

SUGGESTED SPECIFICATION

For

Series 300 Non - Automatic Transfer Switches (3NTS)

PART 1 GENERAL

1.01 Scope

Furnish and install non automatic transfer switches (3NTS) with number of poles, amperage, voltage, and withstand current ratings as shown on the plans. Each automatic transfer shall consist of a mechanically held power transfer switch unit and a microprocessor controller, interconnected to provide complete automatic operation. All transfer switches and control panels shall be the product of the same manufacturer.

1.02 Acceptable Manufacturers

Non automatic transfer switches shall be ASCO Series 300 (3NTS). Any alternate products shall be submitted to the consulting engineer in writing at least 10 days prior to bid. Each alternate bid must list any deviations from this specification.

1.03 Codes and Standards

The non - automatic transfer switches and accessories shall conform to the requirements of:

- A. UL 1008 - Standard for Automatic Transfer Switches
- B. CSA C22.2 No.178 – 1978
- C. NFPA 70 - National Electrical Code
- D. NFPA 99 – Health Care Facilities
- E. NFPA 110 - Emergency and Standby Power Systems
- F. IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
- G. NEMA Standard ICS10-1993 (formerly ICS2-447) - AC Automatic Transfer Switches
- H. NEC Articles 700, 701, 702
- I. International Standards Organization ISO 9001: 2008
- J. IEC 60947-6-1

PART 2 PRODUCTS

2.01 Mechanically Held Transfer Switch

- A. The transfer switch unit shall be electrically operated and mechanically held. The electrical operator shall be a single-solenoid mechanism, momentarily energized. Main operators which include overcurrent disconnect devices will not be accepted. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal or emergency.

- B. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.
- C. All main contacts shall be silver composition. Switches rated 800 amperes and above shall have segmented blow-on construction for high withstand current capability and be protected by separate arcing contacts.
- D. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. A manual operating handle shall be provided for maintenance purposes. The handle shall permit the operator to manually stop the contacts at any point throughout their entire travel to inspect and service the contacts when required.
- E. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.
- F. Where neutral conductors must be switched, the NTS shall be provided with fully-rated neutral transfer contacts.
- G. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully-rated AL-CU pressure connectors shall be provided.

2.02 Group 'G' Controller with Integrated User Interface Panel

- A. The controller shall be connected to the transfer switch by an interconnecting wiring harness. The harness shall include a keyed disconnect plug to enable the controller to be disconnected from the transfer switch for routine maintenance.
- B. The controller shall direct the operation of the transfer switch. The controller's sensing and logic shall be controlled by a built-in microprocessor for maximum reliability, minimum maintenance, inherent serial communications capability, and the ability to communicate via the Ethernet through optional communications module
- C. A single controller shall provide single and three phase capability for maximum application flexibility and minimal spare part requirements. Voltage sensing shall be true RMS type and shall be accurate to $\pm 1\%$ of nominal voltage. Frequency sensing shall be accurate to $\pm 0.1\text{Hz}$. Time delay settings shall be accurate to $\pm 0.5\%$ of the full scale value of the time delay. The panel shall be capable of operating over a temperature range of -20 to $+70$ degrees C, and storage from -55 to $+85$ degrees C.
- D. The controller shall be enclosed with a protective cover and be mounted separate from the transfer switch unit for safety and ease of maintenance. Sensing and control logic shall be provided on printed circuit boards.
- E. The controller shall meet or exceed the requirements for Electromagnetic Compatibility (EMC) as follows:
 1. IEC 60947 – 6 – 1 Multiple Function Equipment Transfer Switching Equipment, 61000-4 Testing And Measurement Techniques - Overview
 - a. IEC 61000 – 4 - 2 Electrostatic Discharge Immunity
 - b. IEC 61000 – 4 - 3 Radiated RF Field Immunity
 - c. IEC 61000 – 4 - 4 Electrical Fast Transient/Burst Immunity

- d. IEC 61000 – 4 - 5 Surge Immunity
 - e. IEC 61000 – 4 – 6 Conducted RF Immunity
2. CISPR 11 – Conducted RF Emissions and Radiated RF Emissions

2.03 Enclosure

- A. The 3NTS shall be furnished in a NEMA type 1 enclosure unless otherwise shown on the plans.
- B. Provide strip heater with thermostat for Type 3R enclosure requirements.
- C. Controller shall be mounted on, visible, and operational through enclosure door.

PART 3 OPERATION

3.01 Controller Operation Provisions

- A. The controller shall be arranged for manually actuated electrical operation with provisions for remote operation using #18 gauge wire minimum. The NTS shall also be configured so that it can easily be capable of automatic operation in the future without modification.

3.02 Controller Display and Keypad

- A. A 128*64 graphical LCD display and keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and limited control through communications port. The following parameters shall only be adjustable via DIP switches on the controller.

1. Nominal line voltage and frequency
2. Single or three phase sensing on normal
3. Transfer operating mode configuration (open transition, or delayed transition)

All instructions and controller settings shall be easily accessible, readable and accomplished without the use of codes, calculations, or instruction manuals.

3.03 Voltage and Frequency Sensing

- A. Voltage and frequency on both the normal and emergency sources (as noted below) shall be continuously monitored, with the following pickup ,dropout, and trip settings capabilities (values shown as % of nominal unless otherwise specified).

<u>Parameter</u>	<u>Sources</u>	<u>Dropout/Trip</u>	<u>Pickup/Reset</u>
Undervoltage	N & E	70 to 98%	85 to 100%
Overvoltage	N & E	102 to 115%	2% below trip
Undervoltage	N & E	85 to 98%	86 to 100%
Overfrequency	N & E	102 to 110%	2% below trip

- B. Repetitive accuracy of all settings shall be within 1% at +25°C.

- C. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad or remotely via serial communications port access.
- D. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage and frequency. *Note: Single phase on emergency*
- E. The backlit 128*64 graphical display shall have multiple language capability. Languages can be selected from the user interface.

3.04 Time Delays

- A. A time delay shall be provided to override momentary normal source outages and delay all transfer and engine starting signals, adjustable 0 to 6 seconds. It shall be possible to bypass the time delay from the controller user interface.
- B. A time delay shall be provided on transfer to emergency, adjustable from 0 to 60 minutes 59 seconds for controlled timing of transfer of loads to emergency. It shall be possible to bypass the time delay from the controller user interface.
- C. A generator stabilization time delay shall be provided after transfer to emergency adjustable 0 or 4 seconds.
- D. A time delay shall be provided on retransfer to normal, adjustable 0 to 9 hours 59 minutes 59 seconds. Time delay shall be automatically bypassed if emergency source fails and normal source is acceptable.
- E. A cooldown time delay shall be provided on shutdown of engine generator, adjustable 0 to 60 minutes 59 seconds.
- F. All adjustable time delays shall be field adjustable without the use of special tools.
- G. A time delay activated output signal shall also be provided to drive an external relay(s) for selective load disconnect control. The controller shall have the ability to activate an adjustable 0 to 5 minutes 59 seconds time delay in any of the following modes:
 - 1. Prior to transfer only.
 - 2. Prior to and after transfer.
 - 3. Normal to emergency only.
 - 4. Emergency to normal only.
 - 5. Normal to emergency and emergency to normal.
 - 6. All transfer conditions or only when both sources are available.
- H. In the event the alternate source is not accepted within the configured Failure to Accept time delay, the common alert indication shall become active.
- I. The controller shall also include the following built-in time delay for delayed transition transfer operation.
 - 1. A time delay for the load disconnect position for delayed transition operation adjustable 0 to 5 minutes 59 seconds.

3.05 Additional Features

- A. The user interface shall be provided with a soft key to transfer between the normal and emergency sources.
- B. Auxiliary contacts, rated 10 amps, 250 VAC shall be provided consisting of one contact, closed when the ATS is connected to the normal source and one contact closed when the ATS is connected to the emergency source.
- C. A single alarm indication shall light up the alert indicator, and de – energize the configured common alarm output relay for external monitoring.
- D. A test soft key shall be provided to simulate a normal source failure.
- E. A reset soft key shall be provided to bypass the time delay on transfer to emergency.
- F. LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).
- G. LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal (green) and emergency (red) source, as determined by the voltage sensing trip and reset settings for each source.
- H. LED indicating light shall be provided to indicate switch not in automatic mode (manual); and blinking (amber) to indicate transfer inhibit.
- I. LED indicating light shall be provided to indicate any alarm condition or active time delay (red).

The following features shall be built – in to the controller, but capable of being activated through keypad programming or the serial port only when required by the user:

- H. A variable window inphase monitor shall be provided in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The inphase monitor shall be specifically designed for and be the product of the ATS manufacturer. The inphase monitor shall be equal to ASCO feature 27.
- J. An engine generator exercising timer shall be provided to configure weekly or bi-weekly automatic testing of an engine generator set with or without load for 20 minutes fixed. It shall be capable of being configured to indicate a day of the week, and time weekly testing should occur.

The following feature shall be built – into the controller, but capable of being activated through keypad programming, communications interface port, or additional hardware.

- K. Terminals shall be provided for a remote contact which opens to signal the ATS to transfer to emergency and for remote contacts to inhibit transfer to emergency. This inhibit signal can be enabled through the keypad.

- L. System Status - The controller LCD display shall include a "System Status" screen which shall be readily accessible from any point in the menu by depressing the "ESC" key. This screen shall display a clear description of the active operating sequences and switch position. For example,

Normal Failed
Load on Normal
TD Normal to Emerg
2min15s

Controllers that require multiple screens to determine system status or display "coded" system status messages, which must be explained by references in the operator's manual are not permissible.

- M. **Self Diagnostics** – The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.

- N. **Communications Interface** – The controller shall be capable of interfacing, through an optional serial communication port with a network of transfer switches, locally (up to 4000 ft.). Standard software specific for transfer switch applications shall be available by the transfer switch manufacturer. This software shall allow for the monitoring, control, and setup of parameters.

- O. **Data Logging** – The controller shall have the ability to log data and to maintain the last 99 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non – volatile memory.

1. Event Logging

1. Data and time and reason for transfer normal to emergency
2. Data and time and reason for transfer emergency to normal
3. Data and time and reason for engine start
4. Data and time engine stopped
5. Data and time emergency source available
6. Data and time emergency source not available

2. Statistical Data

1. Total number of transfers
2. Total number of transfers due to source failure
3. Total number of day's controller is energized
4. Total number of hours both normal and emergency sources are Available
5. Total time load is connected to normal
6. Total time load is connected to emergency
7. Last engine start
8. Last engine start up time
9. Input and output status

PART 4 ACCESSORIES

4.01 Optional Features *(The following section is optional and should be deleted if not required)*

- A. **Accessory Package** - An accessory bundle shall be provided that includes:

1. A fully programmable engine exerciser with seven independent routines to exercise the engine generator, with or without load on a daily weekly, bi – weekly, or monthly basis.
2. Event log display that shows event number, time and date of events, event type, and reason (if applicable). A minimum of 99 events shall be stored.
3. RS – 485 communications port enabled.
4. Common alarm output contact.

(This feature shall be equal to ASCO accessory 11BE, and shall be capable of being activated for existing switches through optional accessory dongle).

- B. Controller Power Supply** - A backup power UPS shall be provided to allow controller to run for 3 minutes minimum without AC power. (This feature shall be equal to ASCO accessory 1UP, and shall be capable of being added to existing switches without modification).
- C. Expansion Module** - A relay expansion module (REX) is a standard feature when delayed transition transfer is specified. A REX module shall also be provided for open transition transfer that includes one form C contact for source availability of the normal (18G) and emergency (18B) sources. Additional output relay shall be provided to indicate a common alarm. The REX module shall have the capability of being daisy chained for multiple sets of contacts. (This feature shall be equal to ASCO accessory 18RX, and shall be capable of being added to existing switches without modification).
- D. Current Sensing Card** - A load current metering card shall be provided that measures either single or three phase load current. It shall include current transformers (CT's) and shorting block. Parameters shall be able to be viewed via the user interface. (This feature shall be equal to ASCO accessory 23GA (single phase), 23GB (three phase), and shall be capable of being added to existing switches without modification).
- E. Communications Module** – Shall provide remote interface module to support monitoring of vendor's transfer switch, controller and optional power meter. Module shall provide status, analog parameters, event logs, equipment settings & configurations over embedded webpage and open protocol. Features shall include:
1. Email notifications and SNMP traps of selectable events and alarms may be sent to a mobile device or PC.
 2. Modbus TCP/IP, SNMP, HTTP, SMTP open protocols shall be simultaneously supported.
 3. Web app interface requiring user credentials to monitor and control the transfer switch supporting modern smart phones, tablets and PC browsers. User will be able to view the dynamic one-line, ATS controls status, alarms, metering, event logging as well as settings.
 4. Secure access shall be provided by requiring credentials for a minimum of 3 user privilege levels to the web app, monitor (view only), control (view and control) and administrator (view, control and change settings). 128-Bit AES encryption standard shall be supported for all means of connectivity.
 5. Shall allow for the initiating of transfers, retransfers, bypassing of active timers and the activating/deactivating of engine start signal shall be available over the embedded webpage and to the transfer switch vendor's monitoring equipment.
 6. An event log displaying a minimum of three-hundred (300) events shall be viewable and printable from the embedded webpages and accessible from supported open protocols.

7. Four (4) 100 Mbps Ethernet copper RJ-45 ports, two (2) serial ports, and LEDs for diagnostics.
8. DIN rail mountable.

This option shall be equivalent to ASCO accessory 72EE

- F. Transfer Alarm** - An audible alarm with silencing feature shall be provided to signal each time transfer to emergency occurs. (This feature shall be equal to ASCO accessory 62W).
- G. Enclosure Heater** - A 125 watt enclosure heater with transformer and thermostat (adjustable from 30° to 140 ° F) shall be provided for outdoor installations where type 3R, 4, enclosures are specified. (This feature shall be equal to ASCO accessory 44G, and shall be capable of being added to existing switches).
- H. Surge Suppression** – A TVSS with a surge current rating of 65kA shall be provided with individually matched fused metal oxide varistors (MOVs). It shall include LED status indication of normal operation, under voltage, power loss, phase loss or component failure. Shall include form C dry contacts for external alarm or monitoring. The unit shall be enclosed in a Noryl housing rated NEMA 4, 12, and 4X. Shall comply with UL 1449 3rd edition. (This feature shall be equal to ASCO accessory 73, and shall be capable of being added to existing switches).
- I. Remote Control Provisions** – Provisions for customer supplied 3 – position selector switch shall be included. (This feature shall be equal to ASCO accessory 43M).

***Note Spec Writer:** *The following section is optional and should be deleted if not required.*

- J. Power Meter** – (This feature shall be equal to ASCO accessory 135L, or feature bundle accessory 150*).

The Power Meter shall conform to the requirements of:

1. UL 3111-1-Electrical Measuring and Testing Equipment
2. CAN/CSA-C22.2 No. 23-M89-CSA Safety Requirements for Electrical and Electronic Measuring and Test Equipment
3. The Power Meter shall be capable of operating without modification at a nominal frequency of 45 to 66Hz.
4. The Power Meter shall be rated for an operating temperature of -4°F to 158°F and a storage temperature of -22°F to 176°F. and shall be rated for an 85% non-condensing, relative humidity.
5. The Power Meter shall accept inputs from industry standard instrument transformers (120 VAC secondary PT's and 5A secondary CT's). Direct phase voltage connections, 0 to 600VAC nominal, shall be possible without the use of PT's.
6. The Power Meter shall accept single, 3 phase, or three & four wire circuits. A fourth CT input shall be available to measure neutral or ground current.

7. The Power Meter shall contain a built-in discrete contact to wire an ATS 14A auxiliary contact to indicate switch position.
8. The Power Meter shall accept AC voltage from the sensing lines for operation. Additional provisions shall be provided for external DC voltage input range 9-36 VDC with a nominal of 24 VDC.
9. The Power Meter shall be equipped with a continuous duty, long –life, 4 line x 20 character green backlit LCD
10. All setup parameters required by the Power Meter shall be stored in non-volatile memory and retained in the event of a control power interruption.
11. The Power Meter shall be flush mountable on a surface.
12. The Power Meter enclosure shall be sealed to IP-51 (NEMA 1) and the faceplate shall be sealed to IP-65 (NEMA 4). All push buttons shall be sealed tact switches.
13. The Power Meter shall send, when prompted, information to a central location equipped with a manufacturer supplied critical power management system or 3rd party monitor through manufacturer supplied communication modules. All 3rd party monitor must utilize industry standard open protocols Modbus/RTU.Modbus/TCP or SNMP.
14. An embedded RS-485 port will be provided which will enable communication at 9600, 19.2K, 38.4K, or 57.6K baud. DIP switches will be provided on the RS-485 port allowing a user to select 2-wire or 4-wire communication as well as the option to activate a terminating resistor on the port.
15. The Power Meter shall help facilities comply with NEC 220. It shall provide Maximum Demand calculations for the past 24 months, as per standards with 15 minute averages.
16. The following data will be available on the display and Modbus registers of the Power Meter:
 - Line-to-neutral voltages (V_{AN} , V_{BN} , and V_{CN})
 - Line-to-neutral voltage average (V_{AVE})
 - Line-to-line voltages (V_{AB} , V_{BC} , and V_{CA})
 - Line-Line voltage average (V_{LAVE})
 - Current on each phase (I_A , I_B , and I_C)
 - Current on the neutral conductor (I_N)
 - Average current (I_{AVE})
 - Active power, KW per phase and total (W_A , W_B , W_C , and W_T)
 - Apparent power, KVA per phase and total (V_{AA} , V_{AB} , V_{AC} , and V_{AT})
 - KWHours importing, exporting and net (KWH_{IMP} , KWH_{EXP} , and KWH_{NET})

- KVARHours leading, lagging and net (KVARH_{LEAD}, KVARLAG, and KVARHNET)
 - Power factor (PF)
 - Signal Frequency (Hz)
 - Digital Input
17. The Power Meter shall offer an LCD which can display no less than nine different languages.
 18. Displaying each of the metered values shall be done through the use of menu scroll buttons. There will be an escape button which will be used to take the user back to the previous page or to cancel a setting change. Pressing escape no more than three times will return the user to the home screen.
 19. For ease of operator viewing, the display can be configured to remain on continuously, with no detrimental effect on the life of the Power Meter.
 20. The display's contrast shall be configurable in intervals of 10% (ranging 0%-100%).
 21. Setup of a system requirements shall be allowed from the front of the Power Meter.

***Note Spec Writer:** *The following section is optional and should be deleted if not required.*

5.01 ATS Remote Annunciator

General

Provide and install ATS Remote Annunciators for monitoring and control of automatic transfer switches remotely over Ethernet.

A. Hardware Specifications

The ATS Remote Annunciator shall be listed to cUL-60950-1 and UL 1008 and include the following features and ratings:

- *User-configured labels with ATS names and power sources*
- *Dual 10/100 Base-T auto sensing and auto crossover Ethernet ports*
- *LED indication of source acceptability, switch position, common alarm, time delay and Ethernet link activity*
- *Push button for transfer/retransfer control operations and time delay bypass*
- *Push buttons for Alarm Silence and Lamp Test*
- *Key lock to enable and disable the transfer push button*
- *Audible and visual alarm to indicate Communication Error ATS Locked Out Failure to Synchronize Extended Parallel and any of the 8 user-configured discrete inputs*

- *Programmable watchdog timer that can generate a system reset upon timeout (minimum 1 sec)*
- *Factory reset capability*
- *100 ms power ride-through*

B. Software Specification

The ATS Remote Annunciator shall contain embedded web pages accessible via various web browsers with the following capabilities:

- *Configuration for protocol and communications management with the ability of auto discovering transfer switches on network*
- *Ability to create and print customized labels for ATS names and power sources*
- *The ability to choose a continuous or periodic audible alarm with customizable interval time*
- *View detailed packet status counters i.e. transmitted received and dropped packets with the ability to reset counters*
- *ATS source name configuration page which allows users to configure power source names and print labels*
- *Upgrade firmware from Ethernet network without interrupting equipment operation*

C. Communications

Dual 10/100 Base-T (RJ-45) Ethernet ports are provided to support TCP/IP communications for up to eight automatic transfer switches via individual remote connectivity modules or daisy-chained serial modules into a single Connectivity Module. Additional features include:

- *Supports Full Duplex Flow Control (IEEE 802.3x)*
- *3.3V power supply with 5V I/O tolerance*
- *Supports 3 LEDs to indicate traffic link speed and collision*

D. Mounting

The ATS Remote Annunciator is suitable for:

- *Surface mounting using mounting screws studs*
- *Flush Mount from behind a cutout section (Enclosure Door Mounting)*
- *Flush Mount from the front of a cutout section (Enclosure Door Mounting)*

E. Power Supply

The ATS Remote Annunciator shall be capable of accepting 24VDC, 120 VAC or 240 VAC power source.

F. Environmental

The ATS Remote Annunciator shall have an Ambient Operating Temperature range of -4 ° to 158 ° F (-20 ° to +70 ° C) @ 5~85% humidity and Ambient Storage Temperature of -40 ° to 185 ° F (-40 ° to 85 ° C).

PART 6 ADDITIONAL REQUIREMENTS

6.01 Withstand and Closing Ratings

- A. The NTS shall be rated to close on and withstand the available RMS symmetrical short circuit current at the NTS terminals with the type of overcurrent protection shown on the plans. WCR NTS ratings shall be as follows when used with specific circuit breakers:

NTS Size	Withstand & Closing Rating MCCB (480v/60hz)	W/CLF
30	22,000A	100,000
70 - 200	22,000A	200,000
230	25,000A	100,000
260 – 400	42,000A	200,000
600	50,000A	200,000
800 – 1200	65,000A	200,000
1600 – 2000	85,000A	200,000
2600 – 3000	100,000A	200,000

6.02 Tests and Certification

- A. The complete NTS shall be factory tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.
- B. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards, and withstand and closing ratings. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.
- C. The NTS manufacturer shall be certified to ISO 9001: 2008 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001: 2008.

6.03 Service Representation

- A. The NTS manufacturer shall maintain a national service organization of company-employed personnel located throughout the contiguous United States. The service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.
- B. The manufacturer shall maintain records of switch shipments, by serial number, for a minimum of 20 years.
- C. For ease of maintenance, the transfer switch nameplate shall include drawing numbers and serviceable part numbers.