New Information
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Closed Transition IQ Transfer (ATC-800)
for Automatic Transfer Switches

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Introduction

The Closed Transition IQ Transfer [CTIQ Transfer (ATC-800)] is a programmable, microprocessor-based monitoring device designed for use in Cutler-Hammer Closed Transition Transfer Switches (CTVI/CBVI). By using the Cutler-Hammer CTIQ Transfer (ATC-800), the user may avoid intentional interruption of power when both sources of power are available. This make-before-break mode of operation is useful during testing of the engine generator under load and where a predetermined transfer to the generator is desired. Source paralleling duration is limited to less than 100 msec.

Passive Closed Transition

The Closed Transition mode of operation requires that both power sources be synchronized in voltage, frequency and phase angle within prescribed limits. Cutler-Hammer's CTIQ Transfer (ATC-800) utilizes a technique that involves waiting for synchronization of the two sources without actively controlling the generator's voltage or frequency. The mode of operation is anticipatory in that the switch close command is initiated before the sources are exactly in-phase. Utilizing the phase angle and frequency difference between the two sources, a calculation is made to predict when both sources would be in-phase. The response time of the switch is then factored in to determine when the switch close signal should be given to assure optimal closure of the two sources in-phase.

The Cutler-Hammer Closed Transition IQ Transfer (ATC-800) must be selected with one of two feature sets: 47C or 47D. The difference between these two feature sets is the action taken by the CTIQ Transfer (ATC-800) if it is determined that the two sources will not achieve synchronization. If Feature set 47C is selected, failure to synchronize results in the switch reverting to an Open Transition mode of operation. However, if Feature set 47D is selected, failure to synchronize will result in the CTIQ Transfer (ATC-800) refusing to Transfer to Source 2 and an alarm signal being activated. In neither case will there be a paralleling of sources if synchronization is not achieved.

Application Considerations

- The generator used with a closed transition transfer switch must be equipped with an isochronous governor.
- When paralleling sources, fault current contributions from both sources should be considered in the system design.
- Closed Transition (make-before-break) technology causes paralleling with the utility. It is the user's responsibility to comply with any requirements regarding protective relaying. Protective relaying is not supplied with the standard transfer switch, but is available.

Switch Application Section

Cutler-Hammer Closed Transition IQ Transfer (ATC-800) Features

The CTIQ Transfer (ATC-800) is a door-mounted, totally enclosed device that is customer accessible from the transfer switch front panel.

Data access and programming operations are performed using the CTIQ (ATC-800) Transfer's touch-sensitive function buttons in conjunction with an easy-to-read, illuminated, alphanumeric LED display. Both the function buttons and the display window are part of the device's front panel. A built-in Help button provides user assistance in the form of message displays.

The CTIQ Transfer (ATC-800) is communications ready and compatible with all Cutler-Hammer IQ devices as well as the Cutler-Hammer PowerNet system-wide supervisory and control software. This permits monitoring and control of several transfer switches, locally or remotely, from a single point.

Additional Features:

- Source paralleling duration is limited to 100 msec or less.
- Applicable for use on any low or medium voltage application through 38 kV.
- True rms three-phase voltage sensing on Normal, Emergency and Load.
- Frequency sensing on Normal and Emergency.
- Programmable set points stored in non-volatile memory.
- PowerNet Communication to personal computer either on-site or remote.
- Historical data on most recent transfers (up to 16 events) viewable at switch. Unlimited history storage (remote) available when used with PowerNet software.
- Wide range of user-selectable option combinations.
- Load sequencing.
- Engine start contacts.
- Engine Test Switch with user-selectable Test Mode and Fail-Safe.
- Alarm contact (multiple alarm functions available).
- Pre-transfer signal.
- Heartbeat Monitor (flashing green Automatic light signifies that the CTIQ Transfer (ATC-800) is operating properly).
- Instrumentation
  - Voltmeter (Accuracy ± 1%)
  - Reads line-to-line on Sources 1 and 2 and Load
  - Frequency Meter (40-80 Hz, accuracy ± .1 Hz)
  - Source Available Time (both sources)
  - Source Connected Time (both sources)
  - Source Run Time

Programming

Button Functions

Three buttons provide easy access to all commonly used CTIQ Transfer (ATC-800) functions.

When the preferred source is connected and the ATS is operating normally, the Automatic indicator light will be flashing and the display window will be blank.

Using the Display Select button, the operator can step through each of the six display families:

- Source 1
- Source 2
- Load
- History
- Time/Date
- Set Points

Note: Stepping through the various display modes does not alter preset values or otherwise affect operation of the ATS.

Once the desired display family is selected, the user may press the Step button to cycle through specific parameters or metered values shown in the display window.

Programming, *Continued*

Initial Programming

Factory programming will load all customer specified functions and presets. At the customer's request, Cutler-Hammer will add, delete or adjust optional features.

Customer Programming

Customers may reprogram set points and other parameters to match their application, using the Program switch located on the rear of the unit. Once the programming mode has been activated and the Program light is flashing, the user may access Set Point settings by pressing the Display Select button until the Set Points LED is illuminated. Values for individual set points may then be altered by pressing the Increase or Decrease buttons. Once a parameter has been reset, the user advances to the next set point by pressing the Step button.

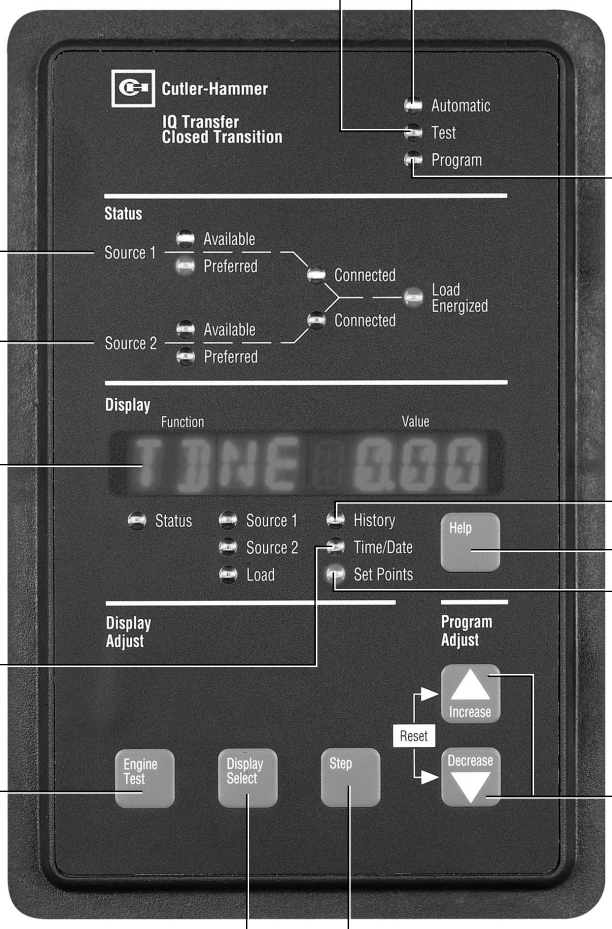
While the CTIQ Transfer (ATC-800) is in the Program mode, the device continues to operate in accordance with the previously programmed set points and parameters. The unit is never off-line, and preset values do not change until programming has been completed.

Once reprogramming is complete, the user may return the Program switch to the Run position. At this point, all new values are stored in the CTIQ's (ATC-800) non-volatile memory, and the unit returns to Automatic mode.

Closed Transition IQ Transfer (ATC-800) Front Panel Display and Button Functions

Test
Indicator light is on when unit is in Test mode.

Automatic
LED indicates that the ATS is operating normally and is in the Automatic mode.



Program
LED indicates unit is in Programming mode. (**Note:** This mode is activated using the Program switch located on the rear of the unit.)

Source 1, Source 2, and Load
Colored LED lights show status of both Sources and Load.

History
By pressing the Display Select button to light the History LED and the Step button to rotate through available data, historical or cumulative values for Available Time (Both Sources), Connected Time (Both Sources), Number of Transfers and Date/Time Reason for last 16 transfers are displayed.

LED Display
Unit will provide LED readout showing actual metered values for Voltage, Frequency and Condition (including Normal, Under Voltage, Over Voltage, etc.).

Help
Pressing the Help button in any function mode will bring up display messages, explanations and prompts to assist the operator.

Time/Date
Displays real-time clock. Clock can be easily set in this mode using the Increase and Decrease buttons.

Set Points
Selecting this LED permits the user to display existing programmed values.

Engine Test Button
Pressing this button twice initiates an engine test.

Increase/Decrease
A detailed explanation of these buttons can be found in the Operation section.

Display Select
- Source 1
- Source 2
- Load
- History
- Time/Date
- Set Points

Button is discussed in Operation section.

Step Button
Shows multiple variables under each display select function.

Operation

Definitions

Closed Transition: Closed transition is a feature that will temporarily parallel two live sources in a make-before-break scheme when performing a transfer. The CTIQ (ATC-800) Transfer will close the switching devices for both sources, paralleling both sources, for a maximum time of 100 milliseconds after the sources are synchronized.

Open Transition/In-Phase Monitor: In-Phase monitor is a feature that will allow a transfer between two sources only when the phase difference between the two sources is near zero. This is an open transition transfer that prevents inrush currents from exceeding normal starting currents in the case where motor loads are being transferred.

Open Transition/Delayed with Load Voltage Decay: Load voltage decay transfer is a feature that, after opening the switch for the original source, holds in the neutral position until the voltage on the load is less than 30% of rated voltage. This is an open transition that prevents inrush currents from exceeding normal starting currents in the case where motor loads are being transferred.

Operation

The Cutler-Hammer CTIQ (ATC-800) Transfer operates in the following modes to meet most load management applications:

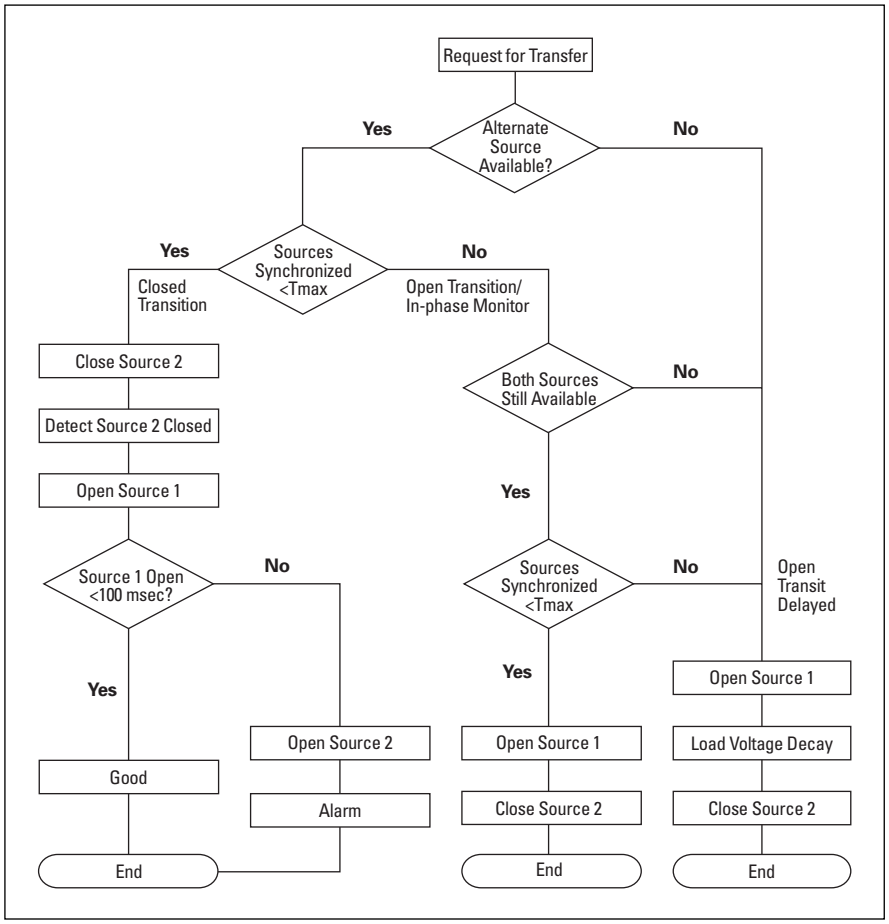
- Loss of Normal Power
  - Open Transition to Alternate Source
- Normal Power Restored
  - Closed Transition back to Normal Source
- Peak Shave (Remote or Local)
  - Closed Transition to and from Alternate Source
- Test (User Selectable)
  - Load Transfer – Closed Transition to and from Alternate Source
  - No-Load Transfer – Starts Alternate Power Source and Allows to Run Unloaded. No Transfer Takes Place

Programming and Options

Closed Transition Operation Modes

Feature Set 47C Closed/In-Phase/ Load Voltage Decay

CTIQ (ATC-800) Transfer controllers equipped with Feature Set 47C execute the following sequence of operations upon receipt of a request for transfer: the controller waits (for a pre-selected time frame) for synchronization of voltage and frequency. If achieved, a closed transition transfer occurs. Failure to synchronize results in the controller defaulting to an in-phase monitor, open transition, mode of operation. If the two sources fail to achieve frequency synchronization within the user selectable range, the controller defaults to an open transition using a Load Voltage Decay delayed transition.

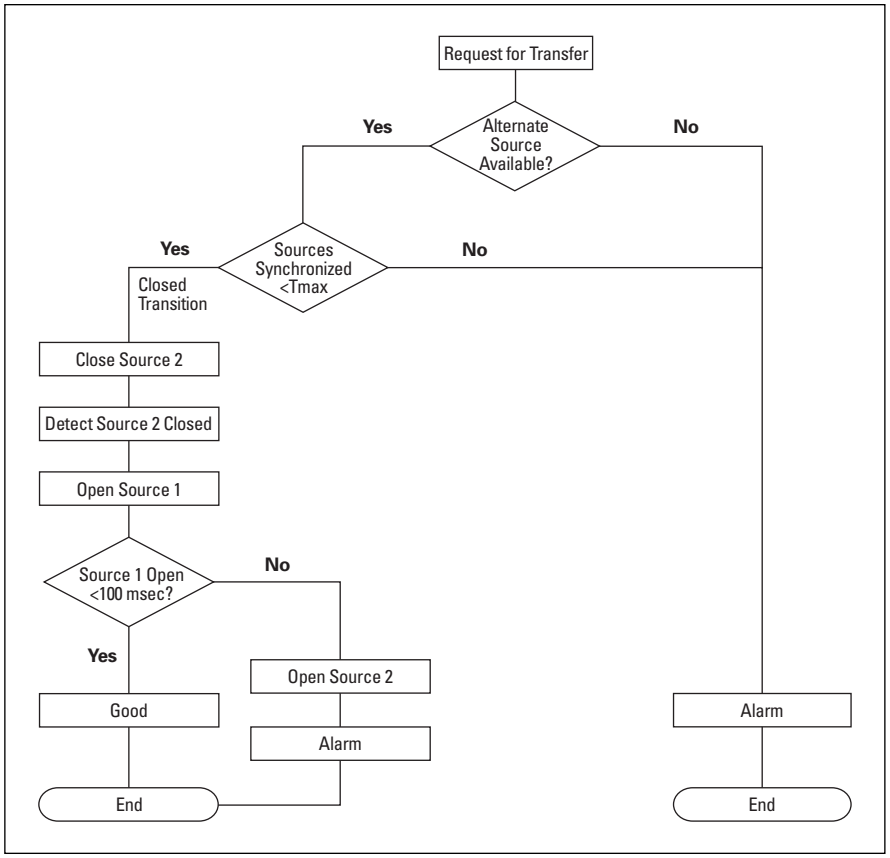


Standard Features	Customer Adjustments
Closed Transition Frequency Difference (Hz)	0.0 to 0.3 Hz
Closed Transition Voltage Difference (Volts)	1 to 5%
In-phase Transition Frequency Difference (Hz)	0.0 to 3.0 Hz
Closed Transition Synchronization Timer	1 to 60 Minutes
In-phase Transition Synchronization Timer	1 to 60 Minutes

Programming and Options, *Continued*

Feature Set 47D Closed Only

CTIQ (ATC-800) Transfer controllers equipped with Feature Set 47D only transfer to an alternate source when both sources are synchronized. For synchronization to occur, both voltage and frequency differentials must fall within the user selectable ranges. If synchronization does not occur (within a pre-selected amount of time) the controller will maintain load connection to the current power source and initiate an alarm.



Standard Features	Customer Adjustments
Closed Transition Frequency Difference (Hz)	0.0 to 0.3 Hz
Closed Transition Voltage Difference	1 to 5%
Closed Transition Synchronization Timer	1 to 60 Minutes

Standard and Optional Features

Quick Summary of Closed Transition IQ (ATC-800) Transfer Factory Options and Customer Adjustments
The following charts illustrate standard features of a CTIQ Transfer unit as well as factory installed optional features.

Standard Features	Feature Number	Customer Adjustments
Voltmeter for Source 1	–	–
Voltmeter for Source 2	–	–
Voltmeter for Load	–	–
Frequency Meter for Source 1	–	–
Frequency Meter for Source 2	–	–
Under Voltage Sensing on Source 1	–	1-Phase or 3-Phase – Depending on System Voltage Dropout Voltage – 90% of Nominal to 50% of Nominal Pickup Voltage – 100% of Nominal to (Dropout + 2%)
Under Voltage Sensing on Source 2	5J	1-Phase or 3-Phase – Depending on System Voltage Dropout Voltage – 90% of Nominal to 50% of Nominal Pickup Voltage – 100% of Nominal to (Dropout + 2%)
Under Frequency Sensing on Source 2	5J	Dropout Frequency – 100% of Nominal to 90% of Nominal Pickup Frequency – 110% of Nominal to (Dropout + 1 Hz)
Time Delay Normal to Emergency	1	Adjustable 0-1800 Seconds
Time Delay Emergency to Normal	3	Adjustable 0-1800 Seconds
Time Delay Engine Start	2	Adjustable 0-120 Seconds
Time Delay Engine Cooldown	4	Adjustable 0-1800 Seconds
Time Delay Emergency Failure	7	Adjustable 0-6 Seconds
System Selection	–	Utility/Generator or Dual Utility or Dual Generator
Position Indicators	12C, 12D	–
Source Availability Indicators	12G, 12H	–
Preferred Source Indicator	–	–
Load Energized Indication	–	–
History		
Source Availability Time	–	–
Source Run Time	–	–
Source Connected Time	–	–
Load Energized Time	–	–
Number of Transfers	–	–
Date, Time, and Reason for last 16 Transfers	–	–
Viewable Setpoints	–	–
PowerNet Capability	–	Communications via PowerNet on Personal Computer
Real-Time Clock	–	Set Time and Date
Programmable Engine Test	6	Run Engine Only or Load Test
Remote Alarm Contact	–	–
Auxiliary Relay Contacts	14C, 14D	–

Optional Features	Feature Number	Customer Adjustments
Over Voltage Sensing on Source 1	26C	Dropout Voltage – 120% of Nominal to 105% Pickup Voltage – 95% of Nominal to (Dropout – 2%)
Over Voltage Sensing on Source 2	5E	Dropout Voltage – 120% of Nominal to 105% Pickup Voltage – 95% of Nominal to (Dropout – 2%)
Under Frequency Sensing on Source 1	26E	Dropout Frequency – 100% of Nominal to 90% of Nominal Pickup Frequency – 110% of Nominal to (Dropout + 1 Hz)
Over Frequency Sensing on Source 1	26F	Dropout Frequency – 120% of Nominal to 100% of Nominal Pickup Frequency – 90% of Nominal to (Dropout – 2%)
Over Frequency Sensing on Source 2 (Also includes Over Voltage Sensing on Source 2	5K	Dropout Frequency – 120% of Nominal to 100% of Nominal Pickup Frequency – 90% of Nominal to (Dropout – 2%)
Time Delay Bypass Pushbutton	8C or 8D	–
Manual Return to Source 1	29E	–
Preferred Source Selection	10B or 10D	Selectable – Source 1 or Source 2 or None
Maintenance Selector Switch	9	–
Plant Exerciser with Real-Time Clock	23J	Set Mode (Load or No-Load Test) with Fail Safe and Time and Day of Exercise
Interruptible Rate (Area Protection)	26D	–
Inhibit to Emergency	36	–
Load Sequencing	45	Up to 10 Devices
Pre-transfer Signal	35	Time Delay Initiated or Confirmation Initiated (up to 10 Devices)
Phase Rotation (Contact Factory for Availability.)	5H or 26H	–

Closed Transition and The PowerNet System

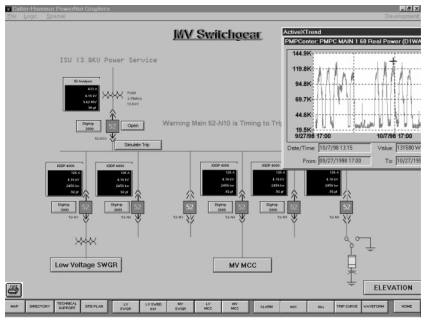
IQ Transfer

Cutler-Hammer IQ Transfer (ATC-800) Switches through PowerNet allow remote monitoring of emergency, normal and load voltages, transfer status, transfer times and load energized time. Transfer switch current settings are easily verified, generator exercise schedules are verified and easily documented and loads can be shed before transferring to emergency sources.

Power Quality

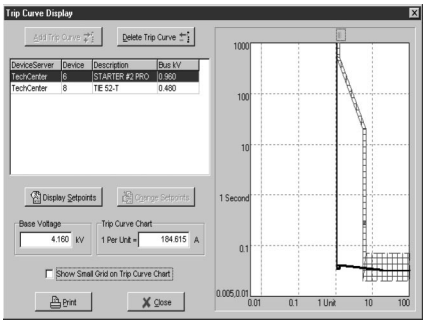
Monitoring, Event Triggering and Waveform Snapshot

Information and Systems Integration



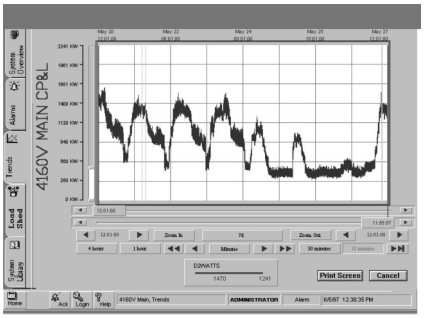
- Graphical one-line, elevation, and site plan interface
- Multi-vendor capable
- Real-time monitoring
- Scripting language
- Event logging
- Trending and reporting

Reliability and Uptime



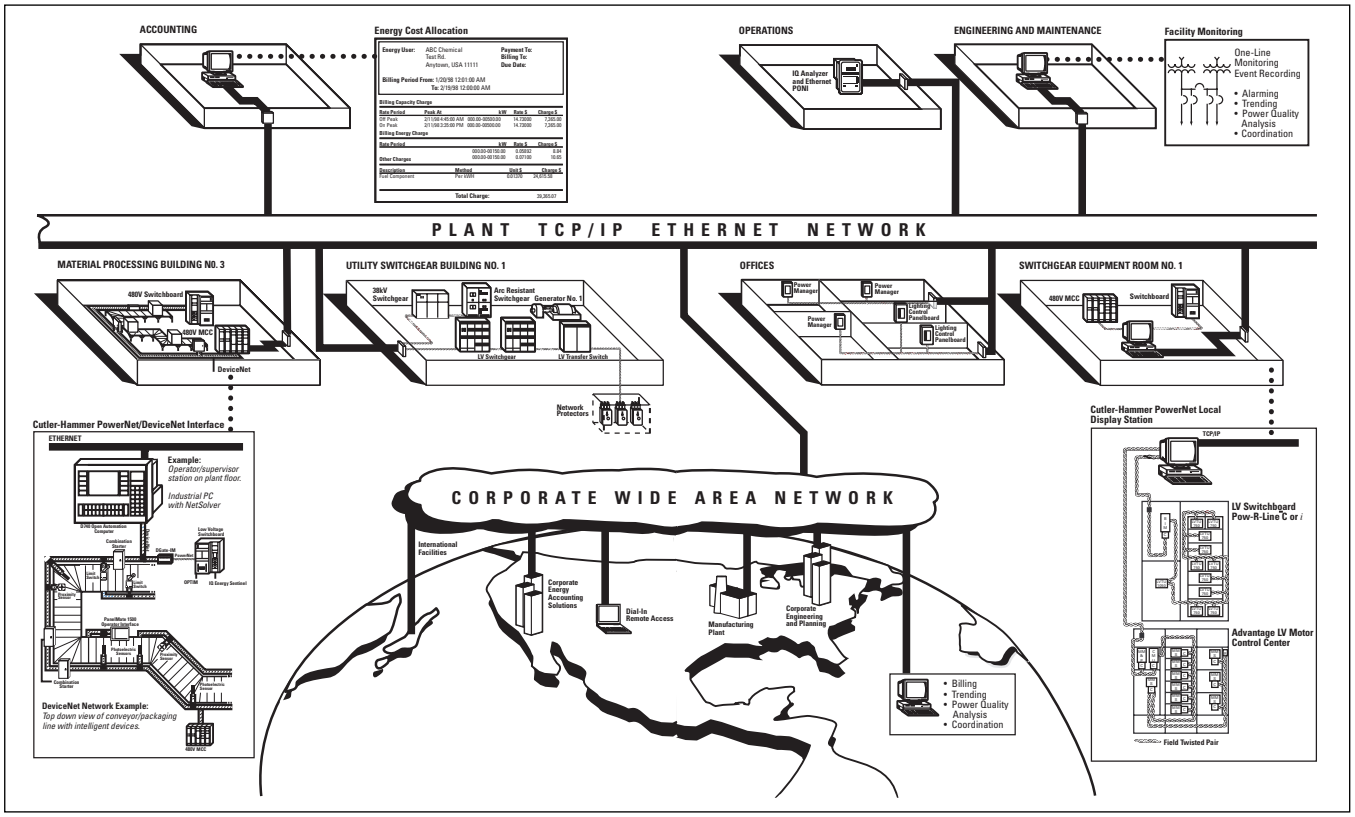
Online Coordination Verification Alarming and Paging

Energy Management



Load Profiling, Cost-allocation, Load Shifting, Arc Shredding and Peak Shaving

Using PowerNet, You Can Communicate with Your ATS and Other Electrical Distribution Assemblies



Programmable Features/Set Points

All Available Programmable Features/Set Points (Order Specific)

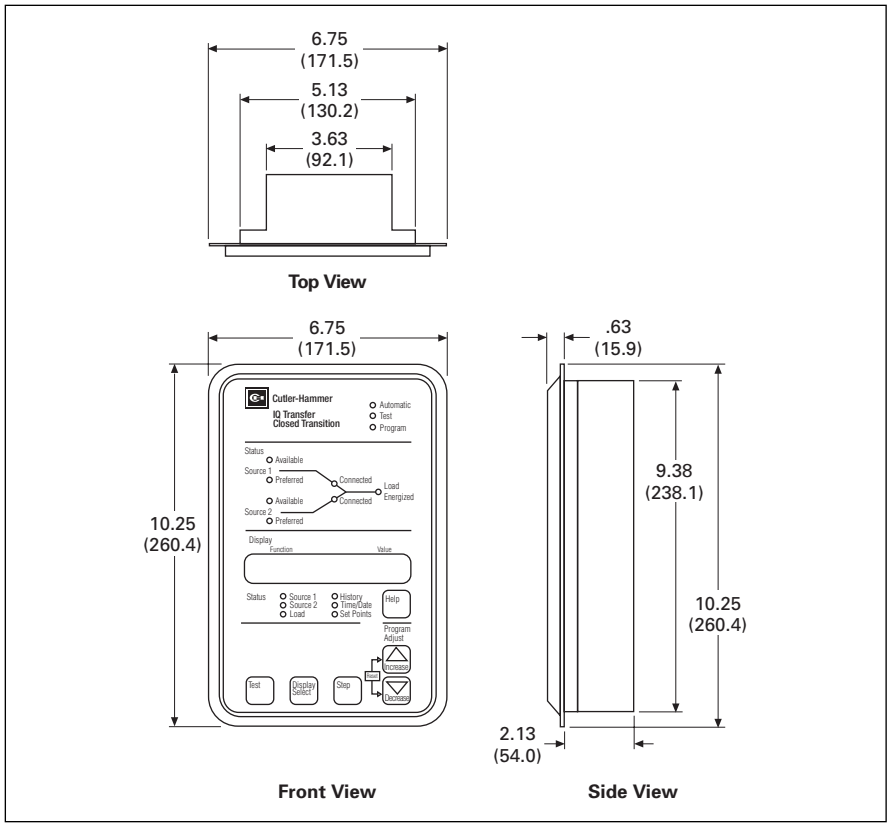
Programmable Feature Display	Set Point Possibilities	Display Explanation
TDES TDNE TDEN TDEC	0 to 120 Seconds 0 to 1800 Seconds 0 to 1800 Seconds 0 to 1800 Seconds	Time Delay Engine Start Timer Time Delay Normal to Emergency Timer Time Delay Emergency to Normal Timer Time Delay Engine Cooldown Timer
NOMF NOMV	50 or 60 Hz 120 to 600V	System Nominal Frequency (Hz) System Nominal Voltage (volts)
1UVD 2UVD 1UVP 2UVP	97% to 50% of Nominal 97% to 50% of Nominal (Dropout +2%) to 99% (Dropout +2%) to 99%	Source 1 Under Voltage Dropout (volts) Source 2 Under Voltage Dropout (volts) Source 1 Under Voltage Pickup (volts) Source 2 Under Voltage Pickup (volts)
1OVD 2OVD 1OVP 2OVP	105% to 120% 105% to 120% 103% to (Dropout – 2%) 103% to (Dropout – 2%)	Source 1 Over Voltage Dropout (volts) Source 2 Over Voltage Dropout (volts) Source 1 Over Voltage Pickup (volts) Source 2 Over Voltage Pickup (volts)
1UFD 2UFD 1UFP 2UFP	90% to 97% 90% to 97% (Dropout +1 Hz) to 99% (Dropout +1 Hz) to 99%	Source 1 Under Frequency Dropout (Hz) Source 2 Under Frequency Dropout (Hz) Source 1 Under Frequency Pickup (Hz) Source 2 Under Frequency Pickup (Hz)
1OFD 2OFD 1OFP 2OFP	103% to 110% 103% to 110% 101% to (Dropout – 1 Hz) 101% to (Dropout – 1 Hz)	Source 1 Over Frequency Dropout (Hz) Source 2 Over Frequency Dropout (Hz) Source 1 Over Frequency Pickup (Hz) Source 2 Over Frequency Pickup (Hz)
TDN	0 to 120 Seconds	Time Delay Neutral Timer
TDNLD	0 = Disabled 1 = Enabled	Time Delay Neutral Load Decay
LDCY	2% to 30% of Nominal Voltage	Load Decay Voltage
PRF SRC	None 1 = Source 1 2 = Source 2	Preferred Source
EXER	1 = Enabled 0 = Disabled	Plant Exerciser Enabled or Disabled
EXLD	1 = Enabled 0 = Disabled	Load Transfer with Plant Exerciser
PEDAY	1 to 7 (1 = Sunday)	Plant Exerciser Day of Week
PEH	1 a.m. to 11 p.m.	Plant Exerciser Hour
PEMIN	0 to 59 Minutes	Plant Exerciser Minute
MANTR	0 = Automatic 1 = PB Return	Re-transfer Mode
CTDNE	0 = Not Committed 1 = Committed	Commitment to Transfer in TDNE
TMODE	0 = No Load Transfer 1 = Load Transfer 2 = Disable Test Pushbutton	Engine Test with/without Load Transfer
TER	0 to 600 Minutes	Engine Test/Plant Exerciser Run Time
TPRE	1 to 120 Seconds Time Delay	Pretransfer Sub-network
GENNO	0 to 2 (Single Generator must be on Source 2)	Number of Generators
PHASE	1 or 3	Number of System Phases
TSEQ	1 to 120 Seconds	Time Delay Load Sequencing
PT	2:1 to 500:1	PT Ratio
CLOSED	1 = Enabled 0 = Disabled	Closed Transition Enabled or Disabled
CTFD	0.0 to 0.3 Hz	Closed Transition Frequency Difference (Hz)
CTVD	1% to 5%	Closed Transition Voltage Difference (volts)
IPHASE	1 = Enabled 0 = Disabled	In-Phase Transition Enabled or Disabled
IPFD	0.0 to 3.0 Hz	In-Phase Transition Frequency Difference (Hz)
SYNC	1 to 60 Minutes	Closed/In-Phase Transition Synchronization Timer
TDEF	0 to 6 Seconds	Time Delay Emergency Fail

IQ Upgrade Module

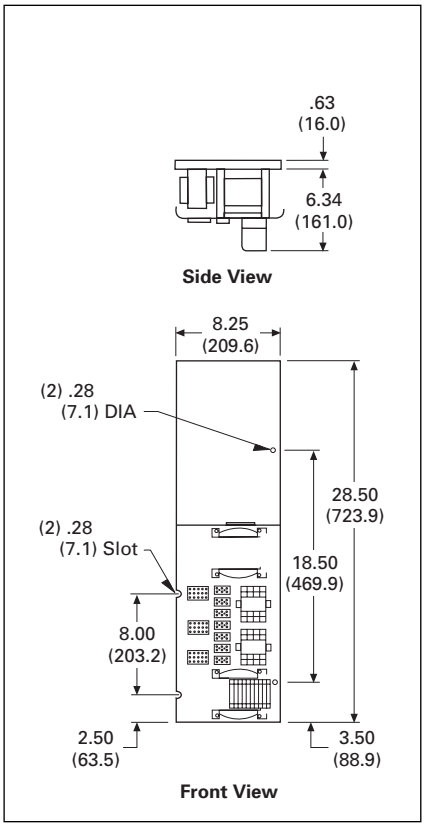
If an optional feature needs to be added after a transfer switch is in the field, contact the factory for availability of field upgrades with the IQ Transfer Options Upgrade Module. This module can download new programs into the Closed Transition IQ Transfer (ATC-800) via connection to the communication module connector on the rear of the IQ device.

IQ Transfer Options Upgrade Module

Dimensions in Inches (mm)



Closed Transition IQ Transfer (ATC-800)



Typical Transformer Panel

Dimensions are approximate and should not be used for construction purposes (1 inch = 25.4 mm).

Notes

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