VISTA® DNP POINTS LIST AND IMPLEMENTATION

DNP points and DNP implementation for: **5802 Vista Control with ViSD2B1X** Software **Rev 2.40**.

DNP SCADA Points List for the Vista Control (5802)

For accessing the Model 5802 with IntelliTEAM, 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

The points are defined in the tables below. Unless otherwise noted, each bit is set if the condition is logically true or active.

Status Points

Status Point #	*Definition*
0	`Switch 1 Open` contact status. This bit is set if the switch (circuit) is open.
1	`Switch 1 Closed` contact status. This bit is set if the switch (circuit) is closed.
2	`Switch 1 Grounded` contact status. This bit is set if the switch (circuit) is in the grounded position.

Status Point #	*Definition*
3	`Switch 2 Open` contact status. This bit is set if the switch (circuit) is open
4	`Switch 2 Closed` contact status. This bit is set if the switch (circuit) is closed.
5	`Switch 2 Grounded` contact status. This bit is set if the switch (circuit) is in the grounded position.
6	Automatic operation enable. This bit is set if automatic control functions have been enabled via either the faceplate switches or SCADA control command.
7	**REMOTE/LOCAL** faceplate switch position. 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.
8	Overcurrent fault detected, Switch 1 or Switch 2. 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 a normally open switch, you can toggle the **REMOTE/LOCAL** switch to clear the condition while the line switch is open or closed. NOTE: If the conditions above are met and you reinitialize the Switch Control using the Setup software or a SCADA operator command, the fault condition also clears.
9	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 the Setup software, or is cleared when you toggle the **REMOTE/LOCAL** switch.
10	Sectionalizer tripped, Switch 2. As above, for Switch 2.
11	Fault interrupter trip indication. If the switchgear is equipped with fault interrupting positions, this bit is set if one or more of the fault interrupting positions have tripped open due to a fault. This bit remains set until the fault interrupting position(s) has been manually closed.

Status Point #	Definition
12	Switch 1 disabled. This bit is set when switch operation is disabled. This may occur when bad battery voltage is present, low pressure is detected, external local is set, or when switch 1 is in the grounded position. See status points 2, 14, 15, and 22 to determine which condition is causing the bit to be set.
13	Switch 2 disabled. This bit is set when switch operation is disabled. This may occur when bad battery voltage is present, low pressure is detected, external local is set, or when switch 2 is in the grounded position. See status points 5, 14, 15, and 22 to determine which condition is causing the bit to be set.
14	Low Pressure detected.
15	Operator is in external local operation.
16	Maintenance 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, or when Voltage Difference Checking is enabled and active. 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 indicator is inconsistent, Switch 1. This bit is set if either both contacts are closed, or both contacts are open.
18	`Open/Close` switch position indicator 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 control power is not available to the battery charger. It indicates that the Switch Control is operating on battery backup.
20	Operator failure override set. 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 low. The bit remains set until the override is disabled using the `Failure Override Latch Off` command. Also, the status point will go off, and `Failure Override` will become disabled, after a 15 minute timeout, if it was not already turned off by the `Latch Off` command.
21	Battery system low. The battery voltage is low, but the switch will operate.
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.

Status Point #	*Definition*
23	Battery charger has 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 the 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. NOTE: If you reinitialize the Switch Control using the Setup software or a SCADA operator command, the fault condition also clears.
28	Phase B - overcurrent fault, Switch 1. As above, for Phase B, Switch 1.
29	Phase C - overcurrent fault, Switch 1. 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 the 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. NOTE: If you reinitialize the Switch Control using the Setup software or a SCADA operator command, the fault condition also clears.

Status Point #	Definition
32	Phase B - overcurrent fault, Switch 2. As above, for Phase B, Switch 2.
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	This point is set for any configured voltage channel where the voltage sensor shows a loss of voltage. For example, pad-mounted gear may be configured with three voltage sensors or six voltage sensors.
36	Phase A - current direction, 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 - current direction, Switch 1. As above, for Phase B, Switch 1.
38	Phase C - current direction, Switch 1. As above, for Phase C, Switch 1.
39	Phase A - current direction, 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 - current direction, Switch 2. As above, for Phase B, Switch 2.
41	Phase C - current direction, 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 change event 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.

Status Point #	Definition
	NOTE: Data link layer confirmations only apply to requests that are generated by the Switch Control to other peer Switch Controls (IntelliTEAM).
44	Switch Control 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 is disabled (see points 12 and 13), automatic operation is disabled (see point 6), or the switch position is inconsistent (see points 17 and 18). 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 (see point 44), or team wide conditions such as isolation of a fault, team configuration errors, team coordination errors, automatic restoration prohibited (see point 49), and team logic disabled on the *TEAM:Setup* 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. NOTE: 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 Operation in Progress. True if any team defined in the control is actively performing an automatic transfer operation.
47	Automatic Return To Normal Operation in Progress. True if any team defined in the control is actively performing a Return-To-Normal operation.
48	Setup Data Revision. True whenever the setup configuration data for any enabled team defined in the control is modified. It remains true until the Team Setup parameter on the *SETUP: Team* screen has been toggled from **Stopped** back to **Running** for any team where the setup data has been changed.

Status Point #	Definition
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 for Switch 1. This point is only applicable when Status Point 6 is enabled.
52	Automatic Operation enabled for Switch 2. This point is only applicable when Status Point 6 is enabled.
53	Source Loading Data is 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 may be 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. 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.

Status Point #	Definition
57	Team 3 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.
58	Team 4 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.
59	Team 5 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.
60	Team 6 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.
61	Team 7 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.
62	Team 8 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.

Analog Input Points

Analog Input Point #	Definition
0	90% voltage reference standard. This is provided for the benefit of the 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 the protocol implementation to conform to the RTU standard. It is loaded as a constant with the value zero.
2	Neutral current of 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 measured on Phase A of Switch 1. Current is measured using true RMS techniques and reported in units of 1 count equals 1 ampere.

Analog Input Point #	Definition
4	Single-phase current measured on Phase B of Switch 1. Current is measured using true RMS techniques and reported in units of 1 count equals 1 ampere.
5	Single-phase current measured on Phase C of Switch 1. Current is measured using true RMS techniques and reported in units of 1 count equals 1 ampere.
6	Neutral current of 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 measured on Phase A of Switch 2. Current is measured using true RMS techniques and reported in units of 1 count equals 1 ampere.
8	Single-phase current measured on Phase B of Switch 2. Current is measured using true RMS techniques and reported in units of 1 count equals 1 ampere.
9	Single-phase current measured on Phase C of Switch 2. Current is measured using true RMS techniques and reported in units of 1 count equals 1 ampere.
10	Single-phase voltage measured on Phase A of 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 ratio, 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 measured on Phase B of Switch 1. As above, for Phase B, Switch 1
12	Single-phase voltage measured on Phase C of Switch 1. As above, for Phase C, Switch 1.
13	Single-phase voltage measured on Phase A of 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 ratio, 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.

Analog Input Point #	*Definition*
14	Single-phase voltage measured on Phase B of Switch 2. As above, for Phase B, Switch 2.
15	Single-phase voltage measured on Phase C of Switch 2. As above, for Phase C, Switch 2.
16	Phase angle on Phase A of Switch 1. Each count equals one eighth of a degree.
17	Phase angle on Phase B of Switch 1. As above, for Phase B, Switch 1.
18	Phase angle on Phase C of Switch 1. As above, for Phase C, Switch 1.
19	Phase angle on Phase A of Switch 2. Each count equals one eighth of a degree.
20	Phase angle on Phase B of Switch 2. As above for Phase B, Switch 2.
21	Phase angle on Phase C of Switch 2. As above for Phase C, Switch 2.
22	Single-phase kVARs measured on Phase A of 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.
23	Single-phase kVARs measured on Phase B of Switch 1. As above, for Phase B, Switch 1.
24	Single-phase kVARs measured on Phase C of Switch 1. As above, for Phase C, Switch 1.
25	Single-phase kVARs measured on Phase A of 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.
26	Single-phase kVARs measured on Phase B of Switch 2. As above, for Phase B, Switch 2.
27	Single-phase kVARs measured on Phase C of Switch 2. As above, for Phase C, Switch 2.
28	The most recent cabinet temperature reading. This value is in units of °F.
29	Battery voltage, nominally 36 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 (sum of A, B, & C phase kVARs) for Switch 1. Each count equals one kVAR.

Analog Input Point #	Definition
31	Three phase sum of kVARs (sum of A, B, & C phase kVARs) for Switch 2. Each count equals one kVAR.
32	Three phase sum of kW (sum of A, B, & C phase kW) for Switch 1. Each count equals one kW.
33	Three phase sum of kW (sum of A, B, & C phase kW) for Switch 2. Each count equals one kW.
34	Three phase sum of kVA (sum of A, B, & C phase kVA) for Switch 1. Each count equals one kVA.
35	Three phase sum of kVA (sum of A, B, & C phase kVA) for Switch 2. Each count equals one kVA.

Analog Output Points

Analog Output Point #	Definition
0	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. NOTE: In "timer byte format," the top two bits are the time units (0 = tenths of seconds, 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.
1	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.
2	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."

Analog Output Point #	Definition
3	Real-time feeder loading. 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 total averaged 3-phase feeder loading measured at the breaker in amps. The team(s) can then use this real-time loading data to determine more accurately whether transferring load can be accomplished safely. Each count equals 1 ampere.

Binary Counter Points

Binary Counter 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 at 65,535.
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 at 65,535.

Frozen Counter Points

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

Control Points

Control 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.

Control Point #	*Definition*
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 (Points 0 - 3): These commands are ignored and return an error if a bad battery condition is active and the Failure Override command has not been issued. These commands are ignored and return an error if any of the following conditions are active on the switch position to be operated: a low pressure condition is active; the external local/remote switch in the motor operator cabinet is set to local; the switch is in the grounded position. These commands are ignored if the **REMOTE/LOCAL** switch is not in the **REMOTE** position.
4	Reset (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.
5	Begin a battery test cycle. 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 the `Failure Override` status. 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.

Control Point #	*Definition*
	NOTE: 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 change event data 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 Automatic Operation for Switch 1. This command must be issued using the `Latch On/Off` request in the control relay output block. NOTE: To operate Control Point 11 or 12 the **REMOTE/LOCAL** switch on the faceplate must be in the **REMOTE** position, and Control Point 8 must be set via SCADA to *Enable*. Switch 1 and Switch 2 Automatic Operation status can be confirmed with Status Points 51 and 52. If the faceplate switches are used to select **LOCAL** Operation and **DISABLED** global Automatic Operation, Control Points 11 and 12 will take effect again when the faceplate switches are set to **REMOTE** Operation and **ENABLED** global Automatic Operation.
12	Enable or disable Automatic Operation for Switch 2. As above, for Switch 2.

DNP Implementation

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 EnergyLine® 5800 Series IntelliTEAM II℗ 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 1 to 25 and infinite

Requires Data Link Layer Confirmation:

- [X] Never
- [ ] Always
- [ ] Sometimes — If 'Sometimes', when?
- [ ] Configurable — If 'Configurable', 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?
- [X] Configurable — If 'Configurable', how? - Response confirmations are configured through SCADA communications or through locally connected setup software.

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 below 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 below for explanation)

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 below)	Sends Static Data in Unsolicited Responses: __ Never __ When Device Restarts X When Status Flags Change No other options are permitted. (see Note 3 below)
Default Counter Object/Variation: __ No Counters Reported __ Configurable (explain) X Default Object - 20 Default Variation - 6 __ Point-by-point list attached	Counters Roll Over at: __ No Counters Reported __ Configurable (explain) X 16 Bits __ 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 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 Attempts” with the Setup software or via SCADA. (See the *Setup* chapter 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 V3.00 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, variation 2 ("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).

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)	Qual Codes (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	

OBJECT			REQUEST		RESPONSE
Obj	Var	Description	Func Code (dec)	Qualifier Codes (hex)	Qual Codes (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		
		No Object	23		

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.

◆NOTE: 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.

NOTE 7: Polling Class

DNP points are assigned to polling classes. S&C Automatic Controls implement only Class 0 and Class 1 polls. The Class 0 poll contains all DNP points for the control that return **static data**, the latest value for all data. The Class 1 poll returns **event data**, any DNP point that has changed since the last event data message was received. Polling frequency is an aspect of the user's SCADA system, and is user selectable.

The Class 2 and 3 polls are user defined lists of DNP points that will be returned when the IED receives a Class 2 or 3 poll. S&C Automatic Controls do not support Class 2 or 3 polling. When received, the Class 2 or 3 poll request is understood, it does not elicit an error response, and the response is just the application header with no objects. The SCADA master station can send a Class 2 or 3 poll to other equipment on the system, and S&C Controls will not return an error.

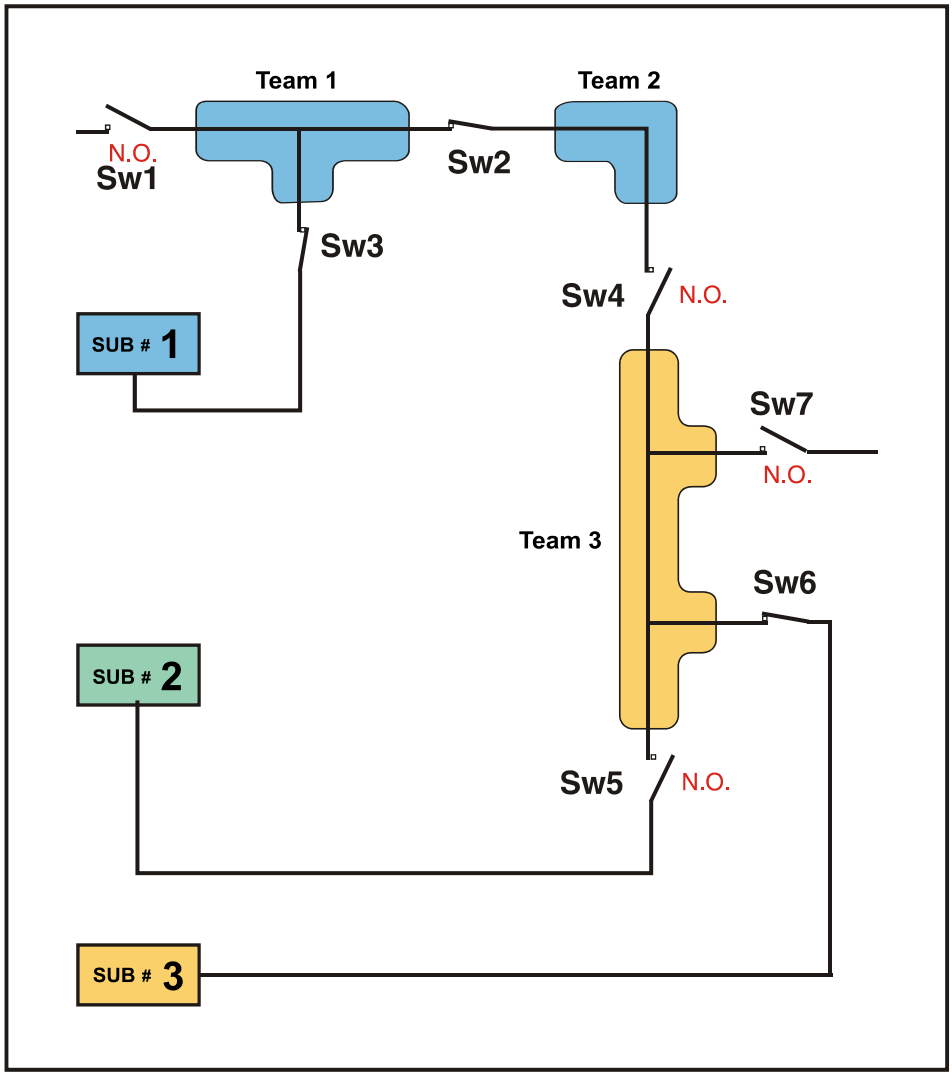

Figure 1 Transfer Ready Status Point Illustration

Issue DO 5 (Disable Automatic Operation) to Control 4							
DI Point	Sw 1	Sw 2	Sw 3	Sw 4	Sw 5	Sw 6	Sw 7
3	1	1	1	0	1	1	1
29	0	0	0	1	0	0	0
30	0	1	0	1	1	1	1
34	0	0	0	0	0	0	0

Issue DO 5 (Disable Automatic Operation) to Control 3							
DI Point	Sw 1	Sw 2	Sw 3	Sw 4	Sw 5	Sw 6	Sw 7
3	1	1	0	1	1	1	1
29	0	0	1	0	0	0	0
30	1	1	1	0	0	0	0
34	0	0	0	0	0	0	0

Issue DO 8 (Prohibit Restoration) to Control 4							
DI Point	Sw 1	Sw 2	Sw 3	Sw 4	Sw 5	Sw 6	Sw 7
3	1	1	1	1	1	1	1
29	0	0	0	0	0	0	0
30	0	1	0	1	1	1	1
34	0	0	0	1	0	0	0

Battery Bad on Control 4							
DI Point	Sw 1	Sw 2	Sw 3	Sw 4	Sw 5	Sw 6	Sw 7
2	0	0	0	1	0	0	0
3	1	1	1	1	1	1	1
14	0	0	0	1	0	0	0
29	0	0	0	1	0	0	0
30	0	1	0	1	1	1	1
34	0	0	0	0	0	0	0

Table 1 Transfer Ready Status Point Illustration