

FXB MICROPROCESSOR-BASED RECLOSER CONTROL TECHNICAL SPECIFICATIONS

INTRODUCTION:

This specification describes the features of the Kyle type FXB electronic control which shall provide the intelligence to supervise an attached three phase recloser. The control shall be operable with all present Kyle electronically controlled reclosers now utilizing the Form 2, Form 3, Form 3A, Form 4A, Form 4C and FXA controls.

STANDARDS:

The type FXB control has been designed and tested in accordance with the following standards as applicable:

ANSI/IEEE C37.60-1981. American National Standard Requirements for Overhead Padmounted, Dry Vault and Submersible Automatic Circuit-Reclosers and Fault Interrupters for Alternating Current Systems.

C37.61-1973 (ANSI) 321-1973 (IEEE). IEEE Standard Guide for Application Operation, and Maintenance of Automatic Circuit Reclosers.

C37.90.1-1989 ANSI/IEEE. American National Standard Guide for Surge Withstand Capability (SWC) tests.

IEC-68-2-30. International Electromechanical Commission Standard for Basic Environmental Testing Procedures - Damp Heat, Steady State.

C37.90.2 ANSI. IEEE-Trial-Use-Standard Withstand Capability of Relay Systems to Radiated Electromagnetic Interface.

KYLE SPEC 574. Surge Withstand Capability Testing of Electronic Controls.

NSTA Standard ASTM D-999. Vibration/shock (Transportation Specification)

Amplitude = 1 inch.

Frequency = Adjusted for 1/16 inch bounce of packaged control.

FEATURES

The control shall be cable-connected to the recloser and can be located remotely from the recloser. The control shall be housed in a weatherproof cabinet with a door that can be padlocked.

The operating temperature range of the control shall be -40°C to +65°C, ambient.

Primary energy for control operation shall be supplied from an external 50 Hertz or 60 Hertz 120 Vac or 240 Vac (two-wire or three-wire) source, provided by the user. A 2.5 amp-hour battery shall be provided for back-up control operation in event of loss of the primary supply. If the primary supply has not been restored within the allowable discharge time of the battery, the

control shall shut down automatically. Upon restoration of AC power, the control shall be restored to full operation within approximately one second. There shall be local indication to indicate loss of operating power.

The control shall include test terminals to allow customer test of battery voltage and charge/discharge current. Manual control via front panel keypad starts the battery test sequence. At test completion, the LCD display will indicate BATTERY OK or BATTERY NOT OK.

Push button controls located on the front panel allow manual trip and lockout and manual close of the recloser.

Keypad control located on the front panel shall be provided to control the status of the following features:

- ◇ Ground Trip Normal/Block feature.
- ◇ Normal/Non-Reclose feature.
- ◇ Normal/Alternate Minimum Trip feature.

The Control shall have LED indicators located on the front panel to provide local indication of the following conditions:

- ◇ Recloser Open
- ◇ Recloser Closed
- ◇ Control Lockout
- ◇ Ground Trip Blocked
- ◇ Non-reclosing Active
- ◇ Control OK
- ◇ Alternate Minimum Trip Active
- ◇ SGF/SEF Blocked
- ◇ Fault Targets

The FXB control allows keypad programmable control utilizing password protection.

A Cold Load Pickup feature shall be provided for use in restoring service after an extended outage. This feature shall transfer operation from the normally programmed phase to ground TCC's to separately programmable TCC's for a programmable time of 1 to 60 seconds. The feature shall be programmable for 1 to 4 operations. This feature shall be capable of being enabled and disabled via the Windows-based programming software.

The control software shall have a customer-programmable security code, to limit access to control programming to authorized personnel.

A total of 41 separate time-current curves (TCC) shall be available for customer selection. Each TCC shall be available for phase trip or ground fault trip timing. Both phase and ground TCC's shall be independently programmable for each trip operation of the programmed number of trip operations to lockout, to a maximum of four trip operations.

The control software shall have the ability to permit modification of any of the time-current curves using the following modifications:

TCC multiplier: Shifts the TCC up or down in time by a selected multiplier. The multiplier can be selected from 0.10 to 2.0 times the selected TCC, in multiplier increments of 0.01.

Constant Time Adder: Adds a constant time value to the selected TCC. The time adder can be selected from 0.01 to 0.20 seconds, in increments of 0.01 seconds.

Minimum Response Time: Provides a fixed minimum response time, from 0.013 to 1.0 seconds in increments of 0.001 seconds.

The control software shall have the capability to provide custom designed TCC's. These custom TCC's can be created by data points (time and current entered by the user).

It shall be possible to view graphically or numerically all programmed TCC's, whether standard TCC's, modified, or custom designed. The TCC representation will be in the familiar log-log graph, for viewing on the PC screen or printer. All programmed TCC's can also be described by data point (time and current) output to PC screen, printer or diskette.

The control shall have a Sequence Coordination feature which allows the control to step through selected operations in the operating sequence without tripping. The number of Sequence Coordination Advances is programmable from 1 to 3 operations. The sequence coordination feature provides complete trip coordination with a downline recloser.

The control software shall be equipped with a Recloser Interrupting Duty Monitor. The Duty Monitor will measure, calculate, store and display the interrupting duty on each phase of the attached recloser. Per Appendix B of ANSI C37.61-1973, the recloser duty shall be calculated on the basis of number of interruptions $\times 1^{1.5}$.

The control shall include the following operational data by means of LED indicator:

Fault Targets: Phases 1-2, 3-4, 5-6, Ground and SGF

Closed: Indicates the recloser contacts are closed.

Open: Indicates that recloser contacts are open.

Control Lockout: Indicates that the control is in the lockout position.

Ground Trip Blocked: Indicates that Ground Trip Block has been activated by either the front panel keypad, via supervisory control, or through programming.

Non-Reclosing Active: Indicates that Non-reclosing operation has been activated by the front panel keypad, via supervisory control, or through programming.

Control OK: Indicates that the control's continuous self diagnostics have detected no EEPROM malfunctions.

Alternate Minimum Trip Active: Indicates Alternate Minimum Trip has been activated by the front panel keypad, via supervisory control, or through programming.

SGF/SEF Blocked: Indicates sensitive ground/earth fault is blocked via the front panel keypad, via supervisory control, or through programming.

The control shall include a Reclose-Retry feature to interrupt the closing signal to the recloser when closing power is lost. The close signal will be issued at regular intervals until closing

power is restored. the duration of time the feature is active and the number of retry attempts can be programmed.

The control software shall include a High Current Trip feature that will bypass the normal TCC and trip the recloser with a programmable constant time (0.016 to 0.150 seconds in 0.001 second increments) when the fault current exceeds a multiple of (1 to 29 times in increments of 1) of programmed minimum trip. This feature can be programmed for any trip operations of the operating sequence.

The control software shall include a High Current Lockout feature to automatically shorten the control sequence for currents above a predetermined fault level, which is selected by a programmable multiple (2 to 29 in increments of 1) of the programmed minimum trip. This feature can be separately programmed for phase and ground trip. It shall be programmable for any trip operation of the operation sequence.

The control software shall include a Sensitive Ground Fault Trip feature that will provide tripping of the recloser after a programmable, definite time for ground (zero sequence) currents below normal ground minimum trip currents. The feature will have its own operations to lockout counter and will be available in both normal ground minimum trip and alternate ground minimum trip settings.

The control shall include a Load Profile Monitor which records and displays the RMS current value for each phase and ground at 15 minute intervals for data stored for the most recent 25.5 hour period.

The control software shall be equipped with an Event Recorder feature which shall record and store the 50 most recent events in non-volatile memory. The event recorder shall include information on the time and date of the event occurrence, the event type and the circuit currents on all three phases and ground (this includes the fault current for an overcurrent trip event). The events recorded shall include the following:

- ◇ Overcurrent trip
- ◇ Trip via PC
- ◇ Trip - SGF Overcurrent Trip
- ◇ Close via PC
- ◇ Close via push button or SCADA feature
- ◇ Close circuit open
- ◇ Lockout via PC
- ◇ Lockout - Trip Circuit Open
- ◇ Lockout - by High Current Lockout Feature
- ◇ Lockout - caused by Reclose - Retry Feature
- ◇ Lockout - recloser failed to close with close signal
- ◇ Lockout - caused by low power supply voltage
- ◇ Lockout - Non-reclose feature activated during reclose interval
- ◇ Lockout - caused by manual trip of recloser
- ◇ Reset - Normal sequence reset
- ◇ Reset - Via manual control switch or SCADA command
- ◇ Sequence Coordination Operation
- ◇ Trip Failure

◇ Close Failure

The control shall have an Ampere Demand Metering Feature, which measures and displays the following current values for three phases and ground:

- ◇ Instantaneous RMS phase Currents
- ◇ Integrated phase current values, with a programmable integration interval of 5 or 15 minutes
- ◇ Peak integrated demand values
- ◇ Ground unbalance values (instantaneous, integrated and peak demand), with a programmable integration interval of 1 or 5 minutes.

The control shall be capable of supervisory operation and interrogation by means of an optional SCADA feature. This feature will include a Supervisory ON-OFF switch and a Hot Line Tag indicator on the FXA control front panel. The feature shall provide the following operation functions and status reports.

Operations:

- ◇ Remote Trip and Lockout. This feature is not disabled with the supervisory ON-OFF switch in the OFF position.
- ◇ Supervisory Trip and Lockout
- ◇ Supervisory Close
- ◇ Supervisory Non-Reclosing
- ◇ Supervisory Ground Trip Block
- ◇ Hot Line Tag. Prevents all closing operations when enabled.

Indicators:

All status indicators are by means of dry contacts.

- ◇ Supervisory Switch Position
- ◇ Recloser Open
- ◇ Recloser Closed
- ◇ Control Lockout
- ◇ Control OK
- ◇ Ground Trip Block
- ◇ Non-Reclosing
- ◇ Fault Targets. Provides indication for phases 1-2, 3-4, 5-6, ground, and SGF.

The control shall be capable of being tested by a portable test set, capable of testing all control functions with or without connections to a recloser. The test set shall be the same as used for testing the Form 3, Form 3A, Form 4A and Form 4C controls.