reduced to remove the later commands in the scan list. If the initial configuration has a pre-defined

configuration tag (1 through 34) the number can be reduced to any value less than the original tags scan number. If the initial configuration has a custom (file transferred) configuration tag the number can only be reduced from the current setting.

The low byte provides an enabling write setpoints feature. If the current INCOM scan list contains a read setpoints command (3 C 9) as the xth command in the list and this setting is set to x, write setpoints will be enabled. Any value not corresponding to the read setpoints command will disable the write setpoints feature.

8.3   Configuration With File Transfers

All configuration features within the DNP MINT are actually contained in EEPROM using configuration tables. The DNP MINT itself only requires the summary table described in **Table 8**. Each of the 16 virtual devices require a set of 4 tables:

    (1)   a summary table (**Table 9**) and appended INCOM scan command list,
    (2)   a binary points list,
    (3)   a non-binary points list and
    (4)   a control (operate) list.

For almost all applications, the pre-defined configurations described in **Section 8.1**, with possibly minor modifications described in **Section 8.2**, would self configure the DNP MINT and generate all the required configuration tables.

Each of these tables can be obtained from the DNP MINT in configuration mode with a simple form of the Read (Function Code 2) File (Group 70, Variation 5=Transport, Qualifier $5B_{16}$ = objects prefixed with 2 octet object size, free formatted) request. (Note: since this is a non-run mode, or configuration only, feature this simple File transaction does not require any Open/Close/etc. DNP File procedures.) The

prefixed with 2 octet object size contains the number of bytes to follow. The table requested is defined by a 32-bit File Handle field containing the DNP MINT (0) or device (1-16) ID followed by a 32-bit Block Number field containing the value 00 (summary table and appended INCOM scan command list information), 01 (binary points list information), 02 (non-binary points list information) or 03 (control list information).

The DNP MINT provides the ability to configure its summary table and/or the devices and their set of object points with a simple form of the Write (Function Code 2) File (Group 70, Variation 5=Transport, Qualifier $5B_{16}$ = objects prefixed with 2 octet object size, free formatted) request using file downloads. The format is equivalent to the read file function except the file information is appended.

These configurations require an extensive knowledge of the INCOM protocol. Additionally, its complexity and the need to interlinked settings between tables prohibit their discussion. Please contact Eaton Electrical if a specific configuration outside the pre-defined configurations is required.

Appendix A

DNP V3.00   **DEVICE PROFILE DOCUMENT**

Vendor Name:	Eaton Corporation
Device Name:	DNP MINT Translator V1.00
Highest DNP Level Supported:	For Requests: DNP-L1 (DNP-L3 without Freeze functionality)
	For Responses: DNP-L1 (DNP-L3 without Freeze functionality)
Device Function:	Slave
Maximum Data Link Frame Size:	Received: 292
(octets)	Transmitted: 292
Maximum Application Fragment Size:	Received: 249
(octets)	Transmitted: 1280
Maximum Data Link Retries:	Configurable from 0 to 15 (default set at 0) (Note 1)
Maximum Application Layer Retries:	None
Requires Data Link Confirmation:	Configurable (Note 1)
Requires Application Link Confirmation:	1) When sending multi-fragment responses
	(all except final fragment)
	2) When reporting Event Data
Timeouts While Waiting For:	
Data Link Confirm:	Configurable from 0 to 655.35 seconds (default: 0.50 seconds) (Note 1)
Complete Application Fragment:	None
Application Confirm:	Configurable from 0 to 655.35 seconds (default: 5.00 seconds) (Note 1)
Complete Application Response:	None
Executes Control Operations:	
Write Binary Outputs	Never
Select/Operate	Always (Only accepts requests for single CROB object header with:
(Select-to-Operate timeout	Group = 12, Varation = 01, Qualifier = 17_{16} or 28_{16},
= 10 seconds)	Latch On/Off, Count = 1, onTime = 0, offTime = 0, Status = 0)
Direct Operate	Always (Only accepts requests for single CROB object header with:
	Group = 12, Varation = 01, Qualifier = 17_{16} or 28_{16},
	Latch On/Off, Count = 1, onTime = 0, offTime = 0, Status = 0)
Direct Operate – No ACK	Always (Only accepts requests for single CROB object header with:
	Group = 12, Varation = 01, Qualifier = 17_{16} or 28_{16},
	Latch On/Off, Count = 1, onTime = 0, offTime = 0, Status = 0)
Count > 1	Never (must = 1)
Pulse On	Never
Pulse Off	Never
Latch On	Always
Latch Off	Always
Queue	Never (must 0 = Normal)
Clear Queue	Never (must 0 = Normal)
Trip / Close	Never (must 00 = NUL)
Reports Binary Input Change Events when no specific variation requested:	Only non-time-tagged
Reports timed-tagged Binary Input Change Events when no specific variation requested:	Never
Sends Unsolicited Responses:	Configurable (default: disabled) (Note 1)
	(idle wait time configurable from 0 to 655.35 seconds,
	default: 0.50 seconds) (Note 1)
Sends Static Data in Unsolicited Responses:	Never
Default Counter Object/Variation:	Delta and Frozen counters are not implemented.
Counters Roll Over at:	Configurable from 0 through $0FFFFFFFF_{16}$ (Note 1)
Sends Multi-Fragment Responses:	Yes

Additional Notes:
The list of object headers in a read request may not exceed what can be placed into a single frame.
Only Binary Counter 0 (Primary/Secondary/Cause), 1 (Product ID) and Setpoints can produce an event, if assigned to a class.
   The "deadband" is set to 0001_{16}. All other Binary Counter "deadbands" are set to 0FF ($0FFFFFFFF_{16}$).

Note 1: Configurable by download configuration.

		OBJECT	REQUEST		RESPONSE	
Grp	Var	Description	FC	Qual Codes (hex)	FC	Qual Codes (hex)
1	0	Binary Input: any variation (Def 1)	1	00, 01, 06	129	00, 01
1	1	Binary Input	1 2	00, 01, 06 00, 01, 17, 28 (*)	129	00, 01 (NULL)
1	2	Binary Input with Status	1	00, 01, 06	129	00, 01
2	0	Binary Input Change: any variation (Def 1)	1	06, 07, 08	129	17
2	1	Binary Input Change without time	1	06, 07, 08	129	17
12	1	Control Relay Output Block	3, 4, 5, 6	17, 28	129	echo request
20	0	Binary Counter: any variation (Def 1)	1	00, 01, 06	129	00, 01
20	1	Binary Counter: 32-bit counter	1	00, 01, 06	129	00, 01
20	2	Binary Counter: 16-bit counter	1	00, 01, 06	129	00, 01
20	5	Binary Counter: 32-bit counter without flag	1 2	00, 01, 06 00, 01, 17, 28 (*)	129	00, 01 (NULL)
20	6	Binary Counter: 16-bit counter without flag	1 2	00, 01, 06 00, 01, 17, 28 (*)	129	00, 01 (NULL)
22	0	Counter Change Event: any variation (Def 1)	1	06, 07, 08	129	17
22	1	Counter Change Event: 32-bit without time	1	06, 07, 08	129	17
22	2	Counter Change Event: 16-bit without time	1	06, 07, 08	129	17
30	0	Analog Input: any variation (Def 1)	1	00, 01, 06	129	00, 01
30	1	Analog Input: 32-bit	1	00, 01, 06	129	00, 01
30	2	Analog Input: 16-bit	1	00, 01, 06	129	00, 01
30	3	Analog Input: 32-bit without flag	1	00, 01, 06	129	00, 01
30	4	Analog Input: 16-bit without flag	1	00, 01, 06	129	00, 01
30	5	Analog Input: Short Floating Point	1	00, 01, 06	129	00, 01
32	0	Analog Input Change: any variation (Def 1)	1	06, 07, 08	129	17
32	1	Analog Input Change: 32-bit without time	1	06, 07, 08	129	17
32	2	Analog Input Change: 16-bit without time	1	06, 07, 08	129	17
32	5 (!)	Analog Input Change: Short Float w/o time	1	06, 07, 08	129	17
34	0	Analog Deadband: any variation (Def 2)	1	00, 01, 06	129	00, 01
34	1	Analog Deadband: 16-bit	1 2 (****)	00, 01, 06 00, 01, 17, 28	129	00, 01 (NULL)
34	2	Analog Deadband: 32-bit	1 2 (****)	00, 01, 06 00, 01, 17, 28	129	00, 01 (NULL)
34	3	Analog Deadband: Short Floating Point	1 2 (****)	00, 01, 06 00, 01, 17, 28	129	00, 01 (NULL)
60	1	Class 0 data	1 22	06 06 (**)	129	see BIN, BCNT, AIN (NULL)
60	2	Class 1 data	1 20, 21, 22	06, 07, 08 06 (**)	129	see BIN, BCNT, AIN (NULL)
60	3	Class 2 data	1 20, 21, 22	06, 07, 08 06 (**)	129	see BIN, BCNT, AIN (NULL)
60	4	Class 3 data	1 20, 21, 22	06, 07, 08 06 (**)	129	see BIN, BCNT, AIN (NULL)
80	1	Internal Indicators	1 2	00, 01, 06 00, 01 (***)	129	00, 01 (NULL)

(*)   Function Code 2 supported for Setpoint Objects only (if setpoint write feature for device is configured).
(**)   Function Code 22 sub-headers supported: see BIN, BCNT, AIN Function Code 1.
(***)   Function Code 2 Internal Indicator write supports Range start = 7, end = 7 only.
(****)   Analog Deadbands are stored in non-volatile memory, and are therefore preserved through reset.
(!)   Not Supported for DNP MINT Version 1.00

Appendix B

Pre-defined Configuration Points Lists

Tag	INCOM Device	Notes
1	MPCV Relay	Read Setpoints; Remote Control
2	MPCV Relay	Read Setpoints; No Control
3	MPCV Relay	No Setpoints; Remote Control
4	MPCV Relay	No Setpoints; No Control
5	MPCV Relay	Read/Write Setpoints; Remote Control
6	Generic Device	Fast Status S7,S6; 305 IA IB IC
7	Generic Device	Fast Status S7,S6; 305 IA IB IC IX
8	Generic Device	Fast Status S7,S6; 30F/03 IA IB IC
9	Generic Device	Fast Status S7,S6; 30F/03 IA IB IC IG
10	Generic Device	Fast Status S7,S6; 30F/03 IA IB IC IN
11	Generic Device	Fast Status S7,S6; 30F/03 IA IB IC IG IN
12	RMS Trip Unit	Fast Status S7,S6/Flags; 305 IA IB IC
13	RMS Trip Unit	Fast Status S7,S6/Flags; 305 IA IB IC IX
14	OPTIM Trip Unit	Fast Status S7,S6/Flags; 30F/03 IA IB IC
15	OPTIM Trip Unit	Fast Status S7,S6/Flags; 30F/03 IA IB IC IG
16	OPTIM Trip Unit	Fast Status S7,S6/Flags; 30F/03 IA IB IC IN
17	OPTIM Trip Unit	Fast Status S7,S6/Flags; 30F/03 IA IB IC IG IN
18	DigiTrip 520MC	301; IA IB IC
19	DigiTrip 520MC	301; IA IB IC IG
20	DigiTrip 520MC	301; IA IB IC IN
21	DigiTrip 520MC	301; IA IB IC IG IN
22	DT3000	
23	DP4000	Without Energy
24	DP4000	With Energy
25	DIM	
26	Addressable Relay	
27	DigiTrip 1150 cv0	302; IA IB IC
28	DigiTrip 1150 cv0	302; IA IB IC IG
29	DigiTrip 1150 cv0	302; IA IB IC IN
30	DigiTrip 1150 cv0	302; IA IB IC IG IN
31	DigiTrip 1150 cv1>	301; IA IB IC
32	DigiTrip 1150 cv1>	301; IA IB IC IG
33	DigiTrip 1150 cv1>	301; IA IB IC IN
34	DigiTrip 1150 cv1>	301; IA IB IC IG IN

Table 10: Device Assignments for Pre-Defined Configuration Tags

Configuration Tag 1:   **MPCV Relay with Read Setpoints and Remote Control**
Configuration Tag 5:   **MPCV Relay with Read/Write Setpoints and Remote Control**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	300 with 3C8	Fast Status & Flags Buffer	Poll
2	305	Current Buffer	Interleaved
3	3CD	MPCV Transformer And Network Voltages	Interleaved
4	30F N=3B	MPCV Phasing Voltage Phasors Buffer	Interleaved
5	308	Power Buffer (1)	Interleaved
6	309	Power Buffer (2)	Interleaved
7	3CA	MPCV Temperature Buffer	Interleaved
8	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed	Poll
6	Status	Remote Trip	Poll
7	Status	Protective Remote Close	Poll
8	Status	Aux #2 Active	Poll
9	Status	Aux #3 Active	Poll
10	Status	Aux #4 Active	Poll
11	Status	Protector Failed To Open Alarm	Poll
12	Status	Protector Failed To Close Alarm	Poll
13	Status	Aux #2 In Alarm	Poll
14	Status	Aux #3 In Alarm	Poll
15	Status	Aux #4 In Alarm	Poll
16	Status	Breaker Pumping	Poll
17	Setpoint	CBA Rotation	Timed3
18	Setpoint	Straight Line Master Line	Timed3
19	Setpoint	Watt / Var Enabled	Timed3
20	Setpoint	Pump Enabled	Timed3
21	Setpoint	Aux #2 In Use	Timed3
22	Setpoint	Aux #2 Alarm Enabled	Timed3
23	Setpoint	Aux #2 Normally Closed Contact	Timed3
24	Setpoint	Aux #3 In Use	Timed3
25	Setpoint	Aux #3 Alarm Enabled	Timed3
26	Setpoint	Aux #3 Normally Closed Contact	Timed3
27	Setpoint	Aux #4 In Use	Timed3
28	Setpoint	Aux #4 Alarm Enabled	Timed3
29	Setpoint	Aux #4 Normally Closed Contact	Timed3
30	Setpoint	Lag Var/PF sign convention (1 = + to load)	Timed3

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	V_{NA}	Interleaved
4	Data	V_{NB}	Interleaved
5	Data	V_{NC}	Interleaved
6	Data	V_{TA}	Interleaved
7	Data	V_{TB}	Interleaved
8	Data	V_{TC}	Interleaved
9	Data	V_{PA}	Interleaved
10	Data	V_{PB}	Interleaved
11	Data	V_{PC}	Interleaved
12	Data	V_{P1d}	Interleaved
13	Data	V_{P1q}	Interleaved
14	Data	Real Power (kW)	Interleaved
15	Data	Reactive Power (kVars)	Interleaved
16	Data	PF (%)	Interleaved
17	Data	Temperature (^{o}C)	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3
3	Setpoint	System Frequency	Timed3
4	Setpoint	System Voltage	Timed3
5	Setpoint	NWP CT Ratio	Timed3
6	Setpoint	Master Line (0.1V increments)	Timed3
7	Setpoint	Phasing Line (positive degrees, where -5° set as 355°)	Timed3
8	Setpoint	Phasing Line 1 (positive degrees, where -5° set as 355°)	Timed3
9	Setpoint	Left Hand Master Line (positive degrees)	Timed3
10	Setpoint	Reverse Trip (0.01% increments)	Timed3
11	Setpoint	Time Delay (1/4 second increments)	Timed3
12	Setpoint	Overcurrent	Timed3
13	Setpoint	Pump Cycles	Timed3
14	Setpoint	Pump Time	Timed3
15	Setpoint	Pump Lockout Reset Delay	Timed3

Control Output	Latch ON	Latch OFF
0	Open Circuit Breaker and Block Open	Clear Block Open
1	Protective Close	Clear Protective Close
2	Reset Pumping Fault	-----

Configuration Tag 2: **MPCV Relay with Read Setpoints and No Remote Control**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	300 with 3C8	Fast Status & Flags Buffer	Poll
2	305	Current Buffer	Interleaved
3	3CD	MPCV Transformer And Network Voltages	Interleaved
4	30F N=3B	MPCV Phasing Voltage Phasors Buffer	Interleaved
5	308	Power Buffer (1)	Interleaved
6	309	Power Buffer (2)	Interleaved
7	3CA	MPCV Temperature Buffer	Interleaved
8	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed	Poll
6	Status	Remote Trip	Poll
7	Status	Protective Remote Close	Poll
8	Status	Aux #2 Active	Poll
9	Status	Aux #3 Active	Poll
10	Status	Aux #4 Active	Poll
11	Status	Protector Failed To Open Alarm	Poll
12	Status	Protector Failed To Close Alarm	Poll
13	Status	Aux #2 In Alarm	Poll
14	Status	Aux #3 In Alarm	Poll
15	Status	Aux #4 In Alarm	Poll
16	Status	Breaker Pumping	Poll
17	Setpoint	CBA Rotation	Timed3
18	Setpoint	Straight Line Master Line	Timed3
19	Setpoint	Watt / Var Enabled	Timed3
20	Setpoint	Pump Enabled	Timed3
21	Setpoint	Aux #2 In Use	Timed3
22	Setpoint	Aux #2 Alarm Enabled	Timed3
23	Setpoint	Aux #2 Normally Closed Contact	Timed3
24	Setpoint	Aux #3 In Use	Timed3
25	Setpoint	Aux #3 Alarm Enabled	Timed3
26	Setpoint	Aux #3 Normally Closed Contact	Timed3
27	Setpoint	Aux #4 In Use	Timed3
28	Setpoint	Aux #4 Alarm Enabled	Timed3
29	Setpoint	Aux #4 Normally Closed Contact	Timed3
30	Setpoint	Lag Var/PF sign convention (1 = + to load)	Timed3

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	V_{NA}	Interleaved
4	Data	V_{NB}	Interleaved
5	Data	V_{NC}	Interleaved
6	Data	V_{TA}	Interleaved
7	Data	V_{TB}	Interleaved
8	Data	V_{TC}	Interleaved
9	Data	V_{PA}	Interleaved
10	Data	V_{PB}	Interleaved
11	Data	V_{PC}	Interleaved
12	Data	V_{P1d}	Interleaved
13	Data	V_{P1q}	Interleaved
14	Data	Real Power (kW)	Interleaved
15	Data	Reactive Power (kVars)	Interleaved
16	Data	PF (%)	Interleaved
17	Data	Temperature (^{o}C)	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3
3	Setpoint	System Frequency	Timed3
4	Setpoint	System Voltage	Timed3
5	Setpoint	NWP CT Ratio	Timed3
6	Setpoint	Master Line (0.1V increments)	Timed3
7	Setpoint	Phasing Line (positive degrees, where -5° set as 355°)	Timed3
8	Setpoint	Phasing Line 1 (positive degrees, where -5° set as 355°)	Timed3
9	Setpoint	Left Hand Master Line (positive degrees)	Timed3
10	Setpoint	Reverse Trip (0.01% increments)	Timed3
11	Setpoint	Time Delay (1/4 second increments)	Timed3
12	Setpoint	Overcurrent	Timed3
13	Setpoint	Pump Cycles	Timed3
14	Setpoint	Pump Time	Timed3
15	Setpoint	Pump Lockout Reset Delay	Timed3

Configuration Tag 3:   **MPCV Relay with No Setpoints and Remote Control**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	300 with 3C8	Fast Status & Flags Buffer	Poll
2	305	Current Buffer	Interleaved
3	3CD	MPCV Transformer And Network Voltages	Interleaved
4	30F N=3B	MPCV Phasing Voltage Phasors Buffer	Interleaved
5	308	Power Buffer (1)	Interleaved
6	309	Power Buffer (2)	Interleaved
7	3CA	MPCV Temperature Buffer	Interleaved
8	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed	Poll
6	Status	Remote Trip	Poll
7	Status	Protective Remote Close	Poll
8	Status	Aux #2 Active	Poll
9	Status	Aux #3 Active	Poll
10	Status	Aux #4 Active	Poll
11	Status	Protector Failed To Open Alarm	Poll
12	Status	Protector Failed To Close Alarm	Poll
13	Status	Aux #2 In Alarm	Poll
14	Status	Aux #3 In Alarm	Poll
15	Status	Aux #4 In Alarm	Poll
16	Status	Breaker Pumping	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	V_{NA}	Interleaved
4	Data	V_{NB}	Interleaved
5	Data	V_{NC}	Interleaved
6	Data	V_{TA}	Interleaved
7	Data	V_{TB}	Interleaved
8	Data	V_{TC}	Interleaved
9	Data	V_{PA}	Interleaved
10	Data	V_{PB}	Interleaved
11	Data	V_{PC}	Interleaved
12	Data	V_{P1d}	Interleaved
13	Data	V_{P1q}	Interleaved
14	Data	Real Power (kW)	Interleaved
15	Data	Reactive Power (kVars)	Interleaved
16	Data	PF (%)	Interleaved
17	Data	Temperature (^{o}C)	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	Open Circuit Breaker and Block Open	Clear Block Open
1	Protective Close	Clear Protective Close
2	Reset Pumping Fault	-----

Configuration Tag 4:   **MPCV Relay with No Setpoints and No Remote Control**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	300 with 3C8	Fast Status & Flags Buffer	Poll
2	305	Current Buffer	Interleaved
3	3CD	MPCV Transformer And Network Voltages	Interleaved
4	30F N=3B	MPCV Phasing Voltage Phasors Buffer	Interleaved
5	308	Power Buffer (1)	Interleaved
6	309	Power Buffer (2)	Interleaved
7	3CA	MPCV Temperature Buffer	Interleaved
8	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed	Poll
6	Status	Remote Trip	Poll
7	Status	Protective Remote Close	Poll
8	Status	Aux #2 Active	Poll
9	Status	Aux #3 Active	Poll
10	Status	Aux #4 Active	Poll
11	Status	Protector Failed To Open Alarm	Poll
12	Status	Protector Failed To Close Alarm	Poll
13	Status	Aux #2 In Alarm	Poll
14	Status	Aux #3 In Alarm	Poll
15	Status	Aux #4 In Alarm	Poll
16	Status	Breaker Pumping	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	V_{NA}	Interleaved
4	Data	V_{NB}	Interleaved
5	Data	V_{NC}	Interleaved
6	Data	V_{TA}	Interleaved
7	Data	V_{TB}	Interleaved
8	Data	V_{TC}	Interleaved
9	Data	V_{PA}	Interleaved
10	Data	V_{PB}	Interleaved
11	Data	V_{PC}	Interleaved
12	Data	V_{P1d}	Interleaved
13	Data	V_{P1q}	Interleaved
14	Data	Real Power (kW)	Interleaved
15	Data	Reactive Power (kVars)	Interleaved
16	Data	PF (%)	Interleaved
17	Data	Temperature (^{o}C)	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Configuration Tag 6:   **Generic Device**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	305	Current Buffer	Interleaved

Binary Input	Type	Description	Scan Level
0	Virtual	Device On-Line	Virtual
1	Status	S7-S6 state = 00	Poll
2	Status	S7-S6 state = 01	Poll
3	Status	S7-S6 state = 10	Poll
4	Status	S7-S6 state = 11	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll

Configuration Tag 7: **Generic Device**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	305	Current Buffer	Interleaved

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	S7-S6 state = 00	Poll
2	Status	S7-S6 state = 01	Poll
3	Status	S7-S6 state = 10	Poll
4	Status	S7-S6 state = 11	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_X (I_G or I_N)	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll

Configuration Tag 8:   **Generic Device**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	30F N=3	Current Buffer	Interleaved

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	S7-S6 state = 00	Poll
2	Status	S7-S6 state = 01	Poll
3	Status	S7-S6 state = 10	Poll
4	Status	S7-S6 state = 11	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll

Configuration Tag 9: **Generic Device**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	30F N=3	Current Buffer	Interleaved

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	S7-S6 state = 00	Poll
2	Status	S7-S6 state = 01	Poll
3	Status	S7-S6 state = 10	Poll
4	Status	S7-S6 state = 11	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_G	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll

Configuration Tag 10: **Generic Device**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	30F N=3	Current Buffer	Interleaved

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	S7-S6 state = 00	Poll
2	Status	S7-S6 state = 01	Poll
3	Status	S7-S6 state = 10	Poll
4	Status	S7-S6 state = 11	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_N	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll

Configuration Tag 11:   **Generic Device**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	30F N=3	Current Buffer	Interleaved

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	S7-S6 state = 00	Poll
2	Status	S7-S6 state = 01	Poll
3	Status	S7-S6 state = 10	Poll
4	Status	S7-S6 state = 11	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_G	Interleaved
4	Data	I_N	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll

Configuration Tag 12: **RMS Trip Unit**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	300 with 3C8	Fast Status & Flags Buffer	Poll
2	305	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Configuration Tag 13:   RMS Trip Unit

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	300 with 3C8	Fast Status & Flags Buffer	Poll
2	305	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_X (I_G or I_N)	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Configuration Tag 14: **Optim Trip Unit**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	300 with 3C8	Fast Status & Flags Buffer	Poll
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Configuration Tag 15:   **Optim Trip Unit**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	300 with 3C8	Fast Status & Flags Buffer	Poll
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_G	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Configuration Tag 16: **Optim Trip Unit**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	300 with 3C8	Fast Status & Flags Buffer	Poll
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_N	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Configuration Tag 17:   **Optim Trip Unit**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	300 with 3C8	Fast Status & Flags Buffer	Poll
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_G	Interleaved
4	Data	I_N	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Configuration Tag 18: **DigiTrip 520MC**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	301	Primary / Secondary / Cause	Interleaved
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed (S6 state)	Poll
6	Status	Remote Trip (S5 state)	Poll
7	Status	Alarms Active (S0 state)	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Interleaved
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Trip	-----
3	Reset Product Statistics	-----
4	Reset Power-Up Indicator	-----

Configuration Tag 19:   **DigiTrip 520MC**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	301	Primary / Secondary / Cause	Interleaved
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed (S6 state)	Poll
6	Status	Remote Trip (S5 state)	Poll
7	Status	Alarms Active (S0 state)	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_G	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Interleaved
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Trip	-----
3	Reset Product Statistics	-----
4	Reset Power-Up Indicator	-----

Configuration Tag 20: **DigiTrip 520MC**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	301	Primary / Secondary / Cause	Interleaved
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed (S6 state)	Poll
6	Status	Remote Trip (S5 state)	Poll
7	Status	Alarms Active (S0 state)	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_N	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Interleaved
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Trip	-----
3	Reset Product Statistics	-----
4	Reset Power-Up Indicator	-----

Configuration Tag 21:   **DigiTrip 520MC**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	301	Primary / Secondary / Cause	Interleaved
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed (S6 state)	Poll
6	Status	Remote Trip (S5 state)	Poll
7	Status	Alarms Active (S0 state)	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_G	Interleaved
4	Data	I_N	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Interleaved
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Trip	-----
3	Reset Product Statistics	-----
4	Reset Power-Up Indicator	-----

Configuration Tag 22: **DT3000**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	300 with 3C8	Fast Status & Flags Buffer	Poll
2	305	Current Buffer	Interleaved
3	30F N=2	Peak Demand Currents Buffer	Interleaved
4	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed	Poll
6	Status	Remote Trip	Poll
7	Status	Time Overcurrent - Long Delay - Trip (LDFLG)	Poll
8	Status	Short Delay Trip (SDFLG)	Poll
9	Status	Instantaneous Trip (INSTFLG)	Poll
10	Status	Discriminator Trip (DISCFLG)	Poll
11	Status	Ground Fault (GNDFLG)	Poll
12	Status	High Load Alarm (HLFLG)	Poll
13	Status	Long Delay Protection In Progress (LDPUFLG)	Poll
14	Status	Breaker Trip (TRIPFLG)	Poll
15	Status	RAM Error (RAMFLG)	Poll
16	Status	EEROM Error (EEROMFLG)	Poll
17	Status	Phase Long Delay Zone Interlock In (PHASE_ZIN)	Poll
18	Status	Override Trip (OVERFLG)	Poll
19	Status	Ground Long Delay Zone Interlock In (GND_ZIN)	Poll
20	Status	External Trip, via INCOM (EXTFLG)	Poll
21	Status	Program Mode (Pgm_Mode)	Poll
22	Status	Test Mode (Test_Mode_Flg)	Poll
23	Status	Ground Long Delay Has Picked-Up (GLDPUFLG)	Poll
24	Status	Phase Short Delay Has Picked-Up (PSDPUFLG)	Poll
25	Status	Ground Short Delay Has Picked-Up (GSDPUFLG)	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_G	Interleaved
4	Data	Peak Demand I_A	Interleaved
5	Data	Peak Demand I_B	Interleaved
6	Data	Peak Demand I_C	Interleaved
7	Data	Peak Demand I_G	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Trip	-----
3	Reset Product Statistics	-----
4	Reset Peak Demand Currents	-----
5	Reset Alarm	-----

Configuration Tag 23: **DP4000 without Energy**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	300 with 3C8	Fast Status & Flags Buffer	Poll
2	305	Current Buffer	Interleaved
3	307	Line-to-Neutral Voltage Buffer	Interleaved
4	306	Line-to-Line Voltage Buffer	Interleaved
5	30F N=6	Power Buffer	Interleaved
6	30F N=1A	Demand & Peak Average Current Buffer	Interleaved
7	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	Alarm (S7-S6 state = 11)	Poll
5	Status	DP-4000 Alarm	Poll
6	Status	Remote Trip	Poll
7	Status	RL1 Energized	Poll
8	Status	RL1 Loss Phase Current	Poll
9	Status	RL1 Phase Reverse	Poll
10	Status	RL1 Phase Unbalance	Poll
11	Status	RL1 Loss Phase Voltage	Poll
12	Status	RL1 Under voltage	Poll
13	Status	RL1 Over Voltage	Poll
14	Status	RL1 IMPACC	Poll
15	Status	RL1 Alarm	Poll
16	Status	RL2 Energized	Poll
17	Status	RL2 Loss Phase Current	Poll
18	Status	RL2 Phase Reverse	Poll
19	Status	RL2 Phase Unbalance	Poll
20	Status	RL2 Loss Phase Voltage	Poll
21	Status	RL2 Under voltage	Poll
22	Status	RL2 Over Voltage	Poll
23	Status	RL2 IMPACC	Poll
24	Status	RL2 Alarm	Poll
25	Status	Pulse Init RL Energized	Poll
26	Status	RAM Failure	Poll
27	Status	ROM Failure	Poll
28	Status	A/D Error	Poll
29	Status	EEPROM Failure	Poll
30	Status	Deadman Error	Poll

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Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	V_{AN}	Interleaved
4	Data	V_{BN}	Interleaved
5	Data	V_{CN}	Interleaved
6	Data	V_{AB}	Interleaved
7	Data	V_{BC}	Interleaved
8	Data	V_{CA}	Interleaved
9	Data	Real Power (kW)	Interleaved
10	Data	Reactive Power (kVars)	Interleaved
11	Data	Voltamperes (kVA)	Interleaved
12	Data	PF Displacement (%)	Interleaved
13	Data	PF Apparent (%)	Interleaved
14	Data	Frequency (Hz)	Interleaved
15	Data	Peak Demand I_A	Interleaved
16	Data	Peak Demand I_B	Interleaved
17	Data	Peak Demand I_C	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Trip (Alarm 1)	-----
3	Reset Product Statistics	-----
4	Reset Peak Demand Currents	-----
5	Reset Alarm (Alarm 2)	-----
6	Activate Relay 1	Deactivate Relay 1
7	Activate Relay 2	Deactivate Relay 2

Configuration Tag 24: **DP4000 with Energy**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	300 with 3C8	Fast Status & Flags Buffer	Poll
2	305	Current Buffer	Interleaved
3	307	Line-to-Neutral Voltage Buffer	Interleaved
4	306	Line-to-Line Voltage Buffer	Interleaved
5	30F N=6	Power Buffer	Interleaved
6	30F N=1A	Demand & Peak Average Current Buffer	Interleaved
7	3C9	Setpoints Buffer	Timed3
8	308	Power Buffer (1)	Interleaved

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	Alarm (S7-S6 state = 11)	Poll
5	Status	DP-4000 Alarm	Poll
6	Status	Remote Trip	Poll
7	Status	RL1 Energized	Poll
8	Status	RL1 Loss Phase Current	Poll
9	Status	RL1 Phase Reverse	Poll
10	Status	RL1 Phase Unbalance	Poll
11	Status	RL1 Loss Phase Voltage	Poll
12	Status	RL1 Under voltage	Poll
13	Status	RL1 Over Voltage	Poll
14	Status	RL1 IMPACC	Poll
15	Status	RL1 Alarm	Poll
16	Status	RL2 Energized	Poll
17	Status	RL2 Loss Phase Current	Poll
18	Status	RL2 Phase Reverse	Poll
19	Status	RL2 Phase Unbalance	Poll
20	Status	RL2 Loss Phase Voltage	Poll
21	Status	RL2 Under voltage	Poll
22	Status	RL2 Over Voltage	Poll
23	Status	RL2 IMPACC	Poll
24	Status	RL2 Alarm	Poll
25	Status	Pulse Init RL Energized	Poll
26	Status	RAM Failure	Poll
27	Status	ROM Failure	Poll
28	Status	A/D Error	Poll
29	Status	EEPROM Failure	Poll
30	Status	Deadman Error	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	V_{AN}	Interleaved
4	Data	V_{BN}	Interleaved
5	Data	V_{CN}	Interleaved
6	Data	V_{AB}	Interleaved
7	Data	V_{BC}	Interleaved
8	Data	V_{CA}	Interleaved
9	Data	Real Power (kW)	Interleaved
10	Data	Reactive Power (kVars)	Interleaved
11	Data	Voltamperes (kVA)	Interleaved
12	Data	PF Displacement (%)	Interleaved
13	Data	PF Apparent (%)	Interleaved
14	Data	Frequency (Hz)	Interleaved
15	Data	Peak Demand I_A	Interleaved
16	Data	Peak Demand I_B	Interleaved
17	Data	Peak Demand I_C	Interleaved
18	Data	Energy (kWh)	Interleaved
19	Data	Energy (kVarh)	Interleaved
20	Data	Energy (kVAh)	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Poll
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Trip (Alarm 1)	-----
3	Reset Product Statistics	-----
4	Reset Peak Demand Currents	-----
5	Reset Alarm (Alarm 2)	-----
6	Activate Relay 1	Deactivate Relay 1
7	Activate Relay 2	Deactivate Relay 2

Configuration Tag 25:   DIM

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	3C8	Flags Buffer	Poll
2	301	Primary / Secondary / Cause	Interleaved
3	3C9	Setpoints Buffer	Timed3

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Normal – unused (S7-S6 state = 00)	Poll
2	Status	Normal – Active (S7-S6 state = 01)	Poll
3	Status	Abnormal – unused (S7-S6 state = 10)	Poll
4	Status	Abnormal – Active (S7-S6 state = 11)	Poll
5	Status	B0: Input Y1 Active	Poll
6	Status	B1: Input Z1 Active	Poll
7	Status	B2: Input Y2 Active	Poll
8	Status	B3: Input Z2 Active	Poll
9	Status	B4: Input Y3 Active	Poll
10	Status	B5: Input Z3 Active	Poll
11	Status	B6: Input Y4 Active	Poll
12	Status	B7: Input Z4 Active	Poll

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Interleaved
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Alarm	-----

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Configuration Tag 26: **Addressable Relay**

Command Number	INCOM Command	Command Description	Scan Level
0	F00	Stand-Alone Slave Status	Poll

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Input #1 Active	Poll
2	Status	Input #2 Active	Poll

Control Output	Latch ON	Latch OFF
0	Energize Relay	De-energize Relay

Configuration Tag 27:   **DigiTrip 1150 cv0**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	302	Primary / Secondary / Cause	Interleaved
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3
4	306	Line-to-Line Voltage Buffer	Interleaved
5	30F N=6	Power Buffer	Interleaved
6	30F N=12	Peak Demand Power Buffer	Interleaved
7	30F N=41	Trip Unit Energy Buffer	Interleaved

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed (S6 state)	Poll
6	Status	Remote Trip (S5 state)	Poll
7	Status	Alarms Active (S0 state)	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	V_{AB}	Interleaved
4	Data	V_{BC}	Interleaved
5	Data	V_{CA}	Interleaved
6	Data	Real Power (kW)	Interleaved
7	Data	Reactive Power (kVars)	Interleaved
8	Data	Voltamperes (kVA)	Interleaved
9	Data	PF Apparent (%)	Interleaved
10	Data	Frequency (Hz)	Interleaved
11	Data	Demand (kW)	Interleaved
12	Data	Peak Demand (kW)	Interleaved
13	Data	Demand (kVA)	Interleaved
14	Data	Energy (kWh)	Interleaved
15	Data	Energy (kVAh)	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Interleaved
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Trip	-----
3	Reset Product Statistics	-----
4	Reset Power-Up Indicator	-----
5	Reset Peak Demands	-----

Configuration Tag 28:   DigiTrip 1150 cv0

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	302	Primary / Secondary / Cause	Interleaved
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3
4	306	Line-to-Line Voltage Buffer	Interleaved
5	30F N=6	Power Buffer	Interleaved
6	30F N=12	Peak Demand Power Buffer	Interleaved
7	30F N=41	Trip Unit Energy Buffer	Interleaved

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed (S6 state)	Poll
6	Status	Remote Trip (S5 state)	Poll
7	Status	Alarms Active (S0 state)	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_G	Interleaved
4	Data	V_{AB}	Interleaved
5	Data	V_{BC}	Interleaved
6	Data	V_{CA}	Interleaved
7	Data	Real Power (kW)	Interleaved
8	Data	Reactive Power (kVars)	Interleaved
9	Data	Voltamperes (kVA)	Interleaved
10	Data	PF Apparent (%)	Interleaved
11	Data	Frequency (Hz)	Interleaved
12	Data	Demand (kW)	Interleaved
13	Data	Peak Demand (kW)	Interleaved
14	Data	Demand (kVA)	Interleaved
15	Data	Energy (kWh)	Interleaved
16	Data	Energy (kVAh)	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Interleaved
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Trip	-----
3	Reset Product Statistics	-----
4	Reset Power-Up Indicator	-----
5	Reset Peak Demands	-----

Configuration Tag 29: DigiTrip 1150 cv0

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	302	Primary / Secondary / Cause	Interleaved
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3
4	306	Line-to-Line Voltage Buffer	Interleaved
5	30F N=6	Power Buffer	Interleaved
6	30F N=12	Peak Demand Power Buffer	Interleaved
7	30F N=41	Trip Unit Energy Buffer	Interleaved

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed (S6 state)	Poll
6	Status	Remote Trip (S5 state)	Poll
7	Status	Alarms Active (S0 state)	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_N	Interleaved
4	Data	V_{AB}	Interleaved
5	Data	V_{BC}	Interleaved
6	Data	V_{CA}	Interleaved
7	Data	Real Power (kW)	Interleaved
8	Data	Reactive Power (kVars)	Interleaved
9	Data	Voltamperes (kVA)	Interleaved
10	Data	PF Apparent (%)	Interleaved
11	Data	Frequency (Hz)	Interleaved
12	Data	Demand (kW)	Interleaved
13	Data	Peak Demand (kW)	Interleaved
14	Data	Demand (kVA)	Interleaved
15	Data	Energy (kWh)	Interleaved
16	Data	Energy (kVAh)	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Interleaved
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Trip	-----
3	Reset Product Statistics	-----
4	Reset Power-Up Indicator	-----
5	Reset Peak Demands	-----

Configuration Tag 30:   **DigiTrip 1150 cv0**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	302	Primary / Secondary / Cause	Interleaved
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3
4	306	Line-to-Line Voltage Buffer	Interleaved
5	30F N=6	Power Buffer	Interleaved
6	30F N=12	Peak Demand Power Buffer	Interleaved
7	30F N=41	Trip Unit Energy Buffer	Interleaved

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed (S6 state)	Poll
6	Status	Remote Trip (S5 state)	Poll
7	Status	Alarms Active (S0 state)	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_G	Interleaved
4	Data	I_N	Interleaved
5	Data	V_{AB}	Interleaved
6	Data	V_{BC}	Interleaved
7	Data	V_{CA}	Interleaved
8	Data	Real Power (kW)	Interleaved
9	Data	Reactive Power (kVars)	Interleaved
10	Data	Voltamperes (kVA)	Interleaved
11	Data	PF Apparent (%)	Interleaved
12	Data	Frequency (Hz)	Interleaved
13	Data	Demand (kW)	Interleaved
14	Data	Peak Demand (kW)	Interleaved
15	Data	Demand (kVA)	Interleaved
16	Data	Energy (kWh)	Interleaved
17	Data	Energy (kVAh)	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Interleaved
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Trip	-----
3	Reset Product Statistics	-----
4	Reset Power-Up Indicator	-----
5	Reset Peak Demands	-----

Configuration Tag 31:   DigiTrip 1150 cv1 >

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	301	Primary / Secondary / Cause	Interleaved
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3
4	306	Line-to-Line Voltage Buffer	Interleaved
5	30F N=6	Power Buffer	Interleaved
6	30F N=12	Peak Demand Power Buffer	Interleaved
7	30F N=41	Trip Unit Energy Buffer	Interleaved

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed (S6 state)	Poll
6	Status	Remote Trip (S5 state)	Poll
7	Status	Alarms Active (S0 state)	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	V_{AB}	Interleaved
4	Data	V_{BC}	Interleaved
5	Data	V_{CA}	Interleaved
6	Data	Real Power (kW)	Interleaved
7	Data	Reactive Power (kVars)	Interleaved
8	Data	Voltamperes (kVA)	Interleaved
9	Data	PF Apparent (%)	Interleaved
10	Data	Frequency (Hz)	Interleaved
11	Data	Demand (kW)	Interleaved
12	Data	Peak Demand (kW)	Interleaved
13	Data	Demand (kVA)	Interleaved
14	Data	Energy (kWh)	Interleaved
15	Data	Energy (kVAh)	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Interleaved
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Trip	-----
3	Reset Product Statistics	-----
4	Reset Power-Up Indicator	-----
5	Reset Peak Demands	-----

Configuration Tag 32:   **DigiTrip 1150 cv1 >**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	301	Primary / Secondary / Cause	Interleaved
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3
4	306	Line-to-Line Voltage Buffer	Interleaved
5	30F N=6	Power Buffer	Interleaved
6	30F N=12	Peak Demand Power Buffer	Interleaved
7	30F N=41	Trip Unit Energy Buffer	Interleaved

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed (S6 state)	Poll
6	Status	Remote Trip (S5 state)	Poll
7	Status	Alarms Active (S0 state)	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_G	Interleaved
4	Data	V_{AB}	Interleaved
5	Data	V_{BC}	Interleaved
6	Data	V_{CA}	Interleaved
7	Data	Real Power (kW)	Interleaved
8	Data	Reactive Power (kVars)	Interleaved
9	Data	Voltamperes (kVA)	Interleaved
10	Data	PF Apparent (%)	Interleaved
11	Data	Frequency (Hz)	Interleaved
12	Data	Demand (kW)	Interleaved
13	Data	Peak Demand (kW)	Interleaved
14	Data	Demand (kVA)	Interleaved
15	Data	Energy (kWh)	Interleaved
16	Data	Energy (kVAh)	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Interleaved
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Trip	-----
3	Reset Product Statistics	-----
4	Reset Power-Up Indicator	-----
5	Reset Peak Demands	-----

Configuration Tag 33:   **DigiTrip 1150 cv1 >**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	301	Primary / Secondary / Cause	Interleaved
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3
4	306	Line-to-Line Voltage Buffer	Interleaved
5	30F N=6	Power Buffer	Interleaved
6	30F N=12	Peak Demand Power Buffer	Interleaved
7	30F N=41	Trip Unit Energy Buffer	Interleaved

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed (S6 state)	Poll
6	Status	Remote Trip (S5 state)	Poll
7	Status	Alarms Active (S0 state)	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_N	Interleaved
4	Data	V_{AB}	Interleaved
5	Data	V_{BC}	Interleaved
6	Data	V_{CA}	Interleaved
7	Data	Real Power (kW)	Interleaved
8	Data	Reactive Power (kVars)	Interleaved
9	Data	Voltamperes (kVA)	Interleaved
10	Data	PF Apparent (%)	Interleaved
11	Data	Frequency (Hz)	Interleaved
12	Data	Demand (kW)	Interleaved
13	Data	Peak Demand (kW)	Interleaved
14	Data	Demand (kVA)	Interleaved
15	Data	Energy (kWh)	Interleaved
16	Data	Energy (kVAh)	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Interleaved
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Trip	-----
3	Reset Product Statistics	-----
4	Reset Power-Up Indicator	-----
5	Reset Peak Demands	-----

Configuration Tag 34: **DigiTrip 1150 cv1 >**

Command Number	INCOM Command	Command Description	Scan Level
0	300	Fast Status	Poll
1	301	Primary / Secondary / Cause	Interleaved
2	30F N=3	Current Buffer	Interleaved
3	3C9	Setpoints Buffer	Timed3
4	306	Line-to-Line Voltage Buffer	Interleaved
5	30F N=6	Power Buffer	Interleaved
6	30F N=12	Peak Demand Power Buffer	Interleaved
7	30F N=41	Trip Unit Energy Buffer	Interleaved

Binary Input	Type	Description	Scan Level
0	Status	Device On-Line	Virtual
1	Status	Open (S7-S6 state = 00)	Poll
2	Status	Closed (S7-S6 state = 01)	Poll
3	Status	Tripped (S7-S6 state = 10)	Poll
4	Status	LDPU Alarm (S7-S6 state = 11)	Poll
5	Status	Breaker Closed (S6 state)	Poll
6	Status	Remote Trip (S5 state)	Poll
7	Status	Alarms Active (S0 state)	Poll

Analog Input	Type	Description	Scan Level
0	Data	I_A	Interleaved
1	Data	I_B	Interleaved
2	Data	I_C	Interleaved
3	Data	I_G	Interleaved
4	Data	I_N	Interleaved
5	Data	V_{AB}	Interleaved
6	Data	V_{BC}	Interleaved
7	Data	V_{CA}	Interleaved
8	Data	Real Power (kW)	Interleaved
9	Data	Reactive Power (kVars)	Interleaved
10	Data	Voltamperes (kVA)	Interleaved
11	Data	PF Apparent (%)	Interleaved
12	Data	Frequency (Hz)	Interleaved
13	Data	Demand (kW)	Interleaved
14	Data	Peak Demand (kW)	Interleaved
15	Data	Demand (kVA)	Interleaved
16	Data	Energy (kWh)	Interleaved
17	Data	Energy (kVAh)	Interleaved

Counter Input	Type	Description	Scan Level
0	Data	Primary / Secondary / Cause	Interleaved
1	Data	INCOM Product ID	Poll
2	Data	Firmware Version / Revision	Timed3

Control Output	Latch ON	Latch OFF
0	-----	-----
1	-----	-----
2	Reset Trip	-----
3	Reset Product Statistics	-----
4	Reset Power-Up Indicator	-----
5	Reset Peak Demands	-----

Appendix C

C.1 Primary / Secondary / Cause Binary Counter

The Primary / Secondary / Cause binary counter object is a 32-bit encoded value. The high byte of the high word (bits 31-24) is the primary status as listed in **Table 11**. The low byte of the high word (bits 23-16) is the secondary status as listed in **Table 12**. The low word (bits 15-0) is the cause–of–status (pertaining to the primary status) as listed in **Table 13**.

Code	Definition	Code	Definition
0	Unknown	19	Phase A Alarm
1	Open	20	Phase B Alarm
2	Closed	21	Phase C Alarm
3	Tripped	22	Neutral Alarm
4	Alarmed	23	Ground / Earth Alarm
5	On	24	Phase AB Alarm
6	Off	25	Phase BC Alarm
7	Ready	26	Phase CA Alarm
8	Starting	27	On Good Source
9	Operational	28	Running
10	Stopped		**Reserved 29 … 251**
11	Locked-out		
12	Transferred		
13	Picked-up		
14	Phase A Trip		
15	Phase B Trip	252	Product Specific Code 252
16	Phase C Trip	253	Product Specific Code 253
17	Neutral Trip	254	Product Specific Code 254
18	Ground / Earth Trip	255	Product Specific Code 255

Table 11: Primary Status Code Definitions

Code	Definition	Code	Definition
0	Unknown	9	**Reserved 9 … 27**
1	Not applicable		
2	Program mode		
3	Test mode		
4	Disabled		
5	Disarmed	28	Product Specific Code 28
6	Controlled device failed to operate	27	Product Specific Code 29
7	Powered up	30	Product Specific Code 30
8	Alarm	31	Product Specific Code 31

Table 12: Secondary Status Code Definitions

Code	Definition	Code	Definition
0	Unknown	40	Diagnostic failure #1
1	Normal operating mode	41	Low Battery
2	External Condition #1	42	Multiple causes
3	Instantaneous Phase Overcurrent	43	Diagnostic warning #2
4	Instantaneous Ground Overcurrent	44	Diagnostic warning #3
5	Instantaneous Neutral Overcurrent	45	Diagnostic warning #4
6	Instantaneous Residual Overcurrent	46	Diagnostic warning #5
7	Phase Inverse-Time Overcurrent	47	Diagnostic warning #6
8	Ground Inverse-Time Overcurrent	48	Diagnostic warning #7
9	Neutral Inverse-Time Overcurrent	49	Diagnostic warning #8
10	Residual Inverse-Time Overcurrent	50	Diagnostic warning #9
11	Over Voltage	51	Diagnostic warning #10
12	Under Voltage	52	Diagnostic failure #2
13	Auxiliary Over Voltage	53	Diagnostic failure #3
14	Auxiliary Under Voltage	54	Diagnostic failure #4
15	Under Frequency	55	Diagnostic failure #5
16	Over Frequency	56	Diagnostic failure #6
17	Current Unbalance	57	Diagnostic failure #7
18	Voltage Unbalance	58	Diagnostic failure #8
19	Apparent Power Factor	59	Diagnostic failure #9
20	Displacement Power Factor	60	Diagnostic failure #10
21	Zone Interlock Phase	61	Long Delay Phase Overcurrent
22	Zone Interlock Ground	62	Short Delay Phase Overcurrent
23	Watt	63	Fixed Instantaneous Phase Overcurrent #1
24	VA	64	Bad / Missing Rating Plug
25	Var	65	Reverse Power
26	Power Demand	66	Fixed Instantaneous Phase Overcurrent #2
27	VA Demand	67	Reverse Phase
28	Var Demand	68	Reverse Sequence
29	Current Demand	69	Phase Current Loss
30	Total Harmonic Distortion	70	Phase Voltage Loss
31	Operations Count	71	Alarm Active
32	Contact Maintenance	72	Bad Frame
33	Control via Communications	73	Phase Currents Near Pickup
34	Contact Disagreement	74	Lockout
35	Breaker Failure	75	Making Current Release
36	Operation Time Exceeded	76	Fixed Instantaneous Phase Overcurrent #3
37	Coil Supervision	77	Setpoints Error
38	Programmable Logic	78	Over-temperature
39	Diagnostic warning #1	79	Accessory Bus

Table 13: Cause-of-Status Code Definitions

Code	Definition	Code	Definition
80	Long Delay Neutral Overcurrent	120	Failed to Sync On Phase
81	External Condition #2	121	Failed to Sync On Frequency
82	Historical Data	122	Failed to Sync On Voltage
83	External Condition #3	123	Anti-Backspin
84	Ground Fault (Instantaneous or Delay)	124	Zero Speed
85	Earth Fault (Instantaneous or Delay)	125	Time Between Starts
86	External Condition #4	126	Source 1
87	External Condition #5	127	Source 2
88	External Condition #6	128	Start
89	External Condition #7	129	Manual
90	External Condition #8	130	Synchronizing
91	External Condition #9	131	Starts Per Hour
92	Multiple External Conditions	132	Preferred Source
93	Motor Bearing Temperature	133	Plant Exerciser
94	Load Bearing Temperature	134	Neutral Ground Overvoltage
95	Auxiliary Temperature	135	Safety Interlock
96	Winding Temperature	136	Real Time Clock
97	Local Temperature	137	High Floating Voltage
98	External Temperature	138	Trip Blocked
99	Rolled Phase	139	Incomplete Sequence
100	Per Unit Voltage	140	Cause N/A (none)
101	Sensitive	141	Trip Position
102	Deenergize	142	Voltage Transient
103	Non Sensitive	143	Tamper
104	Time Delayed Sensitive	144	RTD
105	Breaker Pumping	145	Differential
106	Sub-network Malfunction	146	Frequency Out Of Range
107	Learning	147	Sensor Mismatch
108	Off-line	148	Check Aux Switch
109	Test	149	Overcurrent
110	Jam	150	Time Delayed Watt-Var
111	Under Load	151	Overcurrent Watt-Var
112	Delay Ground Overcurrent	152	Power
113	Calibration		**Reserved 153 … 2043**
114	Emergency		
115	Torque Limit		
116	Deceleration	2044	Product Specific Code 2044
117	Voltage Sag	2045	Product Specific Code 2045
118	Voltage Swell	2046	Product Specific Code 2046
119	Programming Error	2047	Product Specific Code 2047

Table 13: Cause-of-Status Code Definitions , continued.

C.2   INCOM Product ID Binary Counter

The INCOM Product ID binary counter object is a 16-bit encoded value. Bits 15-10 are defined as the "product ID" field. Bits 9-6 are defined as the "INCOM communications version" field. Bits 5-0 are defined as the "division code" field. Refer to IL 17384 for the INCOM Communication Protocol definitions for all INCOM devices.

C.3   Firmware Version / Revision Binary Counter

The INCOM Firmware Version / Revision binary counter object is a 16-bit encoded value. Bits 15-8 (high byte) are defined as the device's firmware version. Bits 7-0 (low byte) are defined as the firmware revision. Refer to IL 17384 for the INCOM Communication Protocol definitions for all INCOM devices.

Appendix D

D.1   MPCV Relay

Refer to IB 02402001E for MPCV Relay operation details.   Section 220 of IL 17384 contains the INCOM Communication Protocol definitions of the MPCV Relay.

The decoding of the Primary-Secondary-Cause Binary Counter Object (Point 0) for the MPCV Relay is listed in **Table 14**.

Binary Pt 5: Protector Open (0) / Closed (1) Status	Binary Pt 4: Alarm (Fast Status S7 S6 = 11)	Binary Pt 3: Tripped (Fast Status S7 S6 = 10)	Binary Pt 2: Closed (Fast Status S7 S6 = 00)	Binary Pt 1: Open (Fast Status (S7 S6 = 01)		Primary Status Code	Secondary Status Code	Cause-of-Status Code	
CL					Status	P	S	C	Cause-of-Status Definition
1	0	0	1	0	Closed	2	1	1	Normal Operating Mode
0	0	0	0	1	Open	1	1	1	Normal Operating Mode
0	0	0	0	1	Open	1	1	33	Control via Communications
0	0	1	0	0	Trip	3	1	67	Reverse Phase
0	0	1	0	0	Trip	3	1	99	Rolled phase
0	0	1	0	0	Trip	3	1	100	Per Unit Voltage
0	0	1	0	0	Trip	3	1	101	Sensitive
0	0	1	0	0	Trip	3	1	104	Time Delayed Sensitive
0	0	1	0	0	Trip	3	1	102	Deenergized
0	0	1	0	0	Trip	3	1	25	Var
0	0	1	0	0	Trip	3	1	105	Breaker Pumping
0	0	1	0	0	Trip	3	1	149	Overcurrent
0	0	1	0	0	Trip	3	1	103	Non Sensitive
0	0	1	0	0	Trip	3	1	23	Watt
0	0	1	0	0	Trip	3	1	150	Time Delayed Watt-Var
0	0	1	0	0	Trip	3	1	151	Overcurrent Watt-Var
0	0	1	0	0	Trip	3	1	77	Setpoints Error
0	0	1	0	0	Trip	3	1	40	Diagnostics failure #1
1	1	0	0	0	Alarm	2	8	35	Breaker Failure
0	1	0	0	0	Alarm	1	8	35	Breaker Failure
1	1	0	0	0	Alarm	2	8	81	External Condition #2
0	1	0	0	0	Alarm	1	8	81	External Condition #2
1	1	0	0	0	Alarm	2	8	83	External Condition #3
0	1	0	0	0	Alarm	1	8	83	External Condition #3
1	1	0	0	0	Alarm	2	8	86	External Condition #4
0	1	0	0	0	Alarm	1	8	86	External Condition #4

Table 14: MPCV Relay Primary / Secondary / Cause Decoding

The INCOM Product ID Binary Counter Object (Point 1) assignment for the MPCV Relay is shown in **Table 15**.

INCOM Product ID Binary Counter (Point 1)															
High Byte								Low Byte							
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
P5	P4	P3	P2	P1	P0	V3	V2	V1	V0	D5	D4	D3	D2	D1	D0
Product ID = 2						INCOM Comm Version				Division Code = 3					

Table 15: MPCV Relay Product ID Decoding

Notes:

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