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User manual THOMSON TS 870
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9087A - 198th Street, Langley, BC Canada V1M 3B1 • Telephone (604) 888-0110
Telefax (604) 888-3381 • E-Mail: info@thomsontechnology.com • www.thomsontechnology.com



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NOTES 22. PERFORMANCE TEST FORM 30 32 33 34 35 PM062 REV 6 08/08/01 Thomson Technology TS 870 TRANSFER SWITCH 1. PRODUCT REVISION HISTORY The following information provides an historical summary of changes made to this product since the original release. Operating & Service Manual Version Rev 0 04/11/19 Rev 1 05/03/08 Rev 2 05/05/26 Rev 3 06/05/08 Rev 4 07/07/31 Rev 5 08/03/05 Rev 6 08/08/01 Original release. Changes to incorporate reversing style ATS Motor for 100-250A transfer switches. Revisions to Section 8 and Section 18. Revisions to Section 15. Changes to Incorporate new S-Style 400A mechanism Changes to Incorporate new S-Style mechanism (100A, 150A, 200A, 250A, 600A, 800A) Changes to Incorporate optional TSC 80E Transfer Controller Contact Thomson Technology, to obtain applicable instruction manuals or if in doubt about any matter relating to installation, operation or maintenance. Soft copy of the most current version is available at www.thomsontechnology.com.

com. NOTE: All information contained in this manual is for reference only and is subject to change without notice. 2. EQUIPMENT STORAGE 2.1. ENVIRONMENTAL CONDITIONS CAUTION!!! Failure to store and operate equipment under the specified environmental conditions may cause equipment damage and void warranty. The following procedures are required for correct storage of the transfer switch prior to installation. 2.1.1.

EQUIPMENT STORAGE The transfer switch shall be stored in an environment with a temperature range not exceeding -4° to +158° Fahrenheit (-20° to +70° Celsius) and a humidity range not exceeding 5%-95% non-condensing. Before storing, unpack sufficiently to check for concealed damage. If concealed damage is found, notify the ATS supplier and the Carrier immediately. Repack with the original, or equivalent packing materials. PM062 REV 6 08/08/01 1 Thomson Technology TS 870 TRANSFER SWITCH Protect from physical damage.

Do not stack. Store indoors in a clean, dry, well ventilated area free of corrosive agents including fumes, salt and concrete/cement dust. Apply heat as necessary to prevent condensation. 2.1.

2. EQUIPMENT OPERATING The transfer switch shall be operated in an environment with a temperature range not exceeding +5° to +122° Fahrenheit (-15° to +50° Celsius) and a humidity range not exceeding 5%-95% non-condensing. 3. NOTES TO INSTALLER DANGER!!!! Arc Flash and Shock Hazard. Will cause severe injury or death. @@Failure to do so may cause personal injury or death 3.1. UPSTREAM CIRCUIT PROTECTIVE

DEVICES/ELECTRICAL CONNECTIONS To ensure satisfactory installation of this equipment be sure to observe "Cable Terminal Information" regarding power cable connection tightness and "Requirements for Upstream Circuit Protective Devices" located in this manual. All mechanical and electrical connections must be checked for tightness prior to placing this equipment in service to ensure proper operation and to validate applicable warranty coverage. PM062 REV 6 08/08/01 2 Thomson Technology TS 870 TRANSFER SWITCH 3.

2. TRANSFER SWITCHES WITH INTEGRAL OVER CURRENT PROTECTION For models of transfer switch with integral over current protection, the over current protection must be set prior to operation. The equipment will be shipped from the factory with a longtime current setting of 100% (of the equipment rating) and maximum shorttime/instantaneous current and time delay settings. WARNING! Do Not Energize this equipment until device settings have been verified to ensure proper coordination. system protection & Failure to do so may result in equipment failure. Refer to Section 5.2.2 of this manual for additional information on operation of the Transfer switch following an over current trip condition. Refer to information supplied with the transfer switch documentation package for adjustment procedures on the power switching units over current protection trip unit. Contact the factory if any additional information is required.

3.3. TRANSFER SWITCHES WITH MULTI-TAP VOLTAGE CAPABILITY If the transfer switch has programmable multi-tap voltage capability (i.e. ATS Model Code with Voltage Code "Y"), confirm the transfer switch has been configured for the correct system voltage prior to installation. WARNING! Failure to confirm and match transfer switch voltage with the system voltage could cause serious equipment damage. The voltage selections and connections are shown on the engineered drawings attached to each transfer switch. The factory default settings will be indicated on the calibration label attached on the inside of the enclosure door (supplied loose on open style models). A blank label is included to record the applicable settings if the configuration is changed from the factory default settings. PM062 REV 6 08/08/01 3 Thomson Technology TS 870 TRANSFER SWITCH To change the transfer switch voltage, refer to "INSTRUCTIONS TO CHANGE SYSTEM VOLTAGE ON TS870 SERIES TRANSFER SWITCHES WITH TSC 80/TSC 80E CONTROLLER" (attached as "Appendix B).

Contact Thomson Technology for further information as may be required. 3.4. SYSTEM PHASING-HIGH LEG DELTA SYSTEMS For systems using high leg delta 240V 3 phase 4 wire systems, connection of supply conductors must have the correct phasing as shown below. WARNING Failure to match correct system phasing will result in serious damage to the TSC 80/TSC 80E controller. Autom atic Transfer Switch (Utility Supply) PH A (UA) PH B (UB) PH C (UC) Neural (N) B (Orange) (High Leg) 240V 208V 240V A (Red) 120V 120V C (Yellow) N (W hite) Where transfer switches are supplied without power isolation transformers (PT1 & PT2) for ATS control logic it is essential that the orientation of phase conductors of PM062 REV 6 08/08/01 4 Thomson Technology TS 870 TRANSFER SWITCH the supply source be arranged such that the phase of highest potential with respect to ground is not connected to the power supply inputs to the controller (A Phase for both supplies).

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Failure to do so will result in equipment damage. Per NEC Article 384-3 (f) "The B phase shall be that phase having the higher voltage to ground on a 3-phase, 4-wire delta connected systems." 3.5.

REMOTE START CONTACT FIELD WIRING As a minimum, the remote engine start control field wiring shall conform to the local regulatory authority on electrical installations. Field wiring of a remote start contact from a transfer switch to a control panel should conform to the following guidelines to avoid possible controller malfunction and/or damage. 3.5.1. Minimum #14 AWG (2.5mm²) wire size shall be used for distances up to 100ft (30m). For distances exceeding 100 ft. (30m) consult Thomson Technology 3.5.

2. Remote start contact wires should be run in a separate conduit. 3.5.3.

Avoid wiring near AC power cables to prevent pick-up of induced voltages. 3.5.4. An interposing relay may be required if field-wiring distance is excessively long (i.

e. greater than 100 feet (30m)) and/or if a remote contact has a resistance of greater than 5.0 ohms. 3.5.5. The remote start contact must be voltage free (i.e. dry contact). The use of a "powered" contact will damage the transfer controller.

3.6. **DIELECTRIC TESTING** Do not perform any high voltage dielectric testing on the transfer switch with the TSC 80/TSC 80E controller connected into the circuit as serious damage will occur to the controller. All AC control fuses and control circuit isolation plugs connected to the TSC 80/TSC 80E must be removed if high voltage dielectric testing is performed on the transfer switch. 3.7. **INSTALLATION OF OPEN TYPE TRANSFER SWITCHES** Please refer to the factory for additional information. 4. **GENERAL DESCRIPTION** Thomson Technology TS 870 series of Automatic Transfer Switches employ two mechanically interlocked enclosed contact power switching units and a microprocessor based controller to automatically transfer system load to a generator supply in the event of a utility supply failure. PM062 REV 6 08/08/01 5 Thomson Technology TS 870 TRANSFER SWITCH System load is then automatically re-transferred back to the utility supply following restoration of the utility power source to within normal operating limits.

The standard TS 870 series Automatic Transfer Switch is rated for 100% system load and requires upstream over current protection. The TS 870 Automatic Transfer Switch may be supplied with optional integral over current protection within the enclosed contact power switching units for applications such as Service Entrance Rated equipment. Refer to Section 6 of this manual for detailed information on over current protection. The TS 870 series transfer switches use a type TSC 80 standard or optional TSC 80E microprocessor based controller, which provides all necessary control functions for fully automatic operation. The TSC 80/TSC 80E controller is mounted on the door of the transfer switch enclosure and operating status is shown via LED lights.

For further information on the TSC 80/TSC 80E Transfer Controller, refer to separate instruction manual PM063. The power switching devices used for the Utility and Generator sources are operated by an electrically driven motor mechanism in the transfer switch. The transfer switch motor utilizes the power from the source to which the electrical load is being transferred. The mechanism provides a positive mechanical interlock to prevent both power switching units from being closed at the same time, which allows an open transition, "break-before-make" transfer sequence. The TSC 80/TSC 80E transfer controller provides a standard neutral position delay timer to allow adequate voltage decay during transfer operation to prevent out of phase transfers.

Note: For the purpose of this manual, the following standard nomenclature is utilized: · · · Utility: to indicate the source of primary power Generator: to indicate the source of standby power Power switching device: to indicate the transfer switch power switching device PM062 REV 6 08/08/01 6 Thomson Technology TS 870 TRANSFER SWITCH 4.1. **PRODUCT MODEL CODE** The type of TS 8 will monitor the generator voltage and frequency levels. Once the generator voltage and frequency rises above Following expiry of the engine start delay period (adjustable from 0 to 60 sec.) an engine start PM062 REV 6 08/08/01 8 Thomson Technology TS 870 TRANSFER SWITCH preset values (adjustable from 70% to 95% of nominal), the engine warm-up timer will be initiated. Once the warm-up timer expires (adjustable from 0 to 60 sec.), the Transfer to Generator Supply signal (contact closure) will be given to the transfer switch mechanism. The load will then transfer from the utility supply to the generator supply via the motor driven mechanism. The generator will continue to supply the load until the utility supply has returned. The retransfer sequence is completed as follows: when the utility supply voltage is restored to above the preset values (adjustable from 70% to 95% of nominal) on all phases, a transfer return delay circuit will be initiated.

Following expiry of the Utility Return Timer (adjustable from 0 to 30 min.), the Transfer to Generator Supply signal will be removed (contact opening), then the Transfer to Utility Supply signal (contact closure) will be given to the transfer switch mechanism. The load will then retransfer the load from the generator supply back to the utility supply. Note: A neutral delay timer circuit will delay the transfer sequence in the neutral position (i.e. both power switching devices open) until the neutral delay time period expires (adjustable from 0 to 60 seconds). An engine cooldown timer circuit will be initiated once the load is transferred from the generator supply. Following expiry of the cooldown delay period (adjustable from 0 to 30 minutes), the engine start signal will be removed (contact opening) to initiate stopping of the generator set. 5.2.

SERVICE ENTRANCE AUTOMATIC TRANSFER SWITCH Note: This applies only to service entrance transfer switches 5.2.1. **NORMAL OPERATION** Under normal conditions, the load is energized from the utility supply through the closed utility transfer power switching device. If the utility power fails, the generator will start and the load will be re-energized via the closed generator transfer power switching device.

In the normal operating mode, the Service Disconnect switch shall be in the "energized" position. 5.2.2. **OVER CURRENT TRIP** Should the utility power switching device trip open due to an over current condition, TSC 80/TSC 80E transfer controller will initiate an engine start signal and will permit PM062 REV 6 08/08/01 9 Thomson Technology TS 870 TRANSFER SWITCH transfer of the load to the generator supply.

The utility source will be locked out and the load will remain on the generator supply until the TSC 80/TSC 80E alarm signal is manually reset. Refer to the TSC 80/TSC 80E Instruction Manual for further details on Transfer Fail operation.



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Should the generator power switching device trip open due to an over current condition, TSC 80/TSC 80E transfer controller will initiate transfer of the load to the utility supply. The generator source will be locked out and the load will remain on the utility supply until the TSC 80/TSC 80E alarm signal is manually reset. 5.2.3. SERVICE DISCONNECT PROCEDURE To perform a service disconnect (i.e. to disconnect the utility and generator supplies), the following procedure is required: 1.

Move the "Service Disconnect" control switch located on the door of the transfer switch to the "Disconnected" position. 2. Verify that the "Service Disconnected" pilot light is illuminated. If the Light is illuminated, the service has been successfully disconnected and it is safe to perform any maintenance procedures as required. power switching devices open. In this condition, the transfer switch is in the neutral position, with both utility and generator transfer The transfer switch will remain in this condition, regardless of condition of the utility and generator supplies (i.e. if the utility power fails, the generator will not receive a start signal, nor will the transfer switch move to the generator position). NOTE: If the Service Disconnect Light is not illuminated, additional procedures are required (refer to the following procedure #5.2.

4). 3. Attach safety lockout padlock to the "Service Disconnect" control switch to prevent unauthorized change in operating condition and verify transfer switch door is locked closed. If the door is not locked, turn and remove door key. WARNING! Close and lock the transfer switch enclosure door before connecting power sources.

PM062 REV 6 08/08/01 10 Thomson Technology TS 870 TRANSFER SWITCH 4. To reenergize the load, remove the padlock(s) from the service disconnect control switch, and move the switch to the energized position. The transfer switch will immediately return to the utility or generator supply if within normal operating limits. 5.2.

4. ADDITIONAL PROCEDURES If the "Service Disconnected" pilot light is not illuminated, the service will not have been successfully disconnected and therefore it is not safe to perform any maintenance until the following additional procedures are performed: DANGER!!!! Arc Flash and Shock Hazard. Will cause severe injury or death. @@Failure to do so may cause personal injury or death 1. Open the door to the transfer switch using a suitable tool and opening the door lock with the key. 2. Visually inspect the actual position of the transfer switch mechanism. If the position of the transfer switch mechanism is clearly in the "neutral position" and the load bus is de-energized on all phases, the service has been successfully disconnected. Proceed to Step. 4.

If the position of the transfer switch mechanism is not in the neutral position or the load bus is energized, further procedures are required. Note: If the position of the transfer switch mechanism is clearly in the "neutral position, the "service disconnected" pilot light may not have illuminated due to the following reasons: a) Utility and generator supply voltages are not present (the pilot light requires AC supply voltage to be present). b) The pilot light may be burnt out. replaced with a suitably rated bulb. The bulb should be immediately PM062 REV 6 08/08/01 11 Thomson Technology TS 870 TRANSFER SWITCH c) Failure of one or more of the sensing/logic contacts. A qualified service technician is required to trouble shoot this specific condition. Switch the utility control circuit isolation switch to the de-energized position to remove utility control power. To isolate the generator supply, remove the control circuit isolation plug. Note: The AC power conductors will still remain energized. of control power.

Note: To return the transfer switch back to normal operation, the utility control circuit disconnect switch and control circuit isolation plug must be switched on and reconnected for correct operation. 3. If the position of the transfer switch mechanism is not in the "neutral position", manually operate the transfer switch mechanism depending on mechanism type as follows: Note: Refer to product drawings in sections 12, 13 & 14 for identification of Transfer Switch Mechanism style supplied with the Transfer Switch. a. T-Style Mechanism: Pull the manual release plunger on the mechanism, releasing the motor drive rod from motor drive arm and move the knob and yoke to the marked "neutral position".

b. S-Style Mechanism: Insert the operating handle into the front of the transfer mechanism and turn the operating handle until the position indication on the mechanism clearly shows the "neutral position". Once all the control circuits are de-energized and isolated the "Service Disconnected" pilot light will not illuminate due to loss WARNING! Failure to move the mechanism to the Neutral Position may result in serious personal injury or death due to electrical shock. 4. Close the transfer switch door securely using a suitable tool.

Lock the door in the closed position and remove the key. WARNING! PM062 REV 6 08/08/01 12 Thomson Technology TS 870 TRANSFER SWITCH Failure to positively lock closed and secure the transfer switch door may result in serious personal injury or death due to electrical shock. 5. Attach a safety lockout padlock to the service disconnect control switch to prevent unauthorized change in operating condition and verify transfer switch door is locked closed. 6. To reenergize the load, remove the padlock(s) from the service disconnect control switch, and move the switch to the Energized position. The transfer switch will immediately return to the utility or generator supply if within normal operating limits. 5.3. TEST MODES The transfer switch may be tested utilizing the TSC 80/TSC 80E controller push-buttons or optional four position test switch.

A simulated utility power failure condition will be activated when the test mode is selected. The transfer switch will operate as per a normal utility power fail condition. The transfer switch will remain on generator supply until the test mode is terminated. It will then immediately transfer back to the utility supply and then continue to operate the generator set for its cooldown period then stop. Note: The transfer switch will automatically return to the utility supply (if within nominal limits) if the generator set fails while in the test mode. 6. OVER CURRENT PROTECTION Thomson Technology TS 870 series of Automatic Transfer Switches may be supplied with or without integral over current protection as described below: 6.1. STANDARD TS 870 AUTOMATIC TRANSFER SWITCH The standard TS 870 Automatic Transfer Switch does not contain any integral over current protection and requires upstream over current protection devices for both Utility and Generator sources. The Standard TS 870 is rated for 100% continuous loading and can withstand a maximum short circuit fault current as noted in Section 15 of this manual.



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If lubrication is necessary, apply medium weight (SAE 20) oil sparingly. 10.8.

Transfer Mechanism 1000A-1200A T Style -yoke pivot bearings and rod ends are permanently lubricated and do not require maintenance. 10.9. Transfer Mechanism 100A-800A S Style lubrication of drive hub/operator arm interface. Use high viscosity moly lubricant.

PM062 REV 6 08/08/01 21 Thomson Technology TS 870 TRANSFER SWITCH 10.10. The motor and gearbox on all Transfer Mechanism styles are permanently lubricated, and should not require attention under normal operating circumstances. PM062 REV 6 08/08/01 22 Thomson Technology TS 870 TRANSFER SWITCH 11. FRONT VIEW (TYPICAL) 3 / 4 POLE 100A-250A S-Style TRANSFER MECHANISM PM062 REV 6 08/08/01 23 Thomson Technology TS 870 TRANSFER SWITCH 12.

FRONT VIEW (TYPICAL) 3 POLE 400A-800A S-Style TRANSFER MECHANISM (Mechanism Front Cover Removed) ØC ØB ØA N N ØA ØB ØC N ØA ØB ØC CUSTOMER ORDER No. DWN BY AUTH BY WORK ORDER No. DATE SHEET REV DRAWING/FILE No. PM062 REV 6 08/08/01 24 Thomson Technology TS 870 TRANSFER SWITCH 13. FRONT VIEW (TYPICAL) 3 / 4 POLE 1000A-1200A T-Style TRANSFER MECHANISM PM062 REV 6 08/08/01 25 Thomson Technology TS 870 TRANSFER SWITCH 14. CONNECTION CONFIGURATION OPTIONS PM062 REV 6 08/08/01 26 Thomson Technology TS 870 TRANSFER SWITCH 15. CABLE TERMINAL INFORMATION TERMINAL RATING CONNECTION TIGHTNESS (In-lbs) TERMINAL MOUNTING SCREW 120 120 150 150 72 72 110 375 CABLE CLAMP 50 120 275 275 275 275 375 375 BASIC MODEL QTY PER PHASE RANGE #14-1/0 #24/0 #6-350MCM #6350MCM 2/0500MCM 2/0500MCM 2/0500MCM 4/0500MCM TS 87xA-0100 TS 87xA-0150 TS 87xA-0200 TS 87xA-0250 TS 87xA-0400 TS 87xA-0600 TS 87xA-0800 TS 87xA-1200 1 1 1 1 1 1 1 1 2 2 3 4 1. Optional terminal ratings are available in some models Consult Thomson Technology. 2. For other model types not shown, contact Thomson Technology for further information.

16. REQUIREMENTS FOR UPSTREAM CIRCUIT PROTECTIVE DEVICES 16.1. WITHSTAND CURRENT RATINGS (ALL MODELS WITHOUT INTEGRAL OVERCURRENT PROTECTION OPTION) RATED CURRENT (A) 100 150 200 250 400 600 800 1000/1200 WITHSTAND CURRENT RATING AMPS (RMS) 1 With Upstream Circuit Breaker Protection With Upstream Fuse Protection @240V @480V @600V @ Up to 600V Fuse Type 65,000 65,000 65,000 65,000 65,000 65,000 65,000 25,000 25,000 N/A 35,000 50,000 50,000 50,000 50,000 50,000 18,000 18,000 N/A 25,000 35,000 35,000 35,000 42,000 100,000 100,000 N/A 100,000 100,000 100,000 100,000 100,000 T, J T, J T, J T, J T, J T, J Consult Factory Consult Factory BASIC MODEL TS87xA-0100 TS87xA-0150 TS87xA-0200 TS87xA-0250 TS87xA-0400 TS87xA-0600 TS87xA-0800 TS87A-1000/1200 1. 2. MAX. VOLTAGE 600 600 240 600 600 600 600 600 Standard ratings only are shown. Consult Thomson Technology for versions with higher withstand current ratings. For other model types not shown, contact Thomson Technology for further information. Fuse ratings shown are maximum allowable to permit use of the transfer switch in application with available fault current not exceeding that shown.

Consideration must be given to fuse sizing when fuses also provide overload protection. PM062 REV 6 08/08/01 27 Thomson Technology TS 870 TRANSFER SWITCH 16.2. INTERRUPTING CAPACITY CURRENT RATINGS (ALL MODELS WITH INTEGRAL OVERCURRENT PROTECTION OPTION) BASIC MODEL TS87xA-0100 TS87xA-0150 TS87xA-0200 TS87xA-0250 TS87xA-0400 TS87xA-0600 TS87xA-0800 TS88xA-1000/1200 MAX. VOLTAGE 600 600 240 600 600 600 600 600 RATED CURRENT (A) 100 150 200 250 400 600 800 1000/1200 INTERRUPTING CAPACITY CURRENT RATING AMPS (RMS) 1 No Upstream Circuit Breaker Protection Required @240V @480V @600V 65,000 65,000 65,000 65,000 65,000 65,000 65,000 25,000 25,000 N/A 35,000 50,000 50,000 50,000 50,000 14,000 14,000 N/A 22,000 25,000 25,000 25,000 50,000 1.

2. Standard ratings only are shown. Consult Thomson Technology for versions with higher interrupting capacity current ratings. For other model types not shown, contact Thomson Technology for further information. 17.

GROUND FAULT SITE TEST REQUIREMENTS Per NEC and UL1008, a ground fault protected system shall be performance tested when first installed on site. A written record of this shall be made and be available to the authority having jurisdiction. A form is provided at the back of this manual for this purpose see Section 21. Confirm and record actual trip setpoints in the form provided which is to be made available on request by inspection authority. 17.1.

PERFORMANCE TEST Qualified Field Service technicians require a calibrated current injection test apparatus and must be knowledgeable in breaker testing to provide primary neutral CT injection up to or greater than the trip setpoint as selected by the responsible party. As indicated in the NEC, the maximum setting of the ground fault protection shall be 1200 amps, and the maximum time delay shall be 1 second for ground faults equal to or greater than 3000 amps. The inspection authority should be contacted to confirm actual test requirements as these may vary by region or local code requirements. PM062 REV 6 08/08/01 28 Thomson Technology TS 870 TRANSFER SWITCH The interconnected system shall be evaluated to ensure compliance with the appropriate schematic drawings.

The proper location of sensors and power cabling shall be determined. The grounding points of the system shall be verified to determine that ground paths do not exist that would bypass the sensors. The use of high-voltage testers and resistance bridges may be required. A simulated fault current is to be generated by a coil around the sensors. The reaction of the circuit-interrupting device is to be observed for correct response. The results of the test are to be recorded on the test form provided. PM062 REV 6 08/08/01 29 Thomson Technology TS 870 TRANSFER SWITCH 18. TROUBLESHOOTING DANGER!!!! Arc Flash and Shock Hazard. Will cause severe injury or death. @@Failure to do so may cause personal injury or death Note: An optional hand held, plug-in Service Display Module (SDM) is available for the TSC 80 Transfer Controller.

The SDM module provides an LCD screen to display additional detailed information on the operation and settings of the TSC 80 controller for simplified servicing/trouble shooting procedures. For detailed information, refer to the separate SDM module instruction manual (PM065). TSC 80e transfer controllers have a built-in LCD display and therefore do not require the SDM unit. Symptom Will not re-transfer to utility source upon restoration Possible Causes

Isolation plug out Utility disconnect switch is in the de-energized position (Service Entrance Rated ATS). Switch to the Energized position. A test mode has been activated (check TSC 80/TSC 80E status LED) Utility voltage is below the pre-programmed limits (check utility source for adequate voltage) A loose control connection Faulty motor limit switch Defective motor TSC 80 has incorrect voltage configuration jumper setting for correct system voltage or TSC 80E has incorrect voltage setting as set via software programming Defective TSC 80/TSC 80E controller (verify output signals with circuit board mounted diagnostic LED's) TSC 80/TSC 80E has "Transfer Fail" alarm activated as indicated by flashing Load on Utility LED.



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Determine cause of alarm and rectify before TSC 80/TSC 80E is reset Isolation plug out Generator set not producing enough voltage/frequency or output circuit breaker open TSC 80 has incorrect voltage configuration jumper setting for correct system voltage or TSC 80E has incorrect voltage setting as set via software programming Will not transfer to generator source upon failure of utility source - PM062 REV 6 08/08/01 30 Thomson Technology TS 870 TRANSFER SWITCH Warm-up time delay function has not timed out yet (verify TSC 80/TSC 80E timer setting) A loose control connection Faulty motor limit switch Defective motor Defective TSC 80/TSC 80E controller (verify output signals with circuit board mounted diagnostic LED's) TSC 80/TSC 80E has "Transfer Fail" alarm activated as indicated by flashing Load on Generator LED. Determine cause of alarm and rectify before TSC 80/TSC 80E is reset A test mode has been activated (check TSC 80/TSC 80E status LED) Utility supply voltage is slightly below voltage sensing setpoints. Verify TSC 80 has correct voltage configuration jumper setting for system voltage or TSC 80E has incorrect voltage setting as set via software programming Defective TSC 80/TSC 80E controller (verify output signals with circuit board mounted diagnostic LED's) Utility power switching device has tripped due to an over current condition and TSC 80/TSC 80E "Transfer Fail" alarm activated as indicated by flashing Load on Utility LED. Determine cause of alarm and rectify before TSC 80/TSC 80E is reset.

Verify remote engine control panel is set for automatic mode Transfer to generator source without a power failure in the utility source - - Generator does not start up or stop when it should No time delay when there should be Power is not available at the load terminals but the utility or generator power switching device appears to be closed to a live source - - Verify time delay setting of the TSC 80/TSC 80E controller The power switching device's over current protection unit has opened due to a fault on the system. Correct the fault, and manually reset the power switching device in the transfer switch by moving it off and then on again with the manual operating handle Limit switch incorrectly adjusted Limit switch failure or improper adjustment has failed to disconnect motor Binding or jamming of the transfer mechanism The transfer switch has completed a transfer, but the motor has overheated and the internal thermal protector has opened - PM062 REV 6 08/08/01 31 Thomson Technology TS 870 TRANSFER SWITCH NOTE There are no user serviceable components located on the TSC 80/TSC 80E printed circuit board. If the TSC 80/TSC 80E controller is deemed to be defective it must be returned to the Thomson Technology Factory for repair or replacement. Please refer to Product Return Policy section of this manual further information on product return procedures required. 19. REPLACEMENT PARTS Replacement parts are available for the transfer switch as follows: NOTE When ordering replacement parts please provide the following information: -Transfer Switch Model code (e.g. TS 873AA0200AS) -Transfer Switch Serial Number (e.g. W-022345) The above information can be found on the transfer switch equipment rating plate located on the outside of the ATS door.

Component Description TSC 80Service Replacement Controller Board c/w lexan TSC 80E Service Replacement Controller Board c/w lexan TSC 80 Lexan Faceplate Thomson Technology Part Number TSC80SR Comments Must set configuration Jumper prior to use. Refer to TSC 80/TSC 80E Instruction Manual. Must program setpoints via software prior to use. Refer to TSC 80/TSC 80E Instruction Manual. Contact Thomson Technology Service Dept for installation procedures. Contact Thomson Technology Service Dept for installation procedures. TSC80ESR 005336 TSC 80E Lexan Faceplate 008315 PM062 REV 6 08/08/01 32 Thomson Technology TS 870 TRANSFER SWITCH Component Description TSC 80/TSC 80E Rear Cover Limit Switch 1 n/o, 1 n/c (all ATS Models) Thomson Technology Part Number 005707 004929 Comments Must install and adjust for proper operation before use. Contact Thomson Technology Service Dept for installation/adjustment procedures Motor is supplied with gear box assembly. Contact Thomson Technology Service Department for installation procedures Motor is supplied with gear box assembly. Contact Thomson Technology Service Department for installation procedures Motor is supplied with gear box assembly.

Contact Thomson Technology Service Department for installation procedures Must ensure coil voltage is correct Must ensure coil voltage is correct Transfer Switch Motor (100A-250A S Style Mechanism) 120V 20 watt 1 PH Transfer Switch Motor (400A-800A S Style Mechanism) 120V 30 watt 1 PH Transfer Switch Motor (1200A T-Style Mechanism) 120V 1/10 hp 1 PH 120VAC Auxiliary Plug-in Relay, 11 pin Square (UX/GX) 120VAC Auxiliary Plug-in Timer 100VA Control Transformer 007701 007961 001075 001278 001515 002159 For other parts not listed, please contact Thomson Technology. 20. PRODUCT RETURN POLICY Thomson Technology uses a Return Material Authorization (RMA) process. Please complete the Return Authorization Request Form (available on our web page) for return of goods, warranty replacement/repair of defective parts, or credit consideration and fax to the appropriate department. Returns only: Sales Fax (604) 888-5606 Warranty replacement/Warranty Repair: Service Fax (604) 888-3370.

Upon receipt of your request, Thomson Technology will confirm with a copy of our Order Acknowledgement via fax advising the RMA number which should be used to tag the defective controller prior to shipment. PM062 REV 6 08/08/01 33 Thomson Technology TS 870 TRANSFER SWITCH 21. NOTES PM062 REV 6 08/08/01 34 Thomson Technology TS 870 TRANSFER SWITCH 22. PERFORMANCE TEST FORM This form should be retained by those in charge of the building electrical installation in order to be available to the authority having jurisdiction. Date Personnel Tests performed Interconnection evaluation Grounding point evaluation Fault current test: Ground fault settings _____ Simulated current _____

Results _____ Comments PM062 REV 6 08/08/01 35 Thomson Technology APPENDIX "A" THOMSON TECHNOLOGY© TYPICAL AUTOMATIC TRANSFER SWITCH COMMISSIONING PROCEDURES Model Series TS 870 Note: The following commissioning procedures are provided for general information only pertaining to typical site installations and applications. Contact the equipment supplier for further information as may be required. DANGER!!!! Arc Flash and Shock Hazard. Will cause severe injury or death. @ @ Failure to do so may cause personal injury or death CAUTION Commissioning procedures must be performed by qualified personnel only.



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Ensure the Automatic Transfer Switch (ATS) Control Isolation Plug is disconnected prior to energizing the supply sources. Manually place the transfer switch mechanism in the neutral position by opening both Utility and Generator Power Switching devices prior to applying power. NOTE: An optional hand held, plug-in Service Display Module (SDM) is available for the TSC 80 Transfer Controller. The SDM module provides an LCD screen to display additional detailed information on the operation and settings of the TSC 80 controller for simplified servicing/trouble shooting procedures. For detailed information, refer to the separate SDM module instruction manual (PM065). TSC 80e transfer controllers have a built-in LCD display and therefore do not require the SDM unit.

Pre-Commissioning Checks Prior to Commissioning Agent On-Site (to allow loads to be supplied prior to final commissioning) 1) Verify the system voltage of both sources (i.e. generator and utility) to be applied to the transfer switch are of the correct nominal system value which matches the ATS drawings and the ATS equipment label ratings. If the system voltage is correct, proceed to step 3. If system voltage is incorrect for the rating of the ATS supplied, proceed to step 2. CAUTION: FAILURE TO RE-CONFIGURE ATS VOLTAGE TO MATCH SYSTEM VOLTAGE WILL RESULT IN EQUIPMENT MALFUNCTION AND DAMAGE. NOTE: The factory default system voltage setting for multi-voltage TS 840/870 transfer switches is 480VAC, which will be indicated by a letter "Y" in the voltage code as shown on the ATS model code (e.g. TS 873A0250A1AY) and on a warning tag attached to the isolation plug. APPENDIX "A" THOMSON TECHNOLOGY© TYPICAL AUTOMATIC TRANSFER SWITCH COMMISSIONING PROCEDURES Model Series TS 870 2) To re-configure the ATS for the correct system voltage prior to energization, refer to Appendix B (as attached).

For further information, refer to the TSC 80/TSC 80E controller manual supplied with the transfer switch. 3) For 240V High Leg Delta systems refer to the ATS instruction manual for correct phasing required and re-configuring procedures. CAUTION: FAILURE TO OBTAIN THE CORRECT ATS PHASING WILL RESULT IN EQUIPMENT MALFUNCTION AND DAMAGE. 4) Confirm cable size is correct for the lugs supplied in the transfer switch (line and load). Confirm the cables were meggered by the electrical contractor to ensure no cross phase connections or conduction to ground.

5) Confirm cable lugs are properly torqued. Confirm cable installation; ensure the cables do not interfere with normal equipment operation or which may cause component damage. 6) Manually operate the transfer mechanism to the appropriate source of supply. Leave the Isolation Plug disconnected until final Transfer Switch Commissioning is to be completed. Final Commissioning 1) Verify installation of the Automatic Transfer Switch as per installation manual and verify wiring (also see the Pre-Commissioning Checks).

Confirm phase, neutral and grounding conductors are installed as per electrical code requirements. Note: Confirm neutral conductors of both sources are correctly installed and are solidly grounded for 3 phase 4 wire configurations. 2) Check for mechanical damage (shipping or installer). 3) Verify correct control wire interconnects to the engine/generator set auto start/stop circuitry. Ensure the engine controller automatic start circuit does not draw more than 5.0 amps (resistive) across the TSC 80/TSC 80E Engine Start contact. The TSC 80/TSC 80E Engine Start contact is voltage free and the only voltage measured should result from the engine controllers internal control logic. Note: The ATS Engine Start contact CLOSES to start the engine and OPENS to stop the engine. 4) Place the generator engine controller in the "OFF" position and open the generator local circuit breaker. 5) Ensure the ATS isolation plug is disconnected prior to application of voltage of the supply sources.

6) Energize the utility supply and the generator supply sources and verify these meet the correct voltage, phasing and phase rotation for the ATS and system. Once these have been confirmed to be correct, de-energize both sources before installing the isolation plug. 7) Once the isolation plug is connected, the ATS and system load may be energized with utility power once the site electrical contractor and/or owner (as required) give authorization to proceed. 8) If Utility power is within nominal limits, the ATS should transfer to the utility source. determine correct operation, observe the following on the TSC 80/TSC 80E faceplate: i) Utility Source green LED is "ON" To APPENDIX "A" THOMSON TECHNOLOGY© TYPICAL AUTOMATIC TRANSFER SWITCH COMMISSIONING PROCEDURES Model Series TS 870 ii) Green LED above mimic bus for the Utility source is "ON" iii) Green "Load" LED is "ON" 9) To verify all LED's are operational, perform a "LAMP TEST" operation (lamp test is initiated by pressing and holding the 2 push buttons on the TSC 80/TSC 80E faceplate simultaneously "ON" until all the LED's change state). 10) Prior to operating the generator, ensure it is ready to be energized and the site electrical contractor and/or owner (as required) give authorization to proceed. In preparation for operation, turn the generator's engine control switch to the "Automatic" start position. 11) To transfer the generator on load, perform a load test by pressing the Utility Power Fail Simulate pushbutton "ON" and holding it for approximately 5 seconds until the LED light above the push button changes state. The engine should start following the 3-second engine start delay period and the transfer switch will begin transferring to the generator supply once the 2second engine warm-up timer expires. Note: The engine warm-up timer will only begin timing once the generator's output rises above 85% nominal voltage and 90% nominal frequency.

Once the Utility power switching device opens, the transfer switch mechanism will pause in the neutral position for the 3-second neutral delay period, then the mechanism will complete the transfer and close the generator power switching device. To determine correct operation, observe the following on the TSC 80/TSC 80E faceplate: i) Generator Source green LED is "ON" ii) Red LED above mimic bus for the generator source is "ON" iii) Green "Load" LED is "ON" iv) Utility Source green LED is "ON" v) Utility Power Fail Simulate yellow LED is "ON" vi) Green LED above mimic bus for the Utility source is "OFF" 12) To terminate the test, press the Utility Power Fail Simulate push button on the TSC 80/TSC 80E faceplate again and hold until the LED above the pushbutton changes state. The transfer switch will begin transferring to the utility supply following the 2-minute utility return delay period. Note: the utility return delay timer will only begin timing if the utility voltage is above 85% nominal on all phases.



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Once the Generator power switching device opens, the transfer switch mechanism will pause in the neutral position for the 3-second neutral delay period, then the mechanism will complete the transfer and close the Utility power switching device to return the load to the Utility source.

Once the load has transferred onto the utility source, the engine will continue to run for the 2-minute cool down time delay period and will then it will automatically stop. 13) Perform a power outage test by opening the upstream utility feeder breaker. The TSC 80/TSC 80E controller Utility supply LED lights will de-energize; the generator set will start after the 3second engine start delay has expired. The generator should transfer on load as described in item #12 above. 14) Return the transfer switch to utility power by re-closing the upstream utility breaker.

The load should re-transfer back to the utility supply and the engine should stop as described in item #13 above. 15) Repeat tests #12 through 14 two (or more) times to ensure correct operation. APPENDIX "A" THOMSON TECHNOLOGY© TYPICAL AUTOMATIC TRANSFER SWITCH COMMISSIONING PROCEDURES Model Series TS 870 16) Automatic Plant Exercise Operation (OPTIONAL): If an automatic weekly plant exercise feature is desired, press the GENERATOR EXERCISE Mode push button on the TSC 80/TSC 80E faceplate. Hold the push button "ON" for approximately 5 seconds until the LED light changes state. Once the mode is initiated, the engine will immediately start and the generator will transfer on load as previously described. Note: The generator may or may not transfer on load, which is dependent on the TSC 80/TSC 80E configuration setting. The factory default setting is for a "Load Transfer" plant exercise test. The engine will remain operating on load until the plant exercise time delay period expires, then the load will re-transfer back to the utility supply following the 2-minute utility return timer. On ATS using TSC 80 controller, the engine will be automatically re-tested on load every week (i.e.

7 days) at the same time of day that the first test was initiated. On ATS using TSC 80E controller, the engine will be automatically re-tested as programmed in software. Refer to the TSC 80/TSC 80E manual for further information. 17) On completion of commissioning ensure all controls are left in automatic. 18) If required, forward document or drawing updates to the equipment supplier if revisions are required and provide the end user with a set of marked-ups to be retained on site. 19) Ensure copies of manuals for the equipment are on site. 20) Record and forward list of deficiencies to the appropriate parties where applicable. APPENDIX "B" THOMSON TECHNOLOGY© INSTRUCTIONS TO CHANGE SYSTEM VOLTAGE ON TS 870 SERIES TRANSFER SWITCHES WITH TSC 80/TSC 80E CONTROLLER DANGER!!!! Arc Flash and Shock Hazard. Will cause severe injury or death. @@@@2.

Disconnect "Control Circuit Isolation Plug" 3. @@(Refer to wiring schematic diagram Figure 1). Ensure all electrical connections are tight. 4. Remove rear cover on door mounted TSC 80/TSC 80E transfer controller.

5. @@Re-install rear cover for TSC 80/TSC 80E transfer controller. 7. Record new programmed voltage on calibration label on TSC 80/TSC 80E rear cover 8. Re-connect "Control Circuit Isolation Plug".

9. Remove all tools and close transfer switch enclosure door. 9087A - 198 Street, Langley, B.C. Canada V1M 3B1 · Telephone (604) 888-0110 · Telefax (604) 888-3370 th APPENDIX "B" THOMSON TECHNOLOGY© INSTRUCTIONS TO CHANGE SYSTEM VOLTAGE ON TS 870 SERIES TRANSFER SWITCHES WITH TSC 80/TSC 80E CONTROLLER TSC 80 Printed Circuit Board 38 600V 480V 380V 240V 50HZ 1 Phase No Xfer Secure SYSTEM VOLTAGE JUMPERS JP5 44 TB7 Gen Warmup Figure 1 Figure 2 B) TSC 80E CONTROLLERS ONLY (Refer to Section A above for TSC 80 Controllers) To change system voltage on a TSC 80E controller, the transfer switch must be energized to provide control power to the controller to allow software programming. To change the software setting, follow the procedure below; NOTE: The TSC 80E controller does not utilize the system voltage jumpers, which are located on the printed circuit board. Any jumpers on the printed circuit board will be ignored. PASSWORD ENTRY PROCEDURE To enter the programming mode, follow the procedure as shown: 1. Press the ENTER key to obtain the Password Main Menu. The "PASSWORD ENTRY & RESETS" prompt will appear).

2. Press the ENTER key a second time to obtain the Password Sub Menus. The "USER PASSWORD" prompt will appear). If the USER password is to be entered, proceed to step #4. 9087A - 198 Street, Langley, B.C. Canada V1M 3B1 · Telephone (604) 888-0110 · Telefax (604) 888-3370 th APPENDIX "B" THOMSON TECHNOLOGY© INSTRUCTIONS TO CHANGE SYSTEM VOLTAGE ON TS 870 SERIES TRANSFER SWITCHES WITH TSC 80/TSC 80E CONTROLLER 3. Press the DOWN arrow key to select USER or MASTER password sub-menu 4. Once the USER or MASTER sub-menu is selected, press the ENTER key again to allow password number entry (an asterisk (*) should appear to signal data entry is possible). 5.

Use the UP arrow key to adjust the right-hand digit, and if required use the DOWN arrow key to adjust the left-hand digit. Once the desired number is displayed, press ENTER key to accept the value. NOTE: Factory default USER PASSWORD is "01". Once the correct password is entered and access is provided to the Programming menus, the following procedure is required to locate and view/change a specific program value. 1.

Press the DOWN key to scroll through the programming menus to find menu SYSTEM CONFIG. 2. Once SYSTEM CONFIG program menu is displayed, press the ENTER key to display the SYSTEM VOLTAGE sub-menu. 3. Once SYSTEM VOLTAGE sub-menu is displayed, press the ENTER key to allow changing to a different value.

An asterisk (*) should appear to signal data entry is possible. NOTE: If an asterisk (*) symbol does not stay displayed, the correct level of password has not been entered which will prevent the value to be changed. 4. Press the DOWN key to change voltage selection required (i.e. 208/240/380/480/600). Once the desired value is selected, press the ENTER key to accept the change. The asterisk will disappear. To exit the programming sub-menus, press the ESC key. To exit back to the normal display mode, press the ESC key again.

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