

DNP Points List and Implementation Without Voltage and Current Sensing Option

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DNP Points List for 6801MSS Software

This instruction sheet provides Distributed Network Protocol (DNP) points and DNP implementation information for an 6801M Automatic Switch Operator without the **Voltage and Current Sensing** option.

This Points List section is used with 6801MSSInstaller-7.6.x. The “x” can indicate any number from 0 to 255. Other related software component version information is found on the *Setup>General>Revisions* screen.

The DNP master station should define the 6801M Automatic Switch Operator with the following Status, Analog Input, Control, Analog Output, and Counter points:

Point	Count
Status	60
Analog Input	8
Control	18
Analog Output	3
Counter	9

The available DNP points are listed in Tables 1 through 5 on pages 2 through 10 in the same order they are presented for selection on the *Setup>Communication>Point Mapping* screens. 6801M Status, Analog Input, and Control points can be assigned to any SCADA DNP point index. Point descriptions begin with a code number used to find the detailed definition in this instruction sheet. Refer to the “Communication Setup” section of S&C Instruction Sheet 1045M-530, “6801M Automatic Switch Operator: *Setup*.” The code number for each point description is listed in this publication and is not the SCADA point index.

For a specific SCADA system, typically all 6801M Automatic Switch Operators operate with the same DNP point index configuration.

Unless otherwise noted, each point is on if the condition is logically true or active.

NOTICE

The source address in IntelliLink® Setup Software is now 65432 instead of 1.



6801M Status Points

These 6801M Automatic Switch Operator features have multiple status points:

Open or Close: 1–2.

NOTICE

When uploading a setpoint or DNP points map file from any version earlier than 7.6.x into a 6801M Automatic Switch Operator with version 7.6.x firmware, the **Code Description** and **Class** fields for DNP Status Points associated with the **SAT** feature (**SAT In Progress**, **SAT Switch Contacts Closed**, **SAT Switch Contacts Open**, **SAT Prohibited Locally** and **SAT Ignore Open Disconnect**) if mapped will display “End” and “Class 1.” These must be manually converted to “Reserved” and “No Event” respectively so the SCADA system receives static data for any points mapped beyond them.

Table 1. 6801M Status Points

Code #	Name—Definition
1	Switch Open —On if the actuator is positioned within the Open actuator limit range and the most recent switch operation completed without the switch operator detecting that the actuator was disengaged from the motor operator rod. Otherwise, off.
2	Switch Closed —On if the actuator is positioned within the Closed actuator limit range and the most recent switch operation completed without the switch operator detecting that the actuator was disengaged from the motor operator rod. Otherwise, off.
3	Motor Operator Disabled (Not Ready) —This point is set when normal, high-speed operation of the switch is blocked. Otherwise, off. This is a summary point. The exact cause of the Motor Disabled alarm can be determined when these status points are on: 10, 14, 18, 29, 33, 34, 35, 36, 37, 47, 48, 49, 50, 53, 54, 56, 58, or 62. If Not Ready for Override mode (Status Point 51) is also active, emergency Open/Close operations are blocked.
4	Automatic Operation Enabled —On when the Automatic Operation mode is enabled using either the faceplate switch or a SCADA command. Otherwise, off.
5	SCADA Control Enabled —On when the SCADA CONTROL faceplate switch is set to the Remote position. Otherwise, off.
6	Overcurrent Fault Detected —On when the fault-detection circuitry detects a Line Fault condition the SCADA operator has not reset. For a normally closed switch, line-fault conditions clear automatically when three-phase line voltage is sensed, the switch is in the Closed position, and 45 minutes have elapsed. For a normally open or normally closed switch, click on one of these options to manually clear the fault: the Clear Faults command in the LCD menu, the Clear Faults button on the <i>Setup>Site Related</i> screen, or the faceplate/screenset pre-assigned User Command button. Note: The Fault condition also clears if the conditions above are met and the switch control is reinitialized using the setup software or a SCADA command.
7	Sectionalizer Tripped —On when any Automatic Control function opens the switch. The point is cleared when the switch is closed for any reason. It is also cleared on reinitialization of the switch control using the setup software or when the SCADA CONTROL switch state is changed. Otherwise, off.
8	Combination Battery —On when the battery is in a Battery Low or Battery Bad state. This indicates battery maintenance or replacement is required. Otherwise, off.

TABLE CONTINUED ►

Table 1. 6801M Status Points—Continued

Code #	Name—Definition
9	Maintenance Required —On when some form of maintenance (other than battery replacement) is required. It is set when the battery charger stops functioning because of overvoltage or when the switch open/close contacts are not mutually exclusive. This is a summary point. An inspection of other status points can determine the exact cause. Otherwise, off.
10	Switch Position is Inconsistent —On when both contacts are closed or open. Otherwise, off.
11	Ac Control Power Not Present —On when ac control power is not available to the battery charger. It indicates the switch operator is operating on battery backup. Otherwise, off.
13	Battery Low —On when battery voltage is low, but the switch will operate. Otherwise, off.
14	Battery Bad —On when battery replacement is required, unless the switch operator is operating or has recently been operating on battery power. Otherwise, off.
15	Battery Charger Problem —On when the charging voltage applied to the battery system was too high and the charger is turned off. Otherwise, off.
16	Battery Test in Progress —On when the switch operator is automatically testing the batteries at periodic intervals. Battery voltage fluctuates during the test. Otherwise, off.
17	Cabinet Door Open —On when the enclosure door is open. When the door is closed, this point is off and all power to the faceplate LEDs is turned off.
18	Internal Temperature Sensor Bad —On when the temperature sensor is reading out of range. Temperature-related correction factors will not be accurate when the sensor is incorrect. Otherwise, off.
19	Phase A Overcurrent Fault —On when the fault-detection circuitry detects a Line Fault condition the SCADA operator has not reset. For a normally closed switch, line fault conditions clear automatically when three-phase line voltage is sensed, the switch is in the Closed position, and 45 minutes have elapsed. For a normally open or normally closed switch, click on one of these options to manually clear the fault: the Clear Faults command in the LCD menu, the Clear Faults button on the <i>Setup>Site Related</i> screen, or the faceplate/screenset pre-assigned User Command button. Note: The Fault condition also clears if the conditions above are met and the switch control is reinitialized using the setup software or a SCADA command.
20	Phase B Overcurrent Fault —As noted in Status Point 19, for Phase B. Otherwise, off.
21	Phase C Overcurrent Fault —As noted in Status Point 19, for Phase C. Otherwise, off.
23	Loss of Voltage —On when ac control power is off. Otherwise, off.
28	External Temperature Sensor Bad —On when the switch operator external temperature sensor reads outside its valid range. Otherwise, off.
29	Decoupled From Operator —On when the switch operator detects the switch is decoupled from the operator. It is cleared by entering Align mode and jogging the operator into the operating range.

TABLE CONTINUED ►

6801M Status Points

Table 1. 6801M Status Points—Continued

Code #	Name—Definition
30	Motor Overload —On when the switch operator detected a Motor Overload condition on the last operation. The condition is automatically cleared on the next operation. The switch operator detects motor overload by monitoring the voltage and current draw of the motor. An overload causes the motor to shut down after a brief delay, regardless of the output actuator position.
31	Operator Undershoot On Last Operation —On when the switch did not reach a fully Open or fully Closed position on the last operation. This is usually caused by a blockage in the switch contacts or external linkages.
32	Operator Overshoot on Last Close —On when the switch operator traveled too far on the Close operation. It is cleared on the next switch operation.
33	Inspection Required —On when inspection of the switch installation is required (after a motor overload or an undershoot on an Open or Close operation). This condition prevents normal operation of the switch but allows an Override operation. It is cleared by clicking on the Clear Warnings button on the <i>Diagnostics>Warnings</i> screen.
34	Calibration Required —On when the output actuator travel limits need to be reset. The condition is set when an encoder error or an undershoot on an Open operation occurs. This prevents a normal high-speed operation of the switch but allows an Emergency-Override operation. This point is cleared by setting the travel limits.
35	Unrecoverable Error —On when an internal error is detected. It is cleared by clicking on the Clear Errors button on the <i>Diagnostics>Errors</i> screen.
36	Motor Overload During Low Torque Operation —On when a motor overload is detected on the last jog operation. It is cleared by clicking on the Clear Errors button on the <i>Diagnostics>Errors</i> screen.
37	Motor Overload During High Torque Operation —On when a motor overload error is detected on a high-speed operation. It is cleared by clicking on the Clear Errors button on the <i>Diagnostics>Errors</i> screen.
38	Internal Bad Command —On when the software is requested to perform an undefined type of operation. This is an impossible operating condition and is a microprocessor malfunction. It is cleared by clicking on the Clear Errors button on the <i>Diagnostics>Errors</i> screen.
39	Internal Bad State —On when the software has moved into an invalid operating state. This is an impossible operating condition and is a microprocessor malfunction. It is cleared by clicking on the Clear Errors button on the <i>Diagnostics>Errors</i> screen.
40	Bad Encoder Checksum —On when the switch operator detects corruption of the information related to the absolute position of the output actuator. The drive train position is considered invalid and requires resetting the travel limits. It is cleared by clicking on the Clear Errors button on the <i>Diagnostics>Errors</i> screen.
42	Bad Encoder Range —On when the switch operator detected an impossible position of the output actuator (beyond the absolute operating range of the drive train). The drive train position is considered invalid and requires resetting the travel limits. It is cleared by clicking on the Clear Errors button on the <i>Diagnostics>Errors</i> screen.

TABLE CONTINUED ►

Table 1. 6801M Status Points—Continued

Code #	Name—Definition
45	Bad Encoder Runaway —On when substantial motion of the drive train is detected without an operation being underway. Because the drive train gearbox is mechanically self-locking, this generally indicates some type of gearbox or position encoder malfunction. It is cleared by clicking on the Clear Errors button on the <i>Diagnostics>Errors</i> screen.
46	Bad Encoder Drift —On when slight motion of the drive train is detected without an operation being underway. Because the drive-train gearbox is mechanically self-locking, this generally indicates some type of gearbox or position encoder malfunction. It is cleared by clicking on the Clear Errors button on the <i>Diagnostics>Errors</i> screen.
47	Overshot Position On Open —On when the switch operator travels too far on an Open operation. It is cleared by clicking on the Clear Errors button on the <i>Diagnostics>Errors</i> screen.
48	Handle Not Stowed —On when the manual operation handle is not stowed on the faceplate. Otherwise, off.
49	Max Limit Spacing Exceeded —On when the closed and open travel limits are more than 180° apart. This condition prevents both normal and override operation of the switch. It is cleared by clicking on the Clear Warnings button on the <i>Diagnostics>Warnings</i> screen.
50	Manufacturing Variance Not Set —On when the manufacturing variance set points have not been set. It is cleared by clicking on the Clear Warnings button on the <i>Diagnostics>Warnings</i> screen.
51	Not Ready For Override —On when a Not Ready condition blocks normal high-speed operation of the switch. It cannot be overridden using an emergency Close/Open operation. Otherwise, off.
52	Align Mode —On when the switch operator is in Low-Speed or Align mode. Active normal high-speed switching operations are blocked and faceplate Close/Open switch operations cause slow or jogging movement of the output actuator. The faceplate NOT READY LED is blinking. Otherwise, off.
53	Travel Limits Not Set —On when the closed or open travel limit needs to be set. Otherwise, off.
54	Battery Test Hardware Error —On when a battery test hardware malfunction is detected during a battery test. The cause may be a malfunctioning battery test relay, a battery load test resistor problem, or a wiring problem. It is cleared on the next successful battery test. Otherwise, off.
56	Sensor Detected Missing Encoder —On when the shaft encoder cable is disconnected from the PS/IO board, is improperly installed, or there is a problem with the cable. Otherwise, off.
57	Worn Switch —On when the captured current profile exceeds the obstruction current threshold from the 125-ms mark to the 1.6-second mark. Otherwise, off. See S&C Instruction Sheet 1045M-550, “Automatic Switch Operators: <i>Troubleshooting</i> ,” for more information.
58	Knife Switch Not Engaged —On when the knife switch is opened to visibly disconnect battery power to the motor. Otherwise, off. This point is only valid for catalog suffix option “-KS.”
59	Surge Suppressor Tripped —On when the optional lightning surge arrester module trips. Otherwise, off. This point is only active when catalog suffix option “-W1” (Ac surge protector) is specified.

TABLE CONTINUED ►

6801M Status Points

Table 1. 6801M Status Points—Continued

Code #	Name—Definition
62	Interlock Open —On when the key interlock locking bolt is in the extended position and the key can be removed. Otherwise, off. This point is only valid for catalog suffix options “-L2” and “-L3.”
75	Hot Line Tag Enabled —On when Hot Line Tag mode is applied. Otherwise, off.
93	Wi-Fi Is Connected —On when a Wi-Fi connection to the switch operator is established. Otherwise, off.
94	Wi-Fi Intrusion Alarm —On when the Wi-Fi module reports a replay attack or improper authentication. Turned off by the user with the Clear Wi-Fi Intrusion Alarm control point (Control Point 16).
95	Wi-Fi Disabled by SCADA —On when the Disable Wi-Fi message (Control Point 13) is received. Off when the Enable Wi-Fi message (Control Point 14) is received. Enable/Disable Wi-Fi control point (Control Point 12) toggles Wi-Fi communication on and off; on when Wi-Fi is disabled and off when Wi-Fi is enabled. Otherwise, off.
96	Warning —On when any warning is active. Otherwise, off.
97	Alarm —On when any alarm is active. Otherwise, off.
98	Error —On when any error is active. Otherwise, off.
99	IntelliLink Intrusion —On when an IntelliLink software log-in attempt failed three times, after which all users are locked out for 15 minutes. Otherwise, off.
100	IntelliLink Session Active —On when a user is presently logged in to the control. Otherwise, off.
101	GPS Not Active Time Source —On when the GPS feature is not the active time source. Otherwise, off.

Table 2. 6801M Analog Input Points

Code #	Name—Definition
1	90% Voltage Reference Standard —A constant representing 90% of the full-scale value.
2	0% Voltage Reference Standard —A constant representing the zero value.
7	Single-Phase Voltage —Reports voltage using true RMS techniques and scaled to yield a nominal value of 120 Vac. Each count equals 0.1 Vac RMS.
16	Cabinet Temperature —Reports the temperature in degrees Fahrenheit. Each count equals one degree.
17	Battery Voltage —Nominally 24 Vdc. If ac power is on, this value is updated only during battery testing. If ac power is off, this value is continuously updated. One count equals 0.035 Vdc.
18	External Temperature —Reports the temperature in degrees Fahrenheit. Each count equals one degree.
19	Switch Actuator Position —Reports the position of the actuator in angular degrees. Each count equals 0.1 degree.
20	Hours Until Battery Low —Reports the approximate time to a Battery Low condition if no operations are performed. Each count equals one hour.

6801M Control Points

The object type must be configured on the *Setup>Point Mapping>Controls* screen for each control point when it is mapped. Only the configured object type will be accepted and acted on for that control point. Some control points will not work with all object types. The available object types are listed for each control point.

Control points related to **Open** or **Close** command: 1.

Table 3. 6801M Control Points

Code #	Name—Definition
1	Open or Close Switch—SCADA —This command opens or closes the switch. Note: These commands are ignored if the Not Ready condition (Status Point 3) is active. These commands are also ignored and return an error if the SCADA CONTROL switch is not in the Remote position.
3	Clear any Outstanding Overcurrent Fault Conditions Present —This command must be issued using a Pulse On request. The fault condition otherwise remains active for 45 minutes after the switch is closed and ac power is fully restored or until the REMOTE/LOCAL switch is toggled.
4	Start Battery Test—SCADA —This command may be issued using a Pulse-On or Latch-On command. If ac power is available, the battery charger is disconnected for several minutes during the test. If ac power is not available, a brief impedance test is used to evaluate the battery condition.
5	Enable/Disable Hot Line Tag—SCADA —The Enable command may be issued using a Latch-On or Pulse-On command. The Disable command may be issued using the Latch-Off or Pulse-Off command. “Latch” is the default object type.
6	Enable/Disable Automatic Operation —This command must be issued using the Latch On/Off request in the control relay output block. In Automatic mode, the switch control automatically opens the switch if a pre-configured reclose sequence is recognized after a detected fault. Note: The Automatic Operation state is not disabled when the faceplate REMOTE/LOCAL switch is set to Local operation.
9	Override Operation with Auto-Reverse —Activates if the Automatic Reverse feature is enabled. This command may be issued using either the Select/Operate sequence, the Direct Operate function, or the Direct Operate without Ack function.
10	Override Operation without Auto-Reverse —This command may be issued using either the Select/Operate sequence, the Direct Operate function, or the Direct Operate without Ack function.
11	Exit Align Mode —This command must be issued using a Pulse On request.
12	Enable/Disable Wi-Fi —This command enables/disables local Wi-Fi communication.
13	Wi-Fi Disable —This command disables local Wi-Fi communication.
14	Wi-Fi Enable —This command enables local Wi-Fi communication.
15	Wi-Fi Test —This command activates the Wi-Fi beacon transmitter for troubleshooting purposes.
16	Clear Wi-Fi Intrusion Alarm —This command clears an active Wi-Fi Intrusion alarm.
17	Clear Alarms —This command clears all active alarms.
18	Clear Warnings —This command clears all active warnings.
19	Clear Errors —This command clears all active errors.
20	Clear IntelliLink Intrusion —This command clears the IntelliLink Software Intrusion alarm.
21	Clear Manual Operation Any State —This command clears the Manual Operation state.

Table 4. 6801M Analog Output Points

Code #	Name—Definition
1	Application Layer Confirmation Retry Time —Time (100 to 65,535 ms.) the switch operator will wait for an application-layer confirmation to an event response message before re-sending the request for confirmation. ^①
2	Application Layer Confirmation Retry Count —Number of times (0 to 10) the switch operator will send an event response message if a confirmation is not received. This number includes the initial response. The retry count is only in effect when the confirmation process is enabled.
3	Control Point Select Time —During a Select-Before-Operate procedure, the time (10 to 1000 tenths of a second) allowed to elapse between receiving the Select function for a point and receiving the Operate function for it. If an Operate function is not received within this period, the point is de-selected and another Select function is required before the point will operate.

① Set and read the **Application Layer Confirmation Retry Time** setpoint based on the required range:

Application Layer Confirmation Retry Time Range	Set Analog Output Value	Read Analog Output Value
100 to 32,737 ms.	Group 41 variation 2 (16-bit)	Group 40 variation 2 (16-bit with flag)
32,738 to 65,535 ms.	Group 41 variation 1 (32-bit)	Group 40 variation 1 (32-bit with flag)

Note: Class 0 will always report group 40 variation 2 and will report negative value for 32-bit values. Use group 40 variation 1 to read values between 32,738 to 65,535 ms.

6801M Counter Points

Table 5. 6801M Counter Points

Code #	Name—Definition
1	Close Operation Count —This is the number of switch operations. The counter is incremented on each Close operation. This is a 32-bit counter and will overflow back to zero at 4,294,967,295.
2	Compact Flash Operational Issue —This is the number of flash memory issues. The counter is incremented on each flash memory issue. This is a 32-bit counter and will overflow back to zero at 4,294,967,295.
3	Logging Overflow —This is the number of log overflows. The counter is incremented on each log overflow. This is a 32-bit counter and will overflow back to zero at 4,294,967,295.
4	Disk Error —This is the number of disk problems. The counter is incremented on each disk problem. This is a 32-bit counter and will overflow back to zero at 4,294,967,295.
5	Wi-Fi Intrusion Attempt —This is the number of Wi-Fi intrusion attempts. The counter is incremented on each Wi-Fi intrusion attempt. This is a 32-bit counter and will overflow back to zero at 4,294,967,295.
6	Phase A Overcurrent Count —This is the number of Phase A overcurrent events. The counter is incremented with each new overcurrent event. This is a 32-bit counter and will overflow back to zero at 4,294,967,295.
7	Phase B Overcurrent Count —This is the number of Phase B overcurrent events. The counter is incremented with each new overcurrent event. This is a 32-bit counter and will overflow back to zero at 4,294,967,295.
8	Phase C Overcurrent Count —This is the number of Phase C overcurrent events. The counter is incremented with each new overcurrent event. This is a 32-bit counter and will overflow back to zero at 4,294,967,295.
9	IntelliLink Intrusion Attempt —This is the number of IntelliLink software log-in attempts that failed three times, after which all users are locked out for 15 minutes.

Table 6. 6801M Group 0 Objects

Variation	Variation Name	Definition
204	Device location longitude	This is the longitude of the control provided by GPS in decimal degree based on the WGS84 reference. A value of zero is returned when a GPS signal is not available, the Fix Quality setting is "Invalid," or no GPS module is installed. When the GPS module is installed the present position is always returned, even when GPS mode is not selected for the Time Source Synchronization setpoint on the <i>Setup>General>Time</i> screen.
205	Device location latitude	This is the latitude of the control provided by GPS in decimal degree based on the WGS84 reference. A value of zero is returned when a GPS signal is not available, the Fix Quality setting is "Invalid," or no GPS module is installed. When the GPS module is installed the present position is always returned, even when GPS mode is not selected for the Time Source Synchronization setpoint on the <i>Setup>General>Time</i> screen.
242	Device manufacturer's software version	The S&C implementation will return a string containing the MCU Application and MCU EOS. The following is an example of the string that will be returned: "003.003.004.003 060.001.021.043," representing MCU Application 3.3.4.3, MCU EOS 60.1.21.43.
248	Device serial number	The S&C implementation will return a string containing the 6801M serial number. The following is an example of the string that will be returned: 14T000001 (14 is the year, T indicates Toronto, and the rest of the serial number resets to 000001 at the beginning of the next year).

DNP Implementation

This implementation of DNP and this section of documentation conform to the document "DNP V3.00 Subset Definitions, Version 2.00," available from the DNP Users Group.

Table 7 describes the compatibility of S&C's implementation of DNP with other devices:

Table 7. Device Profile Description	
DNP 3 DEVICE PROFILE DOCUMENT	
Vendor Name: S&C Electric Company	
Device Name: 6801M Automatic Switch Operator	
Highest DNP Level Supported: For Requests - Level 2 For Responses - Level 2	Device Function: __ Master X Slave
Notable objects, functions, and/or qualifiers supported in addition to the Highest DNP Levels Supported (the complete list is described in the attached table): 8-Bit Unsigned Integers ----- ----- ----- -----	
Maximum Data Link Frame Size (bytes) Transmitted - 292 Received - 292	Max Application Fragment Size (bytes) Transmitted - 249 Received - 249
Maximum Data link Re-tries: X None __ Fixed at _____ __ Configurable, range 1 to 25	Maximum Application Layer Re-tries: __ None __ Fixed at _____ X Configurable, range 1 to 25 and infinite
Requires Data Link Layer Confirmation: X Never __ Always __ Sometimes If "Sometimes," when? __ Configurable If "Configurable," how?	

TABLE CONTINUED ►

Table 7. Device Profile Description—Continued

Requires Application Layer Confirmation:							
	__	Never					
	__	Always	(not recommended)				
	__	When reporting Event Data (Slave devices only)					
	__	When sending multi-fragment responses (Slave devices only)					
	__	Sometimes	If "Sometimes," when?				
X		Configurable	If "Configurable," how?				
Timeouts while waiting for:							
Data Link Confirm	X	None	__ Fixed	__ Variable	__		Config
Complete Appl. Fragment	X	None	__ Fixed	__ Variable	__		Config
Application Confirm		None	__ Fixed	__ Variable	X		Config
Complete Appl. Response	X	None	__ Fixed	__ Variable	__		Config
Others	__	__	__	__	__	__	__
Attach explanation if "Variable" or "Configurable" was checked (see Note 1 for explanation)							
Sends/Executes Control Operations:							
Write Binary Outputs	X	Never	__ Always	__ Sometimes	__		Config
Select/Operate		Never	__ Always	X	Sometimes	__	Config
Direct Operate		Never	__ Always	X	Sometimes	__	Config
Direct Operate - NO ACK		Never	__ Always	X	Sometimes	__	Config
Count > 1	X	Never	__ Always	__ Sometimes	__		Config
Pulse On		Never	__ Always	X	Sometimes	__	Config
Pulse Off	X	Never	__ Always	__ Sometimes	__		Config
Latch On		Never	__ Always	X	Sometimes	__	Config
Latch Off		Never	__ Always	X	Sometimes	__	Config
Queue	X	Never	__ Always	__ Sometimes	__		Config
Clear Queue	X	Never	__ Always	__ Sometimes	__		Config
Attach explanation if "Sometimes" or "Configurable" was checked (see Note 2 for explanation)							

TABLE CONTINUED ►

DNP Implementation

Table 7. Device Profile Description—Continued

FILL OUT THE FOLLOWING ITEM FOR MASTER DEVICES ONLY:	
Master Expects Binary Input Change Events: __ Either time-tagged or non-time-tagged for a single event __ Both time-tagged and non-time-tagged for a single event __ Configurable (attach explanation)	
FILL OUT THE FOLLOWING ITEMS FOR SLAVE DEVICES ONLY:	
Reports Binary Input Change Events when no specific variation requested: __ Never __ Only time-tagged X Only non-time-tagged __ Configurable to send both	Reports time-tagged Binary Input Change Events when no specific variation requested: __ Never X Binary Input Change with Time __ Bin In Change Relative Time __ Configurable (explain)
Sends Unsolicited Responses: __ Never X Configurable (explain) __ Only certain objects __ Sometimes (explain) __ Enable/Disable Unsolicited Function codes supported (see Note 3)	Sends Static Data in Unsolicited Responses: __ Never __ When Device Restarts X When Status Flags Change No other options are permitted. (see Note 3)
Default Counter Object/Variation: __ No Counters Reported __ Configurable (explain) X Default Object - 20 __ Default Variation - 5 __ Point-by-point list attached	Counters Roll Over at: __ No Counters Reported __ Configurable (explain) __ 16 Bits X 32 Bits __ Other Value _____ __ Point-by-point list attached
Sends Multi-Fragment Responses (Slave Only): X Yes __ No	

Note 1: Timeouts While Waiting for Confirmations

When an application layer response confirmation is requested, the switch operator waits before sending another response/confirmation attempt (if the retry number has not been reached) or stopping the **Confirmation** process.

Set the **Time Delay Between Retries** function with the setup software or via SCADA. (See Instruction Sheet 1045M-530, “6801M Automatic Switch Operators: *Setup*,” for more information.)

Note 2: Control Operations Executed

For all **Binary Output Relay (g12)** operations and **Analog Output (g41)** operations, the supported application layer function codess are:

- **Select (3)**
- **Operate (4)**
- **Direct Operate (5)**
- **Direct Operate No Ack (6)**

The control codes supported for **Binary Output Command** operations are:

Control Code	TCC Field	Op Type Field
0x01	NUL	PULSE_ON
0x03	NUL	LATCH_ON
0x04	NUL	LATCH_OFF
0x41	CLOSE	PULSE_ON
0x81	TRIP	PULSE_ON

For **Binary Output Command** operations, set the **Count** value to “1,” **Queue** and **Clear** fields to “0,” and **On-Time** and **Off-Time** fields to any valid values. The control will ignore the **On-Time** and **Off-Time** fields in the request. For the **Select** and **Operate** command sequence, the value of the **On-Time** and **Off-Time** fields must match between **Select** and **Operate** requests otherwise the command will not be executed.

For a **Binary Output Command** requests with the **Clear** field set to “1,” the control will return a status code 4 [NOT_SUPPORTED] in its response and the operation will not be executed.

For more details on **Binary Output Command** operations, see the “Control Relay Output Block” section in the Object library section of “IEEE std 1815TM-2012.”

Note 3: Unsolicited Responses

The switch operator returns unsolicited responses to the configured master station address when a change occurs in any mapped status point or when the device is restarted. The data returned is Object 2, Variation 2 (Binary Input Change with Time).

Enable and disable unsolicited responses from the setup software or via SCADA (Function Code 20 to enable, Function Code 21 to disable).

DNP Implementation

This section describes which objects and requests this implementation accepts and which responses are returned. **Object**, **Variation**, and **Qualifier** codes in the request must exactly match what is expected; otherwise, the switch operator flags an error. All application layer responses use the standard response Function Code 129.

Table 8. Implementation

OBJECT			REQUEST		RESPONSE
Obj	Var	Description	Func Code (dec)	Qualifier Codes (hex)	Default Var. (hex)
1	0	Binary Input - All Variations	1	06	
1	1	Binary Input			00
2	0	Binary Input Change - All Variations	1	06,07,08	
2	1	Binary Input Change without Time	1	06,07,08	17
2	2	Binary Input Change with Time (see Note 4)	1	06,07,08	17
2	3	Binary Input Change with Relative Time (object parsed but no data to return)	1	06,07,08	17
10	0	Binary Output - All Variations	1	06	
10	2	Binary Output Status (See Note 5)		00,01,06	00,01
12	1	Control Relay Output Block	3,4,5,6	17,28	echo of request
20	0	Binary Counter - All Variations	1,7,8,9,10	06	
20	5	32-Bit Binary Counter without Flag			00
21	0	Frozen Counter - All Variations	1	06	
21	9	32-Bit Frozen Counter without Flag			00

TABLE CONTINUED ►

Table 8. Implementation—Continued

OBJECT			REQUEST		RESPONSE
Obj	Var	Description	Func Code (dec)	Qualifier Codes (hex)	Default Var. (hex)
22	0	Counter Change Event - All Variations	1	06,07,08	
22	1	Counter Event - 32-bit with flag (Note 4)		06,07,08	17
22	5	Counter Event - 32-bit		06,07,08	17
30	0	Analog Input - All Variations	1	06	
30	4	16-Bit Analog Input without Flag			00
32	0	Analog Change Event - All Variations (object parsed but no data to return)	1	06,07,08	
32	2	Analog Input Event - 16-bit without time (Note 4)		06,07,08	17
32	4	Analog Input Event - 16-bit with time		06,07,08	17
40	0	Analog Output Status - All Variations	1	06	
40	2	16-Bit Analog Output Status			00
41	2	16-Bit Analog Output Block	3,4,5,6	17,28	echo of request
50	1	Time and Date - Absolute Time	2	07 limited quantity = 1	IINs only
50	3	Time and Date - Absolute time at last recorded time	2	07 limited quantity = 1	IINs only

TABLE CONTINUED ►

DNP Implementation

Table 8. Implementation—Continued

OBJECT			REQUEST		RESPONSE
Obj	Var	Description	Func Code (dec)	Qualifier Codes (hex)	Default Var. (hex)
60	1	Class 0 Data	1	06	
60	2	Class 1 Data	1	06,07,08	
60	3	Class 2 Data	1	06,07,08	
60	4	Class 3 Data	1	06,07,08	
80	1	Internal Indications	2	00 index=7	IINs only
102	0	8-Bit Unsigned Integer (see Note 6)	1	04	04
102	1	8-Bit Unsigned Integer (see Note 6)	1,2	03,04,05	04
No Object			13		
No Object			23		
No Object			24		

Note 4: Change Event Objects

This is the default object returned in the unsolicited report by exception (if enabled) and the default object for any event data request.

Note 5: Binary Output Status

In a response to a **Binary Output Status** request, the switch control returns a status byte for each control point available. In this implementation of the **Binary Output Status** object, only the **Online** bit is used. All other bits, including the **State** bit, should be ignored.

The state of all digital points (controlled and not controlled) can be inspected by using the **Binary Input** object.

Note 6: Polling Class

DNP points are assigned to polling classes. S&C Automatic Switch Operators implement Class 0 for static data and Classes 1, 2, and 3 for event data. The Class 0 poll response contains all DNP points that have been assigned to Classes 0, 1, 2 or 3 and their most recent static value. The Class 1, 2 or 3 polls return event data, any DNP point whose value has changed since the last event response message was transmitted. Polling frequency is an aspect of the user's SCADA system and is user selectable.

The DNP Point Mapping is user-configurable and all points do not need to be mapped. DNP points can be customer-assigned to any of the DNP Event Classes 1, 2, and 3.