Introduction

The Vacuum Breaker (VB) Medium Voltage (MV) Automatic Transfer Switches (ATS) allows the load to be disconnected from both the Normal and Emergency power sources essentially placing the load in a "Neutral" position.

The Standard VB MV ATS utilizes internal motors on both VB control units to operate the load connection to either the normal or emergency power source. Normally, the transfer switch operates on the preferred power source with the Normal VB unit in the closed position and the Emergency VB unit in the open position.

All VB MV ATS are protected by electrical interlocking. Some of these ATS incorporate mechanical interlocking also. This is subject to change based on the breaker manufacture. The provision of the interlock is to prevent accidental paralleling of the sources except when temporary source paralleling is required; see (CTT).

Description of Operation: Microprocessor Controls

All phases of the Normal and Emergency Power Source are continuously monitored by a Phase Sequence Relay on Normal (PSRN) and Emergency (PSRE) which have an adjustable pick-up from 70% to 100% of the nominal voltage. The factory set at 90%.

Assuming the ATS is feeding the load from the Normal Power Source, when the PSRN signal's the loss of Normal Power, the microprocessor starts the Time Delay to Engine Start (TDES). This helps to prevent nuisance tripping of the ATS and only start the generator when normal power is well and truly down.

After the TDES times out and normal power has still not returned, an Engine Start (ES) signal is sent to the generator. The ATS monitors the generators' output via the PSRE. When the generators' output is within the proper operating parameters, the microprocessor also starts the Minimum Run Timer (MRT) for the generator and the Time Delay to Emergency Timer (TDE). Once the TDE completes its counting cycle, the microprocessor operates the normal side motor and connects the load from the Normal Power Source.

At this time, the Time Delay in Neutral Timer (TDN) starts counting. Upon completion, the microprocessor operates the emergency side motor and connects the load to the Emergency Power Source.

The PSRN will continue to monitor the Normal Power Source and will signal the microprocessor when it is once again available for the ATS to use.

When PSRN signals the ATS Normal Power has returned, the Time Delay to Return (TDR) timer will start. This will keep the load of the ATS on the Emergency Power Source until the timer completes to verify that the Normal Power Source has returned.

Once the TDR completes its counting cycle, the microprocessor operates the emergency side motor and disconnects the load from the Emergency Power Source. At this time, the Engine Cool Down Timer (TECD) and the TDN timer are started.

When the TDN timer completes its counting cycle, the microprocessor operates the normal side motor and connects the load to the Normal Power Source.

The generator will continue running until both the MRT and the TDEC timers have completed their counting cycles. After they are done, the microprocessor removes the ES signal and the generator is turned off. This completes the full sequence of the standard ATS transfer process.

Product Features

- 600, 1200, 2000 & 2500 Ampere, 100% Rated Equipment
- Standard Operating Voltages (See VB MV ATS Order Guide)
- Electromechanical or Microprocessor Based Controls
- Phase Sequence Relay on Normal (PSRN)
- Phase Sequence Relay on Emergency (PSRE)
- SPP - Single Phase Protection
- Standard Features: MDS, LTS, ORPB, KPE and PE
- Keyed or Padlock Handle Provided
- Free Standing (F/S) Enclosure
- NEMA 1, 3R, 4, or 4X Std.; NEMA 3R or 4X Stainless Steel
- Front and Rear Accessible
- Space Heaters Included with any Outdoor Equipment
- Space Heaters Under Load
- Aux Contacts for Switch Position, System Trouble and Engine Start
- Safe Manual Transfer Under Load

Factory Options

- SE - Service Entrance
- ED - Emergency Disconnect Switch on Door
- GFP - Ground Fault Protection
- DPC - Dual Prime Source
- CBT(N or E) - Circuit Breaker Trip on Normal and/or Emergency
- CTT - Closed Transition Transfer
- AAS - Aux Contacts for Source Available
- SPF - Surge Protection Devices by Description
- PS - Peak Shave
- LDI - Load Demand Inhibit
- RD - Remote Disconnect
- MLT - Maintained Load Test Switch
- MRTN - Manual Return to Normal
- MFM - Multifunction Metering
- BC - Battery Charger System, 12Vdc only
- SH - Space Heaters
- Custom Controls per Customer Spec (i.e: Generator Differential Protective Relays)
Description of Operation: Electromechanical Controls - P1 Control Board

All phases of the Normal and Emergency Power Source are continuously monitored by a Phase Sequence Relay on Normal (PSRN) and Emergency (PSRE) which have an adjustable pick-up from 70% to 100% of the nominal voltage. This is factory set to 90%. In the event of a drop in any phase of the preferred voltage set-point, the PSRN interrupts the voltage to the ODR1, an off delay timer, and ODR2, a control relay coil. When ODR2 drops out, the Time Delay to Emergency Timer (TDE) is started.

Depending on which timer finishes first, ODR1 or TDE, once one finishes its’ countdown, the Engine Start (ES) contact will close and start the generator. The PSRE will monitor the generators’ output and connect power to the controls once the generators’ output is within proper operating parameters.

Once TDE finishes its’ countdown, two Emergency Control Relays (ER1 and ER2) will change state. ER1 will start the Engine Maintain Timer (EMT) and connect power to the normal side transfer motor (TMN) to open the Normal Side Unit.

The internal aux contacts in the Normal Side Unit will change back to their normal OFF state and remove power from the TMN. This will then apply power to the Time Delay to Transfer timer (TDT), keeping the ATS in the neutral position until it is finished its’ countdown. Once the TDT has finished its countdown, it will then apply power to the emergency side transfer motor (TME).

This will close the Emergency Side Unit. The internal aux contacts in the Emergency Side Unit will change to their ON state and remove power from the TME. The ATS load is now being fed from the Emergency Power Source.

The EMT’s contacts will stay in their current OFF state until the EMT’s countdown finishes. Once the EMT timer finishes, the generator maintain signal, ER2, will be turned off. EMT’s input power will be removed via ER1.

However, as long as normal power has not returned, the generator will continue running via ODR1.

The PSRN continuously monitors the normal side power and once it is back within proper operating parameters, will apply power to the normal side controls. This will start the Time Delay to Return Timer (TDR). When it is finished, power will be applied to ODR1, ODR2 and the Transfer Relay (TR).

ODR1’s contacts will change state immediately, removing the ES signal and power from open normal side unit transfer motor. ODR2 will apply power to the TMN and open the Emergency Side Unit and remove power from the emergency side controls.

With power to the TR, the TDT timer may be started from the normal side power. Once the TDT timer has finished its’ countdown, power will be applied to the TMN, closing the Normal Side Unit. The ATS load is now fed from the Normal Power Source. This completes a full sequence of the ATS via electromechanical controls.

NOTE: By utilizing the time delay (TDT) it is possible to regulate the length of time where the load is neither connected to the Normal or Emergency source. This is useful in allowing residual voltage in inductive loads to decay before reapplying power, thereby avoiding large and possibly damaging in-rush currents.

Standard Microprocessor ATS Features

Along with the standard timers described, there are four standard switches included with all Microprocessor Controlled ATS. These are the momentary load test switch (LTS), the momentary override pushbutton (ORPB), the maintained key pad enable (KPE) and the maintained maintenance disconnect switch (MDS). ATS is also included with a plant exerciser (PE). See the MP7650 System datasheet.

NOTE: If using Electromechanical Controls, only the LTS switch is standard.

The LTS switch provides the ATS operator with a manual way to perform a load test of the transfer switch. When the MP76xx controller receives this input, it will mimic the loss of the Normal Power Source and go through the steps of transferring the load to the Emergency Power Source. This is one to perform a manual routine check of the equipment to ensure it is within proper working order.

The ORPB switch provides the ATS operator with a manual way to force the ATS back to the Normal Power Source without waiting for the timers to finish their timing sequence.

The KPE switch provides the ATS operator with a way to lockout the HMI controls from unauthorized tampering. This switch is located inside the ATS enclosure, which either has a key or padlock locking mechanism preventing entry.

The MDS switch provides the ATS operator with a manual way to disconnect power to the controls of the ATS for maintenance. It is highly recommended that any ATS operator have been properly trained on the unit and have the units control wiring diagrams present when performing any maintenance of the ATS. Be sure that all required PPE is utilized.
VB MV ATS Order Guide

<table>
<thead>
<tr>
<th>VB</th>
<th>OPERATOR</th>
<th>CONTROL BASE</th>
<th>NUMBER OF POLES</th>
<th>AMPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D = Draw Out</td>
<td>A = Automatic</td>
<td>2 = Two Poles</td>
<td>0600 = 600 Amps</td>
</tr>
<tr>
<td></td>
<td>F = Fixed</td>
<td>M = Manual</td>
<td>3 = Three Poles</td>
<td>1200 = 1200 Amps</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4 = Four Poles</td>
<td>2000 = 2000 Amps</td>
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<tr>
<td></td>
<td></td>
<td></td>
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<td>2500 = 2500 Amps</td>
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</tbody>
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AMPACITY
- 0600 = 600 Amps
- 1200 = 1200 Amps
- 2000 = 2000 Amps
- 2500 = 2500 Amps

NOTE: Consult Factory for Higher Amperages

<table>
<thead>
<tr>
<th>VOLTAGE</th>
<th>AMPACITY</th>
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<tbody>
<tr>
<td>A</td>
<td>4160 3φ 3 W 60 Hz</td>
</tr>
<tr>
<td>B</td>
<td>8250 3φ 3 W 60 Hz</td>
</tr>
<tr>
<td>C</td>
<td>12470 3φ 3 W 60 Hz</td>
</tr>
<tr>
<td>D</td>
<td>13800 3φ 3 W 60 Hz</td>
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<table>
<thead>
<tr>
<th>CONTROLS</th>
<th>VOLTAGE</th>
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</thead>
<tbody>
<tr>
<td>P = Microprocessor Controls 24Vdc</td>
<td>A = 4160 3φ 3 W 60 Hz</td>
</tr>
<tr>
<td>M = Microprocessor Controls 12Vdc</td>
<td>B = 8250 3φ 3 W 60 Hz</td>
</tr>
<tr>
<td>E = Electromechanical Controls</td>
<td>C = 12470 3φ 3 W 60 Hz</td>
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<table>
<thead>
<tr>
<th>INTERRUPTING RATING</th>
<th>VOLTAGE</th>
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</thead>
<tbody>
<tr>
<td>S = Standard Rating 16kA rms</td>
<td>A = 4160 3φ 3 W 60 Hz</td>
</tr>
<tr>
<td>H = High Rating 20kA rms</td>
<td>B = 8250 3φ 3 W 60 Hz</td>
</tr>
<tr>
<td>V = Very High Rating 25kA rms</td>
<td>C = 12470 3φ 3 W 60 Hz</td>
</tr>
<tr>
<td>X = Extremely High Rating 40kA rms</td>
<td>D = 13800 3φ 3 W 60 Hz</td>
</tr>
</tbody>
</table>

NOTE: If MVA Ratings are specified, please contact the factory to discuss.

ENCLOSURE
- B = NEMA 1 Free Standing
- D = NEMA 12 Free Standing
- F = NEMA 3R Free Standing
- H = NEMA 4 Free Standing
- J = NEMA 4X Free Standing
- L = NEMA 3R Free Standing (304 or 316 Stainless Steel)
- O = Open Style (no enclosure)
- X = Special (by description)

USE FOR REQUIRED FACTORY OPTIONS

Part Number Example: VBDA0600APSF / SE / ED / CBTE / ACSA / SH (Vacuum Breaker, Draw Out Style, Automatic Operation, 600Amps, Microprocessor Controls 24Vdc, 4160Vac, 16kA rms, NEMA 3R Free Standing Enclosure. Factory Options Requested: Service Entrance Rated, Emergency Disconnect Switch on Door, Circuit Breaker Trip on Emergency, Aux Contacts for Source Available and Space Heaters.)

Recommendations

The VB MV ATS is capable of other configurations outside the standard setup. Please consult the factory for further information on equipment outside the standard packages.