

IEC 60870-5-104 Points List and Implementation

Table of Contents

Introduction	2	Protocol Implementation Conformance Statement	
Single-Point Information, Double-Point Information	3	System or Device	32
Measured Value, Short Floating-Point Number	16	Application Layer	32
Setpoint Command (Short Floating Point) ...	23	Basic Application Functions	41
Single Command, Double Command	24	Additional Notes on Product Configuration and Protocol Compliance	48
		Setpoint Mapping	48
		Methods to Report Monitored Setpoint Data to the Controlling Station	48
		Measured Value Scaling	49
		Single, Double Commands	49



This instruction sheet provides IEC 60870-5-104 setpoints.

Implementation information for an IntelliRupter PulseCloser Fault Interrupter applied in an IntelliTeam® SG Automatic Restoration System.

This instruction sheet is used with **IntelliRupterECInstaller-7.3.x.exe**. The “x” can indicate any number from 0 to 255. Other related software component version information is found in the IntelliLink® Setup Software on the *Setup>General>Revisions* screen.

The IEC 60870-5-104 controlling station should define an IntelliRupter® fault interrupter with the following setpoints:

Point	Count
Single-Point Information	196
Double-Point Information	196
Measured Value	100
Setpoint Command	18
Single Command	100
Double Command	100

The available IEC 60870-5-104 points are listed in Tables 1 through 4 on pages 3 through 31 in the same order they are presented for selection on the IntelliRupter R3 Communication Module’s IEC104 *Setpoints* screen. Refer to S&C Instruction Sheet 766-529, “IntelliRupter® PulseCloser® Fault Interrupter: *IEC 60870 Protocol Communication and Configuration Guide*.” Point descriptions begin with a code number used to find the detailed definition in this instruction sheet. The IEC 60870-5-104 information object address (IOA) for each mapped point will be assigned automatically.

For a specific SCADA system, typically all IntelliRupter fault interrupters operate with the same IEC 60870-5-104 setpoint configuration.

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

The user has multiple options for the delivery of single-point information, double-point information, and measured value setpoints to the controlling station. Each of these setpoint types can be assigned to a specific interrogation group (1-16) to allow differentiated polling by the controlling station. Each of these setpoints can be included in the IEC 60870-5-104 cyclic/periodic reporting mechanism.

Finally, each of these setpoints can be reported via a spontaneous event if enabled by the user. Spontaneous events will be reported for single-point information or double-point information whenever the value changes. The user can assign deadband ranges to measured value setpoints to enable spontaneous event reporting when the measured value changes.

Single-Point Information, Double-Point Information

These IntelliRupter fault interrupter features have multiple single-point information, double-point information points:

Open or Close: 1–8	Hot Line Tag: 17, 22–24	IntelliTeam System Operation: 56–74
Lockout: 88–90	Sensitive Earth Fault: 75–78	Netlist Information: 105–108
Overcurrent Trip: 34–38	Loop Restoration: 79–82	
General Profile: 11–14	PulseFinding™ Fault Location	
Closing Profile: 15, 16, 21	Technique: 91–93	

Table 1. Single-Point Information, Double-Point Information

Code	Name—Definition
1	Pole 1 Open —On when Pole 1 interrupter contact status is Open . Otherwise, off.
2	Pole 1 Closed —On when Pole 1 interrupter contact status is Closed . Otherwise, off.
3	Pole 2 Open —On when Pole 2 interrupter contact status is Open . Otherwise, off.
4	Pole 2 Closed —On when Pole 2 interrupter contact status is Closed . Otherwise, off.
5	Pole 3 Open —On when Pole 3 interrupter contact status is Open . Otherwise, off.
6	Pole 3 Closed —On when Pole 3 interrupter contact status is Closed . Otherwise, off.
7	IntelliRupter Fault Interrupter Open—All Poles —On when Pole 1, Pole 2, and Pole 3 interrupter contact status is in the Open position. Otherwise, off.
8	IntelliRupter Fault Interrupter Closed—All Poles —On when Pole 1, Pole 2, and Pole 3 interrupter contact status is in the Closed position. Otherwise, off.
9	Manual Lever Locked Open —On when interrupter OPEN/CLOSE/READY lever is in the Open position. Off when lever is moved back to the Ready or Closed position.
10	Manual Disconnect Open —On when disconnect on disconnect style models is in the Open position. Otherwise, off.
11	General Profile 1 Active —On when the General Profile 1 setting is in effect. Otherwise, off.
12	General Profile 2 Active —On when the General Profile 2 setting is in effect. Otherwise, off.
13	General Profile 3 Active —On when the General Profile 3 setting is in effect. Otherwise, off.
14	General Profile 4 Active —On when the General Profile 4 setting is in effect. Otherwise, off.
15	Closing Profile 1 Active —On when the Closing Profile 1 setting is in effect after a Close command is issued by SCADA, Wi-Fi, external lever, or automatic load restoration and the Time for Closing Profile to be Active timer has not expired.
16	Closing Profile 2 Active —On when the Closing Profile 2 setting is in effect after a Close command is issued by SCADA, Wi-Fi, external lever, or automatic load restoration and the Time for Closing Profile to be Active timer has not expired.
17	Hot Line Tag Profile Active —On when the Hot Line Tag Profile state is in effect. Otherwise, off.

TABLE CONTINUED ►

Single-Point Information, Double-Point Information

Table 1. Single-Point Information, Double-Point Information—Continued

Code	Name—Definition
18	Ground Trip Blocked —On when the Ground Trip feature is blocked. Off when the Ground Trip feature is enabled.
19	Circuit Testing Blocked —On when the Circuit Testing feature is blocked or the Hot Line Tag state is applied. Off when the Circuit Testing feature is enabled and the Hot Line Tag state is removed.
20	Test on Backfeed Blocked —On when the Test on Backfeed feature is blocked. Off when the Test on Backfeed feature is enabled.
21	2nd Closing Profile Selected —On when the Second Closing Profile setting is selected. Off when the First Closing Profile setting is selected. Note that a selected closing profile is different from an active closing profile.
22	Hot Line Tag Active SCADA —On when the Hot Line Tag setting activated by a SCADA command is in effect. Off when the Hot Line Tag setting is removed.
23	Hot Line Tag Active IntelliLink —On when the Hot Line Tag setting activated by an IntelliLink software command is in effect. Off when the Hot Line Tag setting is removed.
24	Hot Line Tag Active Manual —On when the Hot Line Tag setting activated by a manual lever is in effect. Off when the Hot Line Tag setting is removed.
25	Remote Operation On —On when the Remote Operation setting is on. Off when the Remote Operation setting is off and only local control is permitted.
26	Battery System Low —On when a routine battery test indicates low battery voltage. Otherwise, off. Battery Voltage setpoints are located on the <i>Diagnostics>Control Power</i> screen.
27	Battery System Bad —On when routine battery system test indicates inadequate battery capacity; however, the IntelliRupter fault interrupter will operate normally when power is available from the integrated power module(s). Otherwise, off. The Battery Voltage setpoints are located on the <i>Diagnostics>Control Power</i> screen.
28	Battery Charger Problem —On when a routine battery system test turns the charger off because of overvoltage. Off when the next routine test does not detect overvoltage.
29	Ac Control Power Present —On when there is output from the integrated power module(s). Otherwise, off.
30	IntelliRupter Fault Interrupter Shut Down Because of Control Power Loss —On just before the IntelliRupter fault interrupter shuts down because of loss of line power and no battery power. Otherwise, off.
31	Trip on Loss of Control Energy —On when the IntelliRupter fault interrupter trips because of loss of control energy and there is no ac power. Off when the IntelliRupter fault interrupter closes or a command to close the IntelliRupter fault interrupter is received.
32	Source Loading Data Is Active —On 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 via Setpoint Command (short floating point) Code #4 or the Default Source Segment Loading setting. Otherwise, off.

TABLE CONTINUED ►

Table 1. Single-Point Information, Double-Point Information—Continued

Code	Name—Definition
33	Real-Time Load Data May Be Old or Abnormal —On when the received Real-Time Feeder Loading value (Setpoint Command Code #4) is less than the real-time three-phase load as sensed by the switch. It is also set if the real-time feeder-loading data have not updated within the configured time interval. Off when new data are received, and the received value is equal to or greater than the local measured load. Otherwise, off.
34	Overcurrent Timing —On when any Overcurrent element is timing. Otherwise, off.
35	Overcurrent Current, Pole 1 —On if this pole was timing and >20% of trip and a Phase-Overcurrent element has tripped for this pole or another pole. On if the Phase-Overcurrent element for this pole was timing prior to a Ground-Overcurrent or Negative-Sequence element trip. Off when Phase-Overcurrent elements were not timing prior to trip, the IntelliRupter PulseCloser Fault Interrupter closes, or a command to close the IntelliRupter fault interrupter is given.
36	Overcurrent Current, Pole 2 —On if this pole was timing and >20% of trip and a Phase-Overcurrent element has tripped for this pole or another pole. On if the Phase-Overcurrent element for this pole was timing prior to a Ground-Overcurrent or Negative-Sequence element trip. Off when Phase-Overcurrent elements were not timing prior to trip, the IntelliRupter PulseCloser Fault Interrupter closes, or a command to close the IntelliRupter fault interrupter is given.
37	Overcurrent Current, Pole 3 —On if this pole was timing and >20% of trip and a Phase-Overcurrent element has tripped for this pole or another pole. On if the Phase-Overcurrent element for this pole was timing prior to a Ground-Overcurrent or Negative-Sequence element trip. Off when Phase-Overcurrent elements were not timing prior to trip, the IntelliRupter PulseCloser Fault Interrupter closes, or a command to close the IntelliRupter fault interrupter is given.
38	Overcurrent Trip, Any Pole —On when any Overcurrent element on Pole 1, Pole 2, or Pole 3 has tripped. Off when the IntelliRupter fault interrupter closes or a command to close the IntelliRupter fault interrupter is given.
39	Tripped to Lockout —On when the IntelliRupter fault interrupter is in the Lockout state as the result of an event and the IntelliTeam system begins the reconfiguration process. Off when a Close command is received.
40	Voltage Timing —On when any Voltage element is timing. Otherwise, off.
41	Voltage Trip —On when a Voltage element trips. Off when a Close command is received.
42	Frequency Timing —On when any Frequency element is timing. Otherwise, off.
43	Frequency Trip —On when any Frequency element trips. Off when a Close command is received.
44	Sectionalizing Timing —On when any Sectionalizing element is timing. Otherwise, off.
45	Sectionalizing Trip —On when any Sectionalizing element trips. Off when a Close command is received.
46	IntelliRupter Fault Interrupter Alarm —On when any alarm is active. Turned off automatically when the problem that caused the alarm is resolved.
47	IntelliRupter Fault Interrupter Warning —On when any warning is active. Turned off automatically when the problem that caused the warning is resolved.

TABLE CONTINUED ►

Single-Point Information, Double-Point Information

Table 1. Single-Point Information, Double-Point Information—Continued

Code	Name—Definition
48	IntelliRupter Fault Interrupter Error —On when any error is active. Turned off by a user action to clear the error.
49	Good Source Voltage—Terminal X —On when the X-side terminal voltages equal or exceed the Source Voltage Indication setting for the active profile. Otherwise, off.
50	Good Source Voltage—Terminal Y —On when the Y-side terminal voltages equal or exceed the Source Voltage Indication setting for the active profile. Otherwise, off.
51	Wi-Fi Is Connected —On when a Wi-Fi connection to the IntelliRupter fault interrupter is established. Otherwise, off.
52	Wi-Fi Intrusion Alarm —On when the Wi-Fi module reports a replay attack or improper authentication. Turned off by the user with Single Command, Double Command Code #21, Clear Wi-Fi Intrusion Alarm.
53	Testing —On when the IntelliRupter fault interrupter is circuit-testing. Off when the IntelliRupter fault interrupter closes or a command to close the IntelliRupter fault interrupter is given.
54	Close Blocked by Synch. Check —On when the Close operation is blocked by the Synch. Check feature (i.e., different voltage magnitude, phase angle, or frequency on each side of the IntelliRupter fault interrupter). Off when a Close command is received.
55	PulseClosing, Fault Detected —On when a fault is detected during the PulseClosing® Technology operation. Off when the IntelliRupter fault interrupter closes, or a Close command is received.
56	IntelliTeam Prohibit Restoration Timer Exceeded —On when the Prohibit Restoration Timer expires for any team in which this IntelliRupter fault interrupter is a member. Countdown starts when a transfer process begins at the team, usually when a sectionalizing event occurs. Timers in adjacent teams may start simultaneously. Each team decrements its timer independently so teams can potentially enter the Prohibit Restoration state asynchronously. Off when local manual operations have been cleared, all local trouble indications are cleared, and the Prohibit Restoration state is not active locally.
57	IntelliTeam Prohibit Restoration Enabled —On when the IntelliRupter fault interrupter receives a Prohibit Restoration command locally or from SCADA. No switch on any team in which this IntelliRupter fault interrupter is a member is allowed to automatically close, preventing automatic load restoration. Off when the Prohibit Restoration feature receives a SCADA Latch-Off command.
58	Setup Data Revision —On when the configuration entries for any enabled team defined in the control are modified. It remains on until the Team Setup parameter on the <i>Setup>Team</i> screen has been toggled from Stopped mode back to Running mode for any team where the configuration entries have been changed. Otherwise, off.
59	IntelliTeam Automatic Transfer In Progress —On when any team defined in the IntelliRupter fault interrupter is actively performing an Automatic Transfer operation. Otherwise, off.
60	IntelliTeam Return to Normal In Progress —On when any team defined in the IntelliRupter fault interrupter is actively performing a Return-to-Normal operation. Otherwise, off.
61	IntelliTeam Fault Pole 1 —On when the Phase-Overcurrent element on Pole 1 or any of the Negative Sequence, Ground, or Sensitive Earth Overcurrent elements exceed 50% of the trip time setting. Turned off by the IntelliTeam system.

TABLE CONTINUED ►

Table 1. Single-Point Information, Double-Point Information—Continued

Code	Name—Definition
62	IntelliTeam Fault Pole 2 —On when the Phase-Overcurrent element on Pole 2 or any of the Negative Sequence, Ground, or Sensitive Earth Overcurrent elements exceed 50% of the trip time setting. Turned off by the IntelliTeam system.
63	IntelliTeam Fault Pole 3 —On when the Phase-Overcurrent element on Pole 3 or any of the Negative Sequence, Ground, or Sensitive Earth Overcurrent elements exceed 50% of the trip time setting. Turned off by the IntelliTeam system.
64	IntelliTeam Team Member Not Transfer Ready —On when an IntelliRupter fault interrupter operation is not consistent with the expected team operation. A variety of manual operations will take the IntelliRupter fault interrupter out of the Ready state. Off when local manual operations and all local trouble indications have been cleared.
65	Not All IntelliTeam Teams Transfer Ready —On when any team in which this IntelliRupter fault interrupter is a member is not fully operational. This may be because of conditions of individual team members, team-wide conditions such as the isolation of a fault or during configuration or coordination problems, or when the IntelliTeam SG Restoration system is set to the Disabled state on the <i>IntelliTeam SG>Team Summary</i> screen. Off when all conditions that caused this Single-Point Information, Double-Point Information point to be set initially have been cleared. Unless otherwise prohibited, team member IntelliRupter fault interrupters will revert to standalone basic protection when the Not Transfer Ready state is active, whether because of local conditions or conditions at adjacent team members.
66	IntelliTeam Team 1 Transfer Ready —On when team 1 is in the Ready to Transfer state. Off when any member of team 1 is set to Manual Operation mode, has any trouble indication active, has the Prohibit Restoration state active, or when the line section represented by team 1 contains a fault.
67	IntelliTeam Team 2 Transfer Ready —On when team 2 is in the Ready to Transfer state. Off when any member of team 2 is set to Manual Operation mode, has any trouble indication active, has the Prohibit Restoration state active, or when the line section represented by team 2 contains a fault.
68	IntelliTeam Team 3 Transfer Ready —On when team 3 is in the Ready to Transfer state. Off when any member of team 3 is set to Manual Operation mode, has any trouble indication active, has the Prohibit Restoration state active, or when the line section represented by team 3 contains a fault.
69	IntelliTeam Team 4 Transfer Ready —On when team 4 is in the Ready to Transfer state. Off when any member of team 4 is set to Manual Operation mode, has any trouble indication active, has the Prohibit Restoration state active, or when the line section represented by team 4 contains a fault.
70	IntelliTeam Team 5 Transfer Ready —On when team 5 is in the Ready to Transfer state. Off when any member of team 5 is set to Manual Operation mode, has any trouble indication active, has the Prohibit Restoration state active, or when the line section represented by team 5 contains a fault.
71	IntelliTeam Team 6 Transfer Ready —On when team 6 is in the Ready to Transfer state. Off when any member of team 6 is set to Manual Operation mode, has any trouble indication active, has the Prohibit Restoration state active, or when the line section represented by team 6 contains a fault.
72	IntelliTeam Team 7 Transfer Ready —On when team 7 is in the Ready to Transfer state. Off when any member of team 7 is set to Manual Operation mode, has any trouble indication active, has the Prohibit Restoration state active, or when the line section represented by team 7 contains a fault.
73	IntelliTeam Team 8 Transfer Ready —On when team 8 is in the Ready to Transfer state. Off when any member of team 8 is set to Manual Operation mode, has any trouble indication active, has the Prohibit Restoration state active, or when the line section represented by team 8 contains a fault.

TABLE CONTINUED ►

Single-Point Information, Double-Point Information

Table 1. Single-Point Information, Double-Point Information—Continued

Code	Name—Definition
74	IntelliTeam Manual Operation Team Condition —On when any member of a team registers a manual Open or Close switch operation that puts that team in the Not Ready state. Some manual operations will not cause this condition, such as closing a source switch on a previously faulted team to allow a Return To Normal operation when the Return To Normal state is Enabled . Turned off by using the Clear Manual Operation button on the <i>IntelliTeam SG>Team Summary</i> screen. Also turned off by issuing SCADA Single Command, Double Command Code #23, IntelliTeam Clear Manual Operation .
75	Sensitive Earth Trip Blocked —On when the Sensitive Earth Trip feature is blocked. Off when the Sensitive Earth Trip feature is enabled.
76	Overcurrent Timing—Sensitive Earth Fault —On when the Sensitive Earth element is timing. Otherwise, off.
77	Overcurrent Trip—Sensitive Earth Fault —On when the Sensitive Earth element trips. Off when the IntelliRupter fault interrupter closes, or a Close command is received.
78	Tripped to Lockout—Sensitive Earth Fault —On when the IntelliRupter fault interrupter locks out as the result of a Sensitive Earth Trip element and the IntelliTeam system begins the reconfiguration process. Off when a Close command is received.
79	Loop Restoration Enabled —On when the Loop Restoration system is enabled. Otherwise, off.
80	Loop Restoration Ready —On when the Loop Restoration system is in the Ready state. Otherwise, off.
81	Loop Restoration Timing —On when the Loop Restoration timer is running. Otherwise, off.
82	Loop Restoration Reconfigured —On when the Loop Restoration system closes a normally open device, a normally open device locks out after testing, a normally closed device opens and locks out, or a normally closed device trips, then closes, and is now serving load in the opposite direction. Otherwise, off. This point is reset when a manual Open or Close command is received.
83	Current Flowing In Direction 1 —On when current flows in Direction 1, as configured for this IntelliRupter fault interrupter on the <i>Setup>General</i> screen. Otherwise, off.
84	Current Flowing In Direction 2 —On when current flows in Direction 2, as configured for this IntelliRupter fault interrupter on the <i>Setup>General</i> screen. Otherwise, off.
85	Close Blocked Due to PulseClosing Not Available —On when a closing operation is blocked because of a PulseClosing Technology operation not being available and the user setting for “Conventional Close if PulseClosing Not Available” is set to “No.” The switch can still be closed by issuing a command that does not use a PulseClosing Technology operation. Off when a successful Close operation is performed.
86	Current Restraint-Phase —On when the Phase-Current Restraint mode is in effect for single-phase tripping. Otherwise, off.
87	Current Restraint-Ground —On when the Ground-Current Restraint mode is in effect for single-phase tripping. Otherwise, off.

TABLE CONTINUED ►

Table 1. Single-Point Information, Double-Point Information—Continued

Code	Name—Definition
88	Lockout-Pole 1 —On when Pole 1 is in the Lockout state. Otherwise, off.
89	Lockout-Pole 2 —On when Pole 2 is in the Lockout state. Otherwise, off.
90	Lockout-Pole 3 —On when Pole 3 is in the Lockout state. Otherwise, off.
91	Pulse Detected Fault-Pole 1 —On when a fault is detected during a test sequence or close attempt by a PulseClosing Technology operation on Pole 1. This point is cleared by the next successful Close operation on Pole 1.
92	Pulse Detected Fault-Pole 2 —On when a fault is detected during a test sequence or close attempt by a PulseClosing Technology operation on Pole 2. This point is cleared by the next successful Close operation on Pole 2.
93	Pulse Detected Fault-Pole 3 —On when a fault is detected during a test sequence or close attempt by a PulseClosing Technology operation on Pole 3. This point is cleared by the next successful Close operation on Pole 3.
94	Single-Phase Operation Blocked —On when a Single-Phase Operation function is blocked. Otherwise, off.
95	Ground Trip Block Lever Applied —On when the GROUND TRIP BLOCK lever is applied. Otherwise, off.
96	Battery Disconnected —On when the battery is disconnected, or no battery is installed. Otherwise, off.
97	Battery Test In Progress —On when a battery test is performed. Otherwise, off.
98	GPS Not Active Time Source —On when the GPS feature is not the active time source. Otherwise, off.
99	Communication Test —Toggles the state each time a Test Communication (Single Command, Double Command Code #41) command is received. The initial state on power up is off.
100	Wi-Fi Disabled by SCADA —On when a Disable Wi-Fi (Single Command, Double Command Code #42) command is received. Off when a Enable Wi-Fi (Single Command, Double Command Code #43) command is received. An Enable/Disable Wi-Fi (Single Command, Double Command Code #45) command toggles Wi-Fi communication on and off; on when Wi-Fi is disabled and off when Wi-Fi is enabled. Otherwise, off.
105	Netlist Missing Runners —On when the received runner count doesn't match the expected runner count. The Rapid Self-Healing feature is disabled as long as this is the case. Otherwise, off.
106	Netlist Settings Propagation —On when the local control is receiving Netlist records from either a download or through propagation. If this is a Netlist download, the Single-Point Information, Double-Point Information point remains on until all expected runners arrive with the new Netlist. Otherwise, off.
107	Netlist Settings Accepted —On when a new Netlist has been successfully validated. Off when a Netlist is being downloaded or propagated. Off if the user has changed any team settings so they are different from the screenset.

TABLE CONTINUED ►

Single-Point Information, Double-Point Information

Table 1. Single-Point Information, Double-Point Information—Continued

Code	Name—Definition
108	Netlist Propagation Enabled —On when the IntelliLink software screenset or SCADA enables Netlist propagation. Otherwise, off. (Starting with Revision 7.1.x, the Netlist Propagation mode is always in the Enabled state; therefore, this Single-Point Information, Double-Point Information point is always on.)
109	IntelliTeam II Mode Active —On when IntelliTeam® II Automatic Restoration System software is in use. Otherwise, off.
110	IntelliTeam Overload Alarm —On when the Post Restoration Load Management system is operational, the substation feeder is supplying sections that it does not normally supply, and an overload condition has been present when sampled for 10 consecutive times, 10 seconds apart. The alarm is cleared the first time an overload condition is not present when sampled or when the feeder is no longer supplying the extra sections.
111	Close Blocked Due to Insufficient Energy —On when a Close operation is prevented because of insufficient storage capacitor energy.
112	Communication Enhanced Coordination Ready —On when a closed IntelliRupter fault interrupter is active on a general profile configured for CEC in at least one direction and all source-side IntelliRupter fault interrupters are closed and active on the same general profile as this IntelliRupter fault interrupter. Otherwise, off.
113	Communication Enhanced Coordination Shift for X Terminal —On when the IntelliRupter fault interrupter shifts to the slower curve for the X terminal. Otherwise, off.
114	Communication Enhanced Coordination Shift for Y Terminal —On when the IntelliRupter fault interrupter shifts to the slower curve for the Y terminal. Otherwise, off.
115	Ground Overcurrent Trip —On when the Ground Overcurrent element trips. Off when IntelliRupter fault interrupter closes, or a Close command is received.
116	Negative Sequence Overcurrent Trip —On when the Negative Sequence Overcurrent element trips. Off when IntelliRupter fault interrupter closes, or a Close command is received.
117	Definite Time Overcurrent Trip —On when any Definite Time Overcurrent element trips. Off when the IntelliRupter fault interrupter closes, or a Close command is received.
118	IntelliTeam Out of Normal Switch State —On when the switch state is not in the Normally Open or Normally Closed state for the IntelliTeam system. Off when the switch state is the Normally Open or Normally Close switch state for the IntelliTeam system.
119	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 has been sensed, the switch is in the Closed position, and 45 minutes have elapsed. For a normally open or normally closed switch, to clear the fault click on the faceplate/screenset pre-assigned User Command button. Note: The Fault condition also clears if the conditions above are met, and the Clear Latched Overcurrent Status (Single Command, Double Command Point #46) command is sent.
120	PLI Open —On when the switch has been opened by the Phase-Loss Isolation (PLI) logic. Otherwise, off.

TABLE CONTINUED ►

Table 1. Single-Point Information, Double-Point Information—Continued

Code	Name—Definition
121	Loop Restoration Close Blocked—Underfrequency —On when a Loop Restoration close attempt is blocked because of low frequency detection. Off when the IntelliRupter fault interrupter closes, a Close command is received, or the Loop Restoration setting is enabled by a manual-lever operation or by a Wi-Fi or SCADA command.
122	Any Automatic Timer in Progress —On when any of these timers is active: Overcurrent Timing, Voltage Timing, Frequency Timing, Sectionalizing Timing, Loop Restoration Timing, IntelliTeam Transfer in Progress, IntelliTeam Return to Normal in Progress, Fault Cycling, Pulse Test , or a shutdown is in progress because the Open Under Loss of Control Energy setting is enabled.
123	Low Single-Phase Low Voltage Alert —On when voltage is below the Low Single-Phase Low Voltage Threshold setting for one second. Off when voltage is above the threshold. To avoid flooding the logs and creating excessive SCADA alerts when the voltage is hovering at the threshold level, the setpoint is not allowed more than one transition (on or off) per minute. The value is computed every second but the alert checks and reports once every 30 seconds. This is configured on the <i>Voltage Trip</i> screen.
124	Low Three-Phase Low Voltage Alert —On when voltage is below the Low Three-Phase Low Voltage Threshold setting for one second. Off when voltage is above the threshold. To avoid flooding the logs and creating excessive SCADA alerts when the voltage is hovering at the threshold level, the setpoint is not allowed more than one transition (on or off) per minute. The value is computed every second, but the alert checks and reports once every 30 seconds. This is configured on the <i>Voltage Trip</i> screen.
125	Phase Overcurrent Alert —On when the Phase Overcurrent Alert setting is selected in the active general protection profile and phase current, on any phase in either direction, is above the alert value. The value is computed every second, but the alert checks and reports once every 30 seconds. This is configured on the <i>Initial Trip</i> screen.
126	Ground Overcurrent Alert —On when the Ground Overcurrent Alert setting is checked in the active general protection profile and ground current in either direction is above the alert value. The value is computed every second, but the alert checks and reports once every 30 seconds. This is configured on the <i>Initial Trip</i> screen.
127	Ground Overcurrent Timing —On when the Ground Overcurrent element is timing. Otherwise, off.
128	Phase Pole 1 Overcurrent Timing —On when the Pole 1 Phase Overcurrent element is timing. Otherwise, off.
129	Phase Pole 2 Overcurrent Timing —On when the Pole 2 Phase Overcurrent element is timing. Otherwise, off.
130	Phase Pole 3 Overcurrent Timing —On when the Pole 3 Phase Overcurrent element is timing. Otherwise, off.
131	Phase Any Pole Overcurrent Timing —On when any Phase Overcurrent element is timing. Otherwise, off.
132	Phase Any Pole Overcurrent Tripped —On when any Phase Overcurrent element trips. Off when the IntelliRupter fault interrupter closes, a Close command is received, or Single Command, Double Command Code #44 is received.
133	IntelliTeam SG Close Blocked—Underfrequency —On when IntelliTeam SG operation is prohibited because of low frequency detection. Off when IntelliTeam SG system operation is enabled by a Wi-Fi or SCADA command.

TABLE CONTINUED ►

Single-Point Information, Double-Point Information

Table 1. Single-Point Information, Double-Point Information—Continued

Code	Name—Definition
134	Open-Source Sectionalizing Blocked —On when the Open-Source Sectionalizing element is in the Blocked state. Off when the Open-Source Sectionalizing element is in the Enabled state. When enabled the Open-Source Sectionalizing element will only function if open-source sectionalizing is configured in the active profile.
135	Comm System has Poor Quality —On when the Bad Health alarm is active on the <i>Link Keep Alive Tests</i> screen and/or the <i>Diagnostic Communications Tests</i> screen. Otherwise, off.
136	VS-SEF Alert X —On when the Voltage Supervised Sens Earth Disable Trip check box is checked, and the Voltage Supervised Sens Earth logic has been satisfied for the X direction. The alert automatically resets when the logic is no longer satisfied.
137	VS-SEF Alert Y —On when the Voltage Supervised Sens Earth Disable Trip check box is checked, and the Voltage Supervised Sens Earth logic has been satisfied for the Y direction. The alert automatically resets when the logic is no longer satisfied.
138	IntelliLink Intrusion —On when an IntelliLink software log in attempt failed three times. Then, all users are locked out for 1.5 minutes. Otherwise, off.
139	IntelliLink Session Active —On when a user is presently logged in to the control. Otherwise, off.
140	Reserved.
141	Not all Team Xfer Ready for X sec —At least one of the active teams where the local control is a member is not in the Ready state for greater than the configured time. Otherwise, off.
142	Close Pending Sync Check —When the Sync Check Enabled mode set to the Yes option and the IntelliRupter fault interrupter is open, if a Close or Sync Check Close command is not achieved before the Wait Timer setpoint expires, the Close command is discarded, and this point is set to on. This remains on until a subsequent Close command is issued.
143	PR Remotely Transmitted —On when the local device sends the Prohibit Restoration SCADA command to remote devices in the Remote Prohibit Restoration Transmit List table because of an active Hot Line Tag , Frequency Trip , or Manual Operation state, or when a Prohibit Restoration state is activated via a front panel, IntelliLink software screen, or SCADA command. The Single-Point Information, Double-Point Information point is cleared when the device receives a Clear Remote Prohibit Restoration Status command from SCADA.
144	Enable Restoration Remotely Transmitted —On when the local device sends the Clear Remote Prohibit Restoration Status command to remote devices in the Remote Prohibit Restoration Transmit List table. This event can be triggered by executing a Clear Remote Prohibit Restoration Status command via IntelliLink software or receiving an IT Clear PR to all Devices command from SCADA. This point is cleared when the device receives the Clear Remote Enable Restoration Status command from SCADA.
145	Pickup and Lockout Direction X —On when any element has picked up and locked out for a fault in direction X. Off when all elements and lockout are reset.
146	Pickup and Lockout Direction Y —On when any element has picked up and locked out for a fault in direction Y. Off when all elements and lockout are reset.

TABLE CONTINUED ►

Table 1. Single-Point Information, Double-Point Information—Continued

Code	Name—Definition
147	Phasor Data Captured —This point is used by the IntelliTeam® FMS Feeder Management System. Map this point and configure the unsolicited response setting according to the IntelliTeam FMS setup instructions.
148	Leakage Current Check Error —On when one of the per pole Definite Time Delay element for Open Vacuum Bottle Leakage detection algorithm has been satisfied. Otherwise, off.
149	Transfer Trip Enabled —On when the Transfer Trip state is enabled to allow the local device to send an Initiate Transfer Trip command to all non-zero RTU addresses in the Remote Transfer Trip Transmit List table after an Open and Lockout state because of a Protection or Automatic Sectionalizing event.
150	Transfer Trip Prohibit Restoration Initiated —On when an Initiate Transfer Trip Single Command, Double Command point has been received and executed. Off when the Prohibit Restoration state is no longer active, and the control will be allowed to close by an automatic or manual operation. Note: This Single-Point Information, Double-Point Information point only applies to devices not teamed with a distributed generation source. When teamed with distributed generation, this Single-Point Information, Double-Point Information point will not get activated, even if a Transfer Trip command is initiated and executed.
151	Remote Prohibit Restoration Enabled from Local —On when the Enable Remote Transmit from Local P.R. setting is enabled on the local device.
152	Remote Prohibit Restoration Enabled from SCADA —On when the Enable Remote Transmit from SCADA P.R. setting is enabled on the local device.
153	DG Reconnect Delay Terminated —On when the DG Reconnect Delay Timer is aborted because of an abnormal system condition. The Transfer Trip Prohibit Restoration (TTPR) state remains active on the device and reconnecting the DG source back on the grid must be performed manually.
154	Reserved.
155	Reserved.
156	Reserved.
157	Future Single-Point Information, Double-Point Information point.
158	Future Single-Point Information, Double-Point Information point.
159	Future Single-Point Information, Double-Point Information point.
160	Future Single-Point Information, Double-Point Information point.
161	Future Single-Point Information, Double-Point Information point.
162	Future Single-Point Information, Double-Point Information point.

TABLE CONTINUED ►

Single-Point Information, Double-Point Information

Table 1. Single-Point Information, Double-Point Information—Continued

Code	Name—Definition
163	Future Single-Point Information, Double-Point Information point.
164	Future Single-Point Information, Double-Point Information point.
165	Future Single-Point Information, Double-Point Information point.
166	Future Single-Point Information, Double-Point Information point.
167	Future Single-Point Information, Double-Point Information point.
168	Future Single-Point Information, Double-Point Information point.
169	Future Single-Point Information, Double-Point Information point.
170	Future Single-Point Information, Double-Point Information point.
171	Future Single-Point Information, Double-Point Information point.
172	Future Single-Point Information, Double-Point Information point.
173	Future Single-Point Information, Double-Point Information point.
174	Future Single-Point Information, Double-Point Information point.
175	Future Single-Point Information, Double-Point Information point.
176	Future Single-Point Information, Double-Point Information point.
177	Future Single-Point Information, Double-Point Information point.
178	Future Single-Point Information, Double-Point Information point.
179	Future Single-Point Information, Double-Point Information point.
180	Future Single-Point Information, Double-Point Information point.
181	Future Single-Point Information, Double-Point Information point.
182	Future Single-Point Information, Double-Point Information point.
183	Future Single-Point Information, Double-Point Information point.
184	Future Single-Point Information, Double-Point Information point.

TABLE CONTINUED ►

Table 1. Single-Point Information, Double-Point Information—Continued

Code	Name—Definition
185	Future Single-Point Information, Double-Point Information point.
186	Future Single-Point Information, Double-Point Information point.
187	Future Single-Point Information, Double-Point Information point.
188	Future Single-Point Information, Double-Point Information point.
189	Future Single-Point Information, Double-Point Information point.
190	Future Single-Point Information, Double-Point Information point.
191	Future Single-Point Information, Double-Point Information point.
192	Future Single-Point Information, Double-Point Information point.
193	Future Single-Point Information, Double-Point Information point.
194	Future Single-Point Information, Double-Point Information point.
195	Future Single-Point Information, Double-Point Information point.
196	Future Single-Point Information, Double-Point Information point.
197	Future Single-Point Information, Double-Point Information point.
198	Future Single-Point Information, Double-Point Information point.
199	Future Single-Point Information, Double-Point Information point.
200	Future Single-Point Information, Double-Point Information point.

Measured Value, Short Floating-Point Number

Table 2. Measured Value, Short Floating-Point Number

Code	Name—Definition
1	Voltage, Pole 1X —Primary phase-to-ground or phase-to-phase (1X to 2X voltage depending on setup) measured on Pole 1 Terminal X. Each count equals one Vac RMS.
2	Voltage, Pole 2X —Primary phase-to-ground or phase-to-phase (2X to 3X voltage depending on setup) measured on Pole 2 Terminal X. Each count equals one Vac RMS.
3	Voltage, Pole 3X —Primary phase-to-ground or phase-to-phase (3X to 1X voltage depending on setup) measured on Pole 3 Terminal X. Each count equals one Vac RMS.
4	Voltage, Pole 1Y —Primary phase-to-ground or phase-to-phase (1Y to 2Y voltage depending on setup) measured on Pole 1 Terminal Y. Each count equals one Vac RMS. Note: Because the IntelliRupter fault interrupter voltage sensors are high impedance sensing devices, they will indicate a presence of voltage on the Y side terminals when the optional disconnect is installed and open. The voltage reading is an artifact of leakage current resulting from parasitic capacitance. Therefore, the readings can be quite variable from unit to unit and pole to pole. Humidity and other weather-related conditions add to the variability at a given unit.
5	Voltage, Pole 2Y —Primary phase-to-ground or phase-to-phase (2Y to 3Y voltage depending on setup) measured on Pole 2 Terminal Y. Each count equals one Vac RMS.
6	Voltage, Pole 3Y —Primary phase-to-ground or phase-to-phase (3Y to 1Y voltage depending on setup) measured on Pole 3 Terminal Y. Each count equals one Vac RMS.
7	90% Voltage Reference Standard —A constant representing 90% of the full-scale value.
8	0% Voltage Reference Standard —A constant representing the zero value.
9	Battery Voltage—Nominally 12 Vdc —If ac power is available, the value is updated only during battery testing. If ac power is not available, the value is continuously updated. One count equals 0.0293 Vdc.
10	Current, Pole 1 —Single-phase true RMS current measured on Pole 1. Each count equals one ampere.
11	Current, Pole 2 —Single-phase true RMS current measured on Pole 2. Each count equals one ampere.
12	Current, Pole 3 —Single-phase true RMS current measured on Pole 3. Each count equals one ampere.
13	Residual Current —Vector sum of the fundamental power frequency currents on Pole 1, Pole 2, and Pole 3. Each count equals one ampere.
14	Fault Current, Pole 1 at Time of Trip —Current at time of trip for the last overcurrent or tandem protective element that tripped and opened this pole regardless of which phase caused the trip. Cleared when this pole is manually closed (by a local command, a SCADA command, or IntelliLink software command) or by issuing the Clear Trip Indicators command (Single Command, Double Command Code #44). Each count equals one ampere.

TABLE CONTINUED ►

Table 2. Measured Value, Short Floating-Point Number—Continued

Code	Name—Definition
15	Fault Current, Pole 2 at Time of Trip —Current at time of trip for the last overcurrent or tandem protective element that tripped and opened this pole regardless of which phase caused the trip. Cleared when this pole is manually closed (by a local command, a SCADA command, or IntelliLink software command) or by issuing the Clear Trip Indicators command (Single Command, Double Command Code #44). Each count equals one ampere.
16	Fault Current, Pole 3 at Time of Trip —Current at time of trip for the last overcurrent or tandem protective element that tripped and opened this pole regardless of which phase caused the trip. Cleared when this pole is manually closed (by a local command, a SCADA command, or IntelliLink software command) or by issuing the Clear Trip Indicators command (Single Command, Double Command Code #44). Each count equals one ampere.
17	kW, Pole 1 —Single-phase kW on Pole 1 calculated using instantaneous voltage and current and the respective voltage-current phase angle. Each count equals one kW.
18	kW, Pole 2 —Single-phase kW on Pole 2 calculated using instantaneous voltage and current and the respective voltage-current phase angle. Each count equals one kW.
19	kW, Pole 3 —Single-phase kW on Pole 3 calculated using instantaneous voltage and current and the respective voltage-current phase angle. Each count equals one kW.
20	Total kW —Sum of kW Pole 1, kW Pole 2, and kW Pole 3. Each count equals one kW.
21	kvar, Pole 1 —Single-phase kvar on Pole 1 calculated using apparent power, true power, and phase angle. Each count equals one kvar.
22	kvar, Pole 2 —Single-phase kvar on Pole 2 calculated using apparent power, true power, and phase angle. Each count equals one kvar.
23	kvar, Pole 3 —Single-phase kvar on Pole 3 calculated using apparent power, true power, and phase angle. Each count equals one kvar.
24	Total kvar —Sum of kvar Pole 1, kvar Pole 2, and kvar Pole 3. Each count equals one kvar.
25	Power Factor, Pole 1 —Single-phase power factor measured on Pole 1 reported as the cosine of the phase angle. Each count equals 0.001. For lagging angles, the power factor is reported as 0 to 2000 corresponding to angles from 180 to 0. For leading angles, the power factor is reported as 2000 to 0 corresponding to angles from -180 to 0.
26	Power Factor, Pole 2 —Single-phase power factor measured on Pole 2 reported as the cosine of the phase angle. Each count equals 0.001. For lagging angles, the power factor is reported as 0 to 2000 corresponding to angles from 180 to 0. For leading angles, the power factor is reported as 2000 to 0 corresponding to angles from -180 to 0.
27	Power Factor, Pole 3 —Single-phase power factor measured on Pole 3 reported as the cosine of the phase angle. Each count equals 0.001. For lagging angles, the power factor is reported as 0 to 2000 corresponding to angles from 180 to 0. For leading angles, the power factor is reported as 2000 to 0 corresponding to angles from -180 to 0.

TABLE CONTINUED ►

Measured Value, Short Floating-Point Number

Table 2. Measured Value, Short Floating-Point Number —Continued

Code	Name—Definition
28	Power Factor Angle of Pole 1 —Angle cosine that is the power factor. Each count equals one-eighth of a degree.
29	Power Factor Angle of Pole 2 —Angle cosine that is the power factor. Each count equals one-eighth of a degree.
30	Power Factor Angle of Pole 3 —Angle cosine that is the power factor. Each count equals one-eighth of a degree.
31	Total Harmonic Distortion—Pole 1, X Side Voltage —Each count equals 0.1%.
32	Total Harmonic Distortion—Pole 2, X Side Voltage —Each count equals 0.1%.
33	Total Harmonic Distortion—Pole 3, X Side Voltage —Each count equals 0.1%.
34	Total Harmonic Distortion—Pole 1, Y Side Voltage —Each count equals 0.1%.
35	Total Harmonic Distortion—Pole 2, Y Side Voltage —Each count equals 0.1%.
36	Total Harmonic Distortion—Pole 3, Y Side Voltage —Each count equals 0.1%.
37	Total Harmonic Distortion—Pole 1, Current —Each count equals 0.1%.
38	Total Harmonic Distortion—Pole 2, Current —Each count equals 0.1%.
39	Total Harmonic Distortion—Pole 3, Current —Each count equals 0.1%.
40	Line Frequency —Each count equals 0.01 Hz.
41	Temperature —The most recent temperature reading. Each count equals one degree Fahrenheit.
42	Number of Pole 1 Opening Operations —Number of interrupter operations on Pole 1 incremented on each Open operation.
43	Number of Pole 2 Opening Operations —Number of interrupter operations on Pole 2 incremented on each Open operation.
44	Number of Pole 3 Opening Operations —Number of interrupter operations on Pole 3 incremented on each Open operation.
45	Number of Pole 1 Closing Operations —Number of interrupter operations on Pole 1 incremented on each Close operation.
46	Number of Pole 2 Closing Operations —Number of interrupter operations on Pole 2 incremented on each Close operation.
47	Number of Pole 3 Closing Operations —Number of interrupter operations on Pole 3 incremented on each Close operation.

TABLE CONTINUED ►

Table 2. Measured Value, Short Floating-Point Number—Continued

Code	Name—Definition
48	Number of Pole 1 Pulse Operations —Number of interrupter operations on Pole 1 incremented on each operation using PulseClosing Technology.
49	Number of Pole 2 Pulse Operations —Number of interrupter operations on Pole 2 incremented on each operation using PulseClosing Technology.
50	Number of Pole 3 Pulse Operations —Number of interrupter operations on Pole 3 incremented on each operation using PulseClosing Technology.
51	Phase Angle, X Side Voltage to Y Side Voltage, Pole 1 —Phase angle in degrees between the X side and Y side voltage signals. A positive value indicates that the X side is leading. Each count equals one-eighth degree.
52	Phase Angle, X Side Voltage to Y Side Voltage, Pole 2 —Phase angle in degrees between the X side and Y side voltage signals. A positive value indicates that the X side is leading. Each count equals one-eighth degree.
53	Phase Angle, X Side Voltage to Y Side Voltage, Pole 3 —Phase angle in degrees between the X side and Y side voltage signals. A positive value indicates that the X side is leading. Each count equals one-eighth degree.
54	Analog Communication Test —Displays the value sent to Setpoint Command Code #5. The initial state at powerup is zero.
55	Total kVA —Sum of kVA Pole 1, kVA Pole 2, and kVA Pole 3. Each count equals one kVA.
56	Total Power Factor —Sum of kW Pole 1, kW Pole 2, and kW Pole 3 divided by the sum of kVA Pole 1, kVA Pole 2, and kVA Pole 3, reported as the cosine of the phase angle. Each count equals 0.001. For a balanced system with lagging angles, the power factor is reported as 0 to 2000 corresponding to angles from 180 to 0 (kvar always positive but kW goes from positive to negative). For a balanced system with leading angles, the power factor is reported as 2000 to 0 corresponding to angles -180 to 0 (kvar always negative but kW goes from positive to negative).
57	Latched Overcurrent, Pole 1 —Current at time of trip for the last overcurrent or tandem protective element that tripped and opened this pole, including a Sectionalizing trip, regardless of which phase caused the trip. Cleared when this pole is manually Closed (by a local command, a SCADA command, or IntelliLink software command) or by issuing a Clear Trip Indicators (Single Command, Double Command Code #44) command. Each count equals one ampere.
58	Latched Overcurrent, Pole 2 —Current at time of trip for the last overcurrent or tandem protective element that tripped and opened this pole, including a Sectionalizing trip, regardless of which phase caused the trip. Cleared when this pole is manually Closed (by a local command, a SCADA command, or IntelliLink software command) or by issuing a Clear Trip Indicators (Single Command, Double Command Code #44) command. Each count equals one ampere.
59	Latched Overcurrent, Pole 3 —Current at time of trip for the last overcurrent or tandem protective element that tripped and opened this pole, including a Sectionalizing trip, regardless of which phase caused the trip. Cleared when this pole is manually Closed (by a local command, a SCADA command, or IntelliLink software command) or by issuing a Clear Trip Indicators (Single Command, Double Command Code #44) command. Each count equals one ampere.

TABLE CONTINUED ►

Measured Value, Short Floating-Point Number

Table 2. Measured Value, Short Floating-Point Number —Continued

Code	Name—Definition
60	Delta Frequency—The difference in frequency between the X and Y sides —Reports X frequency minus Y frequency. Therefore, a positive value indicates higher frequency on the X side and a negative value indicates higher frequency on the Y side. Each count equals 0.01 Hz.
61	Averaged Current, Pole 1 —Single-phase time-averaged current measured on Pole 1. Thirty samples are averaged for the last 15 minutes and each count equals one ampere. When the Open-Source Sectionalizing element is set to the Yes, IntelliTeam SG , or Loops Only setting, the current average will latch when the IntelliRupter fault interrupter is closed, and the voltage has dropped below the Open-Source Voltage Threshold setpoint. It will remain latched while the Open-Source Sectionalizing element is timing. If the Open-Source Sectionalizing element trips it will remain latched until the trip indication is cleared by closing the IntelliRupter fault interrupter or Single Command, Double Command Code #44 is received. When the latch is cleared the average current will resume averaging from the latched value. Otherwise, the current average will update normally. When the Open-Source Sectionalizing element is set to the No setting, samples will be collected when the IntelliRupter fault interrupter is open or closed. This value updates each time a new sample is processed and will never be latched.
62	Averaged Current, Pole 2 —Single-phase time-averaged current measured on Pole 2. Same behaviors as Measured Value Code #61.
63	Averaged Current, Pole 3 —Single-phase time-averaged current measured on Pole 3. Same behaviors as Measured Value Code #61.
64	Averaged Residual Current —Vector sum of the fundamental power-frequency current on Poles 1, 2, and 3. 30 samples are averaged for the last 15 minutes and each count equals one ampere. When the Open-Source Sectionalizing element is set to the Yes, IntelliTeam SG or Loops Only setting, the current average will latch when the IntelliRupter fault interrupter is closed, and the voltage has dropped below the Open-Source Voltage Threshold setting. It will remain latched while the Open-Source Sectionalizing element is timing. If the Open-Source Sectionalizing element trips it will remain latched until the trip indication is cleared by closing the IntelliRupter fault interrupter or Single Command, Double Command Code #44 is received. When the latch is cleared, the average current will resume averaging from the latched value. Otherwise, the current average will be updating. When the Open-Source Sectionalizing element is set to the No setting, samples will be collected when the IntelliRupter fault interrupter is open or closed. This value will update each time a new sample is processed and will not be latched.
65	Fault Current Ground Time of Trip —This is the ground current at time of trip for the last ground overcurrent or tandem protective element that tripped. Cleared when the tripped pole or poles are manually closed (locally, via SCADA or IntelliLink software) or by issuing a Clear Trip Indicators (Single Command, Double Command Code #44) command. Each count equals one ampere.
66	Leakage Current Time Pole 1 —This shows the accumulated time for the Pole 1 Definite Time Delay element for the Open Vacuum Bottle Leakage detection algorithm.
67	Leakage Current Time Pole 2 —This shows the accumulated time for the Pole 2 Definite Time Delay element for the Open Vacuum Bottle Leakage detection algorithm.
68	Leakage Current Time Pole 3 —This shows the accumulated time for the Pole 3 Definite Time Delay element for the Open Vacuum Bottle Leakage detection algorithm.
69	Future Measured Value, Short-Floating Point Number point.

TABLE CONTINUED ►

Table 2. Measured Value, Short Floating-Point Number—Continued

Code	Name—Definition
70	Future Measured Value, Short-Floating Point Number point.
71	Future Measured Value, Short-Floating Point Number point.
72	Future Measured Value, Short-Floating Point Number point.
73	Future Measured Value, Short-Floating Point Number point.
74	Future Measured Value, Short-Floating Point Number point.
75	Future Measured Value, Short-Floating Point Number point.
76	Future Measured Value, Short-Floating Point Number point.
77	Future Measured Value, Short-Floating Point Number point.
78	Future Measured Value, Short-Floating Point Number point.
79	Future Measured Value, Short-Floating Point Number point.
80	Future Measured Value, Short-Floating Point Number point.
81	Future Measured Value, Short-Floating Point Number point.
82	Future Measured Value, Short-Floating Point Number point.
83	Future Measured Value, Short-Floating Point Number point.
84	Future Measured Value, Short-Floating Point Number point.
85	Future Measured Value, Short-Floating Point Number point.
86	Future Measured Value, Short-Floating Point Number point.
87	Future Measured Value, Short-Floating Point Number point.
88	Future Measured Value, Short-Floating Point Number point.
89	Future Measured Value, Short-Floating Point Number point.
90	Future Measured Value, Short-Floating Point Number point.
91	Future Measured Value, Short-Floating Point Number point.

TABLE CONTINUED ►

Measured Value, Short Floating-Point Number

Table 2. Measured Value, Short Floating-Point Number—Continued

Code	Name—Definition
92	Future Measured Value, Short-Floating Point Number point.
93	Future Measured Value, Short-Floating Point Number point.
94	Future Measured Value, Short-Floating Point Number point.
95	Future Measured Value, Short-Floating Point Number point.
96	Future Measured Value, Short-Floating Point Number point.
97	Future Measured Value, Short-Floating Point Number point.
98	Future Measured Value, Short-Floating Point Number point.
99	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 is in the Invalid state, 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.
100	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 is in the Invalid state, 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.

Table 3. Setpoint Command (Short Floating Point)

Code	Name—Definition
1	Reserved.
2	Reserved.
3	Reserved.
4	Real-Time Feeder Loading —Total averaged three-phase feeder loading (in amperes) measured at the source breaker. This value is used to determine if the load can be transferred to another source. Each count equals one ampere.
5	Analog Communication Test —Accepts a value that reports back through Measured Value Code #54.
6	Future Setpoint Command (Short Floating Point) points.
7	Future Setpoint Command (Short Floating Point) points.
8	Future Setpoint Command (Short Floating Point) points.
9	Future Setpoint Command (Short Floating Point) points.
10	Future Setpoint Command (Short Floating Point) points.
11	Future Setpoint Command (Short Floating Point) points.
12	Future Setpoint Command (Short Floating Point) points.
13	Future Setpoint Command (Short Floating Point) points.
14	Future Setpoint Command (Short Floating Point) points.
16	Future Setpoint Command (Short Floating Point) points.
17	Future Setpoint Command (Short Floating Point) points.
18	Future Setpoint Command (Short Floating Point) points.
19	Future Setpoint Command (Short Floating Point) points.

Single Command, Double Command

Single Command, Double Command codes related to **Open** or **Close** commands: 1, 2, 24, and 27–35.

Single Command, Double Command codes related to **General Profile** selection: 3–6, and 17.

Single Command, Double Command codes related to the **IntelliTeam SG system**: 22, 23, and 36.

Single Command, Double Command codes related to **Wi-Fi** operation: 20, 21, 42, and 43.

Table 4. Single Command, Double Command

Code	Name—Definition
1	Open IntelliRupter Fault Interrupter—SCADA —This command opens all closed poles.
2	Close IntelliRupter Fault Interrupter—SCADA —This command closes all open poles.
3	General Profile 1—SCADA —Enables General Profile 1.
4	General Profile 2—SCADA —Enables General Profile 2.
5	General Profile 3—SCADA —Enables General Profile 3.
6	General Profile 4—SCADA —Enables General Profile 4.
7	Enable/Disable Hot Line Tag—SCADA —Enables or disables the Hot Line Tag feature.
8	Reserved.
9	Start Battery Test—SCADA —Begins a battery test cycle. 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.
10	Clear Errors—SCADA —Clears all error flags. Alarms and warnings are not affected.
11	Enable/Block Ground Trip —Enables or blocks the Ground Trip feature.
12	Enable/Block Sensitive Earth Trip —Enables or blocks the Sensitive Earth Trip feature.
13	Enable/Block Circuit Testing —Enables or blocks the Circuit Testing feature.
14	Reserved.
15	Enable/Block Test on Backfeed —Enables or blocks the Test on Backfeed feature.
16	Reserved.
17	Turn On/Off Second Closing Profile —Enables or blocks the Second Closing profile.
18	Reserved.
19	Execute Waveform Capture —This command initiates a waveform capture. It can also be issued by the button on the <i>Log Management</i> screen.
20	Wi-Fi Test —Activates the Wi-Fi beacon transmitter for troubleshooting purposes.

TABLE CONTINUED ►

Table 4. Single Command, Double Command—Continued

Code	Name—Definition
21	Clear Wi-Fi Intrusion Alarm —Clears an active Wi-Fi Intrusion alarm.
22	IntelliTeam Prohibit Restoration —Prevents the IntelliRupter fault interrupter and other devices in any team in which this IntelliRupter fault interrupter is a member from automatically closing to restore load.
23	IntelliTeam Clear Manual Operation —Clearing the manual operation via SCADA allows the IntelliTeam system to return to the Ready state provided the IntelliRupter fault interrupter contacts are in the correct IntelliTeam Normally Open or Normally Closed state.
24	Open/Close IntelliRupter Fault Interrupter—SCADA —When the Open or Closed state of the poles is mismatched, an Open command will open all poles or a Close command will close all poles. If SCADA sends this command without specifying “Open” or “Close,” the IntelliRupter fault interrupter will ignore it.
25	Enable/Disable Loop Restoration—SCADA —Enables or disables Loop Restoration functionality.
26	Enable/Block Single Phase Operation—SCADA —When enabled, it allows Single-Phase commands and Automatic operation according to the active General Profile configuration. When blocked, all automatic operations or SCADA commands will be executed three-phase, and any Single-Phase SCADA command will be rejected.
27	Open Pole 1—SCADA —This command opens only Pole 1.
28	Open Pole 2—SCADA —This command opens only Pole 2.
29	Open Pole 3—SCADA —This command opens only Pole 3.
30	Close Pole 1—SCADA —This command closes only Pole 1.
31	Close Pole 2—SCADA —This command closes only Pole 2.
32	Close Pole 3—SCADA —This command closes only Pole 3.
33	Open/Close Pole 1—SCADA —This command opens or closes only Pole 1.
34	Open/Close Pole 2—SCADA —This command opens or closes only Pole 2.
35	Open/Close Pole 3—SCADA —This command opens or closes only Pole 3.
36	Netlist Propagation Enable/Disable —In the Enabled state, allows new Netlist requests and Netlist transmissions. In the Disabled state, multiple downloads of a Netlist can be sent to a local control. (Starting with Revision 7.1.x, the Netlist Propagation mode is always in the Enabled state, therefore this command does not operate.)
37	PulseClose Test —This command initiates a three-phase test using PulseClosing Technology. This command forces an operation where a pulse tests the line regardless of the cross-pole voltage or the state of the Test on Backfeed control. When the test is executed, a PulseTest operation is followed by a Close operation if a fault is not detected. The Close operation executes without point-on-wave control.

TABLE CONTINUED ►

Single Command, Double Command

Table 4. Single Command, Double Command—Continued

Code	Name—Definition
38	PulseClose Test Pole 1 —This command initiates a single-phase test using PulseClosing Technology on pole 1 only. This command forces an operation where a pulse tests the line regardless of the cross-pole voltage or the state of the Test on Backfeed control. When the test is executed, an operation where a pulse tests the line is followed by a Close operation if a fault is not detected. The Close operation executes without point-on-wave control.
39	PulseClose Test Pole 2 —This command initiates a single-phase test using PulseClosing Technology on pole 2 only. This command forces an operation where a pulse tests the line regardless of the cross-pole voltage or the state of the Test on Backfeed control. When the test is executed, an operation where a pulse tests the line is followed by a Close operation if a fault is not detected. The Close operation executes without point-on-wave control.
40	PulseClose Test Pole 3 —This command initiates a single-phase test using PulseClosing Technology on pole 3 only. This command forces an operation where a pulse tests the line regardless of the cross-pole voltage or the state of the Test on Backfeed control. When the test is executed, an operation where a pulse tests the line is followed by a Close operation if a fault is not detected. The Close operation executes without point-on-wave control.
41	Communication Test —This command changes the state of the Communication Test Single-Point Information, Double-Point Information Code #99 each time the Single Command, Double Command Point #41 message is received.
42	Wi-Fi Disable —This command disables local Wi-Fi communication.
43	Wi-Fi Enable —This command enables local Wi-Fi communication.

TABLE CONTINUED ►

Table 4. Single Command, Double Command—Continued

Code	Name—Definition																																																														
44	Clear Trip Indicators —This command clears the points listed below if they are set when it is received. Single Point Information, Double Point Information Points Cleared																																																														
	<table border="1"> <thead> <tr> <th>Code</th> <th>Name—Definition</th> </tr> </thead> <tbody> <tr> <td>31</td> <td>Trip on Loss of Energy</td> </tr> <tr> <td>35</td> <td>Overcurrent Current Trip, Pole 1</td> </tr> <tr> <td>36</td> <td>Overcurrent Current Trip, Pole 2</td> </tr> <tr> <td>37</td> <td>Overcurrent Current Trip, Pole 3</td> </tr> <tr> <td>38</td> <td>Overcurrent Trip, Any Pole</td> </tr> <tr> <td>39</td> <td>Tripped to Lockout</td> </tr> <tr> <td>41</td> <td>Voltage Trip</td> </tr> <tr> <td>43</td> <td>Frequency Trip</td> </tr> <tr> <td>45</td> <td>Sectionalizing Trip</td> </tr> <tr> <td>54</td> <td>Close Blocked by Synch Check</td> </tr> <tr> <td>55</td> <td>Pulse Detected a Fault</td> </tr> <tr> <td>61</td> <td>IntelliTeam Fault Pole 1</td> </tr> <tr> <td>62</td> <td>IntelliTeam Fault Pole 2</td> </tr> <tr> <td>63</td> <td>IntelliTeam Fault Pole 3</td> </tr> <tr> <td>77</td> <td>Overcurrent Trip—Sensitive Earth Fault</td> </tr> <tr> <td>78</td> <td>Tripped to Lockout SEF</td> </tr> <tr> <td>85</td> <td>Close Blocked, Pulse Unavailable</td> </tr> <tr> <td>88</td> <td>Tripped to Lockout—Pole 1</td> </tr> <tr> <td>89</td> <td>Tripped to Lockout—Pole 2</td> </tr> <tr> <td>90</td> <td>Tripped to Lockout—Pole 3</td> </tr> <tr> <td>91</td> <td>Pulse Detected Fault—Pole 1</td> </tr> <tr> <td>92</td> <td>Pulse Detected Fault—Pole 2</td> </tr> <tr> <td>93</td> <td>Pulse Detected Fault—Pole 3</td> </tr> <tr> <td>111</td> <td>Close Blocked, Insufficient Energy</td> </tr> <tr> <td>115</td> <td>Ground Overcurrent Trip</td> </tr> <tr> <td>116</td> <td>Negative Sequence Overcurrent Trip</td> </tr> <tr> <td>117</td> <td>Definite Time Overcurrent Trip</td> </tr> <tr> <td>119</td> <td>Overcurrent Fault Detected</td> </tr> <tr> <td>121</td> <td>LoopRest CIs Blk'd, UnderFreq</td> </tr> <tr> <td>122</td> <td>Any Automatic Timer in Progress</td> </tr> </tbody> </table>	Code	Name—Definition	31	Trip on Loss of Energy	35	Overcurrent Current Trip, Pole 1	36	Overcurrent Current Trip, Pole 2	37	Overcurrent Current Trip, Pole 3	38	Overcurrent Trip, Any Pole	39	Tripped to Lockout	41	Voltage Trip	43	Frequency Trip	45	Sectionalizing Trip	54	Close Blocked by Synch Check	55	Pulse Detected a Fault	61	IntelliTeam Fault Pole 1	62	IntelliTeam Fault Pole 2	63	IntelliTeam Fault Pole 3	77	Overcurrent Trip—Sensitive Earth Fault	78	Tripped to Lockout SEF	85	Close Blocked, Pulse Unavailable	88	Tripped to Lockout—Pole 1	89	Tripped to Lockout—Pole 2	90	Tripped to Lockout—Pole 3	91	Pulse Detected Fault—Pole 1	92	Pulse Detected Fault—Pole 2	93	Pulse Detected Fault—Pole 3	111	Close Blocked, Insufficient Energy	115	Ground Overcurrent Trip	116	Negative Sequence Overcurrent Trip	117	Definite Time Overcurrent Trip	119	Overcurrent Fault Detected	121	LoopRest CIs Blk'd, UnderFreq	122	Any Automatic Timer in Progress
Code	Name—Definition																																																														
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121	LoopRest CIs Blk'd, UnderFreq																																																														
122	Any Automatic Timer in Progress																																																														

TABLE CONTINUED ►

Single Command, Double Command

Table 4. Single Command, Double Command—Continued

Code	Name—Definition																						
44 (Cont.)	Measured Value Points Set to Zero																						
	<table border="1"> <thead> <tr> <th>Code</th> <th>Name—Definition</th> </tr> </thead> <tbody> <tr> <td>14</td> <td>Fault Current, Pole 1, Time of Trip</td> </tr> <tr> <td>15</td> <td>Fault Current, Pole 2, Time of Trip</td> </tr> <tr> <td>16</td> <td>Fault Current, Pole 3, Time of Trip</td> </tr> <tr> <td>57</td> <td>Latched Overcurrent, Pole 1</td> </tr> <tr> <td>58</td> <td>Latched Overcurrent, Pole 2</td> </tr> <tr> <td>59</td> <td>Latched Overcurrent, Pole 3</td> </tr> <tr> <td>61</td> <td>Averaged Current, Pole 1</td> </tr> <tr> <td>62</td> <td>Averaged Current, Pole 2</td> </tr> <tr> <td>63</td> <td>Averaged Current, Pole 3</td> </tr> <tr> <td>64</td> <td>Averaged Residual Current</td> </tr> </tbody> </table>	Code	Name—Definition	14	Fault Current, Pole 1, Time of Trip	15	Fault Current, Pole 2, Time of Trip	16	Fault Current, Pole 3, Time of Trip	57	Latched Overcurrent, Pole 1	58	Latched Overcurrent, Pole 2	59	Latched Overcurrent, Pole 3	61	Averaged Current, Pole 1	62	Averaged Current, Pole 2	63	Averaged Current, Pole 3	64	Averaged Residual Current
	Code	Name—Definition																					
	14	Fault Current, Pole 1, Time of Trip																					
	15	Fault Current, Pole 2, Time of Trip																					
	16	Fault Current, Pole 3, Time of Trip																					
	57	Latched Overcurrent, Pole 1																					
	58	Latched Overcurrent, Pole 2																					
	59	Latched Overcurrent, Pole 3																					
	61	Averaged Current, Pole 1																					
	62	Averaged Current, Pole 2																					
63	Averaged Current, Pole 3																						
64	Averaged Residual Current																						
Note: The scope of points cleared by this command will be dependent on the control's installed firmware and can exceed the list provided for Code #44. However, the provided set of points should always be cleared by Code #44.																							
45	Wi-Fi Enable/Disable —Toggles the state of local Wi-Fi communication.																						
46	Clear Latched Overcurrent Status —Clears the Latch Overcurrent Single Point Information, Double Point Information Code #119 if it is set when this command is received.																						
47	Clear Warnings—SCADA —Clears all warning flags. Errors and alarms are not affected. The Active Warnings function will reassert in approximately one second.																						
48	Clear Alarms—SCADA —Clears all alarm flags. Errors and warnings are not affected. The Active Alarms function will reassert in approximately one second.																						
49	Pulse Test —This command initiates a three-phase test using PulseClosing Technology, which executes a point-on-wave pulse and inverse pulse to evaluate the line. The interrupters will remain open at the end of the test. No action is taken when the test does not find a fault. When a fault is detected by both pulses, the message "Fault-PulseClosing" is displayed on the <i>Operation</i> screen, and the corresponding Single Point Information, Double Point Information Code #55, #91, #92, and #93 are set.																						
50	Pulse Test Pole 1 —This command initiates a single-phase test using PulseClosing Technology on pole 1 that executes a point-on-wave pulse and inverse pulse. The interrupter will remain open at the end of the test. See Single Command, Double Command Point #49 for fault indications.																						

TABLE CONTINUED ►

Table 4. Single Command, Double Command—Continued

Code	Name—Definition
51	Pulse Test Pole 2 —This command initiates a single-phase test using PulseClosing Technology on pole 2 that executes a point-on-wave pulse and inverse pulse. The interrupter will remain open at the end of the test. See Single Command, Double Command Point #49 for fault indications.
52	Pulse Test Pole 3 —This command initiates a single-phase test using PulseClosing Technology on pole 3 that executes a point-on-wave pulse and inverse pulse. The interrupter will remain open at the end of the test. See Single Command, Double Command Point #49 for fault indications.
53	Enable/Block Open Source Sectionalizing —When the Open-Source Sectionalizing element is set to the Yes, IntelliTeam SG , or Loop Only setting, this command will enable or disable the Open-Source Sectionalizing element. When the Open-Source Sectionalizing element is set to the Yes, IntelliTeam SG , or Loop Only setting, the Open-Source Sectionalizing element will default to enabled after a control restart.
54	Clear IntelliLink Intrusion —This command clears the IntelliLink Intrusion Single Point Information, Double Point Information point.
55	Clear Remote PR Status —This command clears the Prohibit Restoration Remotely Transmitted Single Point Information, Double Point Information point. Single Command, Double Command Point #49 = 0x1F00
56	Clear Remote Enable Restoration Status —This command clears the Enable Restoration Remotely Transmitted Single Point Information, Double Point Information point.
57	Remote Transmit Enable Restoration —When received, the device clears the Prohibit Restoration state locally (only if Hot Line Tag , Frequency Trip , or Manual Operation states are not active) and then sends a Clear Prohibit Restoration command to all devices in the Remote Prohibit Restoration Transmit List table. The Enable Remote Transmit from SCADA P.R. setting must be enabled to perform this action.
58	Initiate Transfer Trip —This command sets the Transfer Trip state on a single device. The device issues a command to Open the Switch in Automatic mode (not a manual operation) and verifies the operation. If an Open state is confirmed, the device then activates the Prohibit Restoration state on the team facing the distributed generation source (unless it's a distributed generation team) to prevent restoration of that line segment. For the Prohibit Restoration state to be set, the receiving device must be an S&C switch control that is part of an IntelliTeam SG system.
59	Enable/Disable Transfer Trip —When enabled, the local device sends an Initiate Transfer Trip command to all non-zero RTU addresses in the Remote Transfer Trip Transmit List table when placed in an Open and Lockout state because of a Protection or Automatic Sectionalizing event. When disabled, no condition will result in sending an Initiate Transfer Trip command to remote devices.
60	Enable/Disable Remote PR from Local —When enabled, a local Prohibit Restoration command (via the front panel or IntelliLink software screen) will place the device in a Prohibit Restoration state and then transmit the Prohibit Restoration command to all devices in the Remote Prohibit Restoration Transmit list.
61	Enable/Disable Remote PR from SCADA —When enabled, the device will enter a Prohibit Restoration state and then transmit a Prohibit Restoration command to all devices in the Remote Prohibit Restoration Transmit list if any of the following states are active: Hot Line Tag , Frequency Trip , or Manual Operation or if the Prohibit Restoration state is activated from a SCADA command.

TABLE CONTINUED ►

Single Command, Double Command

Table 4. Single Command, Double Command—Continued

Code	Name—Definition
62	Future Single Command and Double Command points.
63	Future Single Command and Double Command points.
64	Future Single Command and Double Command points.
65	Future Single Command and Double Command points.
66	Future Single Command and Double Command points.
67	Future Single Command and Double Command points.
68	Future Single Command and Double Command points.
69	Future Single Command and Double Command points.
70	Future Single Command and Double Command points.
71	Future Single Command and Double Command points.
72	Future Single Command and Double Command points.
73	Future Single Command and Double Command points.
74	Future Single Command and Double Command points.
75	Future Single Command and Double Command points.
76	Future Single Command and Double Command points.
77	Future Single Command and Double Command points.
78	Future Single Command and Double Command points.
79	Future Single Command and Double Command points.
80	Future Single Command and Double Command points.
81	Future Single Command and Double Command points.
82	Future Single Command and Double Command points.
83	Future Single Command and Double Command points.
84	Future Single Command and Double Command points.
85	Future Single Command and Double Command points.
86	Future Single Command and Double Command points.
87	Future Single Command and Double Command points.

TABLE CONTINUED ►

Table 4. Single Command, Double Command—Continued

Code	Name—Definition
88	Future Single Command and Double Command points.
89	Future Single Command and Double Command points.
90	Future Single Command and Double Command points.
91	Future Single Command and Double Command points.
92	Future Single Command and Double Command points.
93	Future Single Command and Double Command points.
94	Future Single Command and Double Command points.
95	Future Single Command and Double Command points.
96	Future Single Command and Double Command points.
97	Future Single Command and Double Command points.
98	Future Single Command and Double Command points.
99	Future Single Command and Double Command points.
100	Future Single Command and Double Command points.

Protocol Implementation Conformance Statement

System or Device

- System definition
- Controlling station definition (master)
- Controlled station definition (slave)

Application Layer

Transmission Mode for Application Data

Mode 1 (least significant octet first), as defined in 4.10 of IEC 60870-5-4, is used exclusively in this companion standard.

Common Address of ASDU

(System-specific parameter, all configurations that are used are to be marked "X")

- One
- Two

Information Object Address

(System-specific parameter, all configurations that are used are to be marked "X")

- One
- Two octets
- Three
- Structured
- Unstructured

Cause of Transmission

(System-specific parameter, all configurations that are used are to be marked "X")

- One
- Two octets (with originator address.)

Originator address is set to zero if not used.

Length of APDU

The maximum length of APDU for both directions is 253. It is a fixed system parameter.

Selection of Standard ASDUs

Process Information in Monitor Direction

<input checked="" type="checkbox"/> <1> := Single-point information	M_SP_NA_1
<input checked="" type="checkbox"/> <3> := Double-point information	M_DP_NA_1
<input type="checkbox"/> <5> := Step-position information	M_ST_NA_1
<input type="checkbox"/> <7> := Bitstring of 32 bit	M_BO_NA_1
<input type="checkbox"/> <9> := Measured value, normalized value	M_ME_NA_1
<input type="checkbox"/> <11> := Measured value, scaled value	M_ME_NB_1
<input checked="" type="checkbox"/> <13> := Measured value, short floating point number	M_ME_NC_1
<input type="checkbox"/> <15> := Integrated totals	M_IT_NA_1
<input type="checkbox"/> <20> := Packed single-point information with status change detection	M_PS_NA_1
<input type="checkbox"/> <21> := Measured value, normalized value without quality descriptor	M_ME_ND_1
<input checked="" type="checkbox"/> <30> := Single-point information with time tag CP56Time2a	M_SP_TB_1
<input checked="" type="checkbox"/> <31> := Double-point information with time tag CP56Time2a	M_DP_TB_1
<input type="checkbox"/> <32> := Step position information with time tag CP56Time2a	M_ST_TB_1
<input type="checkbox"/> <33> := Bitstring of 32 bit with time tag CP56Time2a	M_BO_TB_1
<input type="checkbox"/> <34> := Measured value, normalized value with time tag CP56Time2a	M_ME_TD_1
<input type="checkbox"/> <35> := Measured value, scaled value with time tag CP56Time2a	M_ME_TE_1
<input checked="" type="checkbox"/> <36> := Measured value, short floating point number with time tag CP56Time2a	M_ME_TF_1
<input type="checkbox"/> <37> := Integrated totals with time tag CP56Time2a	M_IT_TB_1
<input type="checkbox"/> <38> := Event of protection equipment with time tag CP56Time2a	M_EP_TD_1
<input type="checkbox"/> <39> := Packed start events of protection equipment with time tag CP56Time2a	M_EP_TE_1
<input type="checkbox"/> <40> := Packed output circuit information of protection equipment with time tag CP56Time2a	M_EP_TF_1

TABLE CONTINUED ►

Protocol Implementation Conformance Statement

Selection of Standard ASDUs—Continued

Process Information in Control Direction

<input checked="" type="checkbox"/> <45> := Single command	C_SC_NA_1
<input checked="" type="checkbox"/> <46> := Double command	C_DC_NA_1
<input type="checkbox"/> <47> := Regulating step command	C_RC_NA_1
<input type="checkbox"/> <48> := Setpoint command, normalized value	C_SE_NA_1
<input type="checkbox"/> <49> := Setpoint command, scaled value	C_SE_NB_1
<input checked="" type="checkbox"/> <50> := Setpoint command, short floating point value	C_SE_NC_1
<input type="checkbox"/> <51> := Bitstring of 32 bit	C_BO_NA_1
<input checked="" type="checkbox"/> <58> := Single command with time tag CP56Time2a	C_SC_NA_1
<input checked="" type="checkbox"/> <59> := Double command with time tag CP56Time2a	C_DC_NA_1
<input type="checkbox"/> <60> := Regulating step command with time tag CP56Time2a	C_RC_NA_1
<input type="checkbox"/> <61> := Setpoint command, normalized value with time tag CP56Time2a	C_SE_NA_1
<input type="checkbox"/> <62> := Setpoint command, scaled value with time tag CP56Time2a	C_SE_NB_1
<input checked="" type="checkbox"/> <63> := Setpoint command, short floating point value with time tag CP56Time2a	C_SE_NC_1
<input type="checkbox"/> <64> := Bitstring of 32 bit with time tag CP56Time2a	C_BO_NA_1

System Information in Monitor Direction

(Station-specific parameter, mark each with an “X” if it is only used in the standard direction, “R” if only used in the reverse direction, and “B” if used in both directions)

<input checked="" type="checkbox"/> <70> := End of initialization	M_EI_NA_1
---	-----------

System Information in Control Direction

(Station-specific parameter, mark each Type ID “X” if it is only used in the standard direction, “R” if only used in the reverse direction, and “B” if used in both directions)

<input checked="" type="checkbox"/> <100> := Interrogation command	C_IC_NA_1
<input checked="" type="checkbox"/> <101> := Counter interrogation command	C_CI_NA_1
<input checked="" type="checkbox"/> <102> := Read command	C_RD_NA_1
<input checked="" type="checkbox"/> <103> := Clock synchronization command	C_CS_NA_1
<input checked="" type="checkbox"/> <105> := Reset process command	C_RP_NA_1
<input checked="" type="checkbox"/> <107> := Test command with time tag CP56Time2a	C_TS_TA_1

Parameter in Control Direction

(Station-specific parameter, mark each Type ID “X” if it is only used in the standard direction, “R” if only used in the reverse direction, and “B” if used in both directions)

<input type="checkbox"/> <110> := Parameter of measured value, normalized value	P_ME_NA_1
<input type="checkbox"/> <111> := Parameter of measured value, scaled value	P_ME_NB_1
<input type="checkbox"/> <112> := Parameter of measured value, short floating point value	P_ME_NC_1
<input type="checkbox"/> <113> := Parameter activation	P_AC_NA_1

Protocol Implementation Conformance Statement

File Transfer

(Station-specific parameter, mark each Type ID “X” if it is only used in the standard direction, “R” if only used in the reverse direction, and “B” if used in both directions)

<input type="checkbox"/> <120> := File ready	F_FR_NA_1
<input type="checkbox"/> <121> := Section ready	F_SR_NA_1
<input type="checkbox"/> <122> := Call directory, select file, call file, call section	F_SC_NA_1
<input type="checkbox"/> <123> := Last section, last segment	F_LS_NA_1
<input type="checkbox"/> <124> := Ack file, ack section	F_AF_NA_1
<input type="checkbox"/> <125> := Segment	F_SG_NA_1
<input type="checkbox"/> <126> := Directory	F_DR_TA_1
<input type="checkbox"/> <127> := Query Log-Request archive file	F_SC_NB_1

**Type Identifier and Cause of Transmission Assignments
(Station-Specific Parameters)**

Cause of Transmission Numbers

Number	Cause of Transmission
1	Periodic, cyclic
2	Background scan
3	Spontaneous
4	Initialized
5	Request or requested
6	Activation
7	Activation confirmation
8	Deactivation
9	Deactivation confirmation
10	Activation termination
11	Return information caused by a remote command
12	Return information caused by a local command
13	File transfer
20	Interrogated by station interrogation
21 to 36	Interrogated by group <number> interrogation
37	Requested by general counter request
38 to 41	Requested by group <number> counter request
44	Unknown type of identification
45	Unknown cause of transmission
46	Unknown command address of ASDU
47	Unknown information object address

Protocol Implementation Conformance Statement

Shaded boxes are not defined in this companion standard and shall not be used.

Black boxes: Option not permitted in this companion standard

Blank: Functions or ASDU not used.

Mark Type Identification/Cause of transmission combinations:

“X” if only used in the standard direction

“R” if only used in the reverse direction

“B” if used in both directions

Type Identification		Cause of Transmission																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<1>	M_SP_NA_1		X			X									X					
<3>	M_DP_NA_1		X			X									X					
<5>	M_ST_NA_1																			
<7>	M_BO_NA_1																			
<9>	M_ME_NA_1																			
<11>	M_ME_NB_1																			
<13>	M_ME_NC_1	X				X									X					
<15>	M_IT_NA_1																			
<20>	M_PS_NA_1																			
<21>	M_ME_ND_1																			
<30>	M_SP_TB_1			X																
<31>	M_DP_TB_1			X																
<32>	M_ST_TB_1																			

TABLE CONTINUED ►

Protocol Implementation Conformance Statement

Type Identification		Cause of Transmission																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<33>	M_BO_TB_1																			
<34>	M_ME_TD_1																			
<35>	M_ME_TE_1																			
<36>	M_ME_TF_1			X																
<37>	M_IT_TB_1																			
<38>	M_EP_TD_1																			
<39>	M_EP_TE_1																			
<40>	M_EP_TF_1																			
<45>	C_SC_NA_1						X	X										X	X	X
<46>	C_DC_NA_1						X	X										X	X	X
<47>	C_RC_NA_1															X				
<48>	C_SE_NA_1															X				
<49>	C_SE_NB_1															X				
<50>	C_SE_NC_1						X	X										X	X	X
<51>	C_BO_NA_1															X				
<58>	C_SC_TA_1						X	X										X	X	X
<59>	C_DC_TA_1						X	X										X	X	X
<60>	C_RC_TA_1															X				
<61>	C_SE_TA_1															X				
<62>	C_SE_TB_1															X				

TABLE CONTINUED ►

Protocol Implementation Conformance Statement

Type Identification		Cause of Transmission																		
		1	2	3	4	5	6	7	8	9	10	11	12	13	20 to 36	37 to 41	44	45	46	47
<63>	C_SE_TC_1						X	X										X	X	X
<64>	C_BO_TA_1																X			
<70>	M_EI_NA_1*			X																
<100>	C_IC_NA_1						X	X										X	X	
<101>	C_CI_NA_1						X	X										X	X	
<102>	C_RD_NA_1					X												X	X	X
<103>	C_CS_NA_1						X	X										X	X	
<105>	C_RP_NA_1						X	X										X	X	
<107>	C_TS_TA_1						X	X										X	X	
<110>	P_ME_NA_1																X			
<111>	P_ME_NB_1																X			
<112>	P_ME_NC_1																X			
<113>	P_AC_NA_1																X			
<120>	F_FR_NA_1																X			
<121>	F_SR_NA_1																X			
<122>	F_SC_NA_1																X			
<123>	F_LS_NA_1																X			
<124>	F_AF_NA_1																X			
<125>	F_SG_NA_1																X			
<126>	F_DR_TA_1*																			
<127>	F_SC_NB_1*																X			

Note: Mark cause of transmission (COT) 44 only for unsupported type identifications.

Basic Application Functions

Station Initialization

(Station-specific parameter, mark "X" if function is used)

Remote initialization

Cyclic Data Transmission

(Station-specific parameter, mark "X" if function is only used in the standard direction, "R" if only used in the reverse direction, and "B" if used in both directions)

Cyclic data transmission

Read Procedure

(Station-specific parameter, mark "X" if function is only used in the standard direction, "R" if only used in the reverse direction, and "B" if used in both directions)

Read procedure

Spontaneous Transmission

(Station-specific parameter, mark "X" if function is only used in the standard direction, "R" if only used in the reverse direction, and "B" if used in both directions)

Spontaneous transmission

Double Transmission of Information Objects with Cause of Transmission Spontaneous

(Station-specific parameter, mark each information type “X” where both a Type ID without time and corresponding Type ID with time are issued in response to a single spontaneous change of a monitored object)

The following type identifications may be transmitted in succession caused by a single status change of an information object. The particular information object addresses for which double transmission is enabled are defined in a project-specific list:

- Single-point information M_SP_NA_1, M_SP_TA_1, M_SP_TB_1 and M_PS_NA_1
- Step-position information M_ST_NA_1, M_ST_TA_1 and M_ST_TB_1
- Double-point information M_DP_NA_1, M_DP_TA_1 and M_DP_TB_1
- Bitstring of 32 bit M_BO_NA_1, M_BO_TA_1 and M_BO_TB_1 (if defined for a specific project)
- Measured value, normalized value M_ME_NA_1, M_ME_TA_1, M_ME_ND_1 and M_ME_TD_1
- Measured value, scaled value M_ME_NB_1, M_ME_TB_1 and M_ME_TE_1
- Measured value, short floating-point number M_ME_NC_1, M_ME_TC_1 and M_ME_TF_1

Station Interrogation

(Station-specific parameter, mark “X” if function is only used in the standard direction, “R” if only used in the reverse direction, and “B” if used in both directions)

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> global | | |
| <input checked="" type="checkbox"/> group 1 | <input checked="" type="checkbox"/> group 7 | <input checked="" type="checkbox"/> group 13 |
| <input checked="" type="checkbox"/> group 2 | <input checked="" type="checkbox"/> group 8 | <input checked="" type="checkbox"/> group 14 |
| <input checked="" type="checkbox"/> group 3 | <input checked="" type="checkbox"/> group 9 | <input checked="" type="checkbox"/> group 15 |
| <input checked="" type="checkbox"/> group 4 | <input checked="" type="checkbox"/> group 10 | <input checked="" type="checkbox"/> group 16 |
| <input checked="" type="checkbox"/> group 5 | <input checked="" type="checkbox"/> group 11 | |
| <input checked="" type="checkbox"/> group 6 | <input checked="" type="checkbox"/> group 12 | |

Information object addresses assigned to each group must be shown in a separate table.

Clock Synchronization

(Station-specific parameter, mark "X" if function is only used in the standard direction, "R" if only used in the reverse direction, and "B" if used in both directions).

- Clock synchronization
- Day of week used
- RES1, GEN (time tag substituted/ not substituted) used
- SU-bit (summertime) used

Command Transmission

(Object-specific parameter, mark "X" if function is only used in the standard direction, "R" if only used in the reverse direction, and "B" if used in both directions)

- Direct command transmission
- Direct setpoint command transmission
- Select and execute command
- Select and execute setpoint command
- C_SE ACTTERM used
- No additional definition
- Short-pulse duration (duration determined by a system parameter in the outstation)
- Long-pulse duration (duration determined by a system parameter in the outstation)
- Persistent output
- Supervision of maximum delay in command direction of commands and setpoint commands
- Configurable** Maximum allowable delay of commands and setpoint commands

Protocol Implementation Conformance Statement

Transmission of Integrated Totals

(Station- or object-specific parameter, mark "X" if function is only used in the standard direction, "R" if only used in the reverse direction, and "B" if used in both directions)

- Mode A: Local freeze with spontaneous transmission
- Mode B: Local freeze with counter interrogation
- Mode C: Freeze and transmit by counter-interrogation commands
- Mode D: Freeze by counter-interrogation command, frozen values reported spontaneously
- Counter read
- Counter freeze without reset
- Counter freeze with reset
- Counter reset
- General request counter
- Request counter group 1
- Request counter group 2
- Request counter group 3
- Request counter group 4

Parameter Loading

(Object-specific parameter, mark "X" if function is only used in the standard direction, "R" if only used in the reverse direction, and "B" if used in both directions)

- Threshold value
- Smoothing factor
- Low limit for transmission of measured values
- High limit for transmission of measured values

Parameter Activation

(Object-specific parameter, mark "X" if function is only used in the standard direction, "R" if only used in the reverse direction, and "B" if used in both directions)

- Act/deact of persistent cyclic or periodic transmission of the addressed object

Test Procedure

(Station-specific parameter, mark “X” on, and “B” if used in both directions)

Test procedure

File Transfer

(Station-specific parameter, mark “X” if function is used)

File transfer in monitor direction:

- Transparent file
- Transmission of disturbance data of protection equipment
- Transmission of sequences of events
- Transmission of sequences of recorded analogue values

File transfer in control direction:

Transparent file

Background Scan

(Station-specific parameter, mark “X” if function is only used in the standard direction, “R” if only used in the reverse direction, and “B” if used in both directions)

Background scan

Acquisition of Transmission Delay

(Station-specific parameter, mark “X” if function is only used in the standard direction, “R” if only used in the reverse direction, and “B” if used in both directions)

Acquisition of transmission delay

Protocol Implementation Conformance Statement

Definition of Timeouts

Parameter	Default value	Remarks	Selected value
t_0	30s	Time-out of connection establishment	Not applicable
t_1	15s	Time-out of send or test APDUs	user configurable
t_2	10s	Time-out for acknowledges in case of no data messages $t_2 < t_1$	user configurable
t_3	20s	Time-out for sending test frames in case of a long idle state	user configurable

Maximum Number of Outstanding “I” Format APDUs “k” and Latest Acknowledge APDUs “w”

Parameter	Default value	Remarks	Selected value
k	12 APDUs	Maximum difference receive sequence number to send state variable	user configurable
w	8 APDUs	Latest acknowledge after receiving w I format APDUs	user configurable

Portnumber

Parameter	Value	Remarks
Portnumber	2404	In all cases

Redundant connections

Number "N" of redundancy group connections used

RFC 2200 suite

FC 2200 is an official Internet standard that describes the state of standardization of protocols used in the Internet as determined by the Internet Architecture Board (IAB). It offers a broad spectrum of actual standards used on the Internet. The suitable selection of documents from RFC 2200 defined in this standard for given projects has to be chosen by the user of this standard.

Ethernet 802.3

Serial X.21 interface

Setpoint Mapping

The IntelliRupter PulseCloser Fault Interrupter communication module provides a lengthy list of setpoints to be used by the IEC 60870-5-104 controlling station. The user can choose to map any set of setpoints in the communication module. Unmapped setpoints will be hidden and not reported to the controlling station.

Methods to Report Monitored Setpoint Data to the Controlling Station

The IntelliRupter PulseCloser Fault Interrupter communication module offers several configuration options to allow different monitored setpoints to be reported to the controlling station via different methods. Monitored setpoints include single-point information, double-point information, and measured value, short floating point number.

The communication module supports the standard IEC 60870 **Interrogation** command. If the controlling station requests a group interrogation for group 0 (station interrogation), the communication module will return all mapped setpoints of the three monitored point types. In addition, each monitored point can be configured as part of a specific interrogation group (from 1 to 16). In this case, the controlling station can issue an **Interrogation** command to retrieve just the specific interrogation group and the communication module will return only the setpoints configured in that group.

The communication module also supports the IEC 60870 cyclic/periodic reporting and background reporting features. Any measured value point can be configured to be reported via periodic reporting. The periodic reporting interval is also configurable. If any measured value points are configured for periodic reporting, the communication module will report all those points at the configured interval. Similarly, any single-point information or double-point information point can be configured to be reported via background reporting. The background reporting interval is also configurable. If any single-point information or double-point information points are configured for background reporting, the communication module will report all those points at the configured interval.

The communication module can also send monitored setpoints via spontaneous events (IEC 60870 cause of transmission set to “Spontaneous”). Each single-point information and double-point information setpoint can be configured to enable events. If a single- or double-point information setpoint has events enabled and the value changes, the communication module will immediately send a spontaneous event to the controlling station.

The communication module supports a deadband mechanism to generate spontaneous events for measured value setpoints. For each measured value setpoint, the user can configure a fixed deadband and/or percent deadband interval. If either of those is configured and the measured value changes by the configured deadband amount, the communication module will immediately send a spontaneous event to the controlling station.

Finally, the communication module also supports the IEC 60870 read command which allows the controlling station to retrieve the value of a single monitored point.

Measured Value Scaling

The communication module allows the user to configure a scaling multiplier for any measured value setpoint. The default value is “1,” which will leave the measured value unchanged. If the scaling value is set to a different value, that multiplier will be applied to that measured value setpoint before it is reported to the controlling station. If fixed deadbands are enabled, the scaling factor will be applied before fixed deadbands are checked.

Single, Double Commands

The communication module ignores the **QU** field in the **Qualifier of Command** setting, treating values of “short pulse,” “long pulse,” and “persistent” the same.