

DNP Points List and Implementation

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Introduction

These instructions provide DNP point and implementation information for a 5802 Dual-Overhead Automatic Switch Control applied in an S&C IntelliTEAM II Automatic Restoration System, and were prepared for use with software: **SNCD2B6D, Rev. 2.42** or subsequent releases.

For accessing the Model 5802 Dual-Overhead with IntelliTEAM II, the DNP master station should define the Switch Control with the following I/O:

	Point Count
Status Points	63
Analog Inputs	36
Analog Outputs	4
Binary Counter	2
Frozen Counter	2
Control Outputs	13



Status Points

STATUS POINTS	
Point #	Definition
0	Switch 1 Open contact status. This bit is set if the switch is open.
1	Switch 1 Closed contact status. This bit is set if the switch is closed.
2	Switch 2 Open contact status. This bit is set if the switch is open.
3	Switch 2 Closed contact status. This bit is set if the switch is closed.
4	Visible Disconnect Open Switch 1. If the switch is equipped with the visible disconnect option, this bit is set when the disconnect is in the open position.
5	Visible Disconnect Open Switch 2. If the switch is equipped with the visible disconnect option, this bit is set when the disconnect is in the open position.
6	Not used.
7	Switch 1 Disabled. This bit is set when switch operation is disabled. This may occur when bad battery voltage is present, or when the visible disconnect is open. See Status Points 4 and 22 to determine which condition is causing this bit to be set.
8	Switch 2 Disabled. As above, for Switch 2.
9	Automatic Operation Enabled. This bit is set if automatic control functions have been enabled via either the faceplate switch or a SCADA command.
10	REMOTE/LOCAL set to Remote. This bit is set when the switch is in the REMOTE position. In the REMOTE position, local operation of the switch from the faceplate is blocked. In the LOCAL position, operation of the switch from the SCADA master station is blocked.
11	<p>Overcurrent Fault Detected Switch 1. This bit is set if the fault detection circuitry has detected a line fault condition which has not been reset by the SCADA operator. For a normally closed switch, line fault conditions clear automatically once 3-phase line voltage has been sensed, the switch is closed, and 45 minutes have elapsed or the faceplate REMOTE/LOCAL switch is toggled. For the normally open switch, you can toggle the REMOTE/LOCAL switch to clear the condition while the line switch is open or closed.</p> <p>If the conditions above are met and you reinitialize the switch control using IntelliLINK Setup Software or a SCADA operator command, the fault condition also clears.</p>
12	Overcurrent Fault Detected Switch 2. As above, for Switch 2.
13	Sectionalizer Tripped Switch 1. This bit is set if any automatic control function has opened the switch. The bit is cleared when the switch is closed for any reason, and is also cleared on reinitialization of the switch control using IntelliLINK Setup Software.
14	Sectionalizer Tripped Switch 2. As above, for Switch 2.
15	Battery Maintenance Is Required. Unless the switch control is operating or has recently been operating on battery power, this bit indicates that maintenance is required (usually battery replacement).
16	Maintenance is Required. This bit is set when some form of maintenance (other than battery replacement) is required. It is set when the battery charger has failed due to over voltage, when the temperature sensor has failed, when the switch Open/Close contacts are not mutually exclusive. This is a summary bit. The exact cause of the failure can be determined from the inspection of other status points.
17	Open/Close Switch Position Indication Is Inconsistent Switch 1. This bit is set if either both contacts are closed, or both contacts are open.

STATUS POINTS	
Point #	Definition
18	Open/Close Switch Position Indication Is Inconsistent Switch 2. This bit is set if either both contacts are closed, or both contacts are open.
19	Control Power Failure. This bit is set if ac power is not available to the battery charger. It indicates that the switch control is operating on battery backup.
20	Operator Failure Override. This bit is set after the operator has executed the Failure Override Latch On control command to let the switch be operated even if battery power is bad. The bit remains set for 15 minutes, or until the override is disabled using the Failure Override Latch Off command.
21	Battery System Low. The battery voltage has been determined to be low, but the switch may still be operated.
22	Battery System Bad. The battery voltage is too low to operate the switch. This condition blocks the operation of the switch unless the Failure Override bit is set. The “bad” battery status is only set when the battery voltage is definitely too low to operate the switch.
23	Battery Charger Failed. The charging voltage applied to the battery system was too high when the charger was connected, and the charger has been turned off.
24	Battery Test In Progress. The switch control automatically performs a test procedure on the batteries at periodic intervals. During the test, the battery voltage fluctuates.
25	Cabinet Door Open. This bit is set if the door to the switch control enclosure is ajar. When the door is closed, this bit is cleared and all power to the faceplate LEDs is turned off.
26	Temperature Sensor Bad. The temperature sensor in the switch control is reading out of range. When the sensor is reading incorrectly, various temperature-related correction factors will not be accurate.
27	Phase A - Overcurrent Fault Switch 1. This bit is set if a peak current measured on Phase A has exceeded the programmed threshold level continuously for at least the programmed period of time. For a normally closed switch, the bit is cleared automatically once ac power has been restored to all phases, the switch is closed, and 45 minutes have elapsed or the faceplate REMOTE/LOCAL switch is toggled. For the normally open switch, you can toggle the REMOTE/LOCAL switch to clear the condition while the line switch is open or closed. If the conditions above are met and you reinitialize the switch control using IntelliLINK Setup Software or a SCADA operator command, the fault condition also clears.
28	Phase B - Overcurrent Fault Switch 2. As above, for Phase B, Switch 1.
29	Phase C - Overcurrent Fault Switch 2. As above for Phase C, Switch 1.
30	Overcurrent Ground Fault Switch 1. As above, for Ground, Switch 1.
31	Phase A - Overcurrent Fault Switch 2. This bit is set if a peak current measured on Phase A has exceeded the programmed threshold level continuously for at least the programmed period of time. For a normally closed switch, the bit is cleared automatically once ac power has been restored to all phases, the switch is closed, and 45 minutes have elapsed or the faceplate REMOTE/LOCAL switch is toggled. For the normally open switch, you can toggle the REMOTE/LOCAL switch to clear the condition while the line switch is open or closed. If the conditions above are met and you reinitialize the switch control using IntelliLINK Setup Software or a SCADA operator command, the fault condition also clears.
32	Phase B - Overcurrent Fault Switch 2. As above, for Phase B, Switch 2.

Status Points

STATUS POINTS	
Point #	Definition
33	Phase C - Overcurrent Fault Switch 2. As above, for Phase C, Switch 2.
34	Overcurrent Ground Fault Switch 2. As above, for Ground, Switch 2.
35	AC Power Failure. This point is set for any configured voltage channel where the voltage sensor shows a loss of voltage.
36	Phase A - Reverse Current Switch 1. This bit is set if the current on Phase A is flowing in the direction opposite to the “normal” direction configured in the switch control. The switch control identifies reverse current when the voltage-current phase angle deviates more than 90 degrees from the value set during installation for unity power factor.
37	Phase B - Reverse Current Switch 1. As above, for Phase B, Switch 1.
38	Phase C - Reverse Current Switch 1. As above, for Phase B, Switch 1.
39	Phase A - Reverse Current Switch 2. This bit is set if the current on Phase A is flowing in the direction opposite to the “normal” direction configured in the switch control. The switch control identifies reverse current when the voltage-current phase angle deviates more than 90 degrees from the value set during installation for unity power factor.
40	Phase B - Reverse Current Switch 2. As above, for Phase B, Switch 2.
41	Phase C - Reverse Current Switch 2. As above for Phase C, Switch 2.
42	Application Layer Confirmation Requests. This bit is set when requests for application layer confirmations by the switch control are enabled. If enabled, the switch control requests a confirmation of receipt from the master station for every application data response generated. If the switch control does not receive a confirmation within the Time Delay Between Attempts, it issues another data response with request for confirmation. The Number of Confirmation Attempts setpoint determines the maximum number of times the switch control will reissue a request if it does not receive a confirmation.
43	Data Link Layer Confirmation Requests. This bit is set when requests for data link layer confirmations by the switch control are enabled. If enabled, the switch control requests a confirmation of receipt from the destination station for every data link request generated between switch controls.
44	Team Member Not Transfer Ready. Active only for the reporting switch control. This bit is set when a switch operation is not consistent with the expected team operation (i.e. incomplete or manual switch operation). This point is also active if: the switch control is disabled (see point 7), automatic operation is disabled (see point 9), or the switch position is inconsistent(see point 17). This point may be used in conjunction with the Not All Teams Transfer Ready point 45 to identify the specific team member where a problem exists.
45	Not All Teams Transfer Ready. Active if any teams in which the switch control participates are not fully operational. This may be due to error conditions at individual team members, or team wide conditions such as isolation of a fault, team configuration errors, team coordination errors, automatic restoration prohibited, and team logic disabled on the <i>TEAM: Setup</i> screen. If point 44 is set in one switch control of a team, this will cause point 45 to be set in the other team members. Unless otherwise prohibited, team member switch controls will revert to standalone sectionalizing logic when Not Transfer Ready is active in all teams that the control participates in, whether due to local conditions or conditions at adjacent team members.
46	Automatic Transfer Event Status. This bit is set when a transfer operation is in progress.
47	Return to Normal Event Status. This bit is set when a return to normal operation is in progress.

STATUS POINTS	
Point #	Definition
48	Setup Data Revision. This bit is set whenever the setup configuration data for any enabled team defined in the control is modified. It remains set until the Team Setup parameter on the <i>Setup: Team</i> screen has been toggled from Stopped back to Running for any team where the setup data has been changed.
49	Automatic Circuit Restoration Prohibited by SCADA. This point will be set when this switch control has received the command to prohibit load restoration (see Control Point 10) from the SCADA master, or the feature has been enabled on the Prohibit Restoration screen in the Miscellaneous Operation menu. While this point is set no switch on any team in which this switch control participates will be allowed to automatically close, preventing automatic load restoration. This point will be cleared when the Prohibit Restoration feature is latched off with a command from the SCADA master (see Control Point 10), or disabled on the Prohibit Restoration screen in the Miscellaneous Operation menu.
50	Automatic Circuit Restoration Prohibited by Team Timer. This point will be set when a Team Transfer Process Timer has expired in this switch control, resulting in the Prohibit Restoration feature being enabled, for at least one of the teams in which this switch control participates. Only a team for which this timer has expired will be prohibited from further automatic load restoration. This point will be cleared when the Prohibit Restoration feature is latched off with a command from the SCADA master (see Control Point 10), or disabled on the Prohibit Restoration screen in the Miscellaneous Operation menu.
51	Automatic Operation Enabled Switch 1. This bit is set if automatic control functions have been enabled via both the faceplate switches or SCADA command. This point is only applicable when Status Point 9 is enabled.
52	Automatic Operation Enabled Switch 2. This bit is set if automatic control functions have been enabled via both the faceplate switches or SCADA command. This point is only applicable when Status Point 9 is enabled.
53	Source Loading Data Active. This point will be set when the real-time feeder loading logic is active and in use. This point does not indicate whether the control is using actual real-time feeder loading data received from a DNP master, or using the Default Source Segment Loading setting.
54	Real-Time Load Data Old or Abnormal. This point is set when the DNP analog output value received is less than the real-time 3-phase total load as sensed by the switch, and is also set if the real-time feeder loading data has not updated within the configured time interval. This point will be set to 0 if the real-time feeder loading logic is inactive (Status Point 53 = 0).
55	Team 1 in Ready. Active when the team is in the Ready to Transfer state. This point will be inactive if the team is not in use, contains an error condition, or the line section represented by the team contains a fault.
56	Team 2 in Ready. Same as above for Team 2.
57	Team 3 in Ready. Same as above for Team 3.
58	Team 4 in Ready. Same as above for Team 4.
59	Team 5 in Ready. Same as above for Team 5.
60	Team 6 in Ready. Same as above for Team 6.
61	Team 7 in Ready. Same as above for Team 7.
62	Team 8 in Ready. Same as above for Team 8.

Analog Input Points

ANALOG INPUT POINTS	
Point #	Definition
0	90% voltage reference standard. This is provided for the benefit of protocol implementation to conform to the RTU standard. It is loaded as a constant.
1	0% voltage reference standard. This is provided for the benefit of protocol implementation to conform to the RTU standard. It is loaded as a constant with the value zero.
2	Ground Current Switch 1, taken as the vector sum of the phase currents on Phases A, B, and C of Switch 1. Current is measured using true RMS techniques and reported in units of 1 count equals 1 ampere.
3	Single-Phase Current Phase A Switch 1. Current is measured using true RMS techniques and reported in units of 1 count equals 1 ampere.
4	Single-Phase Current Phase B Switch 1. Same as above for Phase B of Switch 1.
5	Single-Phase Current Phase C Switch 1. Same as above for Phase C of Switch 1.
6	Ground Current Switch 2, taken as the vector sum of the phase currents on Phases A, B, and C of Switch 2. Current is measured using true RMS techniques and reported in units of 1 count equals 1 ampere.
7	Single-Phase Current Phase A Switch 2. Current is measured using true RMS techniques and reported in units of 1 count equals 1 ampere.
8	Single-Phase Current Phase B Switch 2. Same as above for Phase B of Switch 2..
9	Single-Phase Current Phase C Switch 2. Same as above for Phase C of Switch 2.
10	Single-Phase Voltage Phase A Switch 1. Voltage is measured using true RMS techniques and scaled to yield a nominal value of 120 Vac. Configuration of the switch control at installation time provides the scaling factors such as voltage transformer turn ration, etc. In cases where loads are connected in a delta (phase-to-phase) configuration, the switch control's sensor conditioning module is jumpered to yield phase-to-phase voltage readings. Voltage is reported in units of 1 sensor count equals 0.1 Vac RMS.
11	Single-Phase Voltage Phase B Switch 1. Same as above for Phase B of Switch 1.
12	Single-Phase Voltage Phase C Switch 1. Same as above for Phase C of Switch 1.
13	Single-Phase Voltage Phase A Switch 2. Voltage is measured using true RMS techniques and scaled to yield a nominal value of 120 Vac. Configuration of the switch control at installation time provides the scaling factors such as voltage transformer turn ration, etc. In cases where loads are connected in a delta (phase-to-phase) configuration, the switch control's sensor conditioning module is jumpered to yield phase-to-phase voltage readings. Voltage is reported in units of 1 sensor count equals 0.1 Vac RMS.
14	Single-Phase Voltage Phase B Switch 2. Same as above for Phase B of Switch 2.
15	Single-Phase Voltage Phase C Switch 2. Same as above for Phase C of Switch 2.
16	Phase Angle Phase A Switch 1. Each count equals one eighth of a degree.
17	Phase Angle Phase B Switch 1. Same as above for Phase B of Switch 1.
18	Phase Angle Phase C Switch 1. Same as above for Phase C of Switch 1.
19	Phase Angle Phase A Switch 2. Each count equals one eighth of a degree.
20	Phase Angle Phase B Switch 2. Same as above for Phase B of Switch 2.
21	Phase Angle Phase C Switch 2. Same as above for Phase C of Switch 2.

ANALOG INPUT POINTS	
Point #	Definition
22	Single-Phase kVARs Phase A Switch 1. kVARs (volt-amperes, reactive) are calculated from single-phase true RMS voltage and current sensor values and the respective voltage-current phase angle. Each count equals one kVAR.
23	Single-Phase kVARs Phase B Switch 1. Same as above for Phase B of Switch 1.
24	Single-Phase kVARs Phase C Switch 1. Same as above for Phase C of Switch 1.
25	Single-Phase kVARs Phase A Switch 2. kVARs (volt-amperes, reactive) are calculated from single-phase true RMS voltage and current sensor values and the respective voltage-current phase angle. Each count equals one kVAR.
26	Single-Phase kVARs Phase B Switch 2. Same as above for Phase B of Switch 2.
27	Single-Phase kVARs Phase C Switch 2. Same as above for Phase C of Switch 2.
28	Cabinet Temperature. The most recent cabinet temperature reading, in units of °F.
29	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.
30	Three-Phase Sum of kVARs Switch 1. kVARs (volt-amperes, reactive) are calculated from the single-phase true RMS voltage and current sensor values and the respective voltage-current phase angle. Each count equals one kVAR.
31	Three-Phase Sum of kVARs Switch 2. kVARs (volt-amperes, reactive) are calculated from the single-phase true RMS voltage and current sensor values and the respective voltage-current phase angle. Each count equals one kVAR.
32	Three-Phase Sum of kW (sum of A, B, & C phase kW) Switch 1. Each count equals one kW.
33	Three-Phase Sum of kW (sum of A, B, & C phase kW) Switch 2. Each count equals one kW.
34	Three-Phase Sum of kVA (sum of A, B, & C phase kVA) Switch 1. Each count equals one kVA.
35	Three-Phase Sum of kVA (sum of A, B, & C phase kVA) Switch 2. Each count equals one kVA.

Analog Output Points

ANALOG OUTPUT POINTS	
Point #	Definition
0	<p>Application Layer Confirmation Retry Time. This is the length of time the switch control waits for an application layer confirmation on a response message before resending the response. It uses timer byte format. The retry time is only in effect when the confirmation process is enabled.</p> <p>In timer byte format, the top two bits are the time units (0=tenths of a second, 1 (\$40)=seconds, 2 (\$80)=minutes, 3 (\$C0)=hours). The bottom 6 bits are the count. A value of 1 second (\$41) can be more accurately specified as 10 tenths (\$0A). A value of 1 minute (\$81) can be specified as 60 seconds (\$7C). A value of 1 hour (\$C1) can be specified as 60 minutes (\$BC). The value \$FF generates an “infinite” time value.</p>
1	<p>Application Layer Confirmation Retry Count. This is the number of times the switch control sends a response message without receiving a confirmation. This number includes the initial response. The retry count is only in effect when the confirmation process is enabled.</p>
2	<p>Control Point Select Time. During a Select-Before-Operate procedure, this is the length of time that may elapse between receiving the Select function for a point and receiving the Operate function for that same point. If an Operate is not received within this time period, the point is deselected and another Select is required before the point will operate. It uses timer byte format.</p>
3	<p>Total Average 3-Phase Feeder Load, in Amps.</p> <p>A DNP device with real-time feeder loading data can use these analog output points to inform the Switch Controls in a team of the real-time loading at both sources for the team. The team can then use this real-time loading data to determine more accurately whether transferring load can be accomplished safely. See the associated setpoints on the second SETUP: Automatic Operation screen.</p>

BINARY COUNTER POINTS

Point #	Definition
0	Operation Counter Switch 1. This is the number of switch operations. The counter is incremented on each Close operation. This is a 16-bit counter and will overflow back to zero.
1	Operation Counter Switch 2. This is the number of switch operations. The counter is incremented on each Close operation. This is a 16-bit counter and will overflow back to zero.

FROZEN COUNTER POINTS

Point #	Definition
0	Frozen Operation Counter Switch 1. This is the number of switch operations before the operation counter received a <i>Freeze</i> command.
1	Frozen Operation Counter Switch 2. This is the number of switch operations before the operation counter received a <i>Freeze</i> command.

Control Output Points

CONTROL OUTPUT POINTS	
Point #	Definition
0	Issue the Close/Open Command to Switch 1. The Close/Open command may be issued using either the Select/Operate sequence, the Direct Operate function, or the Direct Operate Without Ack function. Both Trip and Close are valid for this point.
1	Issue the Close/Open Command to Switch 2. As above, for Switch 2.
2	Issue the Shots-to-Lockout Command to Switch 1. This command may be issued using either the Select/Operate sequence, the Direct Operate function, or the Direct Operate Without Ack function. Only a Close command is valid for this point. This command is ignored and returns an error if the switch is not open, or automatic operation is not enabled.
3	Issue the Shots-to-Lockout Command to Switch 2. This command may be issued using either the Select/Operate sequence, the Direct Operate function, or the Direct Operate Without Ack function. Only a Close command is valid for this point. This command is ignored and returns an error if the switch is not open, or automatic operation is not enabled.
	Note for Points 0 -3: These commands are ignored and return an error if a bad battery condition is active and the <i>Failure Override</i> command has not been issued. These commands are ignored if the REMOTE/LOCAL switch is not in the REMOTE position.
4	Reset (clear) Overcurrent Fault Condition. 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.
5	Begin Battery Test. This command must be issued using a Pulse On request. If ac power is on, the charger is disconnected for several minutes while the test is in progress. If ac power is off, a brief battery impedance test evaluates the battery condition.
6	Enable or Disable Failure Override. This command must be issued using the Latch On/Off request in the control relay output block. This allows Open and Close commands to be processed even if a Bad Battery condition is active.
7	Enable or 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 preconfigured recloser sequence is recognized after a detected fault. Note that Automatic operation is not disabled by the faceplate REMOTE/LOCAL switch being in the LOCAL position.
8	Enable or Disable Application Layer Confirmations. This command must be issued using the Latch On/Off request in the control relay output block. When enabled, the switch control requests a confirmation from the master station for every response message generated.
9	Enable or Disable Data Link Layer Confirmations. This command must be issued using the Latch On/Off request in the control relay output block. When enabled, the switch control uses confirmed user data packets for all messages originated by the switch control.
10	Prohibit Automatic Circuit Restoration. This command must be issued using the Latch On/Off request in the control relay output block. When latched this command will prevent the local switch, and any switches in any team in which this switch control participates, from automatically closing to restore load under any circumstances.
11	Enable or Disable Sectionalizer Operation Switch 1. This command must be issued using the Latch On/Off request in the control relay output block.
12	Enable or Disable Sectionalizer Operation Switch 2. This command must be issued using the Latch On/Off request in the control relay output block.

This implementation of DNP and this section of documentation conform to the document DNP V3.00 Subset Definitions, Version 0.01, available from the DNP Users Group.

Device Profile Description

This section describes the compatibility of S&C's implementation of DNP with other devices.

DNP V3.00 DEVICE PROFILE DOCUMENT	
Vendor Name: S&C Electric Company	
Device Name: S&C 5802 Dual Overhead Automatic Switch Control	
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 0 to 25 and infinite

Requires Data Link Layer Confirmation:

- Never
- Always
- Sometimes If 'Sometimes', when?
- Configurable If 'Configurative', how?

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?
- Configurable If 'Configurable', how? - Response confirmations are configured through SCADA communications or through locally connected setup software.

Timeouts while waiting for:

Data Link Confirm	<input checked="" type="checkbox"/>	None	<input type="checkbox"/>	Fixed	<input type="checkbox"/>	Variable	<input type="checkbox"/>	Config
Complete Appl. Fragment	<input checked="" type="checkbox"/>	None	<input type="checkbox"/>	Fixed	<input type="checkbox"/>	Variable	<input type="checkbox"/>	Config
Application Confirm	<input type="checkbox"/>	None	<input type="checkbox"/>	Fixed	<input type="checkbox"/>	Variable	<input checked="" type="checkbox"/>	Config
Complete Appl. Response	<input checked="" type="checkbox"/>	None	<input type="checkbox"/>	Fixed	<input type="checkbox"/>	Variable	<input type="checkbox"/>	Config
Others _____								

Attach explanation if 'Variable' or 'Configurable' was checked
(see Note 1 below for explanation)

Sends/Executes Control Operations:

WRITE Binary Outputs	<input checked="" type="checkbox"/>	Never	<input type="checkbox"/>	Always	<input type="checkbox"/>	Sometimes	<input type="checkbox"/>	Config
SELECT/OPERATE	<input type="checkbox"/>	Never	<input type="checkbox"/>	Always	<input checked="" type="checkbox"/>	Sometimes	<input type="checkbox"/>	Config
DIRECT OPERATE	<input type="checkbox"/>	Never	<input type="checkbox"/>	Always	<input checked="" type="checkbox"/>	Sometimes	<input type="checkbox"/>	Config
DIRECT OPERATE - NO ACK	<input type="checkbox"/>	Never	<input type="checkbox"/>	Always	<input checked="" type="checkbox"/>	Sometimes	<input type="checkbox"/>	Config
Count > 1	<input checked="" type="checkbox"/>	Never	<input type="checkbox"/>	Always	<input type="checkbox"/>	Sometimes	<input type="checkbox"/>	Config
Pulse On	<input type="checkbox"/>	Never	<input type="checkbox"/>	Always	<input checked="" type="checkbox"/>	Sometimes	<input type="checkbox"/>	Config
Pulse Off	<input checked="" type="checkbox"/>	Never	<input type="checkbox"/>	Always	<input type="checkbox"/>	Sometimes	<input type="checkbox"/>	Config
Latch On	<input type="checkbox"/>	Never	<input type="checkbox"/>	Always	<input checked="" type="checkbox"/>	Sometimes	<input type="checkbox"/>	Config
Latch Off	<input type="checkbox"/>	Never	<input type="checkbox"/>	Always	<input checked="" type="checkbox"/>	Sometimes	<input type="checkbox"/>	Config
Queue	<input checked="" type="checkbox"/>	Never	<input type="checkbox"/>	Always	<input type="checkbox"/>	Sometimes	<input type="checkbox"/>	Config
Clear Queue	<input checked="" type="checkbox"/>	Never	<input type="checkbox"/>	Always	<input type="checkbox"/>	Sometimes	<input type="checkbox"/>	Config

Attach explanation if 'Sometimes' or 'Configurable' was checked
(see Note 2 below for explanation)

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

NOTE 1: Timeouts While Waiting for Confirmations

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

You can set the “Time Delay Between Retries” with the Setup software or via SCADA. (See the Setup Instruction Sheet for more details.)

NOTE 2: Control Operations Executed

For all Binary Output Relay operations and Analog Output operations, the allowed control functions are:

- Select/Operate
- Direct Operate
- Direct Operate No Ack

The master station can choose which of these three functions to use at any given time.

You must use the Trip/Close bits for these functions in the Control Block. Set the Count value to “1” and the Code value to “NUL” (0) or “1.” The switch control ignores the On-Time and Off-Time values and the Queue and Clear flags in the Control Code.

For all momentary point operations, you must use the Pulse On function. When using Pulse On, set the Count value in the Control Block to “1” and the Code value to “1.” Set the Trip/Close to “NUL” (00). The switch control ignores the On-Time and Off-Time values and the Queue and Clear flags in the Control Code.

For all latching point operations, you can use either the Latch On or Latch Off function. For either function, set the Count value in the Control Block to “1.” Set the Code value to “3” for Latch On or “4” for Latch Off. Set the Trip/Close to “NUL” (00). The switch control ignores the On-Time and Off-Time values and the Queue and Clear flags in the Control Code.

For more details, see the *Control Relay Output Block* section of the document object library in the *DNP V 3.00 Basic 4 Document Set*, available from the DNP Users Group.

NOTE 3: Unsolicited Responses

The switch control returns unsolicited responses to the configured master station address when a change occurs in any status point or when the device is restarted. The data returned is object 2, variation2 (“Binary Input Change with Time”).

You can enable and disable unsolicited responses from the setup software or via SCADA (function code 20 to enable, function code 21 to disable).

NOTE 4: Binary Input Change with Time

This is the default object returned in the unsolicited report by exception (if enabled) and the default object for a class 1 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 On-Line bit is used. All other bits, including the State bit, should be ignored.

You can inspect the state of all digital points (controlled and not controlled) by using the Binary Input object.

NOTE 6: 8-Bit Unsigned Integer

This object provides efficient access to all types of memory-mapped data. All virtual memory locations are addressed using 16-bit absolute address identifiers in the Range field (qualifier code 4), least significant byte (LSB) first.

Switch controls with IntelliTEAM II primarily use this object to share specific records or data with each other. It is available for SCADA implementation, but is not required.

Implementation Table

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 control flags an error. All application layer responses use the standard response function code 129.

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	1	Binary Output (object parsed but WRITE not used)	2	17,28	
10	2	Binary Output Status (only use the on-line bit, see Note 5)			00
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	6	16-Bit Binary Counter without Flag			00
21	0	Frozen Counter - All Variations	1	06	
21	10	16-Bit Frozen Counter without Flag			00
22	0	Counter Change Event - All Variations (object parsed but no data to return)	1	06,07,08	

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OBJECT			REQUEST		RESPONSE
Obj	Var	Description	Func Code (dec)	Qualifier Codes (hex)	Default Var. (hex)
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	
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	2	07 where quantity =1	IINs only
60	1	Class 0 Data	1	06	
60	2	Class 1 Data	1	06,07,08	
60	3	Class 2 Data (object parsed but no data to return)	1	06,07,08	
60	4	Class 3 Data (object parsed but no data to return)	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	04	04
		No Object	13		
		3No Object	23		