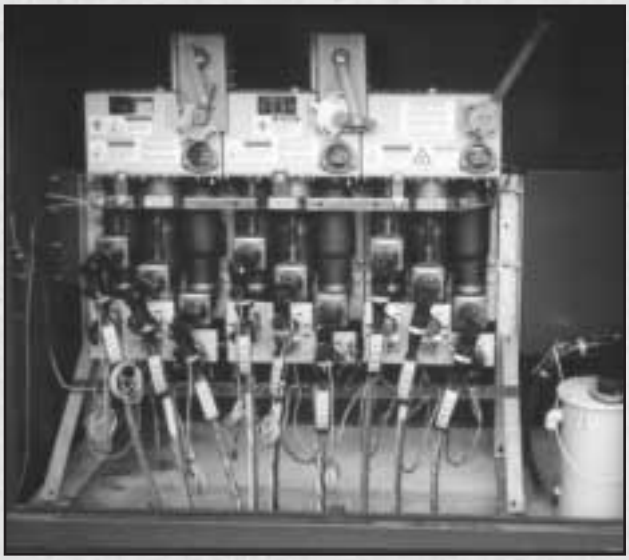
G&W ELECTRIC CO.

AUTOMATIC TRANSFER CONTROL PACKAGES

For transfer times within cycles or seconds.



Automatic transfer solid dielectric switch with integral PT.

Automatic transfer controls can be combined with RTUs for remote SCADA applications.

STANDARD FEATURES

- Variety of switchgear and control options for customized ATC solutions
- Keypad or dial control interface
- SCADA ready
- Generator source settings
- User-selectable common bus or bus-tie configurations
- Programmable overcurrent lockout feature blocks operation into downstream faults
- User-friendly controls for settings and operations
- Automatic and remote lockout for local operator safety
- Total transfer times as fast as 8 cycles
- Sequence of events recorder

2004 Edition

Catalog SG3-ATC03

GW20-SG3-ATC03
August, 2003
Supersedes SG3-ATC99

Automatic Source Transfer Controls

For G&W Switchgear

The age of technology has increased our dependence on electricity for everyday activities. Loss of electric power translates not only into a loss of comfort and convenience, but also into a loss of profits. The purpose of automatic source transfer controls (ATCs) is to minimize or eliminate outages by providing a means of automatically transferring from one source to another. G&W offers a variety of automatic transfer control (ATC) packages that provide customized features for feeding critical load customers or systems. Typical installations include hospitals, airports, processing plants, hotels, and government sites.

ATC requirements vary from installation to installation. Some emphasize transfer time, others require a standby generator as an alternate source of power, while still others need SCADA integration, submersibility, or a small footprint because of confined space limitations. G&W provides flexible, custom power solutions – from switchgear to ATC packages.

ATC Switchgear

ATC controls are available for all types of G&W multi-way switchgear. Switches can be vault, pad, or pole mount styles with either EPOX® solid dielectric or SF6 insulation. The two incoming source switches may be located in one switch, or in two separate switches for added redundancy. Automating a manual switch for ATC applications begins with the actuators. Motor actuators provide the means to remotely and automatically open and close the two incoming source switches. G&W provides 3 types of actuators – each providing a different operation speed.

Standard Motor Actuators

Motor actuators are externally mounted devices that attach to the operating shaft of a G&W switch. The motor turns to charge the operating springs of the switch mechanism and then reaches the toggle point when the mechanism latch throws and operates the switch. Open and close position indication is sent back to the ATC control. Typical operation speed of the motor actuator is 3 seconds. This translates into a total transfer time of approximately 8 seconds*.

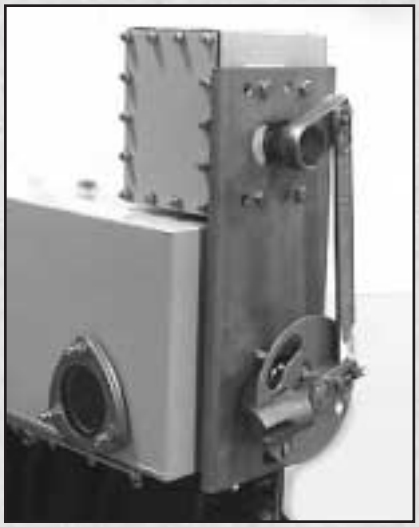
Motor Actuators with Cock-and-Trip Mechanism

Motor actuators may also be provided with SF6 switches incorporating an internal stored-energy mechanism. In this offering, the actuator springs inside the switch are already charged. When the control sends an operation command to the switch, the mechanism latch is released and the switch operates immediately. The motor actuator then recharges the springs, awaiting the next operation command. Typical operation speed of the motor actuator with the cock-and-trip mechanism is under 2 cycles. This translates into a total transfer time of approximately 10 cycles*.

Magnetic Actuators

Powerful and efficient magnetic actuators may be provided for fast auto transfer switching. Like the cock-and-trip mechanism, it is charged and ready to operate immediately upon a control command. However, this mechanism does not have a 3 second motor recharge delay prior to its next operation. Typical operation speed of the magnetic actuator is about 1 cycle. This translates into a total transfer time of approximately 8 cycles*.

**Total transfer time is the sum of the voltage sensing time, twice the mechanism operating time (for a true open transition sequence), and the control processing time. This value will vary only slightly with different combinations of sensors, mechanisms and conrol packages.*



Top mounted motor actuator on a solid dielectric switch.

Top mounted motor actuator on a SF6 gas switch.

Front mounted actuator with cock-and-trip mechanism on an SF6 switch.

System Configurations

Primary-Selective Configuration (Figure 1)

The most common auto transfer system is a primary-selective, or common bus configuration – shown in Figure 1. In this scenario, actuators and voltage sensors (analog or digital type) are installed on the switches for incoming source 1 and incoming source 2. One of the source switches is normally closed (feeding the load), and one is normally open (waiting as a standby, or alternate source). If the load way(s) are load break only (non-fault-interrupting devices), optional faulted circuit indicators may be added for downstream fault indication. All of these devices are wired into the ATC control.

Preferred/Alternate Setting: Either of the incoming sources may be programmed as the preferred, or primary source. In this setting mode, the preferred source switch is normally closed, and the alternate source switch is normally open. Voltage sensors interface with the ATC to indicate the source voltages as either "live" or "dead." If the preferred source voltage is dead, the ATC will initiate a transfer to the alternate source, providing that its voltage is live. When the preferred source voltage is live again, the ATC will initiate a transfer back to the preferred source. These transfers will occur in "open-before-close" or "close-before-open" user-programmable operation sequences.

Non-Preferred Setting: Certain ATC applications do not require a preferred source. In this setting mode, the ATC will only initiate a transfer if the source that is feeding the load is dead. There is no return transfer when a non-preferred mode is selected.

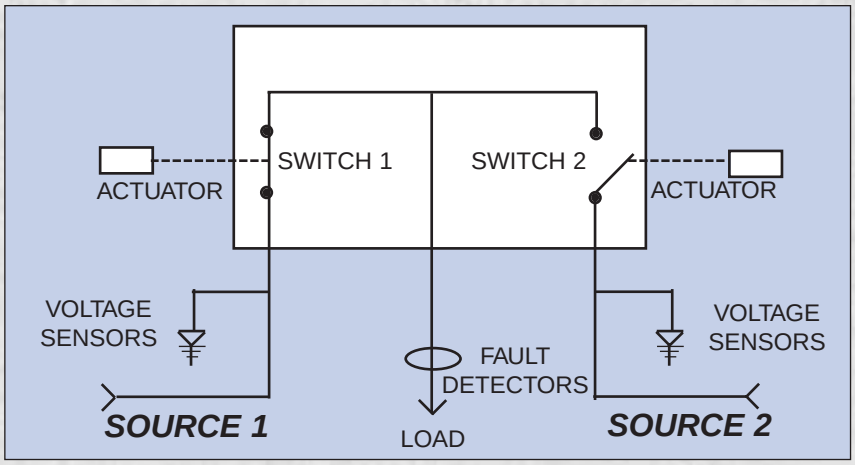


Figure 1: Primary-Selective configuration

Bus-Tie Configuration *(Figure 2)* Bus-tie systems split the load into two sections. One of the load sections is fed by normally-closed incoming source 1 and the other load section is fed by normally-closed incoming source 2. A normally-open switch (bus-tie switch) separates the two sections. Actuators are installed on switches for source 1, source 2, and the bus-tie. Voltage sensors (analog or digital) are installed on the two incoming source switch ways. If the load ways are load break only, optional faulted circuit indicators may be added for down- stream fault indication. All of these devices are wired into the automatic transfer control.

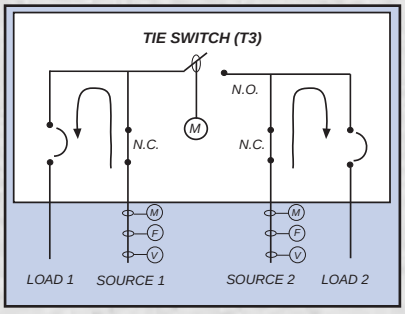


Figure 2: Bus-tie configuration

In bus-tie ATC systems, if either source is dead (and the remain ing source is live), the control will initiate a transfer by opening the dead source switch and closing the bus-tie switch. Once the source is live again, the control will transfer back to its normal state by opening the bus-tie switch and closing the source switch. These transfers will occur in "open-before-close" or "close-before-open" user-programmable operation sequences.

Generator Source Configuration

In some ATC applications, rather than two utility sources, a generator is used as the alternate source. In this application, once the utility source is dead, the control will automatically issue a start command to the generator. It will then monitor the incoming voltage from the generator, initiating a transfer to the generator source only after it measures a live source. When the utility source is live again, the ATC control will initiate a return transfer operation. Simultaneously, it will issue a stop, or cool-down command to the generator.

Custom ATC Configurations

While a majority of the auto transfer applications will fall within the previous three categories, there is a need for specialized ATC configurations. G&W provides custom ATC schemes that include integral SCADA systems and distributed source applications.

ATC 101 Control

Features

- User-friendly system interface, minimal training required
- All ATC logic parameters user-configurable
- Generator source settings
- Integral SCADA contacts for ease of automation
- Individual timing delays for source 1 and 2
- Test mode operations
- Selectable paralleling of sources operation
- NEMA 4 Enclosure
- Integral battery test under load conditions
- Battery back-up to AC input power
- Emergency return functionality

Options

- Sequence of events recorder
- NEMA 4X enclosure
- NEMA 6P enclosure
- Integrated with user-selected RTU or protocol preference for full SCADA operations
- *Faulted Circuit Indicators*

For switchgear configurations with unprotected load taps, three clamp-on style detectors can be provided for downstream fault indication. The cables from these devices can be wired into the ATC controls to prevent operating the switchgear into a downstream fault. Faulted circuit indicators may not be required for G&W vacuum fault interrupter load tap ways.

LEGEND - *See drawing page 5.*

1. System One-Line Diagram and Status Indication:
LED indication of source voltages live (green) or dead (red), and switch open and closed position indications.

2. Timing Selector Switches:
Configurable individual initial transfer and return transfer delay timers help to coordinate with allowable distribution voltage variances.

3. Operation Mode Selector:
Manual mode deactivates the auto transfer logic and operations, while auto mode activates it. The test mode is used for commissioning or routine checks of the ATC. Local mode deactivates all remote SCADA operations, while remote mode activates SCADA operations.

4. Manual Mode Controls:
Local operator can use the toggle switch/push buttons to open and close source switches 1 and 2.

5. Generator Settings:
Either source may be programmed to be a generator. The user selects the generator source and the cool down time.

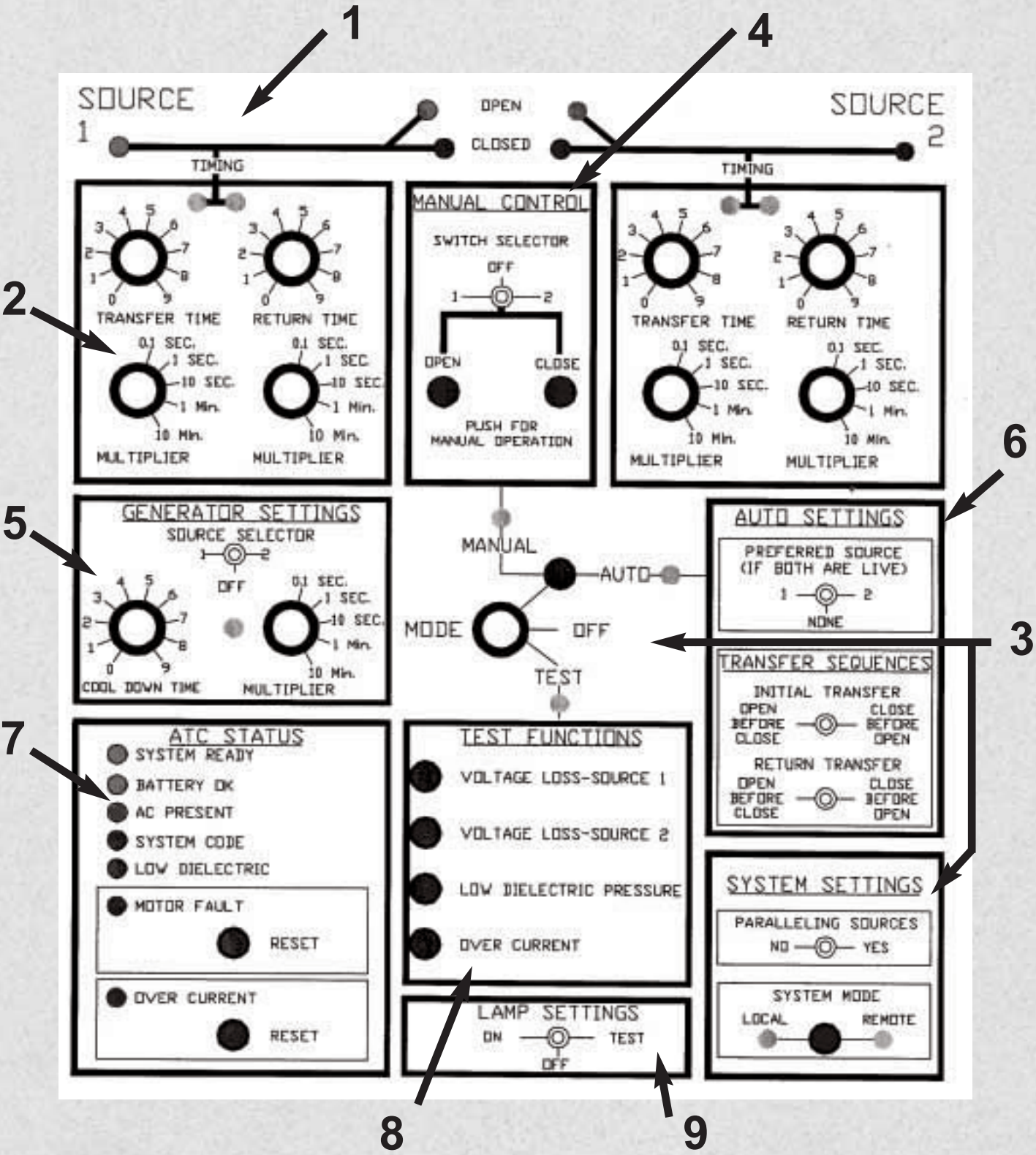
6. Auto Mode Logic Settings:
The user programs a primary-selective system – by choosing source 1 or 2 as the preferred source; or a non-preferred system, which blocks automatic return transfers. Initial and return transfer sequences are programmed as either open transition (open-before-close), or a closed transition (close-before-open) sequence. The paralleling sources parameter is set to either permit or to prohibit source 1 and source 2 switches from being closed at the same time (sources paralleled).

7. ATC Status:
LEDs provide an easy reference for system operating conditions. The operator can easily determine if the control is ready for ATC transfers, if the AC and DC power supplies are adequate, or if there is an error condition. Overcurrent and actuator faults are reset with manual push buttons.

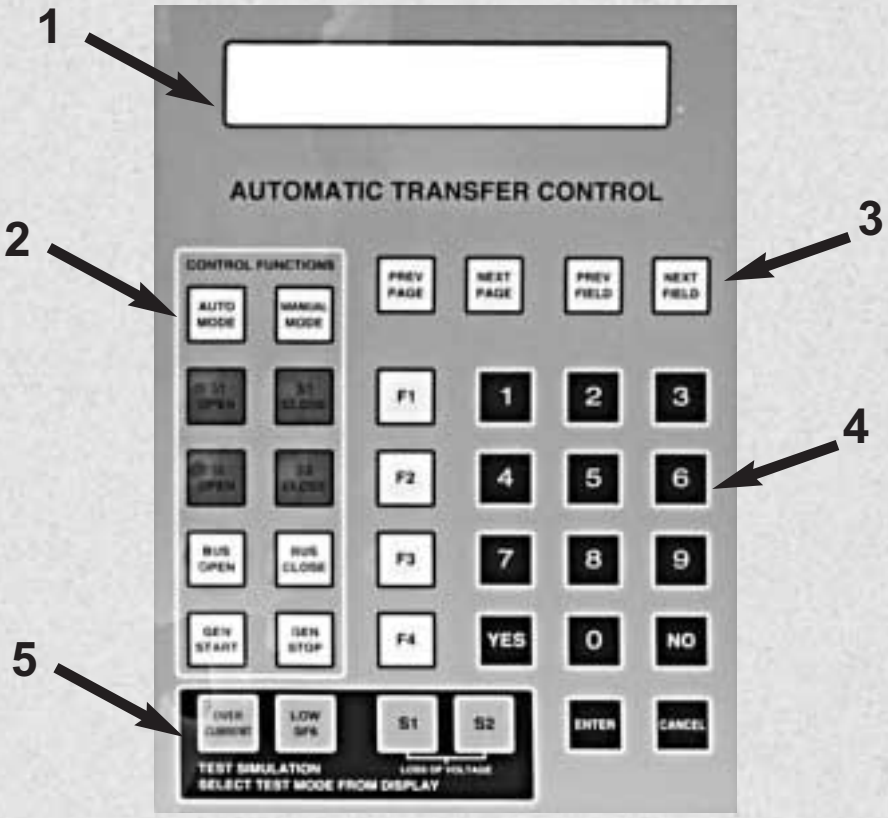
8. Test Functions:
Push buttons simulate loss of voltage for both source 1 and 2, an overcurrent condition, and a low dielectric alarm.

9. Lamp Settings:
Toggle switch turns LED lamps on or off, or performs a momentary test of LED function.

ATC 101 CONTROL PANEL



ATC 201 CONTROL PANEL



ATC 201 Control

Features

- User selection between primary-selective and bus-tie
- Initial transfer delay timers for source 1 and source 2
- Return transfer selection between delay timer and time-of-day window
- Sequence of events recorder
- Generator source settings
- Integral SCADA contacts for ease of automation
- Test mode operations
- NEMA 4 enclosure
- Integral battery test under load
- Battery back-up to AC input
- Emergency return function

Options

- NEMA 4X enclosure
- NEMA 6P enclosure
- Integrated with user-selected RTU or protocol preference for full SCADA operations

Voltage Sensing

Monitoring of source 1 and source 2 voltage can be done with digital voltage sensors mounted to the elbow capacitive test points or with analog voltage sensor resistive devices mounted to the elbow BIP connections. Alternatively, potential transformers can provide analog voltage measurements.

- ***Faulted Circuit Indicators***

For switchgear configurations with unprotected load taps, three clamp-on style detectors can be provided for downstream fault indication. The cables from these devices can be wired into the ATC controls to prevent operating the switchgear into a downstream fault. Faulted circuit indicators may not be required for G&W vacuum fault interrupter load tap ways.

LEGEND

1. Display Screen:
Provides system one-line diagram, indication of source 1 live or dead, source 2 live or dead, switch open and close indications, system mode, and parameter selections.

2. Control Functions:
Permits opening and closing of source 1 switch, source 2 switch, and the bus-tie switch. Provides manual generator start and stop controls, and auto mode and manual mode selections.

3. Scroll Keys:
Navigation buttons to move user through the different programming pages and fields.

4. Keypad:
Used to enter settings and confirm or cancel selections.

5. Test Mode Keys:
Used to simulate system conditions in the test mode.

Typical Specifications

GENERAL

The automatic source transfer control (ATC) is designed to work with G&W SF6 and solid dielectric switchgear in primary selective or bus-tie system configurations. The control monitors two separate source voltages and their respective switch positions. When the source voltage is dead, the control automatically transfers electrical power to minimize the duration of power outages.

OPERATION

***Primary-Selective System*:** The load(s) are combined on one solid bus and are all normally fed from a single source. The first source switch feeding the load(s) is normally closed and the second source switch (acting as the alternate, or backup source) is normally open. When the first source is lost, the control will open the primary switch and close the second switch, thereby restoring power to the load(s) from the alternate source.

***Bus-Tie System*:** The loads are divided between the two sources and the bus is split with a normally open tie switch. The first source switch is normally closed and feeds load 1, while the second source switch is normally closed and feeds load 2. The loads are sized such that if either of the two sources are lost, the control will open that switch and close in the bus tie switch, thereby feeding both loads from the one live source. ATC 201 only.

***Emergency Return Function*:** If the preferred source is lost, the control transfers over to the alternate source. After some time, the preferred source returns and the control begins the return transfer delay timer (or waits for the time-of-day window setting). During this timing process, the alternate source is lost. Under this circumstance, the control will ignore the remainder of the return transfer delay timer and will immediately transfer back to the preferred source in an open transition mode (open the alternate source before closing the preferred source switch) - regardless of how the normal return or initial transfer operation sequence is set.

SETTINGS FEATURES

The control logic parameters are field selectable and determine the specific operation sequence, timing, and source preference for the auto transfer operations. The parameter selections are as follows:

***System Configuration Selection*:** User selects between a Primary-Selective (Combined Load) and a Bus-Tie Configuration. This applies to ATC 201 only.

Preferred Source Selection: The choices for this setting are: SOURCE 1, SOURCE 2, or NONE. When a source is selected as "Preferred," the control will always try to serve the load from this source (as long as this source is live). If the preferred source is lost, the control will transfer to the alternate source (as long as that source is live). If the user selects NONE in this setting, the control will only perform initial transfers.

Operation Sequence Selection Initial and Return Transfers: The choices for these setting are: "OPEN before CLOSE" or "CLOSE before OPEN." The selection determines if the sources will be paralleled or not during an operation sequence.

Initial and Return Transfer: Delay Timers and Time-of-Day Window

The user selects a countdown timer setting to add a delay from the time the voltage is dead and the time the switch begins the transfer. In the ATC 201, the user selects between a countdown delay timer and a time-of-day window for the return transfer operation.

Paralleling of Sources Setting: The user will be able to select between Yes and No. A Yes setting will allow the control to have both source switches closed at the same time. If a No is selected, the user will not be able to close both switches at the same time.

Auto/Manual Mode Setting: If the user selects the Auto Mode, the automatic transfer logic is enabled. No manual electrical open or close operations are allowed, and the control will only respond to the automatic transfer logic. The Manual Mode disables the automatic transfer logic and (in combination with the Local Mode) allows the user to use the local electronics to open and close the switches manually. In combination with the Remote Mode setting, the user is allowed to open and close the switches via remote SCADA.

Local/Remote Setting: If the user selects the Local Mode, all remote access is blocked from the unit. If the user selects the Remote Mode access to the control is allowed.

Test Mode Setting: While in the Test Mode, the user is able to simulate the loss and return of both sources, simulate a low dielectric condition, and simulate an overcurrent. If the actuators can be decoupled, the test mode will also operate them to test the complete system, without actually operating the switches.

Specifications cont.

Overcurrent Lockout: If the overcurrent lockout input is activated, the control is blocked from performing any local, remote, or automatic operations. The overcurrent inputs will come from either a digital (ATC 101 and ATC 201) or analog source (ATC 201 only) that will activate when this device detects a downstream fault. The condition is reset locally at the control once the fault condition has been removed.

Low Dielectric Condition: This feature is applicable for SF6 switches only. If the low dielectric input is activated, the control is blocked from performing any local, remote, or automatic operations and will automatically reset itself once the low dielectric condition is removed.

Voltage Sensing: Three-phase voltage monitoring is required on both sources. This control will accept either digital (ATC 101 and ATC 201)or analog (ATC 201 only) voltage sensing for each source. If any one of the 3 phases is lost, the source will indicate dead. All 3 sources need to be live for a live source indication.

Generator Source Feature: The user will have the ability to set Source 1, Source 2, or NONE as a generator. In this case, when the preferred source is lost and the initial transfer delay timer has expired, the control will activate (close) the Generator Start Contact. The customer will connect this contact to their generator. Once the generator is up and running, its voltage sensors will activate as a good source. The control will then initiate the transfer from the utility source to the generator alternate source. Once the preferred source returns and the return transfer delay timer expires, the control will:

1. Initiate the return transfer to the preferred source; and

2. Begin the Generator Cool Down Timer.

When the timer expires, the control will activate the Generator Stop Contact.

Events Recorder: Each ATC 201 will have an internal sequence of events recorder. The most recent events are logged with a time/date stamp. The sequence of events recorder is an option for the ATC 101.

USER-INTERFACE AND FRONT PANEL

For the ATC 101, all settings and operations of the control may be viewed and adjusted without the use of a keypad/display or any other tools. The ATC 201 will have a keypad/LCD inferface. Both ATC controls will provide system status, parameter settings, local manual operation, test mode operation, and SCADA outputs all integral in one control.

ENCLOSURE

The standard enclosure is rated NEMA 4, and is water-tight, non-condensing, and pad lockable. NEMA 4X and 6P enclosures are available as options.

STANDARDS

The ATC package is rated for -30ºC to +65ºC. The control shall meet applicable sections of the following standards:

- ANSI/IEEE C37.90.2
- ANSI/IEEE C37.90.1
- IEC 60255-22-2
- IEC 60255-21-1 First Edition – 1998
- IEC 60255-21-2 First Edition – 1998

SCADA OUTPUTS

These controls will have a pre-wired terminal block for easy access and connection to an external RTU. The terminal block will have all of the digital status points available from the control and control outputs so the user can remotely take control over the switch and operate the two switch mechanisms open or closed.

ISO 9001:2000 and 14001 Certified Company

G&W ELECTRIC CO.
3500 W. 127th Street
Blue Island, IL 60406
(708) 388-5010
FAX (708) 388-0755
Web site: gwelec.com

G&W ELECTRIC CO.

SHANGHAI G&W ELECTRIC LTD
351 Guoshoujing Road
Zhangjiang Hi-Tech Park
Pudong, Shanghai, China 201203
+86-21-5080-0606
FAX: +86-21-5080-0219
Web site: gwelec.com.cn

August 2003

Printed in U.S.A.