



AUTOMATIC TRANSFER SWITCH STANDARD SPEED SPECIFICATION

**FOR USE WITH 3800 SERIES, 4800 SERIES PADMOUNTED VACUUM FAULT
INTERRUPTER GEAR**

**FOR USE WITH 3100 SERIES, 4100 SERIES SUBMERSIBLE VACUUM FAULT
INTERRUPTER GEAR**



AUTOMATIC TRANSFER SWITCH STANDARD SPEED SPECIFICATION

Prepared by:

Ryan Kowdley
Principal Electrical Engineer

Trayer Engineering Corporation
898 Pennsylvania Avenue
San Francisco, CA 94107
800-377-1774

6 May 2013
© Trayer Engineering Corporation

1 Scope

This specification applies to any automatic transfer switch (ATS) system installed on a motor operable piece of switchgear. This specification describes the behavior of the ATS system as well as the specific electrical and mechanical equipment requirements of the switchgear on which it is installed. The specification for the remainder of the switchgear itself is contained in a separate document.

2 Definitions

The definitions of terms contained in this specification, or in other standards referred to in this document, are not intended to embrace all the legitimate meanings of the terms. They are applicable only to the subject treated in this specification. Any documents or industry standards referred to shall be of the latest revision as of the date of publication of this document.

2.1 Way

A three-phase circuit entrance to a switching assembly

2.2 Switched Way

A way connected to the bus through a three-pole group operated switch

2.3 Source

A pre-specified feeder input into the switchgear

2.4 SEL

Schweitzer Engineering Laboratories

2.5 ATS

Automatic transfer switch or automatic transfer switch system applied to a standard piece of distribution switchgear

2.6 SER

Sequential Events Recorder. A status change log embedded in an SEL relay containing time stamped information as pre-defined in the ATS program. Does not contain fault information.

3 Overview of Operation

3.1 The Trayer Automatic Transfer Switch System allows a single piece or multiple pieces of switchgear to use multiple feeder sources to keep up critical loads.

3.2 The ATS system will need a minimum of two feeder ways and one load way all attached to the same common bus.

3.3 The ATS system can be placed into automatic mode in order to engage the auto transfer logic and initiate transfer operations. The system can also be placed into manual mode in order to perform manual motor operations, hotstick or hookstick operations, or to disable the automatic transfer function during maintenance and testing.

3.3.1 In order to enter automatic mode, the source indicated by the Source Preference toggle must be set to the currently closed source. This closed source must have been energized for a user specified amount of time. This must be done regardless of the operating mode selected. If the source has not been energized for the user-specified amount of time, the ATS will not enter automatic mode.

- 3.6.1.1 A toggle or pushbutton switch shall be provided to allow the user to specify a preferred source, effective only when entering automatic mode and during Preferred Source Operation.
 - 3.6.1.2 Operating the Source Preference toggle switch while in automatic mode will place the unit into manual mode.
 - 3.6.2 Source Transition Toggle/Switch
 - 3.6.2.1 A toggle or pushbutton switch shall be provided to allow the user to dictate the condition for which the ATS will initiate a transfer operation from an alternate source to the healthy preferred source.
 - 3.6.2.2 When set to "CLOSED" transition, the ATS will "make before break", or close the preferred source before opening the alternate source. This will parallel feeders for no more than 8 seconds.
 - 3.6.2.3 When set to "OPEN" transition, the ATS will "break before make", or open the alternate source before closing the preferred source. This will disconnect the loads for no more than 8 seconds.
 - 3.6.2.4 This toggle does not influence the initial transfer operation from a source that has been lost.
 - 3.6.2.5 This toggle has no effect during non-preferred source operation.
 - 3.6.2.6 Operating the source transition toggle while in automatic mode will place the unit into manual mode.
 - 3.6.3 Scheme Selector Switch
 - 3.6.3.1 A scheme selector switch shall be made available in one of two configurations.
 - 3.6.3.1.1 A two position toggle switch will allow for the "Return after Elapsed" and the "Hold" modes.
 - 3.6.3.1.2 A four position rotary switch will allow for the "Return after Elapsed", "Return at Clock Time", "Flip-Flop", and "Hold" modes.
 - 3.6.3.2 Operating the Scheme Selector Switch while in automatic mode will place the unit into manual mode.
- 3.7 The ATS System has four different operating modes: Return after Elapsed, Return at Clock Time, Flip Flop, and Hold. The availability of these modes must be specified at time of quote by Trayer Engineering.
 - 3.7.1 Return after Elapsed
 - 3.7.1.1 This is a Preferred Source Operation mode.
 - 3.7.1.2 This mode has no special conditions to initiate the transfer operation from the alternate to the preferred source, other than outlined in the Preferred Source Operation section.
 - 3.7.2 Return at Clock Time
 - 3.7.2.1 This is a Preferred Source Operation mode.
 - 3.7.2.2 In addition to the conditions listed in the Preferred Source Operation section, this mode will only allow attempts to initiate a transfer at the clock time defined in the user-settings section of the automation logic. The default will be 2 am relay time.
 - 3.7.2.3 The relay clock must be set for this mode to function properly.
 - 3.7.3 Flip-flop
 - 3.7.3.1 This is a Non-preferred Source Operation mode.

3.7.3.2 This mode has no special required conditions to initiate the transfer operation from the currently-closed source to the currently-open source, other than outlined in the Non-preferred Source Operation section.

3.7.4 Hold

3.7.4.1 This is a Preferred Source Operation mode.

3.7.4.2 This mode will not close the preferred source, once the initial source is de-energized and the source motor opened. The ATS must be placed into manual mode, and then the pushbuttons must be used to close the source ways desired, before re-entering manual mode.

4 Other Behaviors, Modes, and Features

4.1 Motor Failure Lockout

4.1.1 The motor failure lockout mode will detect a failure in the motor, should the motor become disconnected or fail to operate in one complete stroke.

4.2 Overcurrent Lockout

4.2.1 This Optional Mode can be configured such that the system will lockout automatic close commands whenever the system detects an overcurrent condition along with a loss of voltage, for a user-specified period of time. .

4.2.2 This mode shall be exited by pushbutton command at the front face of the control package.

4.2.3 This user-specified time delay exists to allow downstream protection to clear the fault.

4.3 Visible Disconnect Motor Lockout

4.3.1 This feature shall prevent close operations when the ATS detects that the visible disconnect is not in the closed state. This feature shall be included on all ATS units with a visible disconnect device on a motorized way.

4.3.2 This feature exists to prevent the motor to attempt to close the mechanically interlocked handles before it is permissible to do so. This prevents clearing a motor power fuse or causing impact damage to the vacuum device handle or the visible disconnect handle.

4.4 Motor Test Mode

4.4.1 A motor test mode is available, when specified, for testing the automatic transfer system.

4.4.2 In this mode the system will ignore the internal switchgear tank status switches when determining whether or not close and open operations were successful. This mode is mutually exclusive with Automatic Mode.

4.4.3 With the exception of the internal switchgear tank status, as stated above in Section 4.4.2, this mode will function identically to Automatic Mode.

4.4.4 This mode allows motors to be mechanically disengaged from the switchgear operating handles, but still operate as normal.

4.4.5 Motor test mode must be canceled in order to re-enter Automatic Mode.

4.4.6

4.5 Local/Remote Switch

- 4.5.1 This optional feature, which must be specified at time of quote by Trayer Engineering, shall include a pushbutton or toggle switch in the ATS control cabinet that will disable SCADA operation and enable local operation in the LOCAL mode, and will enable SCADA operation and disable local operation in the REMOTE mode.

5 Other Notes

- 5.1 The relay clock should be set to local time upon commissioning. This allows for accurate Sequential Events Recorder (SER) report, and event report reading. It also is necessary when using "Return at Clock" mode.
- 5.2 SCADA communication will be made available via a serial, DB9 DNP 3.0 port. Other protocols or connection types must be specified at time of quote by Trayer Engineering.
- 5.3 Customer-specified and customer-provided communication equipment shall be accommodated if and only if model number, manufacturer, physical dimensions, mounting information, and power requirements of said equipment are provided at time of quote by Trayer Engineering.
- 5.4 Auxiliary contacts shall be made available for driving ATS logic, or for monitoring via SCADA.
 - 5.4.1 Open/Closed for each switched way
 - 5.4.2 Open/Close/Tripped for each VFI protected way
 - 5.4.3 Closed for each visible disconnect
 - 5.4.4 Open/Closed for each submersible style motor operator.
 - 5.4.5 Extended/Retracted for each linear actuator.
 - 5.4.6 More contacts are available, but requests must be approved by Engineering at time of quote by Trayer Engineering.

6 Hardware Requirements

6.1 General

- 6.1.1 An ATS system can be incorporated into either padmounted or submersible designs. The designs must have provisions for motor operators.
 - 6.1.1.1 A piece of distribution switchgear can be designed as an ATS from initial design, or in some cases an ATS system can be defined to retrofit an existing piece of motor-operable switchgear.
 - 6.1.1.2 The ATS shall require a minimum of one potential transformer, connected either line to line or line to ground to provide control power, depending upon the associated customer configuration: Delta or grounded wye.
 - 6.1.1.3 If the ATS control platform is to stay energized for more than 24 hours when the voltage feeders are energized but not closed, then a minimum of one potential transformer on each feeder way's bushings, shall be required, connected line to line or line to ground. The potential transformers must be upstream (closer to the source bushings) from any vacuum contacts. or visible disconnect. This allows the ATS to stay powered no matter which source is closed or present.
 - 6.1.1.3.1 An ATS system with at least one potential transformer on each feeder way shall utilize an electromechanically-driven relay system to select an energized potential transformer for control power.

- 6.1.1.4** If the ATS performs power calculations of any sort, then multiple potential transformers will be required **in each location as determined above in 6.1.1.3.1.**
- 6.1.1.4.1** A 451-equipped ATS system must have three potential transformers connected line to ground.
- 6.1.1.4.2** A 487-equipped ATS system may have three potential transformers connected line-to-ground, or may have two potential transformers connected line-to-line in an open-delta configuration.
- 6.1.1.5** If up to two ways are to be protected and monitored for current, an SEL 451 may be specified, along with up to two sets of current transformers with 5 amp secondary connections.
- 6.1.1.6** If up to five ways are to be protected and monitored for current, an SEL 487 may be specified along with up to five sets of current transformers with 5 amp secondary connections.
- 6.1.1.7** Other combinations may exist if additional ways are required for monitoring but not protection.
- 6.1.1.8** Inverse-time phase overcurrent, inverse-time ground overcurrent, instantaneous phase overcurrent and instantaneous ground overcurrent are available for ATS systems that also perform protection functions.
- 6.1.1.9** By default the ATS will have both inverse-time and instantaneous phase overcurrent elements activated.
- 6.1.1.10** Differential, directional, loss-of-potential, and other modes of protection should be specified at time of quote by Trayer Engineering, for proper configuration of unit.
- 6.1.1.11** ATS systems will require a 24VDC battery with charger system.
- 6.1.1.12** ATS enabled units may have the ATS control platform housed in three separate locations.
 - 6.1.1.12.1** The ATS control cabinet may be connected to the left or right side of the switch body when facing the high voltage compartment.
 - 6.1.1.12.2** The ATS control cabinet may be housed in a remote, above-grade pedestal mount, to be located no more than 50 feet away from the ATS switch.
 - 6.1.1.12.3** The ATS control cabinet, when appropriate, may be wall mounted on the side of an underground vault, to be located no more than 50 feet away from the ATS switch.

6.2 Padmounted

- 6.2.1** Padmounted ATS systems can detect loss of voltage conditions to drive the ATS transfer logic in one of three ways, specified at time of quote from Trayer Engineering.
 - 6.2.1.1** Multiple potential transformers on each feeder way in accordance with section 6.1.

6.2.1.2 Capacitive voltage sensors must be installed on the capacitive test points on high voltage connections to the switch, after making the high voltage connections during installation of the switchgear. The rubber goods supplied by the end-user must have capacitive test points available for this system to be able to function. The manufacturer of the rubber goods must be specified at time of quote by Trayer Engineering.

6.2.2 Resistive voltage dividers may be included on the source ways, internal to the switch body. The relay specified must include the low energy input card option (*not yet available- expected availability from Trayer Engineering is December 2013*).

6.3 Submersible

6.3.1 Submersible ATS systems can utilize all of the Padmount ATS voltage detection methods specified in Section 6.2, with the exception of the capacitive voltage sensor option.

6.3.2 Submersible ATS control cabinets can house their 24VDC backup batteries in a separate, sealed enclosure to prevent damage to the ATS control, should the batteries rupture and outgas.

7 Documentation

7.1 A full set of as-built drawings shall be provided with each unit.

7.2 A detailed operations and maintenance (O&M) manual shall be included with each unit, along with relevant documentation for any components, including overcurrent relays and control platforms, provided by their respective manufacturers.