THOMSON™
POWER SYSTEMS

TS 880

AUTOMATIC TRANSFER SWITCH
WITH TSC 900 CONTROLLER

INSTALLATION, OPERATING & SERVICE MANUAL

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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 04/11/15	Original release.
Rev1 04/12/21	Additional information for Closed Transition Operation
Rev 2 05/03/08	Changes to incorporate reversing style ATS motor for 100-250A transfer switches
Rev 3 05/05/11	Changes to Section 5 & Section 21.
Rev 4 06/05/08	Changes to Section 13.
Rev 5 07/02/01	Changes to Section 13.
Rev 6 07/02/27	Changes to Section 12, Cable Terminal Information
Rev 7 08/03/05	Changes to Incorporate new S-Style mechanism (100A, 150A, 200A, 250A)
Rev 8 10/01/25	Changes to Incorporate Seismic Certification and Mounting Requirements
Rev 9 14/01/08	Update to Marathon Thomson Power System Logo
Rev 10 15/02/04	Changes to incorporate TSC 900 Transfer Switch Controller, remove all references to 100A-1200A Molded case switch product models
Rev 11 16/04/19	Added Manual Operation sections and general manual updates

Contact Thomson Power Systems, 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.thomsonps.com.

NOTE: All information contained in this manual is for reference only and is subject to change without notice.

Related Product Instruction Manuals

- TSC 900 Transfer Switch Controller, PM151
- TSC 900 Modbus™ Communication, PM152

Contact Thomson Power Systems, to obtain these instruction manuals. Soft copy of the most current versions of these manuals are available at www.thomsonps.com.

2. EQUIPMENT STORAGE

The following procedures are required for correct storage of the transfer switch prior to installation.

2.1. *ENVIRONMENTAL CONDITIONS*

CAUTION

Failure to store and operate equipment under the specified environmental conditions may cause equipment damage and void warranty.

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. 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.

Do not open equipment until ALL power sources are disconnected

This equipment must be installed and serviced only by qualified electrical personnel utilizing safe work practices and appropriate Personal Protective Equipment (PPE). 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.

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 long-time current setting of 100%, of the equipment rating, and maximum short-time/instantaneous current and time delay settings.

WARNING

Do Not Energize this equipment until device settings have been verified to ensure proper system protection & coordination. Failure to do so may result in equipment failure.

Refer to ***SECTION 5.4.2*** 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 (refer to engineered drawings), 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.

To change the transfer switch voltage, refer to Instructions To Change System Voltage On TS 880 Series Transfer Switches With TSC 900 Controller, attached as Appendix B. Contact Thomson Power Systems for further information as may be required.

3.4. *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 (2.5mm^2) wire size shall be used for distances up to 100ft (30m)[1]). For distances exceeding 100 ft. (30m) consult Thomson Power Systems

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.

3.5. *DIELECTRIC TESTING*

Do not perform any high voltage dielectric testing on the transfer switch with the TSC 900 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 900 must be removed if high voltage dielectric testing is performed on the transfer switch.

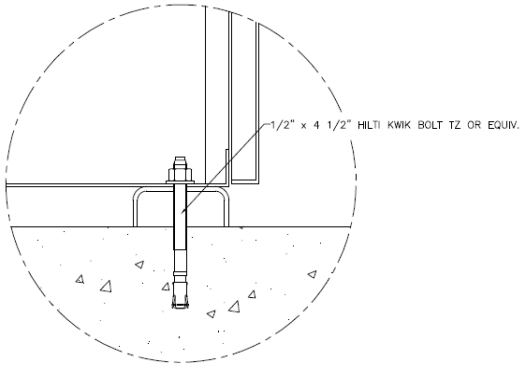
3.6. *MOUNTING OF ENCLOSED TRANSFER SWITCHES*

Model TS880 Automatic Transfer Switches and Automatic Transfer and Bypass Isolation Switches in Standard enclosures are seismic certified under AC156 building code for non-structural components.

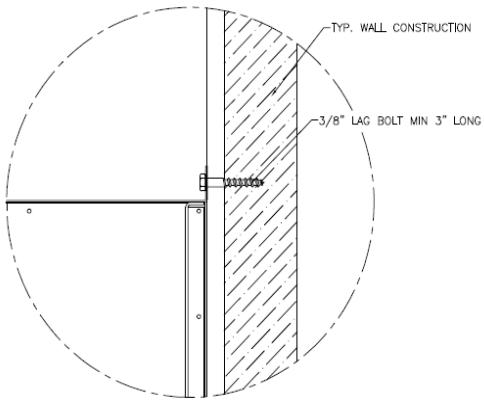
Standard enclosures are all transfer switch enclosures Thomson Power Systems offers in NEMA 1, NEMA 2, NEMA 3R and NEMA 4X for the above listed product. If a customer requests a custom enclosure, it would not be covered under the generic certificate; if certification were a requirement then consult factory before ordering.

The Automatic Transfer Switches are qualified to the highest known level in North America; based on site class D. Specifically, this is a spectral acceleration of 200%.

The transfer switch must be installed per the anchoring details provided for seismic qualification. The equipment can be mounted in alternate means and still qualify if a qualified Civil Engineer designs the alternate method of anchoring.



TYP. FLOOR ANCHORING



TYP. WALL ANCHORING

Anchoring Notes:

1. Anchoring must be designed according to IBC 2012 or latest version.

2. The anchoring details shown are recommended according to the seismic certification; design Engineer may use alternate anchors within the scope of IBC.

3. Wall anchors in concrete; use a typical concrete anchor as necessary.

4. Expansion anchors as shown. To be installed according to manufacturer's recommendation.

GENERAL DESCRIPTION

Thomson Power Systems TS 880 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. 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 880 series Automatic Transfer Switch is rated for 100% system load and requires upstream over current protection. The TS 880 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 880 series transfer switches employs a TSC 900 Microprocessor Based controller which provides all necessary control functions for fully automatic operation. The TSC 900 Controller is mounted on the door of the transfer switch enclosure and operating status is shown via Graphical HMI Controller (GHC) display screen module. For further information on the TSC 900 Transfer Controller, refer to instruction manual PM151.

800A - 4000A rated insulated case power switching devices used for the utility and generator sources are operated by internal drive motor operators. The transfer switch mechanism 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 interrupted open transition “break-before-make” transfer sequence. For transfer switches supplied with Closed Transition transfer option, the mechanical interlock is removed thereby allowing a “make-before break” transfer sequence when both sources of power are available. The TSC 900 transfer controller provides a standard neutral position delay timer for open transition transfer sequences 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:

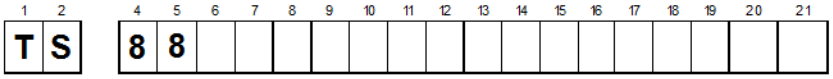
Utility: to indicate the source of primary power

Generator: to indicate the source of standby power

Power Switching Device: to indicate the Automatic Transfer Switch power switching device

3.7. *PRODUCT MODEL CODE (STANDARD ATS MODELS)*

The type of TS 880 series transfer switch supplied is identified by way of a 21-digit product code which appears on the equipment rating plate, or Model, on the door of the transfer switch, and on the transfer switch drawings. The model code structure and definitions are as follows:



1-3. SERIES
TS - TRANSFER SWITCH

4 & 5. MODEL
88 - 880 SWITCH

6. POLES
3 - 3 POLE
4 - 4 POLE

7. CONFIGURATION TYPE
A - ATS
B - BYPASS/ISOLATION ATS
X - SPECIAL

8 - 11. AMPERAGE
0800
1000
1200
1600
2000
2500
3000
4000

12. APPLICATION
A - STANDARD
B - SERVICE ENTRANCE
C - DUAL UTILITY CONTROL
D - DUAL STANDBY GEN (Slave ATS)
H - DUAL PRIME GEN CONTROL
X - SPECIAL

13. OPERATION TYPE
1 - OPEN TRANSITION
2 - MANUAL ELEC. OP.
3 - CLOSED TRANSITION (MOMENTARY)
4 - CLOSED TRANSITION (SOFT LOAD)
X - SPECIAL

14 . SAFETY STANDARD
A - UL 1008 (Service Entrance)
C - UL 1008 / CSA 178
X - NOT APPLICABLE

15 . VOLTAGE
3£ 4 WIRE (GROUNDED NEUTRAL)
E - 120/208 [1]
F - 127/220
G - 120240 [1] (DELTA)
H - 220/380 [2]
S - 230/400 [2]
J - 240/416
K - 254/440
M - 277/480 [1]
N - 347/600 [1]

3£ 3 WIRE
P - 208
Q - 220
R - 240
U - 416
V - 480
W - 600
X - SPECIAL

16. CONTROLLER
5 - TSC 900 c/w GHC Graphic Display
7 - NONE (MANUAL)

17. ENCLOSURE TYPE
A - NEMA 1, ASA #61 GRAY
B - NEMA 2, ASA #61 GRAY
C - NEMA 12, ASA #61 GRAY
D - NEMA 3R SD, ASA #61 GRAY
E - NEMA 3R DD, ASA #61 GRAY
F - NEMA 3RX/4X DD
(304 STAINLESS STEEL)
G - NONE (OPEN STYLE)
H - NEMA 4X SD
(304 STAINLESS STEEL)
K - NEMA 4X SD
(316 STAINLESS STEEL)
L - NEMA 3RX/4X DD
(316 STAINLESS STEEL)
X - SPECIAL

18. UTILITY SWITCHING DEVICE (Cont'd)
Q - INSULATED CASE, FIX MOUNT SWITCH
R - INSULATED CASE, FIX-MOUNT SWITCH
C/W ELECTRONIC TRIP
T - INSULATED CASE, FIX-MOUNT SWITCH
C/W ELECTRONIC & GF TRIP
U - INSULATED CASE DRAW-OUT SWITCH
V - INSULATED CASE DRAW-OUT SWITCH
C/W ELECTRONIC TRIP
W - INSULATED CASE, DRAW-OUT SWITCH
C/W ELECTRONIC & GF TRIP
X - SPECIAL

19. GENERATOR SWITCHING DEVICE
Q - INSULATED CASE, FIX MOUNT SWITCH
R - INSULATED CASE, FIX-MOUNT SWITCH
C/W ELECTRONIC TRIP
T - INSULATED CASE, FIX-MOUNT SWITCH
C/W ELECTRONIC & GF TRIP
U - INSULATED CASE DRAW-OUT SWITCH
V - INSULATED CASE DRAW-OUT SWITCH
C/W ELECTRONIC TRIP
W - INSULATED CASE, DRAW-OUT SWITCH
C/W ELECTRONIC & GF TRIP
X - SPECIAL

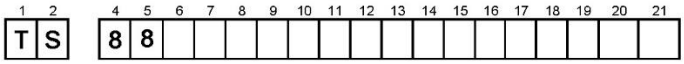
20. POWER CONNECTIONS
A - STANDARD
X - SPECIAL

21. ATS CONNECTION CONFIGURATION [3]
A - STANDARD
E - ALTERNATE E
F - ALTERNATE F
G - ALTERNATE G
X - SPECIAL

NOTES:
[1] MULTI-VOLTAGE CAPABLE
[2] FOR 50 Hz APPLICATION.
[6] FOR BYPASS SWITCH APPLICATIONS REFER TO FACTORY

3.8. *PRODUCT MODEL CODE (30 CYCLE ATS MODELS)*

The type of 30 Cycle TS 880 series transfer switch supplied is identified by way of a 21-digit product code which appears on the equipment rating plate, or Model, on the door of the transfer switch, and on the transfer switch drawings. The model code structure and definitions are as follows:



1-3. SERIES
TS - TRANSFER SWITCH

4 & 5. MODEL
88 - 880 SWITCH

6. POLES
3 - 3 POLE
4 - 4 POLE

7. CONFIGURATION TYPE
A - ATS
B - BYPASS/ISOLATION ATS
X - SPECIAL

8 - 11. AMPERAGE
0800
1200
1600
2000
2500
3000
4000

12. APPLICATION
A - STANDARD
B - SERVICE ENTRANCE
C - DUAL UTILITY CONTROL
D - DUAL STANDBY GEN (Slave ATS)
H - DUAL PRIME GEN CONTROL
X - SPECIAL

13. OPERATION TYPE
1 - OPEN TRANSITION
2 - MANUAL ELEC. OP.
3 - CLOSED TRANSITION (MOMENTARY)
4 - CLOSED TRANSITION (SOFT LOAD)
X - SPECIAL

14 . SAFETY STANDARD
A - UL 1008 (Service Entrance)
C - UL 1008 / CSA 178
X - NOT APPLICABLE

15 . VOLTAGE
3Ø 4 WIRE (GROUNDED NEUTRAL)
E - 120/208 [1]
F - 127/220
G - 120/240 [1] (DELTA)
H - 220/380 [2]
S - 230/400 [2]
J - 240/416
K - 254/440
M - 277/480 [1]
N - 347/600 [1]

3Ø 3 WIRE
P - 208
Q - 220
R - 240
U - 416
V - 480
W - 600
X - SPECIAL

16. CONTROLLER
5 - TSC 900 c/w GHC Graphic Display
7 - NONE (MANUAL)

17. ENCLOSURE TYPE
A - NEMA1, ASA #61 GRAY
B - NEMA2, ASA #61 GRAY
C - NEMA12, ASA #61 GRAY
E - NEMA3R DD, ASA #61 GRAY
F - NEMA3RX DD
(304 STAINLESS STEEL)
G - NONE (OPEN STYLE)
L - NEMA3RX DD
(316 STAINLESS STEEL)
X - SPECIAL

18. UTILITY SWITCHING DEVICE
Q - INSULATED CASE, FIX MOUNT SWITCH
R - INSULATED CASE, FIX-MOUNT SWITCH
C/W ELECTRONIC TRIP
T - INSULATED CASE, FIX-MOUNT SWITCH
C/W ELECTRONIC & GF TRIP

18. UTILITY SWITCHING DEVICE (cont'd)
U - INSULATED CASE DRAW-OUT SWITCH
V - INSULATED CASE DRAW-OUT SWITCH
C/W ELECTRONIC TRIP
W - INSULATED CASE, DRAW-OUT SWITCH
C/W ELECTRONIC & GF TRIP
X - SPECIAL

19. GENERATOR SWITCHING DEVICE
Q - INSULATED CASE, FIX MOUNT SWITCH
R - INSULATED CASE, FIX-MOUNT SWITCH
C/W ELECTRONIC TRIP
T - INSULATED CASE, FIX-MOUNT SWITCH
C/W ELECTRONIC & GF TRIP
U - INSULATED CASE DRAW-OUT SWITCH
V - INSULATED CASE DRAW-OUT SWITCH
C/W ELECTRONIC TRIP
W - INSULATED CASE, DRAW-OUT SWITCH
C/W ELECTRONIC & GF TRIP
X - SPECIAL

20. POWER CONNECTIONS
A - STANDARD
C - ATS CONNECTION PLATE 800A
D - ATS CONNECTION PLATE 1000A-1200A
F - ATS CONNECTION PLATE 800A FOR U&G
G - ATS CONNECTION PLATE 1000A-1200A FOR U&G
H - ATS CONNECTION PLATE 1600A
I - ATS CONNECTION PLATE 2000A
J - ATS CONNECTION PLATE 2500A
K - ATS CONNECTION PLATE 3000A
L - ATS CONNECTION PLATE 4000A
X - SPECIAL

21. ATS CONNECTION CONFIGURATION [6]
A - STANDARD
E - ALTERNATE E
F - ALTERNATE F
G - ALTERNATE G
X - SPECIAL

NOTES:
[1] MULTI-VOLTAGE CAPABLE.
[2] FOR 50 Hz APPLICATION.
[6] FOR BYPASS SWITCH APPLICATIONS
REFER TO FACTORY

TYPICAL COMMISSIONING PROCEDURES

CAUTION

Commissioning procedures must be performed by qualified personnel only. Ensure the Automatic Transfer Switch (ATS) ATS Power Chassis & Voltage Sensing Isolation Plugs PL12 & PL15 are disconnected prior to energizing the supply sources. Manually place the transfer switch mechanism in the neutral position prior to applying power. Failure to do so may result in equipment failure or personal injury.

NOTE: The Typical Automatic Transfer Switch Commissioning Procedures Model Series TS 880, attached as Appendix A, is provided for general information only pertaining to typical site installations and applications. Contact Thomson Power Systems for further information as may be required.

4. AUTOMATIC SEQUENCE OF OPERATION

4.1. *STANDARD ATS - OPEN TRANSITION*

When utility supply voltage drops below a preset nominal value (adjustable from 70% to 99% of nominal) on any phase, an engine start delay circuit is initiated and the transfer to utility supply signal will be removed (i.e. contact opening). Following expiry of the engine start delay period (adjustable from 0 to 60 sec.) an engine start signal (contact closure) will be given.

Once the engine starts, the transfer switch controller will monitor the generator voltage and frequency. Once the generator voltage and frequency rises above preset values (adjustable from 70% to 99% of nominal), the engine warmup timer will be initiated. Once the warmup timer expires (adjustable from 0 to 60 min.), 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 operated mechanism.

NOTE: A neutral delay timer circuit will delay the transfer sequence in the neutral position (i.e. both power switching devices open) until the selected time expires (adjustable from 0 to 120 sec.).

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 99% of nominal) on all phases, a utility 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), and 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.

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 60 minutes), the engine start signal will be removed (contact opening) to initiate stopping of the generator set.

4.2. *STANDARD ATS - CLOSED TRANSITION*

NOTE: This section applies only to Closed Transition configured transfer switches.

For transfer switches equipped with the Closed Transition transfer option, the ATS is configured to operate as follows:

Under normal closed transition operating conditions, the transfer switch operates automatically during a failure and restoration of utility power and does not require operator intervention.

When utility supply voltage drops below a preset nominal value (70 - 99% of rated adjustable) on any phase, an engine start delay circuit will be initiated and the transfer to utility supply signal will be removed (i.e. contact opening). Following expiry of the engine start delay period (0 - 60 sec. adjustable) an engine start signal (contact closure) will be given.

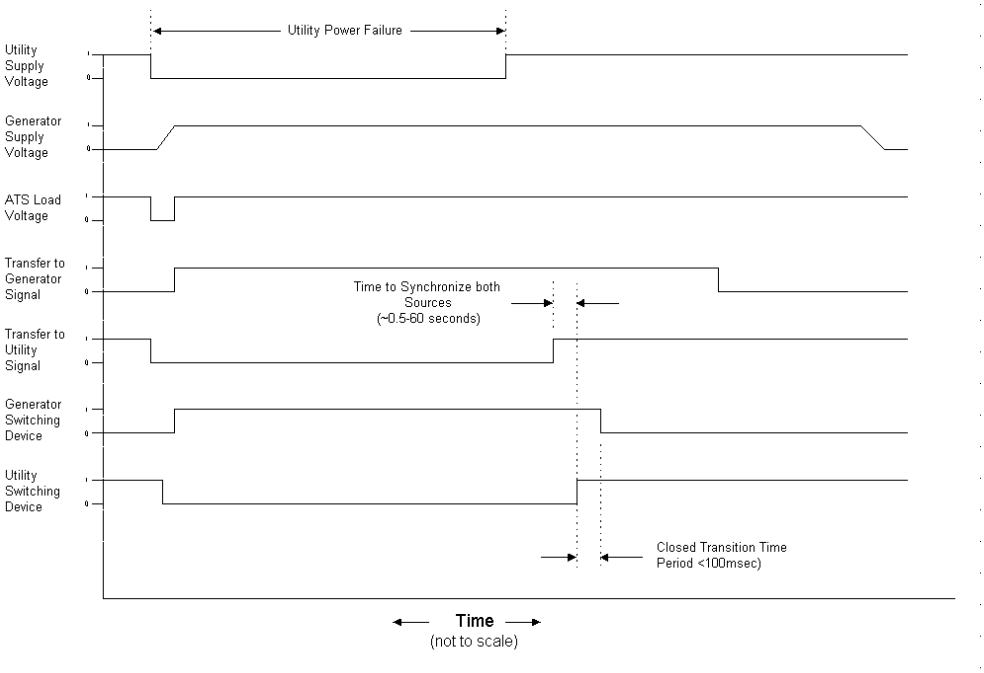
Once the engine starts, the transfer switch controller will monitor the generators voltage and frequency levels. Once the generator voltage and frequency rises above preset values (70 – 99% nominal adjustable) a warmup time delay will be initiated. Once the warmup timer (0-60 Min adjustable) expires, 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 (i.e. opening the utility power switching device) to the generator supply (closing the generator power switching device) via motor driven mechanism to complete a break-before-make open transition transfer sequence.

The generator will continue to supply the load until the utility supply has returned and the retransfer sequence is completed as follows: When the utility supply voltage is restored to above the present values (70 - 99% of rated adjustable) on all phases, a re-transfer sequence will be initiated once the Utility Return timer expires. The utility will close its power switching device when it is in synchronism with the generator supply utilizing the TSC 900 in-phase monitor. The generator power switching device will immediately trip open approximately 50-100 milliseconds after the utility power switching device closes to complete the make-before-break re-transfer sequence.

An engine cooldown timer circuit will be initiated once the load is transferred from the generator supply. Following expiry of the cooldown delay period (0 - 60 min. adjustable) the engine start signal will be removed (contact opening) to initiate stopping of the generator set.

Closed Transition Operation Sequence Diagram

(Normal Power Failure & Return Sequence)



The following operating sequences and time delays are associated with closed transition type transfer switches which momentarily parallel two sources of supply for less than 100 milliseconds. For closed transition type transfer switches, which utilize extended parallel operation for soft-loading operating sequences, refer to separate instruction manual.

1. Transfer Control Switch (Open/Closed Transition): A two position selector switch is provided on the front of the transfer switch for operator section of desired operation. The two positions are as follows:

    - OPEN TRANSITION: The transfer switch will operate in a break-before-make open transition sequence during load transfers. A programmed neutral delay period will occur during the transfer sequence to ensure voltage decays on the load bus before load is re-applied. The two sources will not be paralleled at any time during operation in this mode.

    - CLOSED TRANSITION: When both sources of supply are available, the transfer switch will operate in a make-before-break closed transition sequence during load transfers.

      NOTE: If only one source of supply is available during an initiated transfer sequence, the control system will automatically revert to an open transition transfer sequence.

2. Synchronizing Protection: To ensure both sources are in synchronism prior to initiating a closed transition transfer sequence, a TSC 900 in-phase monitor is used. The GHC has a Sync page to allow monitoring of phase and voltage of the two sources. The in-phase relay will block a closed transition transfer sequence until both sources phase angle and voltages are within programmed limits. The synch check relay settings are field programmable (+-5 to 20 Deg Phase Angle ($\triangle\omega$) and 1-10% voltage difference ($\triangle$U) and they are factory set as follows:

Factory settings
When the product is delivered from the factory, the following basic settings will be set:

ΔU:	5% of $\pm U_{BB}$
t_R:	0.5 sec.
$\Delta\varphi$:	$\pm 10^\circ$
Dead bus:	OFF

NOTE: The standard closed transition transfer switch does not contain an automatic synchronizer to control the generators frequency or voltage to bring it within limits of the sync check relay. For correct closed transition transfer operation, the system requires the generators frequency to be set within 0.25% of nominal frequency and the generators voltage to be set within 0.5% of nominal voltage.

3. Closed Transition Time Period: The time period in which both sources of supply are paralleled together during the closed transition transfer sequence is 50-100 milliseconds (maximum). The time period is inherently controlled by operation of auxiliary contacts from the power switching devices (i.e. when one switching device closes, its aux contact closes to initiate tripping of the opposite switching device).

4. Closed Transition Failure Mode Operation: The TSC 900 continually monitors the closed transition operation time period. The TSC 900 is factory set for 100 milliseconds, that allows normal closed transition operation (i.e. both power switching devices remain closed for less than 100 milliseconds). The alarm circuit is not activated under normal operation. Should the closed transition operation time exceed 100 milliseconds (i.e. both power switching devices remain closed for longer than the normal closed transition time period plus the setting of TSC 900 timer, the following sequence of events will occur:

    - TSC 900 time delay period will expire and will activate auxiliary trip relay.
    - If the transfer switch was transferring power from the generator source to the utility source and the generator switching device failed to open, an auxiliary trip relay will trip open the utility power switching device to immediately separate the two power sources. If the transfer switch was transferring power from the utility source to the generator source and the utility switching device failed to open, an auxiliary trip relay will trip open the generator power switching device to immediately separate the two power sources.

NOTE: The maximum time period both sources will remain paralleled under this failure mode is 200 milliseconds.

- The original source (i.e. prior to the transfer sequence) will remain on load, separated from the other source. An alarm light and TSC 900 controller will indicate a failure condition which must be manually reset before the transfer switch will re-attempt subsequent transfers. For further information on the TSC 900 features and operation, refer to the separate product instruction manual.

NOTE: two alarm contacts are provided for the Closed Transition Failure Mode (i.e. one for a failed generator power switching device and one for the utility power switching device. The contacts are for customer use to remotely trip open upstream devices should an abnormal condition persist.

5. Transfer Fail Alarm (Switching Device Fail to Close): The TSC 900 provides a timer detect and alarm abnormal operating conditions. Should a power switching device fail to close for any reason within a five-minute time period, an alarm light and alarm relay contact will be activated. For further information on the TSC 900 features and operation, refer to the separate product instruction manual.

4.3. *DUAL SOURCE ATS*

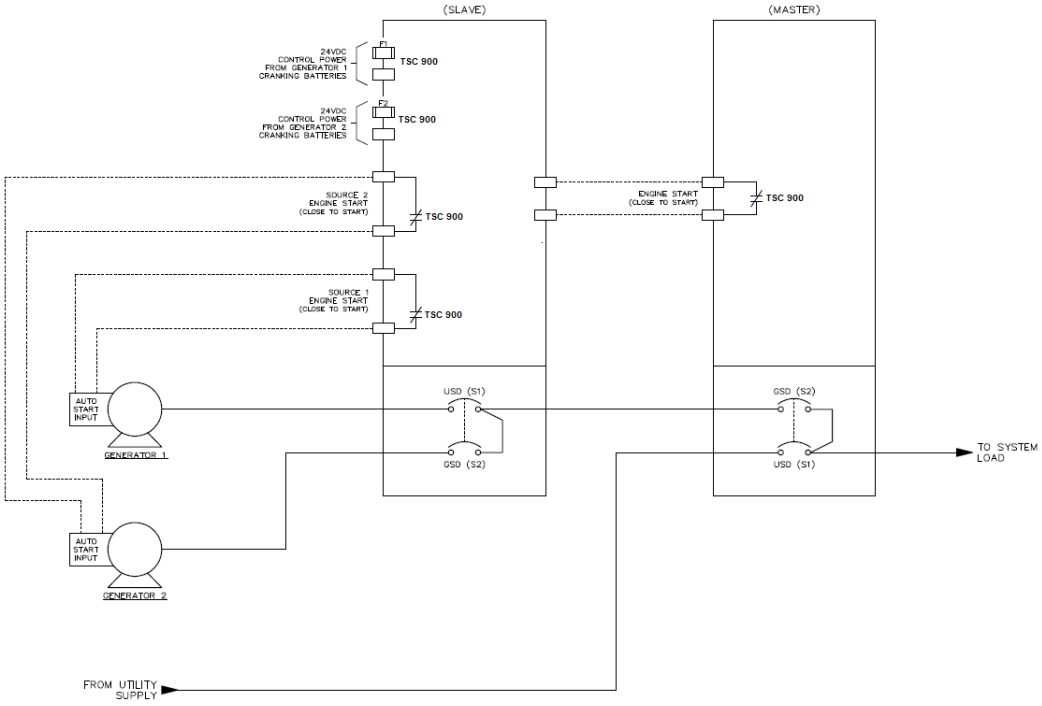
NOTE: This section applies only to Dual Source configured transfer switches.

ATS may be supplied with the following three types of optional Dual Source system configurations:

- **DU** - **Dual Utility ATS**: Used for systems consisting of one ATS connected to two utilities with at least one source continually energized to the ATS. ATS will automatically switch to the alternate source upon failure of the preferred source.

- **DPG** - **Dual Prime Gen ATS**: Used for systems consisting of one ATS connected to two generators with one generator continually energized to the ATS. ATS will automatically switch to the alternate generator upon failure of the preferred source.

- **DSG** - **Dual Standby Gen ATS (Slave ATS):** Used for systems consisting of two ATS's in a Master/Slave Configuration. Refer to the following diagram. Only the Slave ATS is to be ordered and configured with the DSG option. The Master ATS is to be ordered as a standard ATS. The Slave ATS will be connected to two generators which are normally de-energized and are signaled to start from the Master ATS.



4.3.1. **DUAL UTILITY ATS**

A Dual Utility application allows an operator to select which source is Preferred (i.e. Either source may be selected as Preferred), therefore, the alternate source will act as the standby source. The Preferred selected source will continuously operate on load. The non-selected Preferred source, or standby, will remain off load. The standby source will automatically transfer on load should the Preferred source fail once the Transfer From Preferred Source Delay timer expires. When the Preferred selected source is returned to normal operating status, the load will automatically retransfer back to the Preferred selected source once the Return to Preferred Source Delay timer expires. If the Preferred Source selector switch is turned to the non-operating source, the load will automatically transfer to this new Preferred source once the Transfer From Preferred Source Delay timer expires.

4.3.2. **DUAL PRIME GENERATOR ATS**

A Dual Prime Generator application allows an operator to select which generator is Preferred (i.e. Either generator may be selected as Preferred), therefore, the alternate generator will act as the standby source. The Preferred selected generator will continuously operate on load with an engine start signal maintained. The non-selected Preferred generator (standby) will remain off load. The standby generator will be signaled to automatically start the engine and transfer on load (following its warmup delay period) should the Preferred generator fail once the Transfer From Preferred Source Delay timer expires. When the Preferred selected generator is returned to normal operating status, the load will automatically retransfer back to the Preferred selected generator once the Return to Preferred Source Delay timer expires. If the

Preferred Source selector switch is turned to the non-operating generator, the load will automatically transfer to this new Preferred generator once the Transfer From Preferred Source Delay timer expires. The originally selected Preferred unit will continue to operate for its cooldown period then stop. An automatic Engine Run-Hour balancing program is provided for configuration/use in the Dual Prime Mode. When enabled it will automatically start/stop and transfer each engine (generator set) on/off load to try to balance engine running hours as stored in memory. Refer to TSC 900 Instruction Manual for detailed programming instructions.

4.3.3. **DUAL STANDBY GENERATOR ATS**

Under normal Utility Power operation, power to the load will be fed from the Master ATS via closed Utility power switching device. The Dual Standby, or Slave ATS remains de-energized with both generators stopped. Should the utility power fail, the Master ATS will send a common gen start signal to the Dual Standby ATS. The Dual Standby ATS will then send a start signal to one or both generator sets (programmable) to start. The Dual Standby ATS will transfer to the Preferred selected generator position. Once generator voltage is established back to the Master ATS, the load will automatically transfer onto the operating generator. The Standby Gen will automatically stop if selected to do so. The Preferred selected generator will be continuously connected to the load via the Master ATS until Utility Power is re-established. Should the Preferred generator fail while on load, the Standby selected generator set will automatically start and the load will be automatically transferred to the Standby generator. When the utility power returns to normal, the Master ATS will transfer the load back to the utility supply and will send a signal to the Dual Standby ATS to stop the operating generator. The operating generator unit will continue to run for its cooldown period then stop. An automatic Engine Run-Hour balancing program is provided for configuration/use in the Dual Prime Mode. When enabled it will automatically start/stop and transfer each engine (generator set) on/off load to try to balance engine running hours as stored in memory. Refer to TSC 900 Instruction Manual for detailed programming instructions.

4.4. *SERVICE ENTRANCE ATS*

NOTE: This applies only to service entrance transfer switches

4.4.1. **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.

4.4.2. **OVER CURRENT TRIP**

Should the utility power switching device trip open due to an over current condition, the TSC 900 transfer controller will initiate an engine start signal and will permit 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 900 alarm signal is manually reset.

Refer to the TSC 900 Instruction Manual for further details on Transfer Fail operation.

Should the generator power switching device trip open due to an over current condition, TSC 900 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 900 alarm signal is manually reset.

4.4.3. **SERVICE DISCONNECT PROCEDURE**

To perform a service disconnect (i.e. to disconnect the utility and generator supplies), the following procedure is required:

a. Move the Service Disconnect control switch located on the door of the transfer switch to the "Transfer to Neutral Position" position.
b. Once the ATS has transferred to the neutral position, move the Service Disconnect control switch to the Disconnected position.
c. 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. In this condition, the transfer switch is in the neutral position, with both utility and generator transfer power switching devices open. The transfer switch will remain in this condition, regardless of condition of the utility and generator supplies. **NOTE**: If the Service Disconnect Light is not illuminated, additional procedures are required (refer to the following procedure #5.2.4).
d. 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.

5. To re-energize 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.

4.4.4. **ADDITIONALSERVICE DISCONECT 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.

Do not open equipment until ALL power sources are disconnected

This equipment must be installed and serviced only by qualified electrical personnel utilizing safe work practices and appropriate Personal Protective Equipment (PPE). Failure to do so may cause personal injury or death.

1. Visually inspect the actual position of the transfer switch power switching devices. If both power switching devices indicate they are open, the transfer switch is clearly in the Neutral Position, the service has been successfully disconnected. Proceed to Step. 4.

   If either power switching device is not in the Open position, or the load bus is energized, further procedures are required.

   NOTE: If the power switching devices are both Open, 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. The bulb should be immediately replaced with a 6Vdc rated LED bulb.

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 ATS Power Chassis & Voltage Sensing circuits, remove the isolation plugs PL12 and PL15.

   NOTE: The AC power conductors will remain energized. Once all the control and voltage sensing circuits are de-energized and isolated the Service Disconnected pilot light will not illuminate due to loss of control power.

   NOTE: To return the transfer switch back to normal operation, the utility control circuit disconnect switch and ATS Power Chassis & Voltage Sensing

Isolation Plugs (PL12 & PL 15) must be switched on and reconnected for correct operation.

2. If the position of both power switching units are not in the Open position, the power switching units must be manually operated as follows. To operate manually, push the power switching units Open pushbutton. The unit should then open. Repeat for the other power switching unit.

3. Close all transfer switch doors securely using a suitable tool. Lock the door in the closed position and remove the key.

WARNING

Failure to move the mechanism to the Neutral Position may result in serious personal injury or death due to electrical shock.

4. 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.

5. 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.

4.5. *TEST MODES*

The transfer switch may be tested utilizing the TSC 900 GHC display pushbuttons, optional four position test switch, if fitted, or remote power fail 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.

5. OVER CURRENT PROTECTION

Thomson Power Systems ***TS 880*** series of Automatic Transfer Switches may be supplied with or without integral over current protection as described below:

5.1. *STANDARD TS 880 AUTOMATIC TRANSFER SWITCH*

The standard TS 880 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 880 is rated for 100% continuous loading and can withstand a maximum short circuit fault current as noted in ***SECTION 12*** of this manual. The standard TS 880 Transfer Switch model without integral over current protection is identified in the product model code. Refer to ***SECTION 4.1*** of this manual for further details on model coding.

5.2. *OPTIONAL TS 880 ATS WITH INTEGRAL OVER CURRENT PROTECTION*

TS 880 Transfer Switches will have integral over current protection supplied on the Utility source as standard. For transfer switches rated 800A through 4000A over current protection is adjustable electronic type with long time & instantaneous trip unit elements with optional ground fault protection elements.

NOTE: Ground fault protection is supplied as standard on 1000A and 1200A transfer switches that are used on systems greater than 240V.

An upstream over current protection device is required on the generator source which feeds the TS 880 Transfer Switch if integral over current protection option is not specified on the ATS.

NOTE: For models of transfer switch with adjustable integral over current protection trip units, the over current protection must be set prior to operation. The equipment will be shipped from the factory with a long-time current setting of 100% (of the equipment rating) and maximum instantaneous/short-time current and time delay settings.

WARNING

Do Not Energize this equipment until device settings have been verified to ensure proper system protection & coordination. Failure to do so may result in equipment failure.

Refer to ***SECTION 4.1&2*** Product Model Code for types of integral over current protection which are supplied with the transfer switch.

6. SERVICING TRANSFER SWITCH MECHANISMS

DANGER

Arc Flash and Shock Hazard. Will cause severe injury or death.

Do not open equipment until ALL power sources are disconnected.

This equipment must be installed and serviced only by qualified electrical personnel utilizing safe work practices and appropriate Personal Protective Equipment (PPE). Failure to do so may cause personal injury or death.

Failure to correctly maintain an Automatic Transfer Switch may present a hazard to life and equipment. Full operational testing must be done prior to placing a transfer switch in service subsequent to any maintenance or repair. Any service work involving electrical components requires high-potential testing to ensure that required insulation levels have been maintained.

6.1. *SERVICING INSULATED CASE TYPE TRANSFER MECHANISMS*

DANGER

Arc Flash and Shock Hazard. Will cause severe injury or death.

Do not open equipment until ALL power sources are disconnected

This equipment must be installed and serviced only by qualified electrical personnel utilizing safe work practices and appropriate Personal Protective Equipment (PPE). Failure to do so may cause personal injury or death

6.1.1. **EQUIPMENT INSPECTION**

To maintain mechanical integrity, ensure that:

- All linkages are correctly adjusted
- Mechanical interlocking is correct - it should not be possible to close a power switching unit without first opening the other power switching unit
- All fasteners are adequately tightened
- The operating linkages are not damaged or bent, and that all bearing points operate freely

To maintain electrical integrity, ensure that:

- All electrical connections are clean and adequately tightened. Corroded or lose power connections will cause destructive heating, and may cause premature tripping of the power switching devices that incorporate integral over current protection units

- All insulating devices are in place and in good condition
- No moisture or other contamination is present
- Electrical conductors are adequately secured away from moving parts

To maintain operational integrity, ensure that:

- All control devices are in good condition and correctly calibrated
- All control devices are adequately secured in their plug-in fixtures

6.1.2. **RECOMMENDED MAINTENANCE**

DANGER

Arc Flash and Shock Hazard. Will cause severe injury or death.

Do not open equipment until ALL power sources are disconnected

This equipment must be installed and serviced only by qualified electrical personnel utilizing safe work practices and appropriate Personal Protective Equipment (PPE). Failure to do so may cause personal injury or death

- Do not perform dielectric tests on the equipment with the control components in the circuit
- Check if control components are tight in sockets
- Periodically inspect all terminals (load, line and control) for tightness. Re-torque all bolts, nuts and other hardware. Clean or replace any contact surfaces which are dirty, corroded or pitted
- Transfer switches should be in a clean, dry and moderately warm location. If signs of moisture are present, dry and clean transfer switch. If there is corrosion, try to clean it off. If cleaning is unsuitable, replace the corroded parts. Should dust and/or debris gather on the transfer switch, brush, vacuum, or wipe clean. Do not blow dirt into power switching devices
- Test the transfer switch operation. While the unit is exercising, check for freedom of movement, hidden dirt, corrosion or any excessive wear on the mechanical operating parts. Ensure that the power switching device travel is correct
- Verify all program settings on the TSC 900 Controller are as per the programming sheet supplied with the transfer switch

7. TRANSFER SWITCH MECHANISM OPERATION

7.1. *GENERAL DESCRIPTION*

800A-4000A transfer switches consist of two insulated case, electrically operated power switching units mounted in a vertical stack configuration. Standard transfer switches have insulated case power switching devices, which are fix-mounted. Draw-out type power switching devices are available as an option for additional service and maintenance benefits. Open Transition Type Transfer Switches are provided with power switching devices which are electrically and mechanically interlocked using a cable interlock mechanism. On Closed Transition type transfer switches, the mechanical interlock is removed. The power switching units are provided with 120VAC powered internal motor operators and open-and-close coils. Mechanically operated Open and Close pushbuttons are provided on the face of the power switching units for Manual Operation.

An Open Transition Type Transfer switch has three possible operating positions:

a) Utility power switching device closed and generator power switching device open;
b) Generator power switching device closed and utility power switching device open;

c) Both utility and generator power switching devices open, but never both utility and generator power switching devices closed at the same time.

A Closed Transition Type Transfer Switch has an additional operating position:

d) Both utility and generator power switching devices closed during Closed Transition Transfer sequence. The time duration of closed transition time sequence is dependent upon type of transfer switch configuration (i.e. Fast (momentary) time of 100 milliseconds or Soft-Load time typically between 1-10 seconds)

7.2. *MANUAL OPERATION*

Manual operation of the transfer switch is selected either by a door mounted two position control switch or via internally software selection on the TSC 900 Controller.

AUTO: This selects automatic operation of the transfer switch. The power switching device will automatically open/close as detailed in the sequence of operation per ***SECTION 5*** of this manual.

MAN: This position inhibits automatic operation and automatic engine starting. The power switching device must be manually operated via pushbuttons located on the face of the power switching devices to open/close them as required.

NOTE

When the Manual Mode is selected the engine start output logic is disabled. Where generator voltage is required during manual operation the local generator controls must be set for manual operation.

7.3. *MANUAL TRANSFER TO GENERATOR SUPPLY (Open Transition)*

To transfer manually to generator supply, follow procedure listed below;

a) Turn the transfer switch door mounted System Operation Mode selector to Manual or Select Man mode on TSC 900 Controller (refer to TSC 900 manual for further information).

b) Manually start the generator set at its local control panel, and ensure it is operating at normal voltage and frequency, with its output circuit breaker closed.

c) Manually open the utility power switching device using the Red (O) Mechanical Open pushbutton located on the face of the power switching device. Refer to Diagram #1 below. Verify the utility power switching device contacts are open via Green (O) Open contact status flag.

d) Ensure the generator power switching device's spring mechanism is fully charged as indicated by Yellow –Charged OK flag. If the power switching device is not charged, it may be manually charged by locating the manual charge handle mechanism on the face of the power switching device, then pulling forward and then down one-four times until the Yellow Charged OK flag is displayed. Refer to diagram #1 below and the power switching device's manual for further information.

NOTE

The Yellow OK Flag indicates the power switching device is charged however it may not be ready to close if the transfer switch mechanical or electrical interlocks are not satisfied.

e) If the generator supply is at normal voltage and frequency levels, manually Close the generator power switching device using the Black (I) Mechanical Close pushbutton located on the face of the power switching device. Refer to Diagram #1 below. Verify the generator power switching device contacts are closed via Red (I) Closed contact status flag.

NOTE

If the Transfer Switch is supplied with Closed Transition Transfer feature, the mechanical close pushbutton on the face of the power switching unit is not available for use. A separate electrical close pushbutton located on the power switching unit door is provided for manual closing. Power switching unit closure is only permitted in open transition mode (i.e. Utility power switching device must be open)

7.4. *MANUAL TRANSFER TO UTILITY SUPPLY (Open Transition)*

To transfer manually to the utility supply, follow procedure listed below;

a) Turn the Transfer Switch door mounted System Operation Mode selector to Manual or select Man mode on TSC 900 Controller (refer to TSC 900 manual for further information).

b) Manually open the generator power switching device using the Red (O) Mechanical Open pushbutton located on the face of the power switching device. Refer to Diagram #1. Verify the generator power switching device contacts are open via Green (O) Open contact status flag.

c) Ensure the utility power switching device's spring mechanism is fully charged as indicated by Yellow - Charged OK flag. If the power switching device is not charged, it maybe manually charged by locating the manual charge handle mechanism on the face of the power switching device, then pulling forward and then down 1-4 times until the Yellow Charged OK flag is displayed. Refer to diagram #1 and the power switching device's manual for further information.

NOTE

The Yellow OK Flag indicates the power switching device is charged however it may not be ready to close if the transfer switch mechanical or electrical interlocks are not satisfied.

d) If the utility supply is at normal voltage and frequency levels, manually Close the utility power switching device using the Black (I) Mechanical Close pushbutton located on the face of the power switching device. Refer to Diagram #1. Verify the utility power switching device contacts are closed via Red (I) closed contact status flag.

NOTE

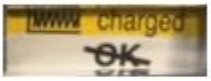
If the Transfer Switch is supplied with Closed Transition Transfer feature, the mechanical close pushbutton on the face of the power switching unit is not available for use. A separate electrical close pushbutton located on the power switching unit door is provided for manual closing. Power switching unit closure is only permitted in open transition mode (i.e. Gen power switching device must be open)

The generator set should be manually turned off at the local control panel.

DIAGRAM #1

** Spring Charged Status Flag has 3 positions as follows:

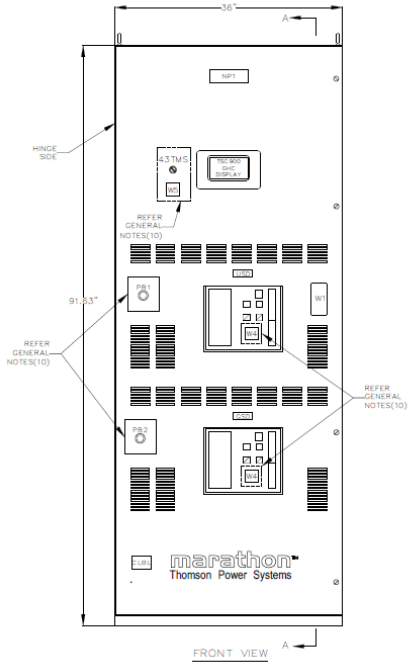
= (Yellow) Spring is Charged; power switching device is ready for manually closing provided electrical and mechanical close interlocks are satisfied.



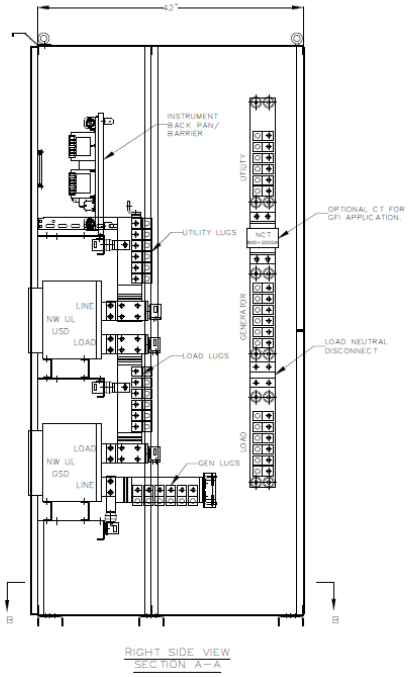
= (Yellow/White) Spring is Charged; power switching device is not ready to close (electrical trip Interlock is activated by automatic control signals). **Note:** This is the normal flag position for automatic operation of the Transfer Switch

= (White) Spring is Discharged; power switching device is not ready to close.

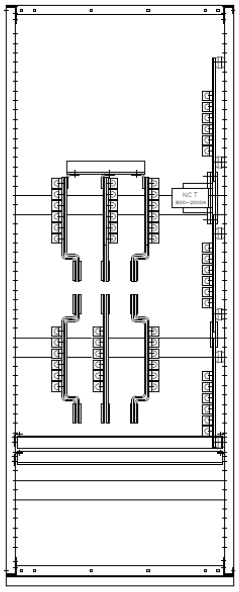
8. FRONT VIEW (TYPICAL) 3 POLE 800A-4000A INSULATED CASE TYPE TRANSFER MECHANISM



FRONT VIEW



RIGHT SIDE VIEW
SECTION A–A



BACK VIEW

9. CABLE TERMINAL INFORMATION

BASIC MODEL	TERMINAL RATING		CONNECTION TIGHTNESS (In-lbs)	
	QTY PER PHASE	RANGE	TERMINAL MOUNTING SCREW	CABLE CLAMP
TS88xA-0800/4000[2]	As Required	#2–600mcm	--	450

1. With molded case power switching units
2. With insulated case power switching units
3. For other model types not shown, contact Thomson Power Systems for further information.

10. REQUIREMENTS FOR UPSTREAM CIRCUIT PROTECTIVE DEVICES

10.1. *WITHSTAND CURRENT RATINGS (STANDARD 3 CYCLE MODELS)*

(All 3 Cycle Models Without Integral Overcurrent Protection Option)

BASIC MODEL	MAX. VOLTAGE	RATED CURRENT (A)	WITHSTAND CURRENT RATING AMPS (RMS)		
			@240V	@480V	@600V
TS88xA-0800[2]	600	800	100,000	100,000	85,000
TS88xA-1200[2]	600	1200	100,000	100,000	85,000
TS88xA-1600[2]	600	1600	100,000	100,000	85,000
TS88xA-2000[2]	600	2000	100,000	100,000	85,000
TS88xA-2500[2]	600	2500	100,000	100,000	85,000
TS88xA-3000[2]	600	3000	100,000	100,000	85,000
TS88xA-3200[4]	600	3200	100,000	100,000	85,000
TS88xA-4000[2]	600	4000	100,000	100,000	85,000

1. With insulated case power switching units
2. For other ratings, contact Thomson Power Systems for further information
3. IEC Rating

10.2. *INTERRUPTING CAPACITY CURRENT RATINGS (STANDARD 3 CYCLE MODELS)*

(All 3 Cycle Models With Integral Overcurrent Protection Option)

BASIC MODEL	MAX. VOLTAGE	RATED CURRENT (A)	INTERRUPTING CAPACITY CURRENT RATING AMPS (RMS) [4]		
			No Upstream Overcurrent Protection Required		
			@240V	@480V	@600V
TS88xA-0800[2]	600	800	100,000	100,000	85,000
TS88xA-1200[2]	600	1200	100,000	100,000	85,000
TS88xA-1600[2]	600	1600	100,000	100,000	85,000
TS88xA-2000[2]	600	2000	100,000	100,000	85,000
TS88xA-2500[2]	600	2500	100,000	100,000	85,000
TS88xA-3000[2]	600	3000	100,000	100,000	85,000
TS88xA-3200[5]	600	3200	100,000	100,000	85,000
TS88xA-4000[2]	600	4000	100,000	100,000	85,000

1. With insulated case power switching units
2. For other ratings, contact Thomson Power Systems for further information
3. With insulated case switching devices equipped with integral Overcurrent protection. Typically supplied on service entrance Automatic Transfer Switches.
4. IEC Rating

10.3. *WITHSTAND CURRENT RATINGS (30 CYCLE MODELS)*

(All 30 Cycle Models Without Integral Overcurrent Protection Option)

BASIC MODEL	MAX. VOLTAGE	RATED CURRENT (A)	3 CYCLE/30 CYCLE WITHSTAND CURRENT RATING AMPS (RMS)		
			@240V	@480V	@600V
TS88xA-0800[2]	600	800	65,000	65,000	65,000
TS88xA-1200[2]	600	1200	65,000	65,000	65,000
TS88xA-1600[2]	600	1600	65,000	65,000	65,000
TS88xA-2000[2]	600	2000	65,000	65,000	65,000
TS88xA-2500[2]	600	2500	65,000	65,000	65,000
TS88xA-3000[2]	600	3000	65,000	65,000	65,000
TS88xA-3200[4]	600	3200	65,000	65,000	65,000
TS88xA-4000[2]	600	4000	65,000	65,000	65,000

1. With insulated case power switching units
2. For other ratings, contact Thomson Power Systems for further information
3. IEC Rating

10.4. *INTERRUPTING CAPACITY CURRENT RATINGS (30 CYCLE MODELS)*

(All 30 Cycle Models With Integral Overcurrent Protection Option)

BASIC MODEL	MAX. VOLTAGE	RATED CURRENT (A)	INTERRUPTING CAPACITY CURRENT RATING AMPS (RMS) [4] No Upstream Overcurrent Protection Required			
			3 CYCLE RATING			30 CYCLE RATING
			@240V	@480V	@600V	Up To 600VAC
TS88xA-0800[2]	600	800	85,000	85,000	85,000	65,000
TS88xA-1200[2]	600	1200	85,000	85,000	85,000	65,000
TS88xA-1600[2]	600	1600	85,000	85,000	85,000	65,000
TS88xA-2000[2]	600	2000	85,000	85,000	85,000	65,000
TS88xA-2500[2]	600	2500	85,000	85,000	85,000	65,000
TS88xA-3000[2]	600	3000	85,000	85,000	85,000	65,000
TS88xA-3200[5]	600	3200	85,000	85,000	85,000	65,000
TS88xA-4000[2]	600	4000	85,000	85,000	85,000	65,000

1. With insulated case power switching units
2. For other ratings, contact Thomson Power Systems for further information
3. With insulated case switching devices equipped with integral Overcurrent protection. Typically supplied on service entrance automatic transfer switches.
4. IEC Rating

11. GROUND FAULT SITE TEST REQUIREMENTS

Per NEC and UL 1008, 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 20***.

Confirm and record actual trip setpoints in the form provided which is to be made available on request by the inspection authority.

11.1. *PERFORMANCE TEST*

Qualified Field Service technicians require a calibrated current injection test apparatus and must be knowledgeable in power switching unit 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 one 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.

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.

TROUBLESHOOTING

DANGER

Arc Flash and Shock Hazard. Will cause severe injury or death.

Do not open equipment until ALL power sources are disconnected

This equipment must be installed and serviced only by qualified electrical personnel utilizing safe work practices and appropriate Personal Protective Equipment (PPE). Failure to do so may cause personal injury or death

MALFUNCTIONS	PROBABLE CAUSES	CORRECTIVE ACTIONS
Will not re-transfer to utility source upon restoration (OPEN TRANSITION)	Utility Return Time delay period in TSC 900 has not yet expired.	Verify TSC 900 time delay setting
	A Load Test mode has been activated locally or remotely	Check TSC 900 GHC Home Page status indicators
	An Exercise Test mode has been activated by the TSC 900 scheduler	Check TSC 900 GHC Scheduler page
	Utility supply is not operating at correct voltage or frequency levels.	Verify correct nominal levels the utility source should be operating at and compare to TSC 900 settings for under/over voltage, voltage phase balance and under/over frequency
	TSC 900 has incorrect utility voltage or frequency settings for the ATS.	Re-Program TSC 900 with correct settings as required for voltage or frequency.
	Utility Phase Rotation is not matched with Generator supply (first time transfer).	Check Generator & Utility Voltage Phase rotation matches on TSC 900 GHC Utility & Generator Voltage Pages. If power cabling has non-matching phase rotation, reverse power conductors on one phase on one of the supplies
	TSC 900 connection plugs are unplugged (J1,2,3,4)	Verify all TSC 900 connectors are fully inserted
	ATS Power Chassis & Voltage Sensing Isolation Plugs (PL12 or PL15) are unplugged	Verify both PL12 & PL15 connectors are fully inserted
	TSC 900 has “Transfer Fail” alarm activated.	Determine cause of alarm and rectify before TSC 900 is reset on GHC
	Defective Utility power switching unit close coil	Verify Utility power switching device close coil is fully functional.
	Defective generator power switching unit trip coil (open transition)	The generator power switching unit must be open before the utility power switching device is permitted to close (open transition).
	Faulty Power Switching Device	Refer to Power Switching Device Troubleshooting Section
	Transfer Mode selector is not in “Auto” position	Turn Transfer Mode selector to “Auto” position
	Mechanical Interlock between generator and Utility Power switching units is defective (open transition)	Verify mechanical interlock is operating correctly (refer to power switch device instruction manual for further detail)
	A lose control wire connection	Check all wiring connections in the ATS

Will not re-transfer to utility source upon restoration (OPEN TRANSITION (cont'd)	A Transfer Inhibit signal has been activated	Check TSC 900 indicators if a utility transfer inhibit signal has been activated and reset)
	On Service Entrance Rated ATS, Service Disconnect switch is in the "De-Energized" or "Transfer to Neutral" positions.	Switch to the Energized position
	On Service Entrance Rated ATS, Utility Voltage Disconnect switch inside ATS is switched to "Off" position.	Switch Utility Voltage Disconnect switch to the "On" position
	Defective TSC 900 controller	• Verify TSC 900 has 120Vac control power applied to the utility control power input (J1- 15, 16) and Diagnostic green LED is flashing. • Verify TSC 900 has 120Vac control power applied to the ATS control contacts (J1-9) • Verify TSC 900 SCU has SD Memory Card fully inserted into socket. If defective Return to Thomson Power Systems using RMA process
	Faulty Power Switching device auxiliary contact	Verify Generator & Utility auxiliary contacts are operating correctly
Closed Transition – Fail to Transfer	Only one source of supply is within normal operating voltage and frequency limits	Both utility and generator sources must be at nominal operating voltage and frequency limits. Verify correct nominal levels the utility and generator source should be operating at and compare to TSC 900 settings for under/over voltage, voltage phase balance and under/over frequency.
	Frequency difference between utility and generator is too low which prevents Utility and generator sources to drift into synchronism within the maximum sync time.	Adjust generator frequency to be +-0.2hz different that the utility source to allow enough slip frequency to come into synchronism
	Frequency difference between utility and generator is too high which prevents Utility and generator sources to attain synchronism long enough to satisfy in-phase monitor dwell time.	Adjust generator frequency to be +-0.2hz different that the utility source to allow enough slip frequency to come into synchronism for in-phase monitor.
	TSC 900 In-phase monitor is not enabled	Verify TSC 900 in-phase monitor in enabled for closed transition transfer.
	TSC 900 In-phase monitor settings are incorrect for application.	Verify TSC 900 in-phase monitor setting have correct phase, voltage and dwell settings for the application
	Closed Transition Transfer mode is not enabled on TSC 900	Verify Closed Transition transfer mode is enabled via GHC display or door mounted control switch (if fitted)

MALFUNCTIONS	PROBABLE CAUSES	CORRECTIVE ACTIONS
Will not transfer to generator source upon failure of utility source	Warmup time delay function has not timed out yet	Verify TSC 900 timer setting
	Generator set output circuit breaker which feeds ATS is open	Close generator set output circuit breaker
	Generator supply is not operating at correct voltage or frequency levels.	Verify correct nominal levels the generator should be operating at and compare to TSC 900 Settings for under/over voltage, voltage phase balance and under/over frequency
	TSC 900 has incorrect generator voltage or frequency settings for the ATS.	Re-Program TSC 900 with correct settings as required for voltage or frequency.
	Generator Phase Rotation may not match Utility supply (First Time Transfer).	Check Generator & Utility Voltage Phase rotation matches on TSC 900 GHC Utility & Generator Voltage Pages. If power cabling has non-matching phase rotation, reverse power conductors on one phase on one of the supplies
	TSC 900 connection plugs are unplugged (J1,2,3,4)	Verify all TSC 900 connectors are fully inserted
	ATS Power Chassis & Voltage Sensing Isolation Plugs (PL12 or PL15) are unplugged	Verify both PL12 & PL15 connectors are fully inserted
	TSC 900 has “Transfer Fail” alarm activated.	Determine cause of alarm and rectify before TSC 900 is reset on GHC
	Defective Generator power switching unit close coil	Verify Generator power switching device close coil is fully functional.
	Defective Utility power switching unit trip coil (open transition)	The Utility power switching unit must be open before the generator power switching device is permitted to close (open transition).
	Faulty Power Switching Device	Refer to Power Switching Device Troubleshooting Section
	Transfer Mode selector is not in “Auto” position	Turn Transfer Mode selector to “Auto” position
	A loose control wire connection	Check all wiring connections in the ATS

	Defective TSC 900 controller	• Verify TSC 900 has 120Vac control power applied to the generator control power input (J1-12, 13) and Diagnostic green LED is flashing. • Verify TSC 900 has 120Vac control power applied to the ATS control contacts (J1-1). • Verify TSC 900 SCU has SD Memory Card fully inserted into socket. If defective Return to Thomson Power systems using RMA process
	Faulty Power Switching device auxiliary contact	Verify Generator & Utility auxiliary contacts are operating correctly
MALFUNCTIONS	**PROBABLE CAUSES**	**CORRECTIVE ACTIONS**
Transfer to generator source without a power failure in the utility source	A Load Test mode has been activated locally or remotely	Check TSC 900 GHC Home Page status indicators
	An Exercise Test mode has been activated by the TSC 900 scheduler	Check TSC 900 GHC Scheduler page
	Utility supply is not operating at correct voltage or frequency levels.	Verify correct nominal levels the utility source should be operating at and compare to TSC 900 settings for under/over voltage, voltage phase balance and under/over frequency
	TSC 900 has incorrect utility voltage or frequency settings for the ATS.	Re-Program TSC 900 with correct settings as required for voltage or frequency.
	Utility power switching device has tripped open due to an over current condition and TSC 900 “Transfer Fail” alarm is activated on GHC.	Determine cause of alarm and rectify before TSC 900 is reset.
	A loose control wire connection	Check all wiring connections in the ATS
	Defective TSC 900 controller	• Verify TSC 900 is reading correct Utility Voltage or frequency on GHC as compared to separate meter. If defective Return to Thomson Power Systems using RMA process
Generator does not start or stop when it should	Remote engine control panel is not set to automatic mode	Verify remote engine control panel is set for automatic operation
	Engine start contact is wired incorrectly from ATS to engine control panel	Verify engine start contact is wired correctly from ATS to engine control panel
	Incorrect TSC 900 Engine start contact is used	For single engine applications, use Engine Start Signal #2 contact on TSC 900 lower terminal block (J10b)

Generator does not start or stop when it should (con't)	TSC 900 Engine start contact terminal block (j10b) is unplugged	Verify two position TSC 900 terminal block j10b is fully inserted into controller and it is connected to correct position (i.e. lower TB)
	Defective TSC 900 SCU Engine Start relay/contact	• Verify Engine start signal LED diagnostic light is illuminated on SCU when engine is signaled to start. If LED is on, verify contacts are closing. If defective Return TSC 900 SCU to Thomson Power Systems using RMA process
	Engine Start and/or Cooldown timers may be duplicated in both ATS control and Engine control Panel	Disable timers in either ATS or Engine control panel.
No time delay when there should be	Incorrect TSC 900 time delay setting	Verify TSC 900 timer setting
GHC Display is not showing any system information	GHC screen maybe in a "sleep" mode.	Touch screen to re-activate LCD display
	GHC USB cable is unplugged at the GHC end or the SCU end	Verify USB cable is fully inserted into the GHC and SCU devices
	Defective GHC Display	Temporarily unplug GHC USB cable for five seconds then re-inset to reboot GHC comptroller. Wait 30 seconds to determine if GHC reboots to normal operation. If defective Return to Thomson Power Systems using RMA process
	TSC 900 SCU Control board is not powered from 120VAC Utility supply, 120Vac Generator supply, or 24Vdc aux supply (if fitted)	The GHC needs maintained 5Vdc power from the TSC 900 SCU Control board at all times. Verify SCU is powered from either 120VAC Utility supply, 120VAC Generator supply, or 24Vdc aux supply (if fitted).
	SCU USB Jumper (J24 on SCU PCB) is in the incorrect position	Verify SCU USB Jumper (J24 on SCU PCB) is in the "GHC" position.

NOTE

There are no user serviceable components located on the TSC 900 printed circuit board. If the TSC 900 Controller (i.e. SCU or GHC) are deemed to be defective, they must be returned to the Thomson Power Systems Factory for repair or replacement. Please refer to Product Return Policy section of this manual further information on product return procedures required.

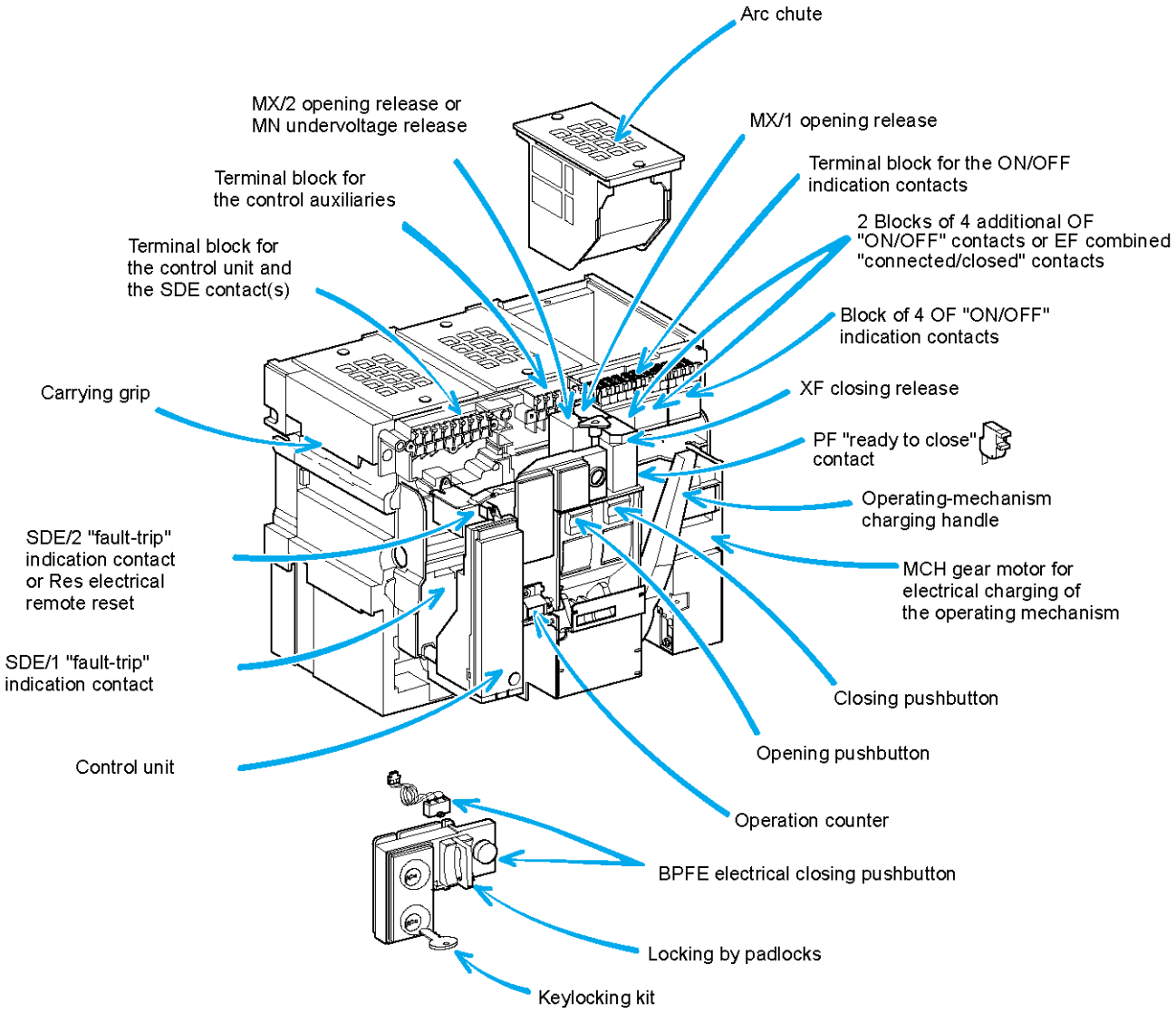
12. POWER SWITCHING DEVICE TROUBLESHOOTING

MALFUNCTIONS	PROBABLE CAUSES	CORRECTIVE ACTIONS
The power switching device cannot be opened locally.	• Open pushbutton locked • Faulty mechanism or main circuits bonded	• Remove the locking • Contact Thomson Power Systems Service Department
The power switching device cannot be manually closed.	• Power switching device closing on short-circuit. • Fault trip indicator-on power switching device button not reset. (Service Entrance type ATS) • Power switching device not fully connected. (draw-out type only) • Anti-pumping function. • Power switching device not charged. • Closing coil is continuously supplied. • Power switching device locked in “open” position. • Power switching device interlocked.	• Clear the fault. Check power switching device condition before putting back into operation. • Reset fault trip indicator-button. • Connect power switching device fully. • Move transfer mode switch to the manual position, then back to the auto position to cycle the control signal. • Check the geared motor power supply is greater than 85% nominal voltage. Check the power supply circuit. Attempt a manual recharging. Replace the geared motor if necessary. (Contact Thomson Power Systems Service Department) • Move transfer mode switch to the manual position, then back to the auto position to cycle the control signal. • Remove the locking. • Check whether this refusal to close is not normal. •
The power switching device does not recharge electrically.	• Charge motor supply voltage too low (less than 85% nominal voltage). •	• Apply a voltage greater than 85% nominal voltage. Check the charge motor electrical circuit. Attempt to recharge manually. If problem: mechanism is faulty. Contact Thomson Power Systems Service Department. If okay: motor faulty. Replace it.

MALFUNCTIONS	PROBABLE CAUSES	CORRECTIVE ACTIONS
It is impossible to insert the racking handle to connect or to disconnect the power switching device.	• There is a padlock or a key-lock for connected or disconnected position. There is a racking interlock. • The extraction rails or the power switching device is not completely pushed in. •	• Remove disabling. • Push the rails or the power switching device completely in. •
It is impossible to extract the right side rail (on chassis alone) or the power switching device.	• The racking handle is remained inserted. • The power switching device is not completely disconnected. • There is a padlock or a key-lock for connected or disconnected position. There is a racking interlock.	• Remove the racking handle and put it in its storage. • Disconnect the power switching device • Remove disabling.
It is impossible to extract the power switching device whenever it is charged.	• There is an extraction locking when **power switching device** is charged.	• Discharge the power switching device **(**open, close then open again the **power switching device**).
It is impossible to rack in the power switching device	• The chassis does not correspond with the **power switching device**. • The plastic ties which hold clusters during transport are not removed. • The clusters positions are not correct. • There is a safety shutters locking.	• Fit fouling-plate on your chassis and **power switching device** to avoid new mistakes. • Remove the plastic ties. • Put them in order again. • Remove this locking.

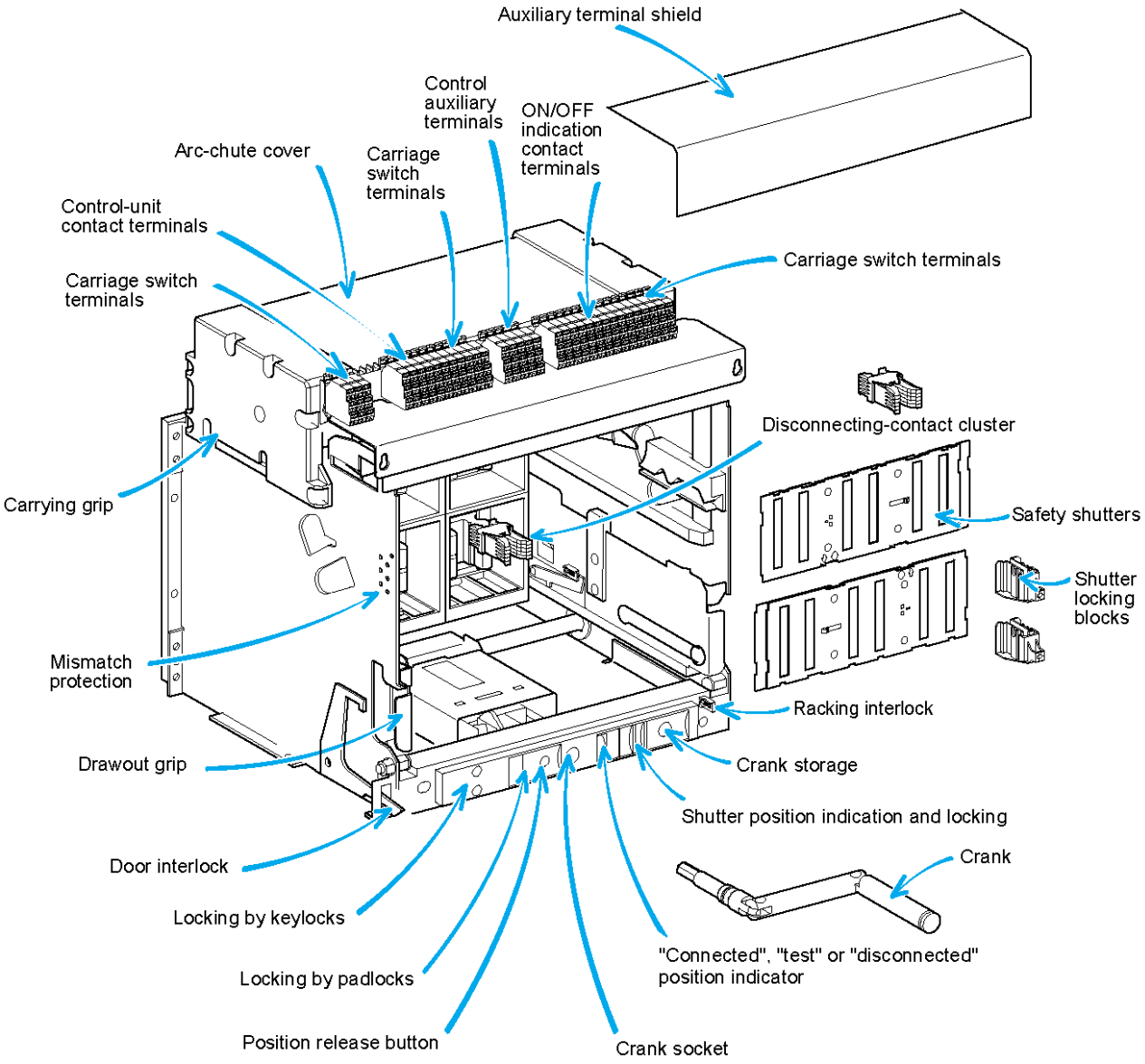
13. POWER SWITCHING DEVICE DRAWING

Power Switching Device



14. POWER SWITCHING DEVICE DRAW-OUT CHASSIS DRAWING

Chassis



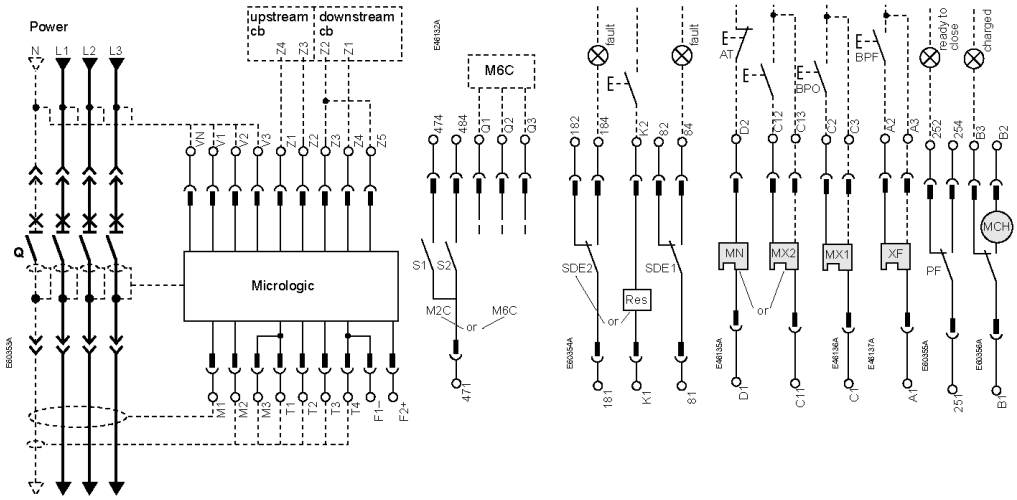
15. POWER SWITCHING DEVICE ELECTRICAL DIAGRAMS

Electrical Diagrams

Fixed and Drawout Devices

The diagram is shown with circuits de-energised, all devices open, connected and charged and relays in normal position.

Power | **Control unit** | **Remote operation**



Control unit

Com		UC1		UC2		UC3	UC4	M2C / M6C
E5	E6	Z5	M1	M2	M3	F2+	V3	484 / Q3
E3	E4	Z3	Z4	T3	T4	VN	V2	474 / Q2
E1	E2	Z1	Z2	T1	T2	F1 –	V1	471 / Q1

Remote operation

SDE2 / Res		SDE1	MN / MX2		MX1	XF	PF	MCH
184	/ K2	84	D2	/ C12	C2	A2	254	B2
182		82			C3	A3	252	B3
181	/ K1	81	D1	/ C11	C1	A1	251	B1

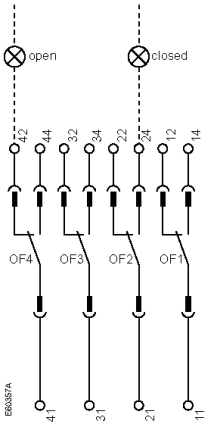
A	P	H	Control unit	Remote operation
■	■	■	**Com**: E1-E6 communication	**SDE2**: Fault-trip indication contact **or** **Res**: Remote reset
■	■	■	**UC1**: Z1-Z5 zone selective interlocking; Z1 = ZSI OUT SOURCE Z2 = ZSI OUT; Z3 = ZSI IN SOURCE Z4 = ZSI IN ST (short time) Z5 = ZSI IN GF (earth fault) M1 = Vigi module input (Micrologic 7)	**SDE1**: Fault-trip indication contact (supplied as standard)
■	■	■		**MN**: Undervoltage release **or** **MX2**: Shunt release
■	■	■	**UC2**: T1, T2, T3, T4 = external neutral;	
■	■	■	M2, M3 = Vigi module input (Micrologic 7)	**MX1**: Shunt release (standard or communicating)
				XF: Closing release (standard or communicating)
■	■	■	**UC3**: F2+, F1– external 24 V DC power supply VN external voltage connector	**PF**: "Ready to close" contact
	■	■		**MCH**: Gear motor.
	■	■	**UC4**: V1, V2, V3 optional external voltage protector	
	■	■	**M2C**: 2 programmable contacts (internal relay); ext. 24 V DC power supply required **or**	***Note:*** *When communicating MX or XF releases are used, the third wire (C3, A3) must be connected even if the communications module is not installed.*
	■	■	**M6C**: 6 programmable contacts (external relay); 24 V DC power supply required	

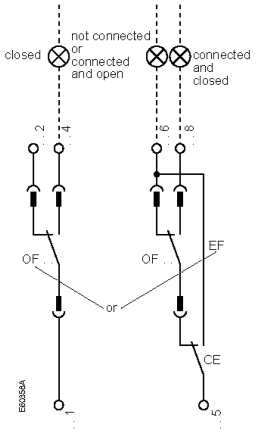
A : *Digital ammeter*
P : *A + power meter + programmable protection*
H : *P + harmonics*

Identifying the electrical auxiliaries

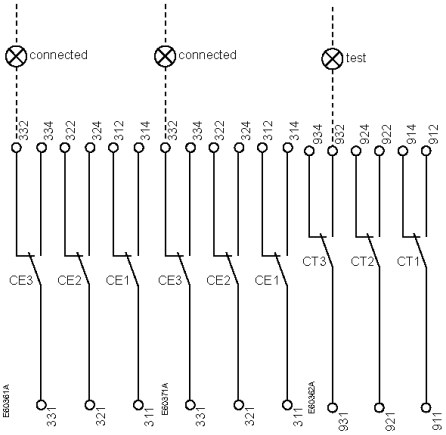
Electrical diagrams

Indication contacts





Chassis contacts



Indication contacts

OF4	OF3	OF2	OF1
44	34	24	14
42	32	22	12
41	31	21	11

OF24	OF23	OF22	OF21	OF14	OF13	OF12	OF11
244	234	224	214	144	134	124	114
242	232	222	212	142	132	122	112
241	231	221	211	141	131	121	111

or or or or or or or or

EF24	EF23	EF22	EF21	EF14	EF13	EF12	EF11
248	238	228	218	148	138	128	118
246	236	226	216	146	136	126	116
245	235	225	215	145	135	125	115

Chassis contacts

CD3	CD2	CD1	CE3	CE2	CE1	CT3	CT2	CT1
834	824	814	334	324	314	934	924	914
832	822	812	332	322	312	932	922	912
831	821	811	331	321	311	931	921	911

or or

CE6	CE5	CE4
364	354	344
362	352	342
361	351	341

CE9	CE8	CE7
394	384	374
392	382	372
391	381	371

Indication contacts

OF4: ON/OFF
OF3 indication
OF2 contacts
OF1

OF 24 or EF 24 ON/OFF indication contacts Combined "connected/closed" indication contacts

OF 23 or EF 23

OF 22 or EF 22

OF 21 or EF 21

OF 14 or EF 14

OF 13 or EF 13

OF12 or EF12

OF11 or EF11

Chassis contacts

CD3: Disconnected **CD2** -position **CD1** contacts

or

CE6: Connected **CE5** position **CE4** contacts

CE3: Connected **CE2** -position **CE1** contacts

or

CE9: Connected **CE8** position **CE7** contacts

or

CD6: Disconnected **CD5** position **CD4** contacts

CT3: Test-position **CT2** contacts **CT1**

or

Key:

Drawout device only

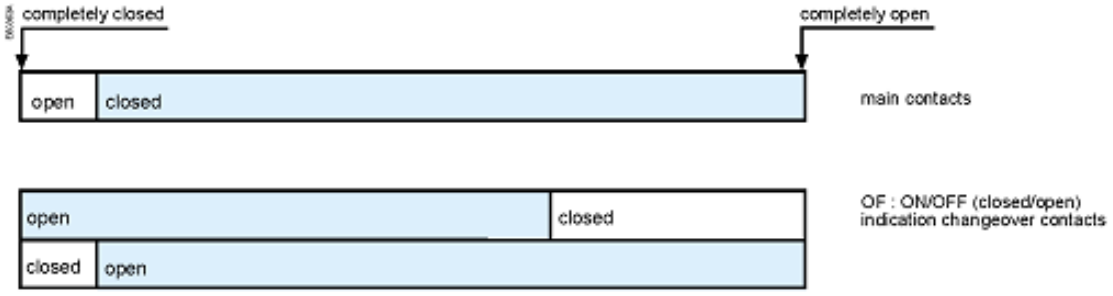
XXX *SDE1, OF1, OF2, OF3, OF4 supplied as standard*

Interconnected connections (only one wire per connection point)

Operation

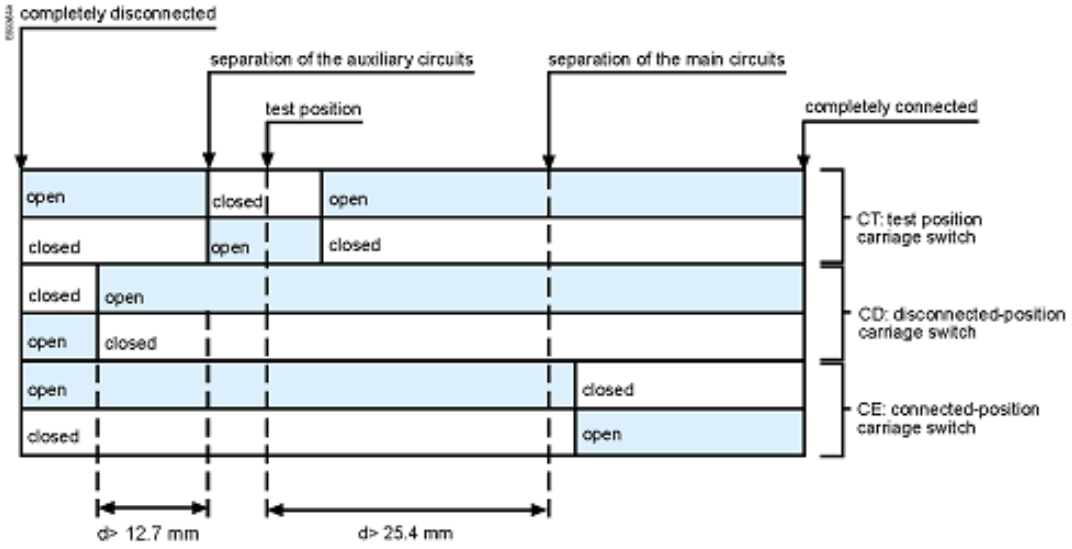
Power Switching Device

The ON/OFF indication contacts signal the status of the device main contacts.



Chassis

The carriage switches indicate the "connected", "test" and "disconnected" positions.



16. 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 883AA2000AS)

-Transfer Switch Serial Number (e.g. W-022345)

The above information can be found on the transfer switch rating plate located on the outside of the ATS door.

Component Description	Thomson Power Systems Part Number	Comments
TSC 900 SCU Controller Service Replacement	TSC900SCUSR	Must verify program settings prior to use. Refer to TSC 900 Instruction Manual.
TSC 900 GHC Display Service Replacement	TSC900GHCSR	Contact Thomson Power Systems Service Department for installation procedures.
120VAC Load Relay (LR), 14 pin Square	001276	Must ensure coil voltage is correct
120VAC Auxiliary Plug-in Relay, 11 pin Square (UX/GX)	001278	Must ensure coil voltage is correct
120VAC Auxiliary Plug-in Timer	001515	Must ensure coil voltage is correct
100VA Control Transformer	002159	
200VA Control Transformer	002162	

For other parts not listed, please contact Thomson Power Systems.

17. PRODUCT RETURN POLICY

Thomson Power Systems 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.

Returns only: Email sales@thomsonps.com

Warranty replacement/repair: Email support@thomsonps.com.

Upon receipt of your request, Thomson Power Systems will confirm with a copy of our Order Acknowledgement, advising the RMA number which should be used to tag the defective controller prior to shipment.

18. NOTES

19. 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	Comments
		Interconnection evaluation	
		Grounding point evaluation	
		Fault current test:	
		Ground fault settings - _____	
		Simulated current - _____	
		Results - _____	

APPENDIX "A"

THOMSON POWER SYSTEMS	**TYPICAL TS 880 ATS COMMISSIONING PROCEDURES (OPEN TRANSITION)**

NOTE

The following commissioning procedures are provided for general information only pertaining to typical site installations and applications. Contact Thomson Power Systems for further information as may be required.

A) Pre-Energization Checks

1. Verify the generator and utility supply voltages match the model of the ATS ordered. If a different voltage is required, refer to procedure in Appendix B of this guide for voltage change programming procedure.

2. Confirm power cable size is correct for the lugs supplied in the transfer switch (line, load, and neutral) and are properly torqued.

3. Confirm transfer switch has been adequately grounded per NEC/CEC requirements.

4. Confirm power cables have been Insulation Resistance Tested to ensure no cross phase connections or conduction to ground.

5. Check to ensure there is no mechanical damage.

6. Check to ensure no packaging materials or tools are left inside the transfer switch.

7. Verify control wiring connected to terminal blocks are properly installed (i.e. no frayed ends, screws are tight, no damage, etc.)

8. Ensure ATS Power Chassis & Voltage Sensing Isolation Plugs (PL12 & PL15) are inserted and all TSC 900 Controller plugs are inserted prior to operation.

9. Visually verify the transfer switch mechanism is closed in the utility position as indicated on the power switching device cover.

10. Verify correct control wire interconnects have been installed to the generator set auto start/stop controls.

    NOTE: The ATS Engine Start contact closes to start the engine and opens to stop the engine.

11. Ensure the inside of the transfer switch is clean from all dust, and other foreign materials.

12. Close ATS enclosure door and tighten all door screws.

13. Visually verify on the transfer switch enclosure that there are no gaps, holes, or potential for water ingress.

B) Equipment Energization

DANGER

HAZARD OF ELECTRICAL SHOCK, EXPLOSION, OR ARC FLASH

This equipment must be serviced only by qualified electrical personnel utilizing safe work practices and appropriate Personal Protective Equipment (PPE). Many components of this equipment operate at line voltage. DO NOT TOUCH. Use only electrically isolated tools. Failure to do so may cause personal injury or death

DANGER - HAZARD OF ELECTRICAL SHOCK, EXPLOSION, OR ARC FLASH

This equipment must be serviced only by qualified electrical personnel utilizing safe work practices and appropriate Personal Protective Equipment (PPE). Many components of this equipment operate at line voltage. DO NOT TOUCH. Use only electrically isolated tools. **Failure to do so may cause personal injury or death**

1. Confirm Utility, Generator and loads can be energized in a safe manner.
2. Energize utility supply and wait approximately two minutes for the TSC 900 DISPLAY to successfully perform an initial "boot-up" process. A Thomson Power Systems Logo will be displayed during the booting process.

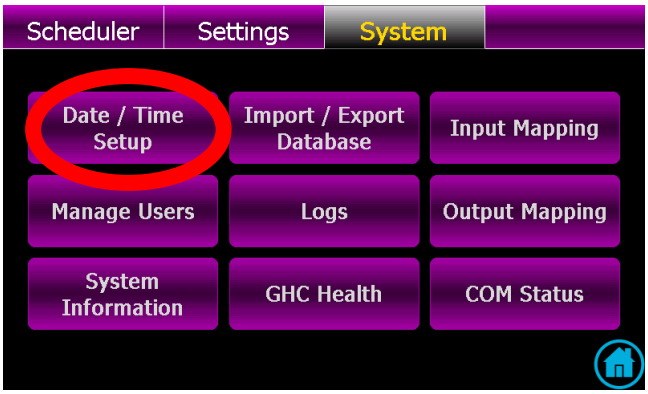
   NOTE: Under normal operation, TSC 900 DISPLAY will not require a re-booting process due to use of a control power reservoir circuit which maintains DC control power under normal operating sequences
3. Once the TSC 900 has successfully completed the boot-up process, confirm utility voltage on the TSC 900 DISPLAY Home page is displaying the correct voltage to match the rating of the ATS, and the ATS Mechanism is in the Utility position.
4. To allow any changes to the TSC 900 controller settings, Login to the TSC 900 with an Admin or Power group name. Refer to TSC 900 instruction manual for further details.

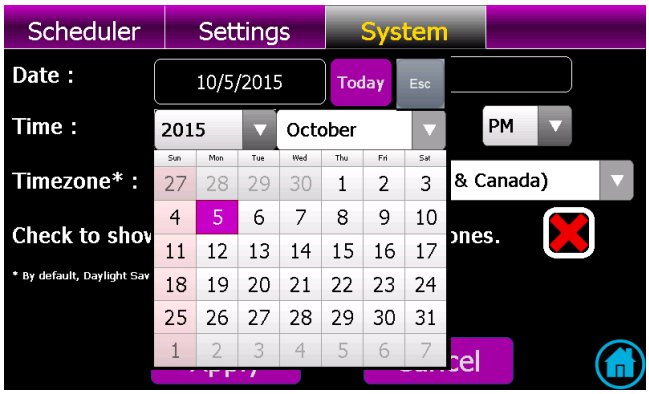
   NOTE: Initial Factory Default Password is: pass. For security purposes, it is strongly recommended to change the group passwords from the factory defaults.

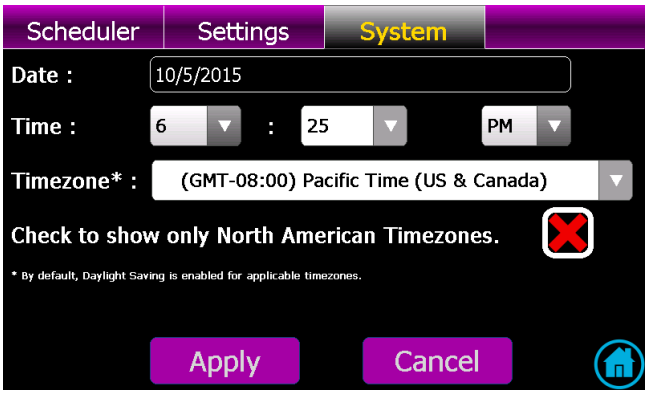
APPENDIX "A"

THOMSON POWER SYSTEMS	TYPICAL TS 880 ATS COMMISSIONING PROCEDURES (OPEN TRANSITION)

5. Set the TSC 900 Internal time clock – On the TSC 900 Display, navigate to System screen and press Date/Time Setup button as shown below. Select calendar date/year and enter time in HR:MIN







6. Verify the status of the following indicator lights on the TSC 900 Display Home page:
   - Utility Source Green light is On
   - Load on Utility Green light is On
7. Run the generator manually and confirm generator voltage on the TSC 900 Display Home page is displaying the correct voltage to match the rating of the ATS.
8. With generator still running, confirm generator phasing matches that of the Utility supply by viewing the Utility and Generator metering pages with phase rotation indication on the TSC 900 Display. If phase rotation does not match, de-energize ATS and re-confirm supply rotation and power wiring is correct.
9. Verify the TSC 900 Display Home Page Generator Source Red Light is On
10. Manually stop generator and place the generator controls in the Automatic position.
11. To confirm automatic starting and load transferring of the generator, press the Change Mode control button on the TSC 900 Display home page and select On Load Test mode.

APPENDIX "A"

THOMSON POWER SYSTEMS	TYPICAL TS 880 ATS COMMISSIONING PROCEDURES (OPEN TRANSITION)

The generator will start and transfer on load per Automatic Sequence. The following lights on the TSC 900 DISPLAY home page should be on: Gen Start, Gen Source available and Load on Gen Red light.

12. To stop the generator and transfer load back to the utility supply, press the Change Mode control button on the TSC 900 Display home page and select Return to Auto mode. The load will re-transfer back to the utility power as per Automatic Sequence.
13. Perform a utility power outage test by opening the upstream utility feeder breaker to the ATS. The TSC 900 DISPLAY Utility Supply available light will turn off; the generator set will start after the three second engine start delay has expired and the generator will start and transfer on load as per Automatic Sequence.
14. Return Utility supply voltage to the ATS by re-closing the upstream utility breaker. The load should re-transfer back to the utility supply as per Automatic Sequence.

APPENDIX “B”

TS 880 SYSTEM VOLTAGE CHANGE PROCEDURE

The system voltage change procedure is a two step process 1) ATS Potential Transformer Tap Change and 2) TSC 900 Software Programming. Details of each step are as follows:

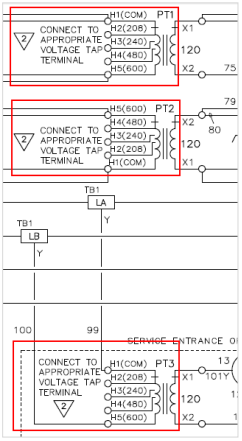
1) ATS Potential Transformer Tap Change

DANGER

HAZARD OF ELECTRICAL SHOCK, EXPLOSION, OR ARC FLASH

- This equipment must be serviced only by qualified electrical personnel utilizing safe work practices and appropriate Personal Protective Equipment (PPE).
- Many components of this equipment operate at line voltage. DO NOT TOUCH. Use only electrically isolated tools.
- Install and close all covers before applying power to this equipment
- Do not open covers to equipment until ALL power sources are disconnected

1. Ensure all power sources are de-energized and are safely Locked-out from service prior to opening the transfer switch enclosure door.
2. Disconnect AC Sensing and ATS Power Chassis Circuit Isolation Plugs PL12 & PL15.
3. Change voltage transformer primary taps settings as follows to match new system voltage on all potential transformers (PTs). (Refer to wiring schematic diagram below).

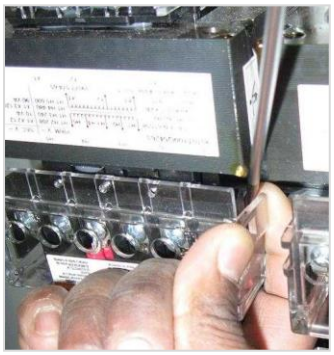


APPENDIX "B"

THOMSON POWER SYSTEMS™

TS 880 SYSTEM VOLTAGE CHANGE PROCEDURE

4. Carefully remove the potential transformer high voltage side covers by prying up on the edge of the cover with a ¼" Flat Head Blade screwdriver and lifting off.

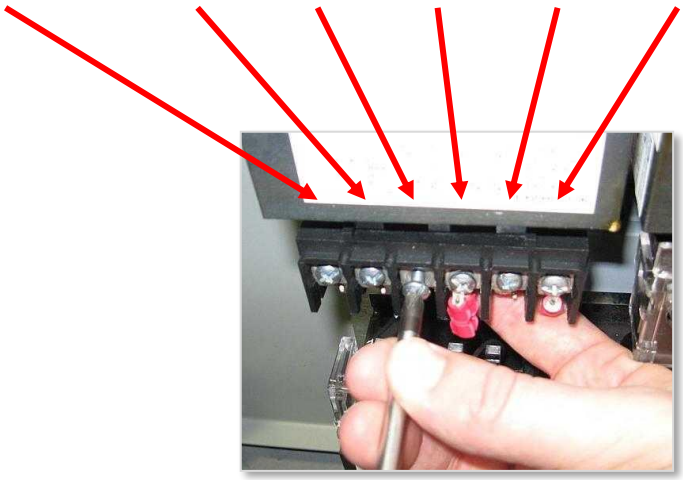




NOTE: You can also use your finger to pry up on the edge of the PT cover.

5. Remove the screw on the PT Tap which is the correct voltage selected for the application

   (i.e. H2-208V, H3-240V, H4-480V or H5-600V)

H6-Not Used H5-600V H4-480V H3-240V H2-208V H1 (Never Changes)



APPENDIX "B"

THOMSON™ POWER SYSTEMS

TS 880 SYSTEM VOLTAGE CHANGE PROCEDURE

CAUTION

Brace PT terminal block with your hand when loosening or tightening ANY screws.

6. Remove the screw and red ring terminal connected to the incorrect (existing) PT voltage terminal. Install the screw and red ring terminal to the new selected PT Tap Terminal based on required voltage and tighten while supporting the terminal block. Make sure the ring terminal is not misaligned or the PT cover will not fit back on.

7. Install the extra screw back onto the old PT location and tighten.

CAUTION

Confirm that PT screws are correctly tightened, and do not put strain on the PT Tap wires.

8. Replace the PT cover. PT covers should 'snap' in place, confirm they are installed correctly by gently "twisting" the PT cover. DO NOT use excessive force.

9. Repeat steps one to five for <u>all</u> Potential Transformers.

   <u>NOTE:</u> two to three PT's will be installed in the Transfer Switch depending on the Model type.

APPENDIX "B"

THOMSON POWER SYSTEMS

TS 880 SYSTEM VOLTAGE CHANGE PROCEDURE

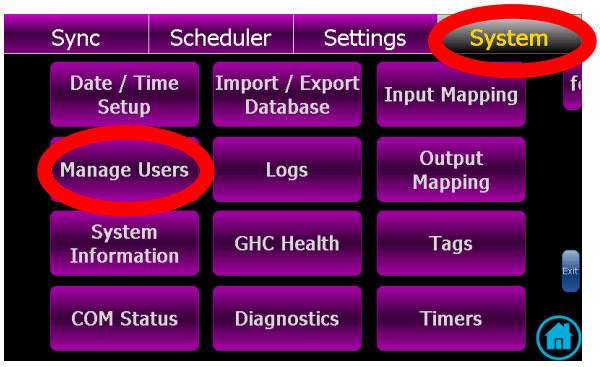
2) TSC 900 Software Programming

To change system voltage on the TSC 900 Controller, the transfer switch must be energized to provide control power to the controller to allow software programming. If safe to do so, energize Transfer Switch on either Utilty or Generator sources and follow the programming procedure shown below.

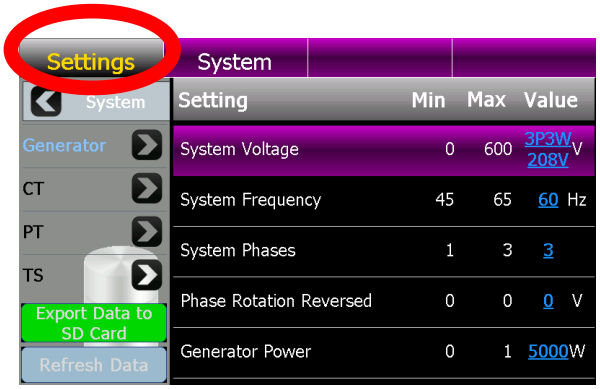
NOTE: The TSC 900 Controller does not contain any system voltage jumpers on the printed circuit board. All voltage changes are done via software programming only.

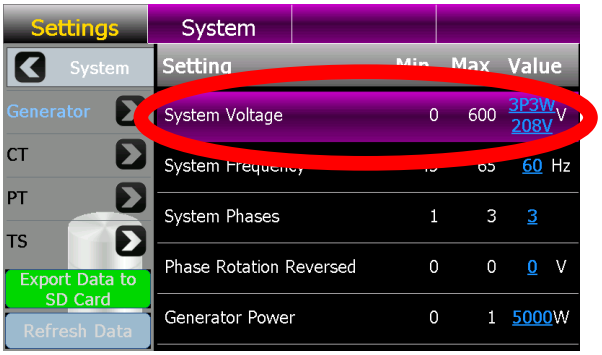
1. Security Password Login: To allow a change in voltage setting, a Security Login with a level of Power or Admin will be required. Navigate to the Settings Page below and select Manage Users. Next from the Manage Users Page, Select User Name drop down box and choose (Power or Admin), then type in password, then select the Apply button. Refer to TSC 900 Instruction manual further details on Security Login if required.

NOTE: Initial Factory Default Password is: pass



2. Once successfully logged in, From the TSC 900 DISPLAY Home Page, Navigate to the Settings Page below and select System Voltage as shown below.





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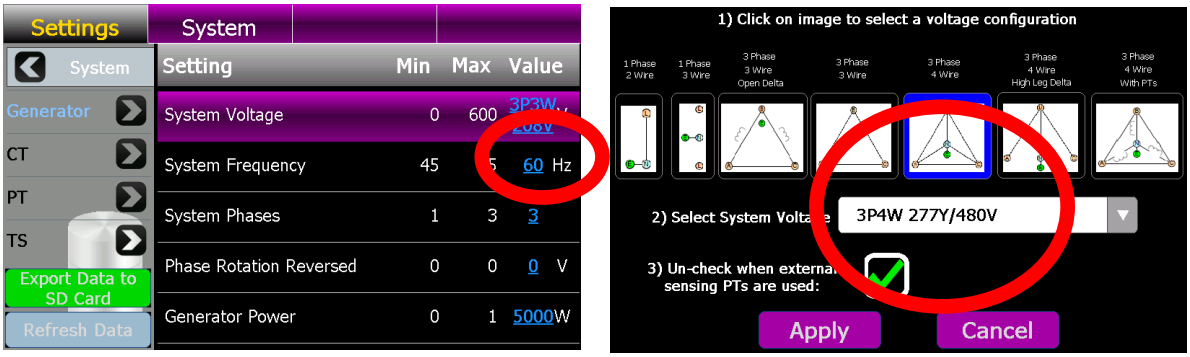
APPENDIX “B”

THOMSON™ POWER SYSTEMS

TS 880 SYSTEM VOLTAGE CHANGE PROCEDURE

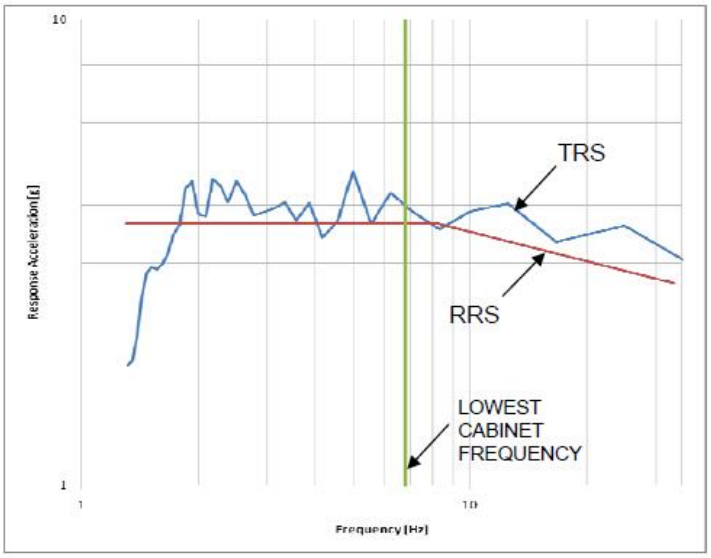
3. On the System Voltage Row, select the underlined System Voltage value and from the drop down list which appears, select the desired voltage for the application as shown below. To confirm the change, press the Confirm button.



Seismic Certification

Thomson Technology – Automatic Transfer Switches
TS 840, 870, 880
Approved for use in Seismic Applications

Thomson Technology has seismically certified its line of **Automatic Transfer Switches** including all models of **TS 840, 870, 880**. The certification was done by shake-table testing according to the nationally recognized standard, AC156. The standard covers seismic design requirements for non-structural components according to IBC 2006 and ASCE7-05.



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Dr. Carlos E. Ventura, PE
Director, TVP Engineering Ltd.
Certifying Company

engineering ltd

Norm Schmidt
Vice President, Engineering and Administration
Thomson Technology

Shake-table tests were performed at Alpha Seismic and Environmental Test Laboratory and the Earthquake Engineering Research Facility, University of British Columbia. The figure shows a representative Test Response Spectrum (TRS) plotted with 5% damping against the AC156 Required Response Spectrum (RRS) with a S_s value of 342%. For more details, please refer to the certification notes.

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