Field Programming and Operation

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Note: Micro-AT control instruction sheets are posted as PDF files at **sandc.com/en/support/product-literature/.** Matlink™ software (all revisions) and the Human Machine Interface (HMI) software application installer (for Wi-Fi adapter users) are available for download at **sandc.com/en/support/sc-customer-portal/.** If assistance is needed, contact **customerportal@sandc.com,** or call (800) 621-5546.

Qualified Persons

⚠ WARNING

Only qualified persons who are knowledgeable in the installation, operation, and maintenance of overhead and underground electric distribution equipment, along with all associated hazards, may install, operate, and maintain the equipment covered by this publication. A qualified person is someone who is trained and competent in:

- The skills and techniques necessary to distinguish exposed live parts from nonlive parts of electrical equipment
- The skills and techniques necessary to determine the proper approach distances corresponding to the voltages to which the qualified person will be exposed
- The proper use of special precautionary techniques, personal protective equipment, insulated and shielding materials, and insulated tools for working on or near exposed energized parts of electrical equipment

These instructions are intended ONLY for such qualified persons. They are not intended to be a substitute for adequate training and experience in safety procedures for this type of equipment.

Read this Instruction Sheet

NOTICE

Thoroughly and carefully read this instruction sheet and all materials included in the product's instruction handbook before installing or operating a Micro-AT Source-Transfer Control. Familiarize yourself with the Safety Information and Safety Precautions on pages 3 and 4. The latest version of this publication is available online in PDF format at **sandc.com/en/support/product-literature/**.

Retain this Instruction Sheet

This instruction sheet is a permanent part of the Micro-AT Source-Transfer Control. Designate a location where you can easily retrieve and refer to this publication.

Proper Application

⚠ WARNING

The equipment in this publication must be selected for a specific application. The application must be within the ratings furnished for the equipment.

Warranty

The warranty and/or obligations described in S&C's Price Sheet 150, "Standard Conditions of Sale–Immediate Purchasers in the United States" (or Price Sheet 153, ""Standard Conditions of Sale–Immediate Purchasers Outside the United States"), plus any special warranty provisions, as set forth in the applicable product-line specification bulletin, are exclusive. The remedies provided in the former for breach of these warranties shall constitute the immediate purchaser's or end user's exclusive remedy and a fulfillment of the seller's entire liability. In no event shall the seller's liability to the immediate purchaser or end user exceed the price of the specific product that gives rise to the immediate purchaser's or end user's claim. All other warranties, whether express or implied or arising by operation of law, course of dealing, usage of trade or otherwise, are excluded. The only warranties are those stated in Price Sheet 150 (or Price Sheet 153), and THERE ARE NO EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ANY EXPRESS WARRANTY OR OTHER OBLIGATION PROVIDED IN PRICE SHEET 150 (OR PRICE SHEET 153) IS GRANTED ONLY TO THE IMMEDIATE PURCHASER AND END USER, AS DEFINED THEREIN. OTHER THAN AN END USER, NO REMOTE PURCHASER MAY RELY ON ANY AFFIRMATION OF FACT OR PROMISE THAT RELATES TO THE GOODS DESCRIBED HEREIN, ANY DESCRIPTION THAT RELATES TO THE GOODS, OR ANY REMEDIAL PROMISE INCLUDED IN PRICE SHEET 150 (or PRICE SHEET 153).

Understanding Safety-Alert Messages

Several types of safety-alert messages may appear throughout this instruction sheet and on labels and tags attached to a Micro-AT Source-Transfer Control. Familiarize yourself with these types of messages and the importance of these various signal words:

⚠ DANGER

"DANGER" identifies the most serious and immediate hazards that will likely result in serious personal injury or death if instructions, including recommended precautions, are not followed.

⚠ WARNING

"WARNING" identifies hazards or unsafe practices that can result in serious personal injury or death if instructions, including recommended precautions, are not followed.

⚠ CAUTION

"CAUTION" identifies hazards or unsafe practices that can result in minor personal injury if instructions, including recommended precautions, are not followed.

NOTICE

"*NOTICE*" identifies important procedures or requirements that can result in product or property damage if instructions are not followed.

Following Safety Instructions

If you do not understand any portion of this instruction sheet and need assistance, contact your nearest S&C Sales Office or S&C Authorized Distributor. Their telephone numbers are listed on S&C's website **sandc.com**, or call the S&C Global Support and Monitoring Center at 1-888-762-1100.

NOTICE

Read this instruction sheet thoroughly and carefully before installing a Micro-AT Source-Transfer Control.

Replacement Instructions and Labels

If additional copies of this instruction sheet are needed, contact your nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

It is important that any missing, damaged, or faded labels on the equipment be replaced immediately. Replacement labels are available by contacting your nearest S&C Sales Office, S&C Authorized Distributor, S&C Headquarters, or S&C Electric Canada Ltd.

⚠ DANGER

The Micro-AT Source Transfer Control operates equipment at high voltage. Failure to observe the precautions below will result in serious personal injury or death.

Some of these precautions may differ from your company's operating procedures and rules. Where a discrepancy exists, follow your company's operating procedures and rules.

1. **QUALIFIED PERSONS.** Access to a Micro-AT Source-Transfer Control must be restricted only to qualified persons. See the "Qualified Persons" section on page 2.
2. **SAFETY PROCEDURES.** Always follow safe operating procedures and rules.
3. **PERSONAL PROTECTIVE EQUIPMENT.** Always use suitable protective equipment such as rubber gloves, rubber mats, hard hats, safety glasses, and flash clothing, in accordance with safe operating procedures and rules.
4. **SAFETY LABELS.** Do not remove or obscure any of the "DANGER," "WARNING," "CAUTION," or "NOTICE" labels.
5. **OPERATING MECHANISM AND BASE.** Do not remove or disassemble operating mechanisms or remove access panels on the Micro-AT Source-Transfer Control unless directed by S&C Electric Company.
6. **ENERGIZED COMPONENTS.** Always consider all parts live until de-energized, tested, and grounded. Voltage levels can be as high as the peak line-to-ground voltage last applied to the unit. Units that have been energized or installed near energized lines should be considered live until tested and grounded.
7. **MAINTAINING PROPER CLEARANCE.** Always maintain proper clearance from energized components.

General

The following instructions are for field programming and operation of the Micro-AT Source-Transfer Control. See Figure 1. This control is designed for use in S&C Metal-Enclosed Switchgear, Source-Transfer Pad-Mounted Gear, and Source-Transfer Vista® Underground Distribution Switchgear in conjunction with power-operated Mini-Rupter® Switches, Alduti-Rupter® Switches, or Vista switchgear to provide automatic source transfer for common-bus or split-bus primary selective systems rated through 34.5 kV.

Note*:* If you are already familiar with the Micro-AT control, you may wish to skip these instructions and just check the quick-reference instructions for changing field adjustable menu items, contained in S&C Instruction Sheet 515-530.

For instructions on the use of the optional **Test Panel** feature for the Micro-AT control catalog number suffix "-Y5", refer to S&C Instruction Sheet 515-505. For instructions on the use of the optional communications card feature (catalog number suffix "-Y8"), refer to Instruction Sheet 515-506. For instructions on the use of the Wi-Fi adapter for applicable Micro-AT controls (kit number TA-3401), refer to S&C Instruction Sheet 515-535.

For instructions for the interrupter switches and associated switch operators, refer to the specific S&C instruction sheets furnished with those devices.

The Micro-AT Source-Transfer Control ensures a high degree of critical-load continuity by minimizing interruptions resulting from the loss of one source. Excluding the intentional time delay to coordinate with upstream protective devices and/or transition dwell time●, transfer is achieved in 10 cycles when the control is combined with power-operated Mini-Rupter Switches, 3 seconds when the control is combined with power-operated Alduti-Rupter Switches, or 6 seconds when combined with motor-operated Vista switchgear load-interrupter switches.

Figure 1. Micro-AT Source-Transfer Control.

● An adjustable time delay to allow motor residual voltage—the voltage appearing at the terminals of a connected motor when the source is interrupted—to drop sufficiently before service is restored.

Common-Bus Primary Selective System Applications

Under normal operating conditions in a common-bus primary-selective system, the preferred-source interrupter switch is closed and the alternate-source interrupter switch is open. See Figure 2 (top) on page 8.

The Micro-AT control monitors the condition of both power sources and initiates automatic loss-of-source transfer switching when preferred-source voltage has been lost (or reduced below a predetermined level) for a period of time sufficient to confirm that the loss is not transient. The preferred-source interrupter switch is automatically opened and the alternate-source interrupter switch is then automatically closed, restoring service to the load.

Following a loss of preferred source that has resulted in a transfer away from the preferred-source and then to the alternate-source, the preferred-source interrupter switch is open and the alternate-source interrupter switch is closed. While in this condition, if the preferred source voltage meets the criteria for being considered normal but has not yet been normal for a sufficient period of time to satisfy the return-of-source time setting and the alternate-source is lost (or reduced below a predetermined level) for a period of time sufficient to confirm that the loss is not transient, the Micro-AT control will initiate a loss-of-source transfer. The alternate-source interrupter switch is automatically opened and the preferred-source interrupter switch is then automatically closed, restoring service to the load.

Both types of loss-of-source transfers in the common-bus primary selective system are always "open transition." The primary reason for the loss-of-source transfer always being "open transition" is to best ensure a fault on the distribution system is not fed by both sources simultaneously. In addition to the "open transition" loss-of-source transfer providing protection for closing both sources into a fault on the distribution system, the use of the transition dwell time can be made to further minimize the risk of creating a system fault condition by closing a source interrupter switch to connect a large motor load with the load out of synchronization during completion of a loss-of-source transfer.

Depending on the control settings, return to the normal circuit configuration—preferred-source interrupter switch closed, alternate-source switch open—may be performed automatically on restoration of normal voltage to the preferred source after a delay sufficient to establish that the return is not temporary (**Automatic Return** mode or **Window Return** mode) or manually at a convenient time (**Hold Return** mode).

In the **Automatic Return** mode, such return-of-source transfer may be accomplished with "open transition" or "closed transition." With "open transition" retransfer—used when the power sources are not to be paralleled—the alternate-source interrupter switch opens before the preferred-source interrupter switch closes , with a momentary interruption of service to the load. With "closed transition" retransfer—selected when it is permissible to parallel the sources so that there will be no interruption of service to the load—the alternate-source interrupter switch will open after the preferred-source interrupter switch closes.

The **Window Return** mode is functionally identical to the **Automatic Return** mode, except that return-of-source transfer is permitted to occur only if the time of day is within a user-specified time "window," typically at a time when the implications are least severe for critical loads.

In **Hold Return** mode, if the preferred-source voltage meets the criteria for being considered normal and if the alternate-source is lost (or reduced below a predetermined level) for a period of time sufficient to confirm that the loss is not transient, an automatic "open transition" loss-of-source transfer will take place so that the load is served from the preferred source following the loss-of-source transfer.

Split-Bus Primary Selective System Applications

In a basic split-bus primary-selective system, the switchgear bus is divided into two sections by a bus-tie switch. See Figure 2 (bottom) on page 8. The switchgear normally operates with the two source interrupter switches closed and the bus-tie interrupter switch open, so each bus section receives power from its associated, separate source. Each source, in effect, is the preferred source for its section of the bus and the alternate source for the other section of bus. Typically, each source cable is sized for normal operating conditions and is loaded to rated capacity. Because under emergency conditions most installations have some loads that can be shed, it's not necessary for either source to carry the switchgear's total load over an extended period of time. Full use of both sources precludes the need for the serving utility to maintain idle substation and feeder capacity. And because the switchgear's load is segmented by the split bus, only a portion of the total load is transferred when a source is lost, greatly reducing the likelihood of the alternate source tripping out when transfer takes place.

The Micro-AT control monitors the condition of both power sources and initiates automatic switching when voltage on one source has been lost (or reduced below a predetermined level) for a period of time sufficient to confirm that the loss is not transient. Provided that the loads are being served by the preferred sources in the split-bus primary selective system prior to the loss of one of the sources, the interrupter switch associated with that source is automatically opened and the bus-tie interrupter switch is then automatically closed so all of the loads are served from the remaining good source following the loss-of-source transfer. If the loads are being fed by only one of the two sources, if the voltage of the source not serving any loads meets the criteria for being considered normal but has not yet been normal for a sufficient period of time to satisfy the return-of-source time setting, and the source serving loads is lost (or reduced below a predetermined level) for a period of time sufficient to confirm that the loss is not transient, the Micro-AT control will initiate a loss-of-source transfer.

Both types of loss-of-source transfers in the split-bus selective system are always "open transition." The primary reason for the loss-of-source transfer always being "open transition" is to best ensure that a fault on the distribution system is not fed by both sources simultaneously. In addition to the "open transition" loss-of-source transfer providing protection for closing both sources into a fault on the distribution system, the use of the transition dwell time can be made to further minimize the risk of creating a system fault condition by closing a source interrupter switch to connect a large motor load with the motor load out of synchronization during completion of a loss-of-source transfer.

Depending on the control settings, return to the normal circuit configuration—bus-tie interrupter switch open and both source interrupter switches closed—may be performed automatically on restoration of normal voltage to the affected source after a delay sufficient to establish that the return is not temporary (**Automatic Return** mode or **Window Return** mode) or manually at a convenient time (**Hold Return** mode).

In the **Automatic Return** mode, such return-of-source transfer may be accomplished with "open transition" or "closed transition." With "open transition" retransfer—used when the power sources are not to be paralleled—the bus-tie interrupter switch opens before the affected source interrupter switch closes . . . with a momentary interruption of service to the load. With "closed transition" no interruption of service to the load—the bus-tie interrupter switch will open after the affected source interrupter switch closes.

The **Window Return** mode is functionally identical to the **Automatic Return** mode, except that return-of-source transfer is permitted to occur only if the time of day is within a user-specified time "window," typically at a time when the implications are least severe for critical loads.

In **Hold Return** mode, if the voltage of the source not serving loads meets the criteria for being considered normal and if the source that is serving loads is lost (or reduced below a predetermined level) for a period of time sufficient to confirm that the loss is not transient, an automatic "open transition" loss-of-source transfer will take place so that the load is served from the preferred source following the loss-of-source transfer.

A variation of the split-bus primary-selective system uses a bus-tie interrupter switch that does not function automatically. In this variation, the switchgear normally operates with one source interrupter switch closed (the preferred-source switch) and one source interrupter switch open (the alternate-source switch); the bus-tie interrupter switch is always closed. Such switchgear, termed "spltcom," functions automatically in the manner of common-bus switchgear, described earlier. "Spltcom" switchgear has the capability for future conversion to split-bus switchgear (i.e., automatic functioning of the bus-tie interrupter switch as well as the source interrupter switches).

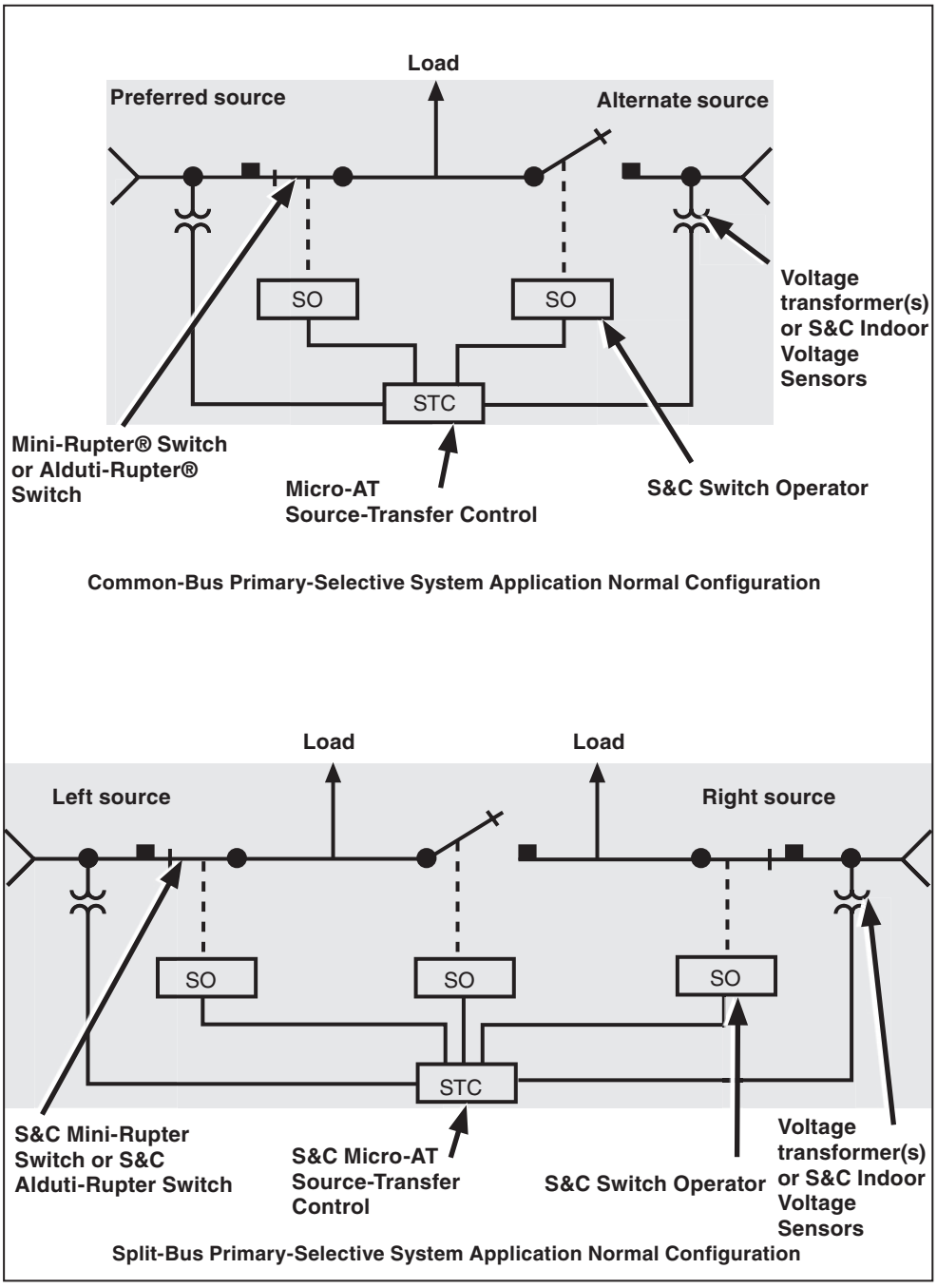

Figure 2. Application of Micro-AT Source-Transfer Control in common-bus and split-bus primary-selective systems.

Voltage Sensing

In S&C Metal-Enclosed Switchgear, the voltage-sensing input circuitry of the Micro-AT Source-Transfer Control accommodates either of the following single-phase or three-phase voltage-sensing schemes:

- For single-phase sensing, one line-to-ground connected voltage transformer per source
- For three-phase sensing, three line-to-ground connected voltage transformers, one line-to-ground connected voltage transformer and two S&C Indoor Voltage Sensors per source, or two line-to-line connected voltage transformers per source

In S&C Source-Transfer Pad-Mounted Gear, the voltage sensing input circuitry of the Micro-AT control accommodates three-phase voltage sensing provided by three S&C Indoor Voltage Sensors per source.

In S&C Source-Transfer Vista® Underground Distribution Switchgear, the voltage-sensing input circuitry of the Micro-AT control accommodates three-phase voltage sensing per source.

In instances where the metal-enclosed gear has been equipped for three-phase source voltage sensing, an output-voltage magnitude unbalance and/or phase-angle unbalance will likely exist between the sensing devices on each source. The Micro-AT control must be normalized to compensate for such differences on the left source and the right source, respectively. A source can be normalized only if each phase has measurable voltage and its sequence of rotation is the same as on the other source.

The base voltages on phase 2 of the left and right sources can also be calibrated to known values.

Unbalance Detection

An **Unbalance Detection** feature may be field-programmed in the Micro-AT control in instances where the metal-enclosed gear has been equipped for three-phase voltage sensing. This feature protects the loads from any source-side **Open Phase** condition at the same system voltage level as the metal-enclosed gear—whether caused by utility-line burndown, broken conductors, single-phase switching, equipment malfunctions, or single-phasing resulting from blown source-side fuses. The **Unbalance Detection** feature continuously develops and monitors the negative-sequence and zero-sequence voltages to detect any unbalance present as the result of an **Open Phase** condition. ●

If the voltage unbalance exceeds a preset reference level for a period of time sufficient to confirm that the loss is not transient, the Micro-AT control will initiate an automatic loss-of-source transfer to the other source. By monitoring negative-sequence and zero-sequence voltages, the **Unbalance Detection** feature detects virtually all source-side open-phase sensing schemes.

● The unbalance detection feature should not be programmed in metal-enclosed switchgear applications using three-phase voltage sensing provided by two line-to-line connected voltage transformers per source.

Overcurrent Lockout

An **Overcurrent Lockout** feature may be field programmed in the Micro-AT control in instances where the metal-enclosed gear has been equipped with S&C Current Sensors on the sources. This feature prevents an automatic-transfer operation that would close a source interrupter switch or bus-tie interrupter switch into a fault, thereby avoiding further utility-system disturbance.●

An overcurrent in excess of a preset level will set up the lockout feature. If the overcurrent is due to a fault cleared by a source-side protective device, the prolonged loss of voltage will cause the associated source interrupter switch to open. At the same time, a **Lockout** mode will be set up in the source-transfer control so the other source interrupter switch or the bus-tie interrupter switch will not automatically close into the fault. (If the overcurrent is due to a fault cleared by a load-side protective device, however, there will be no prolonged loss of voltage and the source-transfer control will not initiate any switching operations.)

To prevent nuisance lockouts resulting from reclosing operations by source-side circuit breakers, the **Overcurrent Lockout** feature includes a magnetizing-inrush current restraint scheme. Upon loss-of-source voltage or, if the **Unbalance Detection** feature is programmed, upon voltage unbalance exceeding a preset reference level for 5 cycles, the magnetic inrush current restraint scheme is initiated for a period of 2 minutes. During the period of magnetic inrush current restraint scheme activation, 1 second is added to the **Overcurrent Pickup Delay** setting duration, adjustable from 3 to 100 milliseconds. Unless an overcurrent condition exists that is greater than the 1 second plus overcurrent pickup delay duration, the magnetic inrush current restraint scheme remains in effect for 2 minutes immediately subsequent to the initial loss of voltage. The magnetic inrush current restraint scheme prevents pickup of the **Overcurrent Lockout** feature due to transformer magnetizing-inrush current that can be experienced during upstream recloser activity.

The **Lockout** mode may be externally reset; however, a terminal block must be included in the metal-enclosed gear for attachment of user-furnished control wiring providing the appropriate reset signal.

Supervisory Control

A **Supervisory Control** feature may be field-programmed in the Micro-AT control, permitting switch operation and Micro-AT operating mode control from a remote location. This feature also requires that the metal-enclosed gear be equipped with a terminal block for attachment of user-furnished control wiring providing the appropriate supervisory control signals.

Remote Indication

A **Remote Indication** feature may be optionally furnished in the Micro-AT control. This feature permits remote monitoring of presence or absence of source voltages, manual or automatic operating mode, status of the READY indicator, EVENT indicator, and overcurrent lockout. This feature requires that the metal-enclosed gear be equipped with a terminal block for attachment of user-furnished control wiring to remote indicators.

● The **Overcurrent Lockout** feature should not be programmed in metal-enclosed switchgear applications using entrance bays containing switches with fuses.

Test Panel

A **Test Panel** feature may also be optionally furnished. This feature permits the use of an external, adjustable three-phase source to verify, through independent measurement, the response of the control to **Loss Of Source**, **Phase Unbalance**, and **Overcurrent Lockout** conditions.

Communications Card

A **Communications Card** feature may be optionally furnished as well. This feature is used in conjunction with a user-furnished personal computer● for local uploading of the Micro-AT control's "events," operating characteristics and operating parameters, digital input and output states, and messages explaining why the AUTOMATIC-TRANSFER READY indicating lamp isn't lit. This feature also allows local downloading of the user's standard operating parameters to the Micro-AT control.

A Micro-AT communication cable is necessary for connecting the communications card to the personal computer. Refer to the "ACCESSORIES" table on page 37. Included with the communication cable is the Matlink communication software, which is available for download at: **sandc.com/en/support/sc-customer-portal/.** If you need assistance, please contact **customerportal@sandc.com** or phone (800) 621-5546.

Wi-Fi Adapter Kit

For Micro-AT control users with Windows 7 or 10 64-bit operating system platforms, a Wi-Fi adapter kit (kit number TA-3401) in tandem with the HMI application software can be used to locally connect to the Micro-AT control.

To obtain the HMI software application, go to **sandc.com/en/support/sc-customer-portal/** and download the Micro-AT control HMI application software installer.

● Requires a Windows® 95, 98, 2000, NT, XP, or Windows 7 32-Bit operating system. A Windows 7 64-Bit operating system must be run in **XP** mode (only available for Professional and Ultimate operating systems).

Normal Condition

In a common-bus primary selective system, with adequate voltage available from both utility sources, the preferred-source interrupter switch should be closed and the alternate-source interrupter switch should be open with its associated circuit available as a standby. Similarly, in a split-bus primary selective system, with adequate voltage available from both utility sources, both source interrupter switches should be closed and the bus-tie interrupter switch should be open. The MANUAL/AUTOMATIC operation selector switch should be set to **Automatic** mode and—if the **Supervisory Control** option is enabled—the supervisory manual/automatic dry contact is closed and the left source voltage, right source voltage, and AUTOMATIC-TRANSFER READY indicating lamps should be lit. See "Conditions required to light AUTOMATIC-TRANSFER READY indicating lamp" listed on page 31.

Transfer on Loss of Source Voltage

At installations using single-phase source voltage sensing, the Micro-AT control continuously monitors the signal-input voltage level on phase 2 of each of the two sources and compares these inputs to the predetermined reference level to determine the status of each source. The control will initiate a loss-of-source transfer when each of the following conditions exist:

- The signal-input voltage from phase 2 of the source serving the load (phase 2 of the source serving one of the bus sections in a split-bus primary selective system) is reduced below the predetermined **Loss of Source Voltage** setting● for a period of time considered sufficient to confirm that the condition is not transient—the predetermined **Loss of Source Time** setting■
- The signal-input voltage from phase 2 of the standby source (phase 2 of the source serving the other bus section in a split-bus primary selective system) exceeds the predetermined **Return of Source Voltage** setting▲
- The **Overcurrent Lockout** feature, if programmed, is not "set up" to prevent an **Automatic Transfer** operation that would close a source or bus-tie interrupter switch into a fault (See the "Overcurrent-Lockout Condition" section on page 14.)

At installations using three-phase source voltage sensing, the Micro-AT control continuously monitors the signal-input voltage level on each phase of the two sources and compares these inputs to the predetermined reference level to determine the status of each source. The control will initiate a loss-of-source transfer when each of the following conditions exist:

- The signal-input voltage from one or more phases of the source serving the load (one or more phases of the source serving one of the bus sections in a split-bus primary selective system) is reduced below the predetermined **Loss of Source Voltage** setting● for a period of time considered sufficient to confirm that the condition is not transient—the predetermined **Loss of Source Time** setting■
- The signal-input voltages from all three phases of the standby source (all three phases of the source serving the other bus section in a split-bus primary selective system) exceed the predetermined **Return of Source Voltage** setting▲
- The **Overcurrent Lockout** feature, if programmed, is not "set-up" to prevent an **Automatic Transfer** operation that would close a source or bus-tie interrupter switch into a fault (See the "Overcurrent-Lockout Condition" section on page 14.)

In addition, at installations using three-phase source voltage sensing, if the unbalance detection feature is programmed, the control will initiate a transfer as a result of an open-phase condition when the system unbalance exceeds the predetermined unbalance-detection voltage. See the "Transfer on Unbalance Condition" section on page 13.

If a loss-of-source transfer occurs, the AUTOMATIC-TRANSFER READY indicating lamp will extinguish—indicating that the normal condition no longer exists.

● Factory-set at 85.0 Volts.
■ Factory-set at 2.00 seconds.
▲ Factory-set at 105 Volts.

Transfer on Return of Source Voltage

Upon return of preferred-source voltage (voltage to the previously lost source in a split-bus primary selective system) for a period of time sufficient to establish the return is not temporary—the predetermined return-of-source time setting,● automatic return-of-source transfer to the normal condition will occur if the control has been programmed for **Automatic Return** mode. The return-of-source transfer will either be a "closed transition" or an "open transition," depending on the control settings.

With a closed transition return, the preferred-source interrupter switch will close before the alternate-source interrupter switch is opened (the restored-source interrupter switch will close before the bus-tie interrupter switch is opened in a split-bus primary selective system), so there is no interruption of service to the load. With an open transition return—which prevents an automatic operation that would parallel the sources—the alternate-source interrupter switch will open prior to closing of the preferred-source interrupter switch (the bus-tie interrupter switch will open prior to closing of the restored-source interrupter switch in a split-bus primary selective system).

If the control has been programmed for a **Window Return** function, automatic return-of-source transfer to the normal condition will be performed in the same manner as for an **Automatic Return** function. But return-of-source transfer is permitted to occur only if the time of day is within the specified time "window." The beginning of this window is the predetermined **Window Begin** setting;■ the window length is adjustable from 1 minute to 3 hours.

If the control has been programmed for a **Hold Return** function, transfer to the normal condition must be accomplished manually—unless alternate-source voltage becomes inadequate and preferred-source voltage is adequate (voltage on the source in use becomes inadequate and voltage on the other source is adequate in a split-bus primary selective system). In this case of loss of alternate-source voltage, an automatic open transition loss-of-source transfer will take place.

When the return-of-source transfer occurs, the AUTOMATIC-TRANSFER READY indicating lamp will again light—indicating the normal condition has been restored.

Transfer on Unbalance Condition

At installations using three-phase source voltage sensing, the control may be programmed to detect phase unbalance conditions on the source. This feature protects the loads from any source-side **Open Phase** condition at the same system voltage level as the metal-enclosed gear—whether caused by utility-line burn-down, broken conductors, single-phase switching, equipment malfunctions, or single-phasing resulting from blown source-side fuses▲.

When this feature has been programmed, the control will initiate an automatic source transfer when each of the following conditions exist:

- The signal-input phase-voltage unbalance of the source serving the load (the source serving one of the bus sections in a split-bus primary selective system) exceeds the predetermined unbalance-detection voltage◆ for a period of time considered sufficient to confirm the condition is not transient—the predetermined **Loss of Source Time** setting▼
- The signal-input phase-voltage unbalance of the standby source (the source serving the other bus section in a split-bus primary selective system) is less than the predetermined unbalance-detection voltage◆
- The **Overcurrent-Lockout** feature, if programmed, is not "set up" to prevent an **Automatic Transfer** operation that would close a source or bus-tie interrupter switch into a fault. (See the "Overcurrent-Lockout Condition" section on page 14.)

Upon return of the preferred-source phase voltages to their normal balanced state (the phase voltages on the previously lost source to their normal, balanced state in a split-bus primary selective system), return-of-source transfer to that source can be accomplished as described in the "Transfer on Return of Source Voltage" section.

● Factory-set at 3.00 minutes.

■ Factory-set at 01:00 (24-hour format).

▲ The **Unbalance Detection** feature should not be programmed in metal-enclosed switchgear applications using three-phase voltage sensing provided by two line-to-line connected voltage transformers per source.

◆ Factory-set at 18 volts in switchgear applications, 30 Volts in pad-mounted gear applications.

▼ Factory-set at 2.00 seconds.

Overcurrent-Lockout Condition

At installations where the metal-enclosed gear has been equipped with S&C Current Sensors on the sources, the control may be programmed to include an **Overcurrent-Lockout** feature. This feature prevents an **Automatic Transfer** operation that would close a source or bus-tie interrupter switch into a fault, thereby avoiding further utility-system disturbances●.

An overcurrent in excess of the predetermined lockout level setting■ detected as the imbalance in the three-phase current—the summation of the currents sensed by the individual phase current sensors of the source serving the load–will "set up" the **Lockout** feature. The LOCKOUT lamp will light.

If the overcurrent is due to a fault that is cleared by a source-side protective device, the prolonged loss of source voltage will cause the associated source interrupter switch to open, and the **Lockout** feature will prevent the other source interrupter switch or the bus-tie interrupter switch from closing into the fault.

After the fault has been located and repaired, the MANUAL/AUTOMATIC operation selector switch must be set in to **Manual** mode and the RESET key pressed to cancel the **Lockout** condition, which will extinguish the LOCKOUT lamp.

Service to the load can then be restored by pressing the CLOSE pushbutton on the preferred-source interrupter switch operator (interrupter switch operator for the previously lost source in a split-bus primary selective system). If, however, voltage is not available on the preferred source or on the source previously serving the bus section, service to the load can be restored by pressing the CLOSE pushbutton on the alternate-source interrupter switch operator (the bus-tie interrupter switch operator in a split-bus primary selective system). After the source or bus-tie interrupter switch has closed, the manual/automatic operation selector switch should be placed in the **Automatic** mode. If the normal condition has been restored, the AUTOMATIC-TRANSFER READY indicating lamp will light.

If the overcurrent is due to a fault is cleared by a load-side protective device, no switching will occur since loss-of-source voltage is not of sufficient duration to initiate opening of the source interrupter switch serving the load or the bus section. In this case, although the fault current initially "sets up" the **Lockout** feature (and the LOCKOUT lamp lights), the subsequent return of normal source voltage will actuate the lockout-reset time delay▲. After this predetermined time delay, the **Lockout** feature will automatically reset and the control will return to its normal state, and the LOCKOUT lamp will extinguish.

● The **Overcurrent-Lockout** feature should not be programmed in metal-enclosed switchgear applications using entrance bays containing switches with fuses.

■ Factory-set at 1200 amperes. S&C recommends customers use the factory-default setting or adjust this value to 70% of the available neutral fault current, whichever is lower. In some applications, the **Lockout Level** setting is determined by the setting of user-furnished external relaying. An adjustable overcurrent-lockout pickup time delay is provided to prevent nuisance lockouts due to motor load backfeed into upstream faults. Factory-set at 50 milliseconds. Adjustment range is 3 to 100 milliseconds.

▲ Factory-set at 20.0 seconds.

The Micro-AT Source-Transfer Control uses an electronic microprocessor to perform control operations, as directed by settings programmed into the device at the factory and in the field. Such settings—consisting of the control's operating characteristics and voltage-, current-, and time-related operating parameters—are entered into the control by means of a keypad on the front panel. See Figure 3 on page 16.

To simplify entry of this information and to permit its quick review on the LCD screen, the operating characteristics have been grouped together as a series of "items" in the **Configure** menu. Similarly, the voltage-, current-, and time-related operating parameters have been grouped together as a series of items in the **Voltage**, **Current**, and **Time** menus respectively. A particular item can be accessed for display by first pressing the appropriate menu key and then scrolling through the items, using the NEXT or LAST key. To prevent unauthorized changes to the operating characteristics and operating parameters, each item is protected by an access code; the correct access code must be entered before the item can be altered.

The **Test** menu provides the means for checking the functioning of the source-transfer control and is also used to enable the test keys for simulating overcurrent and/or loss of voltage on the sources.

The Micro-AT control features powerful built-in diagnostic tools. The control automatically records system status and the status of the device's controller circuits every time a control operation occurs. Each such operation, referred to as an "event," is indicated by the illumination of a lamp on the **Event** menu key and is available for display under this menu. Further, the control has available for display, as items under the **Examine** menu, the present source voltage and current inputs, and the present status of discrete inputs to and outputs from the control.

The Display

The LCD screen provides the means for viewing the operating characteristics and operating parameters which have been programmed into the control as items in the **Configure**, **Voltage**, **Current**, and **Time** menus, entries in the **Event** menu, and present system and control states in the **Examine** menu.

The display normally appears like this:

```
DATE                          TIME
PRESS  ANY  MENU  KEY
```

If a menu key is pressed—for example, the VOLTAGE key—the display changes to:

```
VOLTAGE:
PRESS  LAST/NEXT  ITEM
```

If the NEXT key is then pressed, the first item in the menu—in this case, loss-of-source voltage—appears.

```
VOLTS:  LOSS  OF     SOURCE
  85.0  VOLTS         CHANGE
```

In this example, the display is indicating that the present value of loss-of-source voltage programmed into the control is 85.0 Volts. The "Change" message in the lower right-hand corner of the display indicates the value of loss-of-source voltage can be changed.

If a change to the present value of loss-of-source voltage is desired, the MANUAL/AUTOMATIC operation selector switch must first be placed in **Manual** mode. Then, if the CHANGE key is pressed, the following display appears:

```
VOLTS:  LOSS  OF  SOURCE
ENTER  ACCESS  CODE
```

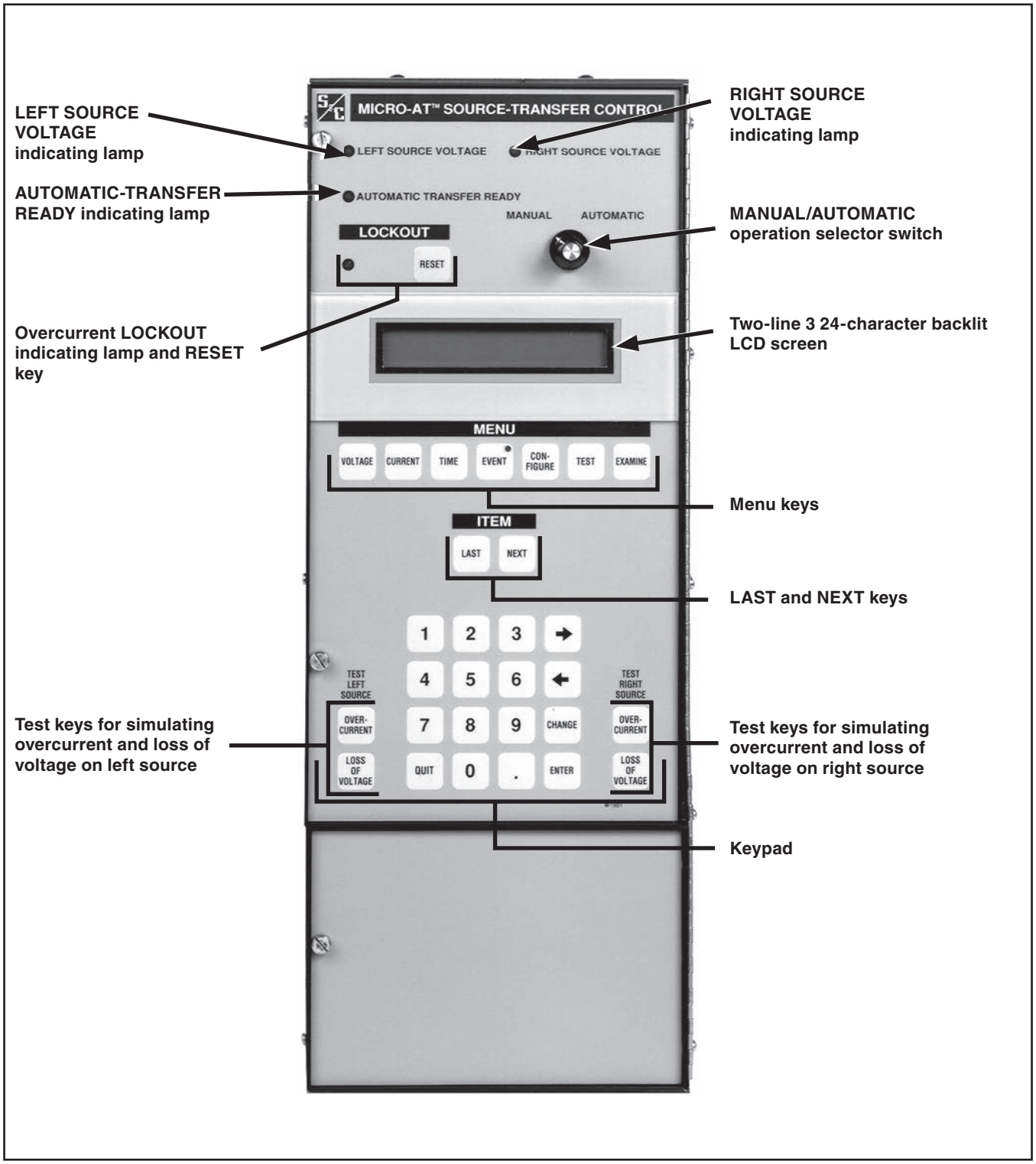

Figure 3. Close-up of front panel features.

The display is indicating that the access code must be entered before the value of loss-of-source voltage can be changed. As each digit of the access-code number is pressed, the display indicates that digit. When all the digits have been pressed—followed by the ENTER key—the display changes to:

```
VOLTS:  LOSS  OF  SOURCE
  85.0  VOLTS
```

The desired value of loss-of-source voltage can be entered at this time. If a value of 102 Volts were desired, the **1**, **0**, and **2** keys would be pressed—followed by the ENTER key. The display changes to:

```
  VOLTS:  LOSS  OF  SOURCE
102  VOLTS              CHANGE
```

Other items in the **Voltage** menu are accessed by use of the NEXT key (or LAST key) and changed, if necessary, in the same manner. The access code need not be reentered. When no further items are to be accessed in the **Voltage** menu, the NEXT key should be pressed and then the QUIT key should be pressed.

Items in other menus are similarly accessed by pressing the appropriate menu key, followed by the NEXT key (or LAST key) and exited by pressing the QUIT key. Following completion of the changes to the various settings, the MANUAL/AUTOMATIC operation selector switch placed in **Automatic** mode. The display will revert to its normal appearance:

```
DATE                        TIME
   PRESS  ANY  MENU  KEY
```

Incidentally, the display will also revert to its normal appearance if no keystrokes of the keypad have been detected for 5 minutes. Should this occur, the access code will need to be reentered before the value of an item can be changed.

Error Messages

If an invalid access code is entered in the course of changing the value of an item, an error message will be displayed for 5 seconds. For the example given above, this display would appear as follows:

```
VOLTS:  LOSS  OF  SOURCE
   INVALID  ACCESS  C-
     ODE
```

If an unacceptable value (one not within the specified range) is entered in the course of changing the value of an item, another error message will be displayed for 5 seconds. For the example given above, this display would appear as follows:

```
   ENTRY  MUST  BE  BE-
TWEEN  80.0  AND  105
     VOLTS
```

Non-Numeric Items

A few field changeable items in the **Configure** menu require a non-numeric response. In such instances, the display will be similar to this:

```
CONFIG:  SELECT  TRANSITION
OPEN                CHANGE
```

Here the display is indicating that the **Open** option has been selected as the type of transition by which an automatic return-of-source transfer will be effected. The "Change" message in the lower right-hand corner of the display indicates that this selection can be changed.

If a change is desired, the access code will need to be entered—in the same manner described above.

After the access code has been entered, pressing the OR key will display the other possible selection(s): in this case, the **Closed** option. The ENTER key must be pressed to accept the selection of **Closed** mode transition.

The display will now look like this:

```
CONFIG:  SELECT  TRANSITION
CLOSED              CHANGE
```

"Read-Only" Items

Some items are available only for display of information. One such item, in the **Voltage** menu, is left-source phase 2 voltage. The display will be similar to this:

```
VOLTS:  LEFT  PHASE 2118 VOLT-
S               MENU/ITEM
```

Here the display is indicating that the actual voltage on left-source phase 2 is 118 Volts. The "Menu/Item" message in the lower right-hand corner of the display indicates that a menu key, the NEXT key, or LAST key can be pressed to exit this particular menu item.

To operate properly, the Micro-AT Source-Transfer Control must be correctly programmed. Some menu items have been factory-set and *can't* be field adjusted.● Some menu items have factory settings but can be field-adjusted. Still, other menu items must be field-adjusted.

If the gear is not energized, users may set up S&C Test Accessory catalog number TA-1316. See Instruction Sheet 515-510. With this accessory, an external single-phase 120-Vac source may be used to provide control power for the Micro-AT control and perform all of the following programming steps except Step 2 (d)—normalizing the left and right sources—and Step 2 (e)—setting the base voltages on phase 2 of the left and right sources.

Note: Steps 2 (d) and 2 (e) can only be performed with the gear energized.

NOTICE

Always normalize the left and right sources and set the base voltages on phase 2 of the left and right sources after executing **CONFIG: RESTORE VALUES**. You must also manually reconfigure the following parameters (even if the display shows correct values): Loss of Source, Return of Source, Over Voltage, and Unbalance. Failure to do so may result in erratic operations.

NOTICE

Be sure to check each field adjustable item in the **Configure**, **Voltage**, **Current**, and **Time** menus in the manner described below—the factory-settings for these items may not all be appropriate for a particular installation.

To perform the field-adjustment and programming procedures outlined in this document, enter the correct access-code number when so directed. Contact S&C to obtain the access code.

NOTICE

To ensure any changes to the factory-settings in all menus are stored in memory, press the NEXT key before the QUIT key.

NOTICE

When changing **Select Bus Type** or **Select Preferred** options in the **Configure** menu, the Micro-AT control will power down and reboot. A "System Startup" will be recorded in the event log.

● Non-field adjustable items in the **Configure** and **Voltage** menus are listed in the Appendix on page 38.

Configure Menu

Follow these steps to set the configure menu for field adjustment and programming:

STEP 1. Place the MANUAL/AUTOMATIC operation selector switch in **Manual** mode to prevent automatic operation during adjustment and programming.

STEP 2. Set the operating characteristics of the Micro-AT control using the following procedure.

(a) Press the CONFIGURE key menu key. The following display will appear:

```
CONFIG:
  PRESS LAST/NEXT ITEM
```

(b) Press the NEXT key. The first item of the **Configure** menu will appear on the first line of the display:

```
        CONFIG:
SELECT  BUS  TYPE
```

(c) Press the NEXT key repeatedly to scroll to each field adjustable item of the **Configure** menu, as listed in Table 1.

Is the factory setting for each item (shown in the last column of the table, in boldface type) appropriate for this installation? If not, change it.

Table 1. Field-Adjustable Items in the Configure Menu

Field Adjustable Item CONFIG:	Description	Displayed If	Operating State or Range①
SELECT PREFERRED	Assignment of "LEFT" or "RIGHT" as preferred source	CONFIG: SELECT BUS TYPE has been factory-set for "COMMON," "VISTACOM," "VISTASPLT," "PAD MNT," or "SPLTCOM" bus type	**LEFT**, RIGHT
UNBALANCE DETECT	Selection of **Unbalance Detection** feature "ON" or "OFF"	CONFIG: UNBALANCE INSTALL has been factory-set for In	**ON**, OFF
SELECT RETURN	Selection of "HOLD," "AUTO," or "WINDOW" as means by which return-of-source transfer will be effected	Displayed at all installations	HOLD, **AUTO**, WINDOW
SELECT TRANSITION	Selection of "OPEN" or "CLOSED" as type of transition by which automatic return-of-source transfer will be effected	CONFIG: SELECT RETURN has been set for AUTO or WINDOW return	**OPEN**,CLOSED
RESTORE VALUES②③	Sets all field-adjustable items back to the factory-settings	Displayed at all installations	PRESS ENTER
DWELL TIMER	Selection of transition-dwell time delay "IN" or "OUT"	Displayed at all installations	IN, **OUT**
NORMALIZE LEFT	Means of compensating for any output-voltage magnitude unbalance and/or phase-angle unbalance between voltage-sensing devices on the left source	CONFIG: VOLTAGE SENSING has been factory-set for "4 WIRE" voltage sensing	PRESS ENTER
NORMALIZE RIGHT	Means of compensating for any output-voltage magnitude unbalance and/or phase-angle unbalance between voltage-sensing devices on the right source	CONFIG: VOLTAGE SENSING has been factory-set for "4 WIRE" voltage sensing	PRESS ENTER
SET BASE LEFT	Means of calibrating control to a known voltage on phase 2 of the left source	Displayed at all installations	105-130 VOLTS **(120 VOLTS)**
SET BASE RIGHT	Means of calibrating control to a known voltage on phase 2 of the right source	Displayed at all installations	105-130 VOLTS **(120 VOLTS)**
ACCESS CODES	Selection of alternative access code	Displayed at all installations	4 DIGITS MIN., 7 DIGITS MAX.
COM Ø BIT RATE	Selection of communication port data transfer bit rate	Optional communications card has been installed	2400, 4800, 9600, 19200, or 38400 BPS **(19200 BPS)**

① Factory settings are shown in boldface type.

② Always normalize the left and right sources and set the base voltages on phase 2 of the left and right sources after executing a **CONFIG: RESTORE VALUES** command. The following parameters (even if the display shows correct values) must be manually configured: **Loss of Source**, **Return of Source**, **Over Voltage**, and **Unbalance**. Failure to do so may result in erratic operations.

③ The **CONFIG: RESTORE VALUES** command has been removed from firmware version 2.6.1 and subsequent releases.

For example, here is the display for CONFIG: SELECT PREFERRED with its factory setting, LEFT:

CONFIG: SELECT PREFERRED
LEFT CHANGE

(d) If the right source is the preferred source at this installation, press the CHANGE key. The following display will appear:

CONFIG: SELECT PREFERRED
ENTER ACCESS CODE f

(e) Press each digit of the access-code number, then press the ENTER key.

NOTICE

You will not be required to reenter the access code number until one of the following occurs:

- The QUIT key is pressed.
- The MANUAL/AUTOMATIC operation selector switch is placed in **Automatic** mode
- No keystrokes of the keypad have been detected for 5 minutes.

(f) Press the → key to select the other possible operating state for CONFIG: SELECT PREFERRED, the RIGHT source. Then, press the ENTER key. The display will now look like this:

CONFIG: SELECT PREFERRED
RIGHT CHANGE

The other field adjustable items of the **Configure** menu can be changed in the same manner. Procedures for normalizing the left and right sources, setting the base voltages on the left and right sources, selecting a custom access code, and selecting the communications card bit rate are discussed below.

(g) Normalize the left and right sources (unless CONFIG: VOLTAGE SENSING has been factory-set for 2 WIRE voltage sensing).

Note: Each source must be normalized to compensate for any output-voltage magnitude unbalance and/or phase-angle unbalance between the voltage-sensing devices on that source. Each source should be in its known normal state, so that unusual system conditions aren't calibrated out. Here, for example, is the display for CONFIG: NORMALIZE LEFT:

CONFIG: NORMALIZE LEFT
NORMALIZE CHANGE

(h) Press the CHANGE key. If the display prompts you to reenter the access-code number, do so. The following display will appear:

CONFIG: NORMALIZE LEFT
ENTER TO: NORMALIZE

(i) Press the ENTER key. The display will now look like this:

CONFIG: NORMALIZE LEFT
NORMALIZE CHANGE

(j) Normalize the right source the same way.

NOTICE

A source can be normalized only if each phase has measurable voltage and its sequence of rotation is the same as on the other source. If normalizing can't be performed, one of the following messages will be displayed:

CANNOT NORMALIZE
PHASE VOLT(S) TOO LOW

CANNOT NORMALIZE
OPPOSITE PHASE ROTATION

If either of these messages is displayed, contact your nearest S&C Sales Office.

(k) Set the base voltages on phase 2 of the left and right sources.

Note: Each source should be in its known normal state so unusual system conditions aren't calibrated out.

Here, for example, is the display for CONFIG: SET BASE LEFT with its factory-setting, 120 VOLTS:

CONFIG: SET BASE LEFT
120 VOLTS CHANGE

(l) If the left-source base voltage is to be set to some other value, press the CHANGE key. If the display prompts you to reenter the access-code number, do so. The display will now look like this:

CONFIG: SET BASE LEFT
120 VOLTS ————

(m) Enter the desired left-source base voltage. If, for example, 117 Volts is the desired value, the **1**, **1**, and **7** keys would be pressed—followed by the ENTER key. The display will change to:

CONFIG: SET BASE LEFT
117 VOLTS CHANGE

Set the right-source base voltage the same way.

(n) The Micro-AT control can be programmed to accept a custom access-code number of your choosing, using the following procedure.

Note: If you don't wish to enter a custom access-code number, proceed to Step 2(r). Here's the display for **CONFIG: ACCESS CODES:**

CONFIG: ACCESS CODES
CHANGE

(o) Press the CHANGE key. The following display will appear:

CONFIG: ACCESS CODES
ENTER ACCESS CODE

(p) Press each digit of the standard access-code number, then press the ENTER key. The display will change to:

```
CONFIG:  ACCESS  CODES
USER  ENTER  NEW  CODE    –
```

(q) Enter the desired custom access-code number (4 digits minimum, 7 digits maximum). The display will change to:

```
CONFIG:  ACCESS  CODES
USER  REENTER  NEW  CODE  –
```

To make sure the number entered is really the custom access-code number desired, reenter the same number.

NOTICE

If you accidentally enter a different custom access-code number the second time, the following message will appear: ***REENTRY FAILED***.

If you attempt to enter a custom access-code number that is already in use, the following message will appear: ***CODE IN EFFECT***.

In either case, you'll need to repeat the procedure described above.

The Micro-AT control will now accept either the custom access-code number that you just entered or the standard access-code number.

(r) If the Micro-AT control has been furnished with the optional communications card feature (catalog number suffix "-Y8"), you may need to change the communication port data transfer bit rate, using the following procedure. Refer to Instruction Sheet 515-506.

Note: If the Micro-AT control has not been furnished with the communications card, proceed to Step 3 on page 24.

Here's the display for CONFIG: COM Ø BIT RATE with its factory-setting, 19200 BITS PER SECOND:

```
CONFIG:  COM  0  BIT  RATE
19200                 CHANGE
```

If a different data transfer bit rate is needed to establish communications between the Micro-AT control and your personal computer, press the CHANGE key. The following display will appear:

```
CONFIG:  COM  0  BIT  RATE
ENTER  ACCESS  CODE     –
```

Press each digit of the access-code number, and then press the ENTER key. The display will change to:

```
CONFIG:  COM  0  BIT  RATE
19200  ←OR→        38400
```

Press the → key to select the other possible selections: 2400, 4800, 9600, or 38400 bits per second. Then, press the ENTER key.

Voltage Menu

Follow these steps to set the voltage menu for field adjustment and programming:

STEP 3. Set the voltage-related operating parameters of the Micro-AT control using the following procedure.

(a) Press the **Voltage** menu key. The following display will appear:

```
VOLTAGE:
  PRESS  LAST/NEXT  ITEM
```

(b) Press the NEXT key. The first item of the **Voltage** menu will appear on the first line of the display:

```
VOLTS:  LOSS  OF  SOURCE
```

(c) Press the NEXT key repeatedly to scroll to each field adjustable item of the **Voltage** menu, as listed in Table 2 on page 25. Is the factory setting for each item (shown in the last column of the table, in boldface type) appropriate for this installation? If not, change it.

For example, here is the display for VOLTS: LOSS OF SOURCE with its factory-setting, 85.0 VOLTS:

```
VOLTS:  LOSS  OF  SOURCE
85.0  VOLTS            CHANGE
```

If the loss-of-source voltage is to be set to some other value, press the CHANGE key. If the display prompts you to reenter the access-code number, do so. The display will now look like this:

```
VOLTS:  LOSS  OF  SOURCE
85.0  VOLTS            ----
```

Enter the desired loss-of-source voltage. If, for example, 102 Volts is the desired value, the **1**, **0**, and **2** keys would be pressed—followed by the ENTER key. The display will change to:

```
VOLTS:  LOSS  OF  SOURCE
102  VOLTS             CHANGE
```

The other field adjustable items of the **Voltage** menu can be changed in the same manner.

Current Menu

STEP 4. If the **CONFIG: LOCKOUT OPTION** setting has been factory-set for **Internal** mode, set the lockout level of the Micro-AT control using the following procedure:

(a) Press the CURRENT key. The following display will appear:

Table 2. Field-Adjustable Items in the Voltage Menu

Field Adjustable Item VOLTS:	Description	Displayed If	Operating Range①
LOSS OF SOURCE	Voltage level on source serving the load (or voltage level on source serving one of the bus sections, in split-bus switchgear) which, if reduced below, will result in control initiating automatic loss-of-source transfer. Also, if **Hold Return** option has been selected, voltage level on alternate source (or voltage level on source in use, in split-bus switchgear) which, if reduced below, will result in control initiating automatic return-of-source transfer	Displayed at all installations	10-105 Volts (85 Volts)
RETURN OF SOURCE	Voltage level on source formerly serving the load (or voltage level on source formerly serving one of the bus sections, in split-bus switchgear) which, if equaled or exceeded, will result in control initiating automatic return-of-source transfer. (Applicable only if **Auto** or **Window** option has been selected)	Displayed at all installations	100-120 Volts (105 Volts)
OVERVOLT DETECT	Voltage level on a source which, if equaled or exceeded, will result in the control posting an entry in the event log	Displayed at all installations	120-140 Volts (135 Volts)
UNBALANCE DETECT	Unbalance level on source serving the load (or unbalance level on source serving one of the bus sections, in split-bus switchgear) which, if equaled or exceeded, will result in control initiating automatic transfer. Also, if **Hold Return** option has been selected, unbalance level on alternate source (or unbalance level on source in use, in split-bus switchgear) which, if equaled or exceeded, will result in control initiating automatic return transfer	CONFIG: UNBALANCE INSTALL has been factory-set for "In"	12-60 Volts (18 Volts) in switchgear and Vista switchgear 30-60 Volts (30 Volts) in pad-mounted gear

① Factory settings are shown in parentheses.

```
CURRENT:
  PRESS  LAST/NEXT  ITEM
```

(b) Press the NEXT key. The following display will appear for CURRENT: LOCKOUT LEVEL:

```
CURRENT:  LOCKOUT  LEVEL
1200  AMPS            CHANGE
```

Lockout level has been factory-set for 1200 amperes but may be field-adjusted to any value between 200 and 1500 amperes.

(c) Is the factory-setting appropriate for this installation? If not, change it. If the lockout level is to be set to some other value, press the CHANGE key. If the display prompts you to reenter the access-code number, do so. The display will now look like this:

```
CURRENT:  LOCKOUT  LEVEL
1200  AMPS            ____
```

Enter the desired lockout level. If, for example, 600 amperes is the desired value, the **6**, **0**, and **0** keys would be pressed—followed by the ENTER key. The display will change to:

```
CURRENT:  LOCKOUT  LEVEL
600  AMPS              CHANGE
```

Time Menu

Follow these steps to set the **Time** menu for field adjustment and programming:

STEP 5. Set the voltage-related operating parameters of the Micro-AT control using the following procedure.

(a) Press the TIME key. The following display will appear:

```
VOLTAGE:
   PRESS  LAST/NEXT  ITEM
```

(b) Press the NEXT key. The first item of the **Time** menu will appear on the first line of the display:

```
TIME:  LOSS  OF  LEFT  SOURCE
```

Table 3. Field-Adjustable Items in the Time Menu

Field Adjustable Item TIME:	Description	Displayed If	Operating Range①
LOSS OF LEFT SOURCE	Time delay between detection of loss of voltage on left source and initiation of automatic loss-of-source transfer	Displayed at all installations	0.25-240 seconds (2.00 seconds)
LOSS OF RIGHT SOURCE	Time delay between detection of loss of voltage on right source and initiation of automatic loss-of-source transfer	Displayed at all installations	0.25-240 seconds (2.00 seconds)
RETURN OF SOURCE	Time delay between return of preferred-source voltage (or voltage to the previously failed source, in split-bus switchgear) and initiation of automatic return-of-source transfer	CONFIG: SELECT RETURN has been set for **Auto** or **Window** return mode	5 seconds TO 8 hours (00:03:00)
LOCKOUT RESET	Time delay that voltage must remain on load, following its resumption after a momentary overcurrent, before lockout feature is automatically reset	CONFIG: LOCKOUT OPTION has been factory-set for **Internal** or **External** mode	0.25-240 seconds (20.0 seconds)
OC LOCKOUT PICKUP	Time delay between detection of overcurrent and initiation of overcurrent lockout	CONFIG: LOCKOUT OPTION has been factory-set for **Internal** mode	3-100 milliseconds (50 ms)
TRANSITION DWELL	Time delay, during automatic loss-of-source transfer, between opening of a source interrupter switch and closing of the other source interrupter switch (or closing of the bus-tie interrupter switch, in split-bus switchgear). Also, time delay, during automatic return-of-source transfer, between opening of a source interrupter switch (or opening of the bus-tie interrupter switch, in split-bus switchgear) and closing of the other source interrupter switch	CONFIG: DWELL TIMER has been set for "In"	0.25-10 seconds (2.00 seconds)
WINDOW BEGIN	The beginning of a time "window" in which an automatic return-of-source transfer can occur; the window is adjustable from 1 minute to 3 hours. (Transfer will take place after the return-of-source time delay has expired—provided that the time of day is within the window selected)	CONFIG: SELECT RETURN has been set for **Window** return mode	hh:mm (hour: minute—24-hour format) (01:00)
WINDOW LENGTH (24 HR)	The time duration of the "window" in which an automatic return-of-source transfer can occur	CONFIG: SELECT RETURN has been set for **Window** return mode	hh:mm (hour: minute—24-hour format) (03:00)
TODAY'S DATE	Month-day-year reference for event log	Displayed at all installations	mm/dd/yy (month/day/year)
TIME OF DAY (24 HR)	Hour-minute-second reference for event log	Displayed at all installations	hh:mm (hour: minute—24-hour format)

① Factory settings are shown in parentheses.

(c) Press the NEXT key repeatedly to scroll to each item of the **Time** menu, as listed in Table 3. Each item in the **Time** menu is field-adjustable.

Is the factory-setting for each item (shown in the last column of the table, in boldface type) appropriate for this installation? If not, change it.

For example, here is the display for TIME: LOSS OF LEFT SOURCE with its factory-setting, 2.00 SECONDS:

```
TIME: LOSS OF  LEFT  SOURCE
2.00 SECONDS          CHANGE
```

If the loss-of-left source time is to be set to some other value, press the CHANGE key. If the display prompts you to reenter the access-code number, do so. The display will now look like this:

```
TIME:LOSS  OF  LEFT  SOURCE
2.00 SECONDS          ----
```

Enter the desired loss-of-left source time. If, for example, 10.5 seconds is the desired value, the "1," "0," "." and "5" keys would be pressed—followed by the ENTER key. The display will change to:

```
TIME:LOSS  OF  LEFT  SOURCE
10.5 SECONDS          CHANGE
```

The other items of the **Time** menu can be changed in the same manner.

Test Menu

NOTICE

- The loss-of-left-source and loss-of-right-source time delays should be set for values sufficient to establish that the loss of source is not transient (thus preventing unnecessary transfers). Care should be exercised to ensure these settings coordinate properly with those of the upstream protection devices.
- The return-of-source time delay should be set for a value sufficient to establish that return of preferred-source voltage (in common-bus or "spltcom" switchgear and pad-mounted gear) or return of voltage to the previously lost source (in split-bus switchgear) is not temporary.
- The lockout-reset time delay should be set for a value greater than the longest clearing time of all feeder fuses.
- The transition dwell time delay should be set for a value greater than the longest time required for motor residual voltage (the voltage appearing at the terminals of a connected motor when the source is interrupted) to drop to 25% or less of rated voltage.

STEP 6. Perform the loss-of-source testing and overcurrent-lockout testing outlined in the "Operational Testing" section on pages 29 through 31.

The **Test** menu provides a means for checking the functioning of the source-transfer control. Items listed under this menu include the following:

- Test lamps
- Test display
- Test keypad

• **Enable test keys**—The means for enabling loss-of-source testing and overcurrent-lockout testing, as described in the "Operational Testing" section on pages 29 through 31

STEP 7. To check the functioning of the source-transfer control, perform the following:

(a) Press the TEST key.

(b) Press the NEXT key (or LAST key) repeatedly to scroll through the items, until the desired one is displayed.

(c) When the "TEST LAMPS" item has been selected, press the ENTER key. The lamps on the control should flash a total of five times. Press the NEXT key.

(d) When the "TEST DISPLAY" item has been selected, press the ENTER key. All dot segments comprising each character of the display should alternately appear black then disappear, a total of five times. Press the NEXT key.

(e) When the "TEST KEYPAD" item has been selected, press the ENTER key. Now, pressing any key on the control should result in the value or name of that key being shown on the display, thus testing the switch contact of that key. Press the QUIT key.

(f) When the "ENABLE TEST KEYS" item has been selected, perform the following:

(1) Place the MANUAL/AUTOMATIC operation selector switch in **Manual** mode. Then, press the CHANGE key.

(2) Press the ◄— or —► key to select "On." Then, press the ENTER key. The test keys are now enabled for 15 minutes.

Loss-of-source testing and overcurrent-lockout testing can now be performed in the manner described in the "Operational Testing" section on pages 29 through 31.

(g) When no additional items are to be tested, press the QUIT key. Then, place the MANUAL/AUTOMATIC operation selector switch in **Automatic** mode.

The testing procedures described herein should be performed during initial startup and then thereafter about once per year to verify that the source-transfer control and its associated switch operators are fully functional.

Because S&C Switch Operators may be readily decoupled from their associated Mini-Rupter or Alduti-Rupter Switches, checkout of functional performance (e.g., operating sequence and timing) of the source-transfer control—and the switch operators—may be accomplished at any convenient time, without requiring an interruption of service.

Loss-of-Source Testing

STEP 8. To simulate a loss-of-source voltage, perform the following:

(a) Decouple each switch operator from its interrupter switch—unless temporary service interruptions are permissible.

(b) Enable the test keys in the manner described in Step 7 (a), (b), and (f) on page 28.

(c) Place the MANUAL/AUTOMATIC operation selector switch in **Automatic** mode.

NOTICE

The control will not function automatically if one switch operator is coupled and the other switch operator is decoupled. As a point of information, when operational testing is performed with the switch operators decoupled, the AUTOMATIC-TRANSFER READY indicating lamp will not light. (See "Conditions required to light AUTOMATIC TRANSFER READY indicating lamp" on page 31.)

(d) ***If the source-transfer control has been programmed for automatic return or window return:***

(1) Simulate a prolonged loss of preferred-source voltage (prolonged loss of voltage on the source serving one of the bus sections in split-bus switchgear) by pressing and holding in the LOSS OF VOLTAGE key for the left source or right source, as appropriate. The associated source voltage lamp will extinguish. The key must be held in long enough for the associated loss-of-source time delay to complete its preset cycle. A loss-of-source transfer will occur.

(2) Release the LOSS OF VOLTAGE key to simulate a return of the preferred-source voltage (return of voltage to the previously lost source in split-bus switchgear). The associated source voltage lamp will relight. Return-of-source transfer will occur automatically after the return-of-source time delay has completed its preset cycle●. Return will be open transition or closed transition, depending on the control settings.

(e) ***If the source-transfer control has been programmed for hold return:***

(1) Simulate a prolonged loss of preferred-source voltage (prolonged loss of voltage on the source serving one of the bus sections in split-bus switchgear) by pressing and holding in the LOSS OF VOLTAGE key for the left source or right source, as appropriate. The associated source voltage lamp will extinguish. The key must be held in long enough for the associated loss-of-source time delay to complete its preset cycle. A loss-of-source transfer will occur.

(2) Release the LOSS OF VOLTAGE key to simulate a return of the preferred-source voltage (return of voltage to the previously lost source in split-bus switchgear). The associated source voltage lamp will relight. Wait a sufficient length of time to verify that return-of-source transfer does not occur automatically. Then, simulate a loss of alternate-source voltage (loss of voltage on the source in use in split-bus switchgear) by pressing and holding in the LOSS OF VOLTAGE key for the left source or right source, as appropriate. The associated source voltage lamp will extinguish. The key must be held in long enough for the associated loss-of-source time delay to complete its preset cycle. A loss-of-source transfer will occur.

(f) If the **Lockout Option** setting has been factory-selected, proceed to the "Overcurrent-Lockout Testing" section. Otherwise, place the MANUAL/AUTOMATIC operation selector switch in Manual mode and recouple each switch operator to its interrupter switch. Then, place the MANUAL/AUTOMATIC operation selector switch in Automatic mode. To ensure the source-transfer control is ready for automatic operation, perform the final checks outlined in the "Before Walking Away . . ." section on page 31.

● If the source-transfer control has been programmed for **Window Return** mode, return-of-source transfer is permitted to occur only if the time of day is within the user-specified time "window."

Overcurrent-Lockout Testing

To simulate an **Overcurrent** condition on the sources, perform the following:

(a) With the MANUAL/AUTOMATIC operation selector switch in **Automatic** mode, simulate a fault cleared by feeder fuses by momentarily pressing, then releasing, the OVERCURRENT key for the preferred source (for either one of the sources in split-bus switchgear). This action will "set up" the **Lockout** feature, as indicated by illumination of the LOCKOUT lamp. Because the continuity of source voltage has not been affected, the lockout-reset time delay will start; after it completes its preset cycle, the **Lockout** feature will automatically reset and the LOCKOUT lamp will extinguish.

(b) To simulate lockout resulting from a fault cleared by a source-side protective device, momentarily press, then release the OVERCURRENT key for the preferred source (for either one of the sources in split-bus switchgear)—and, at the same time, press and hold *in* the associated LOSS OF VOLTAGE key. The associated source voltage lamp will extinguish. Further, this action will "set up" the **Lockout** feature, as indicated by illumination of the LOCKOUT lamp.

In common-bus or "spltcom" switchgear and pad-mounted gear, if the LOSS OF VOLTAGE key is held in long enough for the loss-of-source time delay to complete its preset cycle, the preferred-source switch operator will move to its **Switch Open** position; the alternate-source switch operator will remain in the **Switch Open** position, locked out. In split-bus switchgear in the normal switch configuration, if the LOSS OF VOLTAGE key is held in long enough for the loss-of-source time delay to complete its preset cycle, the switch operator for the interrupter switch serving the affected bus section will move to its **Switch Open** position; the bus-tie switch operator will remain in the **Switch Open** position, locked out.

(c) To cancel the **Lockout** condition, perform the following:

(1) Place the MANUAL/AUTOMATIC operation selector switch in **Manual** mode.

(2) Press the RESET key. The LOCKOUT lamp will extinguish.

(3) Press the **Close** pushbutton on the preferred-source switch operator (the switch operator associated with the affected bus section in split-bus switchgear). The switch operator will move to its **Switch Closed** position.

(d) Place the MANUAL/AUTOMATIC operation selector switch in **Manual** mode and recouple each switch operator to its interrupter switch. Then, place the MANUAL/AUTOMATIC operation selector switch in "**Automatic** mode. To ensure the source-transfer control is ready for automatic operation, perform the final checks outlined under "Before Walking Away . . . " section on page 31.

Before Walking Away . . .

To ensure the source-transfer control is ready for automatic operation, verify the following:

- The manual/automatic operation selector switch is in **Automatic** mode.
- If the **Supervisory Control** option is enabled—the Supervisory manual/automatic dry contact is closed.
- The left source voltage and right source voltage indicating lamps are illuminated, indicating the availability of voltage on the sources
- The AUTOMATIC-TRANSFER READY indicating lamp is illuminated.

Conditions required to light AUTOMATIC TRANSFER READY indicating lamp:

1. The MANUAL/AUTOMATIC operation selector switch is in **Automatic** mode.
2. If the **Supervisory Control** option is enabled—the Supervisory manual/automatic dry contact is closed.
3. The LOCKOUT lamp is reset (if the **Lockout** option has been factory-selected).
4. The **Unbalance Detection** feature is "On" (if unbalance install has been factory-selected).
5. The switch operators are coupled to switches.
6. The preferred-source switch is closed and the alternate-source switch is open (in common-bus switchgear and pad-mounted gear); both source switches are closed and the bus-tie switch is open (in split-bus switchgear); or the preferred-source switch is closed, the alternate-source switch is open, and bus-tie switch is closed (in "spltcom" switchgear).
7. The operation selector for each operator is in **Operating Position** mode(in pad-mounted gear applications).
8. The source switch compartment doors are closed and latched (in switchgear applications using Type MS-2 Switch Operators, or in pad-mounted gear applications if mechanical cable interlocks are furnished).
9. The key interlock for each source switch operator is unlocked (if key interlocks are furnished).

If the display is not being used to show menu information, it will show messages explaining why the AUTOMATIC TRANSFER READY indicating lamp isn't lighted.

NOTE: If the AUTOMATIC TRANSFER READY indicating lamp is not illuminated, it does not necessarily mean that the control is inoperative. For example, when a loss-of-source transfer occurs, the lamp extinguishes but the control is ready for any subsequent programmed automatic operation required by a change in source conditions. Likewise, if the switch operators are decoupled, the lamp is extinguished—and the switches will not operate—but the control is fully operative.

Now, replace and padlock the protective steel covers, if furnished, over the source-transfer control and the switch operators (in switchgear applications), or close and padlock the access doors to the control compartment and high-voltage compartments (in pad-mounted gear applications).

Event Menu

The Micro-AT control automatically records system status and the status of the device's controller circuits each time a control operation occurs. Each such operation, referred to as an "event," is indicated by the illumination of a lamp on the EVENT key and is available for display under this menu. The last 130 events are stored in memory at any given time.

Each event is time-marked to indicate its date and time of occurrence, and is identifiable by an "event ID" code number. There are a total of 85 such code numbers—each representing a specific action by the source-transfer control; these code numbers are listed and described in the "Appendix" section on pages 39 and 40.

Also recorded for each event are the operating conditions that existed at the time of the control operation. Included are the left-source and right-source phase and unbalance voltages and the status of the source-transfer left-source and right-source control states, overcurrent left-source and right-source control states, and switch operator control states.

Table 4 summarizes the items available for display under the **Event** menu for each of the last 130 events. (Items are listed in their order of appearance upon consecutively pressing the NEXT key.)

Table 4. Non-field Adjustable Items in the Event Menu

Non-Field Adjustable Item EVENT:	Operating Response			
DATE TIME ID	mm/dd/yy (month/day/year)	hh:mm:ss (hour:minute:second)		Event ID①
LEFT VOLTAGES	Phase 1	Phase 2	Phase 3	Unbalance
LEFT UNBALANCE	Negative Sequence		Zero Sequence	
RIGHT VOLTAGES	Phase 1	Phase 2	Phase 3	Unbalance
RIGHT UNBALANCE	Negative Sequence		Zero Sequence	
SOURCE STATES	Left-source voltage state (good, bad, or overvoltage)		Right-source voltage state (good, bad, or overvoltage)	
OC STATES	Left-source overcurrent state (normal, latch, or reset)		Right-source overcurrent state (normal, latch, or reset)	
OPER STATES	Left-source operator state③		Right-source operator state③	
TIE OPER STATE②	Bus-tie operator state③			
TRANSFER STATE	Transfer controller state④			
FLAGWORD	16-bit flagword (for diagnostic use)			

① See the "Appendix" section pages 39 and 40.

② Displayed if the **CONFIG: SELECT BUS TYPE** setting has been factory-set for "SPLIT" bus type.

③ Possible responses include the following:

Text Displayed	Meaning
N/A	Not Applicable
Hold Chrg Cl	Holding Charge of Spring to Close
Chrg Closel	Charging Spring to Close
Ready Close	Ready to Close Operator
Steer Close●	Presteering Operator to Close
Closing	Closing Operator (Trip Relay Activated)
Retry Close	Retrying Close Operation
Unknown	Unknown or Ambiguous Data Inputs
Oper Except	Operator Exception, Conflicting Data Inputs
Hold Chrg O●	Holding Charge of Spring to Open
Chrg Open●	Charging Spring to Open
Ready Open	Ready to Open Operator
Steer Open●	Presteering Operator to Open
Opening	Opening Operator (Trip Relay Activated)
Retry Open	Retrying Open Operation

● Pad-mounted gear applications only.

④ Possible responses include the following:

Common-Bus and "Vistacom" or "Spltcom" Switchgear and Pad-Mounted Gear	Split-Bus Switchgear and "Vistasplit"
On Preferred	Both on Preferred
Timing Loss of Preferred	Timing Loss of Left
Verify Preferred Loss	Verify Loss of Left
Opening Preferred	Open Left
Delay Forward Transfer	Timing Loss of Right
Closing Alternate	Verify Loss of Right
On Alternate	Open Right
Time Loss Alternate	Delay Transfer
Verify Alternate Loss	Close Tie
Time Return Preferred	Both on Left
Opening Alternate	Timing Return of Right
Closing Preferred	Close Right
Lockout	Both on Right
Manual	Timing Return of Left
Exception	Close Left
Delaying Return	Open Tie
	Exception

To read an item listed under the **Event** menu, perform the following:

STEP 1. Press the EVENT key.

STEP 2. Press the NEXT key (or LAST key) repeatedly to scroll through the items associated with the *latest* event until the desired one is displayed. (The number in the upper right-hand corner of the display indicates the event identification code number—from 0 to 523.)

STEP 3. If the same item associated with an *earlier* event is desired, use the ← key, as necessary, to display that event. The → key may then be used to display the same item associated with *later* events up to the latest event.

STEP 4. When no additional items are to be read, press the QUIT key. The EVENT lamp, if lit, will extinguish.

Examine Menu

The present source voltage and current inputs, and the present status of discrete inputs to and outputs from the source-transfer control, are available for display under the **Examine** menu.

Table 5 summarizes the items available for display under the **Examine** menu. (Items are listed in their order of appearance upon consecutively pressing the NEXT key.)

To read an item listed under the **Examine** menu, perform the following:

STEP 1. Press the EXAMINE key.

STEP 2. Press the NEXT key (or LAST key) repeatedly to scroll through the items in this menu, until the desired one is displayed.

STEP 3. Use the ← key or → key, as necessary, to display a particular discrete input or discrete output.

STEP 4. When no additional items are to be read, press the QUIT key.

Table 5. Non-Field-Adjustable Items in the Examine Menu

Non-Field Adjustable Item EXAMINE:	Operating Response
SOFTWARE VERSION	Version ID String
SYSTEM FREQUENCY	Ac system frequency
LEFT NEUTRAL①	Left-source neutral current, amperes
RIGHT NEUTRAL①	Right-source neutral current, amperes
LEFT NEG SEQ	Left-source negative sequence voltage, Volts
LEFT POS SEQ	Left-source positive sequence voltage, Volts
LEFT ZER SEQ	Left-source zero sequence voltage, Volts
RIGHT NEG SEQ	Right-source negative sequence voltage, Volts
RIGHT POS SEQ	Right-source positive sequence voltage, Volts
RIGHT ZER SEQ	Right-source zero sequence voltage, Volts
LEFT MC①	Left-source Phase 1 real and imaginary correction factors
LEFT MC2	Left-source Phase 2 real and imaginary correction factors
LEFT MC3	Left-source Phase 3 real and imaginary correction factors
RIGHT MC①	Right-source Phase 1 real and imaginary correction factors
RIGHT MC②	Right-source Phase 2 real and imaginary correction factors
RIGHT MC③	Right-source Phase 3 real and imaginary correction factors
LEFT SETBASE	Left-source set base conversion factor
RIGHT SETBASE	Right-source set base conversion factor
ROTATION FLAG	Phase rotation, forward or reverse
DISCRETE INPUTS②	Input data line states, true or false
DISCRETE OUTPUTS③	Output data line states, true or false

① Displayed if **CONFIG: LOCKOUT OPTION** setting has been factory-set for **Internal** Or **External** mode.

② See Table 15 on page 41.

③ See Table 16 on page 42.

No routine maintenance is recommended for the Micro-AT Source-Transfer Control other than an occasional operational test—in the manner described on pages 29 through 31—about once per year, to verify the control and its associated switch operators are operational.

Occasionally, check functioning of the lamps, display, and keypad in the manner described on page 27. Functioning of the lamps may also be checked at any time by pressing and holding for approximately 5 seconds the TEST key.

An odd-looking clock display is an indication the clock battery requires replacement. Refer to the clock battery specifications on page 37.

NOTICE

The Micro-AT CPU Card battery should be replaced every 10 years; catalog number TA-3230 is available from S&C.

S&C Instruction Sheet 515-526 describes CPU Card battery replacement.

Should an operating problem be experienced with the Micro-AT control, refer to the troubleshooting guide in Instruction Sheet 515-520. Instructions for replacing a circuit card or front panel assembly of a Micro-AT control are provided in Instruction Sheet 515-525. Spare circuit cards and front panel assemblies are listed in the Appendix section on pages 43 and 44.

Table 6. Micro-AT Source-Transfer Control①

Primary-Selective System Application	Catalog Number
Common-Bus Metal-Enclosed Switchgear—Two-Way Source Transfer Using Two S&C Switch Operators or Split-Bus Metal-Enclosed Switchgear—Two-Way Source Transfer Using Three S&C Switch Operators	39050
Source-Transfer Pad-Mounted Gear	39070
Source-Transfer Pad-Mounted Gear—For Replacement of Type AT-12 Source-Transfer Control	39080
Source-Transfer Vista UDS	39090

① For use with control source rated 120 Volts 60 Hertz nominal.

A suffix to the basic catalog number listed above specifies the voltage-sensing arrangement utilized on each source, in accordance with the following tables:

Table 7. Voltage-Sensing Arrangements—For Metal-Enclosed Switchgear Applications

System Rating kV, Nom.	Type of Voltage-Sensing Devices Applied on Sources	Suffix Added to Source-Transfer Control Catalog Number 39050
4.16 through 34.5	One Voltage Transformer or Three Voltage Transformers (connected line-to-ground) or Two Voltage Transformers (connected line-to-line)	-V1
11.43 through 17 or 20.44 through 27	Three 14.4-kV or 25-kV Voltage Sensors (connected line-to-ground)①	-V3
11.43 through 17 or 20.44 through 27	One Voltage Transformer and Two 14.4-kV or 25-kV Voltage Sensors (connected line-to-ground)	-V4

① Requires separate 120-Volt, 60-Hertz control source for switch operators and Micro-AT Source-Transfer Control.

Table 8. Voltage-Sensing Arrangements—For Source-Transfer Pad-Mounted Gear Applications

System Rating kV, Nom.	Type of Voltage-Sensing Devices Applied on Sources	Suffix Added to Source-Transfer Control Catalog Number 39070 or 39080
4.16	Three 14.4-kV Voltage Sensors (connected line-to-ground)①	-V2
11.43 through 17 or 20.44 through 27	Three 14.4-kV or 25-kV Voltage Sensors (connected line-to-ground)	-V3

① Requires separate 120-Volt, 60-Hertz control source for switch operators and Micro-AT Source-Transfer Control.

Table 9. Voltage-Sensing Arrangements—For Source-Transfer Vista Switchgear Applications

System Rating kV, Nom.	Type of Voltage-Sensing Devices Applied on Sources	Suffix Added to Source-Transfer Control Catalog Number 39090
4.16 through 34.5	One Voltage Transformer and Two 14.4-kV, 25-kV, or 34.5-kV Voltage Sensors (connected line-to-ground)	-V5
4.16 through 34.5	Three 14.4-kV, 25-kV, or 34.5-kV Voltage Sensors (connected line-to-ground)	-V6
4.16 through 34.5	Three 14.4-kV, 25-kV, or 34.5-kV Voltage Sensors (connected line-to-ground) and High-Voltage Output Card	-V7

The basic catalog number may also be suffixed to specify one or more optional features, in accordance with the following table:

Table 10. Optional Features

Item	Applicable to Source-Transfer Control Catalog Number	Suffix Added to Source-Transfer Control Catalog Number
Remote Indication. Permits remote monitoring of presence or absence of source voltages, manual or automatic operating mode, status of the "ready" indicator, "event" indicator, and overcurrent lockout①	39050, 39070, 39090	-Y4
Test Panel. Permits the use of an external, adjustable three-phase source to verify, through independent measurement, the response of the control to loss-of-source, phase-unbalance, and overcurrent-lockout conditions②	39050,● 39070,■ 39090●	-Y5
Communications Card. Permits local uploading of "events" and settings from the Micro-AT control to a user-furnished personal computer, as well as downloading of the user's standard operating parameters③④	39050, 39070, 39090	-Y8

① Requires terminal block and associated wiring for user's connections.

② If a three-phase test source is not available, limited testing may be performed using an external, adjustable single-phase source.

③ Requires a Windows® 95, 98, 2000, NT, XP, or Windows 7 32-Bit operating system. A Windows 7 64-Bit Operating System must be run in XP Mode (only available for Professional and Ultimate Operating Systems). A USB-to-Serial adapter must be used if the computer does not have a Serial port.

④ Requires S&C Communication Cable Catalog Number TA-2320 or TA-2321. See Table 11 on page 37.

● If the source-transfer control is to be tested with the switchgear de-energized, S&C Test Accessory Catalog Number TA-2669 must be furnished to provide control power for the switch operators. See Table 11 on page 37.

■ In instances where a three-phase test source is to be used, an S&C Voltage Limiter—Three-Phase Catalog Number TA-1741 must be furnished for the test circuit. Refer to the nearest S&C Sales Office.

Table 11. Accessories

Item		Applicable to Source-Transfer Control Catalog Number	Catalog Number
S&C Test Accessory. Permits preliminary checkout of source-transfer control using single-phase 120-volt ac source (before high-voltage connections are made to the gear) to expedite full service once high voltage is available①		39050, 39070	TA-2669
		39090	TA-2669
Communication Cable. For connecting optional communications card to user-furnished personal computer.	For personal computers having 25-pin serial communication port	All	TA-2320
	For personal computers having 9-pin serial communication port	All	TA-2321
Wi-Fi Adapter Kit. Used to locally connect to the Micro-AT control for users with Windows 7 or 10 64-bit operating system platforms. ●		All ■	TA-3401

① Required with Micro-AT Source-Transfer Control catalog number 39050 or 39090 furnished with optional test panel feature (catalog number Suffix "-Y5"), if the source-transfer control is to be tested with the switchgear de-energized.

● Used in tandem with the HMI application software. To obtain the HMI software application, download the installer from the S&C customer portal as described on page 11.

■ Contact S&C to determine if additional items are required to make the Micro-AT control components and firmware compatible with the Wi-Fi adapter kit.

Micro-AT Source-Transfer Control

Control Circuit
Voltage, Nominal . . . . . 120 Vac
Voltage, Operating Range . . . . . 95 to 140 Vac

Operating Temperature Range
Ambient adjacent to device: . . . . . −40°F to +160° F

Signal-Input Circuits

For all models of Micro-AT except 39090 in which "VISTA COM" and"VISTA SPLT" bus types are exclusively used.

Voltage Input, Nominal . . . . . 120 Vac
Voltage Input, Nominal● . . . . . 5 Vac (A and C phases), 120Vac (B phases)
Voltage Input, Nominal■ . . . . . 5 Vac
Voltage Input, Nominal▲ . . . . . 58 Vac
Voltage-Level Detector Accuracy (over ambient temperature range) . . . . . ±3% of setting
Current Input◆
Continuous, Nominal . . . . . 600 amperes, RMS
Momentary Withstand, 10 cycles . . . . . 22,400 amperes RMS asymmetrical
Current-Level Detector Accuracy . . . . . ±10% of setting
Frequency Range . . . . . 60±0.3 hertz▼

Timing
Timer Accuracy . . . . . ±1%
Clock Accuracy . . . . . ±2 hours/year

Output-Relay Contact Ratings
Current Carrying Continuous . . . . . 5 amperes
Interrupting . . . . . 5 amperes, 120 Vac, 40% P.F.

Indicating Lamps
Hewlett-Packard Part Number HLMP-1340

Clock Battery
S&C Part Number TA-3230

● For Micro-AT Model 39090-V5.
■ For Micro-AT Model 39090-V6.
▲ For Micro-AT Model 39090-V7.
◆ Sensed at the primary of S&C Current Sensors.
▼ For 50-hertz applications, refer to nearest S&C Sales Office.

Table 12. Non-Field-Adjustable Items in the Configure Menu

Non-Field Adjustable Item CONFIG:	Description
SELECT BUS TYPE	Setting of the control to accommodate “COMMON” bus or “SPLIT” bus (in switchgear applications), “PAD MNT” bus (in pad-mounted gear applications), or “VISTACOM” or “VISTASPLIT” in Vista switchgear applications. A sixth setting, “SPLTCOM,” applies to split-bus switchgear in which the bus-tie interrupter switch does not function automatically; the source interrupter switches function as in common-bus switchgear●
VOLTAGE SENSING	Setting of the control to accommodate “2 WIRE” voltage sensing provided by one line-to-ground connected voltage transformer per source (in switchgear applications so equipped). Or, the setting of the control to accommodate “4 WIRE” voltage sensing provided by three line-to-ground connected voltage transformers or one line-to-ground connected voltage transformer and two S&C Indoor Voltage Sensors per source (in switchgear applications so equipped), or three S&C Indoor Voltage Sensors per source (in pad-mounted gear applications)■
VOLT SENSE CONFIG	Setting of the control to accommodate between either monitoring sensors whose primary windings are connected line to line, or monitoring sensors whose primary windings are connected line-to-ground. In both cases, the sensor secondaries must be referenced to local chassis ground
SRCE BAD CRITERIA	Setting of the control to accommodate a source considered BAD when a single phase drops below the **Loss-Of-Source Threshold** setting, or a source considered BAD when all three phases drop below the **Loss-Of-Source Threshold** setting
UNBALANCE INSTALL	Setting of the **Unbalance Detection** feature “In” or “Out"▲
VOLT VALUE FORMAT	Setting of the control to display voltage values in units of Volts or in percentage variance (%). The percentage values are relative to 120 V.
LOCKOUT OPTION	Setting of the **Overcurrent Lockout** feature “Internal” or “External,” or “Out” (depending on whether the metal-enclosed gear is equipped with S&C Current Sensors on the sources)▼
SUPERVISORY CONTROL	Setting, “In” or “Out” of the capability of the control to accept an external signal to operate manually (depending on whether the metal-enclosed gear is equipped with a terminal block for attachment of user-furnished control wiring)

● “SPLTCOM” switchgear has the capability for future conversion to split-bus switchgear (i.e., automatic functioning of the bus-tie interrupter switch as well as the source interrupter switches).

■ The “4 WIRE” setting is also applicable to switchgear using two line-to-line connected voltage transformers per source; an auxiliary transformer is supplied for each source to produce a third signal-voltage input.

▲ Displayed if **CONFIG: VOLTAGE SENSING** setting has been factory-set for “4 WIRE” voltage sensing.

▼ In **Internal** mode, the lockout level is field-adjustable at the source-transfer control. In **External** mode, the lockout level is determined by the setting of user-furnished external relaying.

Table 13. Non-Field-Adjustable Items in the Voltage Menu

Non-Field Adjustable Item VOLTS:	Description
LEFT PHASE 1	Actual left-source phase 1 voltage after normalizing●
LEFT PHASE 2	Actual left-source phase 2 voltage after normalizing
LEFT PHASE 3	Actual left-source phase 3 voltage after normalizing●
LEFT UNBALANCE	Actual left-source unbalance voltage after normalizing■
RIGHT PHASE 1	Actual right-source phase 1 voltage after normalizing●
RIGHT PHASE 2	Actual right-source phase 2 voltage after normalizing
RIGHT PHASE 3	Actual right-source phase 3 voltage after normalizing●
RIGHT UNBALANCE	Actual right-source unbalance voltage after normalizing■

● Displayed if the **CONFIG: VOLTAGE SENSING** setting has been factory-set for “4 WIRE” voltage sensing.

■ Displayed if the **CONFIG: UNBALANCE INSTALL** setting has been factory-set for “In.”

Table 14. Event Identification Code Numbers in the Event Menu

Code Number	Description
General Events	
0	System Startup
10	Local to Auto
11	Local to Manual
12	Remote to Auto
13	Remote to Manual
20	Test keys enabled
21	Test keys disabled
88	Illegal Power Fail
90	EEPROM Initialized
99	Power Fail
Switch Operator Control Events	
100	Closing Left
101	Charge to Open Left●
102	Opening Left
103	Charge to Close Left●
104	Operation Timeout Left
105	Operation Limit Left
111	Unexpected Opening Left
112	Unexpected Closing Left
113	Unknown Position Left
114	Unknown Spring Left●
115	Illegal Position Left
116	Illegal Spring Left●
117	Presteer Left●
118	Cancel Presteer Left●
120	Closing Right
121	Charge to Open Right●
122	Opening Right
123	Charge to Close Right●
124	Operation Timeout Right
125	Operation Limit Right
131	Unexpected Opening Right
132	Unexpected Closing Right
133	Unknown Position Right
134	Unknown Spring Right●
135	Illegal Position Right
136	Illegal Spring Right●
137	Presteer Right●
138	Cancel Presteer Right●
Switch Operator Control Events (Split-Bus, "Vistasplit"and "Spltcom" Switchgear Only)	
140	Closing Tie
142	Opening Tie
144	Operation Timeout Tie
145	Operation Limit Tie
151	Unexpected Opening Tie
152	Unexpected Closing Tie
153	Unknown Position Tie
155	Illegal Position Tie

Code Number	Description
Source-Transfer Control Events (Common-Bus, "Vistacom" and"Spltcom" Switchgear and Pad-Mounted Gear Only	
201	On Preferred
202	Timing Preferred Loss
203	Opening Preferred
204	Closing Alternate
205	On Alternate
206	Timing Alternate Loss
207	Timing Preferred Return
208	Opening Alternate
209	Closing Preferred
210	Delaying Return
211	Delaying Forward Transfer
212	Verify Preferred Loss
213	Verify Alternate Loss
217	Enter Lockout
218	Enter Manual
219	Enter Exception
220	Waiting for Window
221	Enter Grounded
Source-Transfer Control Events (Split-Bus and "Vistasplit" Switchgear Only)	
301	Both on Preferred
302	Timing Left Loss
303	Verify Left Loss
304	Opening Left Switch
305	Timing Right Loss
306	Verify Right Loss
307	Opening Right Switch
308	Delaying Transfer
309	Closing Tie Switch
310	Both on Left
311	Timing Right Return
312	Closing Right Switch
313	Both on Right
314	Timing Left Return
315	Closing Left Switch
316	Opening Tie Switch
317	Enter Lockout
318	Enter Manual
319	Enter Exception
320	Waiting for Window
321	Enter Grounded

● Pad-mounted gear applications only.

Table 14. Event Identification Code Numbers in the Event Menu—Continued

Code Number	Description
Overcurrent Latch Events	
410	Latch OC Left
411	Start LR Timer Left
412	Cancel LR Timer Left
413	Reset OC Latch Left
414	Enter Normal Left
415	Enter Restraint Left
416	Enter Reset Restraint Left
417	Cancel Restraint Left
418	Cancel Confirm OC Left
419	Cancel Reset Restraint Left
420	Latch OC Right
421	Start LR Timer Right
422	Cancel LR Timer Right
423	Reset OC Latch Right
424	Enter Normal Right
425	Enter Restraint Right
426	Enter Reset Restraint Right
427	Cancel Restraint Right
428	Cancel Confirm OC Right
429	Cancel Reset Restraint Right
430	Start Verify OC Timer Left
431	Reset Verify OC Timer Left
440	Start Verify OC Timer Right
441	Reset Verify OC Timer Right
601	Bus Type changed to COMMON
602	Bus Type changed to SPLIT
603	Bus Type changed to SPLIT-COM
604	Bus Type changed to PAD MNT
605	Bus Type changed to VISTA COM
606	Bus Type changed to VISTA SPLT
620	Preferred set to LEFT
621	Preferred set to RIGHT
622	System Frequency set to 50 Hz
623	System Frequency set to 60 Hz
624	Voltage Sensing set to 2-WIRE
625	Voltage Sensing set to 4-WIRE
626	Voltage Sensing Configuration set to LINE-TO-GND
627	Voltage Sensing Configuration set to LINE-TO-LINE
628	Source Bad Criteria set to 1-PHASE
629	Source Bad Criteria set to ALL PHASES
630	Unbalance Detect set to OUT
631	Unbalance Detect set to IN and OFF
632	Unbalance Detect set to IN and ON
633	Voltage Value Format set to VOLTS
634	Voltage Value Format set to PERCENTAGE
635	Return set to HOLD
636	Return set to AUTO
637	Return set to WINDOW
638	UPS Application set to NO UPS
639	UPS Application set to UPS ON LEFT

Code Number	Description
Source Condition Events	
510	Loss of Left Due to Undervoltage
511	Loss of Left Due to Open Phase
512	Return of Left
513	Overvoltage Left
520	Loss of Right Due to Undervoltage
521	Loss of Right Due to Open Phase
522	Return of Right
523	Overvoltage Right
Overcurrent Latch Events	
640	UPS Application set to UPS ON RIGHT
641	Transition set to OPEN
642	Transition set to CLOSED
643	Lockout set to OUT
644	Lockout set to IN
645	Lockout set to EXTERNAL
646	Restore Values Executed
647	Dwell Timer set to OUT
648	Dwell Timer set to IN
649	Supervisory Control set to OUT
650	Supervisory Control set to IN
651	Normalize Left Executed
652	Normalize Right Executed
653	Set Base Left Executed
654	Set Base Right Executed
655	COM0 Bit Rate set to 2400
656	COM0 Bit Rate set to 4800
657	COM0 Bit Rate set to 9600
658	COM0 Bit Rate set to 19200
659	COM0 Bit Rate set to 38400
700	System date changed
701	System time changed

Table 15. Discrete Inputs in the Examine Menu

Non-Field Adjustable Item EXAMINE:	Description
L SW OPEN **L OP OPEN①②** **L SW CLOSED** **L OP CLOSED①②** **L OP GROUNDED①②** **L SW COUPLED③④⑤** **L SW TR OPEN** **L SW TR CLOSED** **L SPRING CHRG OP③** **L SPRING CHRG CL③** **L SHUTTER INT③** **L DOOR INT④** **L KEY INT③④⑤**	Left Switch Open Left Operator Open Left Switch Closed Left Operator Closed Left Operator Grounded Left Switch Coupled Left Switch Trip to Open (Manual Open Push key) Left Switch Trip to Close (Manual Close Push key) Left Spring Charged to Open Left Spring Charged to Close Left Shutter Interlock Left Door Interlock Left Key Interlock
R SW OPEN **R OP OPEN①②** **R SW CLOSED** **R OP CLOSED①②** **R OP GROUNDED①②** **R SW COUPLED③④⑤** **R SW TR OPEN** **R SW TR CLOSED** **R SPRING CHRG OP③** **R SPRING CHRG CL③** **R SHUTTER INT③** **R DOOR INT④** **R KEY INT③④⑤**	Right Switch Open Right Operator Open Right Switch Closed Right Operator Closed Right Operator Grounded Right Switch Coupled Right Switch Trip to Open (Manual Open Push key) Right Switch Trip to Close (Manual Close Push key) Right Spring Charged to Open Right Spring Charged to Close Right Shutter Interlock Right Door Interlock Right Key Interlock
Local Enabled①② **Tnk Pressure Low①②**	Vista Rack Faceplate Push Key Inputs Enabled Vista Tank Internal Pressure Is Low
T SW OPEN⑤ **T OP OPEN②** **T SW CLOSED⑤** **T OP CLOSED②** **T SW COUPLED⑤** **T SW TR OPEN⑤** **T SW TR CLOSED⑤** **T DOOR INT⑤** **T KEY INT⑤**	Tie Switch Open Tie Operator Open Tie Switch Closed Tie Operator Closed Tie Switch Coupled Tie Switch Trip to Open (Manual Open Push key) Tie Switch Trip to Close (Manual Close Push key) Tie Door Interlock Tie Key Interlock
SUPER AUTO/MAN⑥ **L SUPV TR OPEN⑥** **L SUPV TR CLOSE⑥** **R SUPV TR OPEN⑥** **R SUPV TR CLOSE④⑥**	Supervisory Auto/Manual Left Supervisory Trip to Open (Supervisory Open) Left Supervisory Trip to Close (Supervisory Close) Right Supervisory Trip to Open (Supervisory Open) Right Supervisory Trip to Close (Supervisory Close)
L CAP CHARGED③ **R CAP CHARGED③**	Left Capacitor Charged Right Capacitor Charged
T SUPV TR OPEN⑤⑥ **T SUPV TR CLOSE⑤⑥**	Tie Switch Supervisory Trip to Open (Supervisory Open) Tie Switch Supervisory Trip to Close (Supervisory Close)
L EXT OC SET⑦ **R EXT OC SET⑦** **L EXT OC RESET⑧** **R EXT OC RESET⑧**	Left External Overcurrent Set Right External Overcurrent Set Left External Overcurrent Reset Right External Overcurrent Reset

① Displayed if CONFIG: SELECT BUS TYPE has been factory-set for "VISTA COM" bus type.

② Displayed if CONFIG: SELECT BUS TYPE has been factory-set for "VISTA SPLIT" bus type.

③ Displayed if CONFIG: SELECT BUS TYPE has been factory-set for "PAD MNT" bus type.

④ Displayed if CONFIG: SELECT BUS TYPE has been factory-set for "COMMON," "SPLIT," or "SPLTCOM" bus type.

⑤ Displayed if CONFIG: SELECT BUS TYPE has been factory-set for "SPLIT" or "SPLTCOM" bus type.

⑥ Displayed if CONFIG: SUPERVISORY CONTROL has been factory-set for "IN."

⑦ Displayed if CONFIG: LOCKOUT OPTION has been factory-set for "EXTERNAL."

⑧ Displayed if CONFIG: LOCKOUT OPTION has been factory-set for "EXTERNAL" or "INTERNAL."

Table 16. Discrete Outputs in the Examine Menu

Non-Field Adjustable Item EXAMINE:	Description
R OPERATOR TRIP R RUN MOTOR① R STEER TO CLOSE①② R STEER TO OPEN①	Right Operator Trip Right Run Motor Right Steer to Close Right Steer to Open
L OPERATOR TRIP L RUN MOTOR① L STEER TO CLOSE①② L STEER TO OPEN①	Left Operator Trip Left Run Motor Left Steer to Close Left Steer to Open
T OPERATOR TRIP③	Tie Operator Trip
LOCAL ENABLED④	Vista Rack Faceplate Pushkey Inputs Enabled
VISTA SOURCE SEL④	Vista LVE Control Power Source Selection

① Displayed if the **CONFIG: SELECT BUS TYPE** setting has been factory-set for "PAD MNT" bus type.

② Displayed if the **CONFIG: SELECT BUS TYPE** setting has been factory-set for "VISTA COM" bus type.

③ Displayed if the **CONFIG: SELECT BUS TYPE** setting has been factory-set for "SPLIT," "SPLTCOM," or "VISTA SPLIT" bus type.

④ Displayed if the **CONFIG: SELECT BUS TYPE** setting has been factory-set for "VISTA COM" or "VISTA SPLIT" bus type.

Table 17. Spare Circuit Cards

Item	For Source-Transfer Control		Catalog Number
	Catalog Number	Suffix	
Power supply card	39050, 39060, 39070, 39080, 39090	All	TA-2257
CPU card	39050, 39060, 39070, 39080, 39090	All	TA-2283R1
Digital input card	39050, 39060, 39070, 39080, 39090	All	TA-2285
Analog input card	39050	-V1	TA-2284-3
		-V3	TA-2284-3
		-V4	TA-2284-2
	39060	All	TA-2284-3
	39070, 39080	-V2	TA-2284-4
		-V3	TA-2284-1
	39090	-V5	TA-2284-6
		-V6	TA-2284-5
		-V7	TA-2284-7
Burden card	39050, 39090	-V1	TA-2286-3
		-V1Y5	TA-2280-3
		-V3	TA-2286-5
		-V3Y5	TA-2280-5
		-V4	TA-2286-2
		-V4Y5	TA-2280-2
	39060	All (Except -Y5)	TA-2286-3
		-Y5	TA-2280-3
	39070, 39080	-V2	TA-2286-4
		-V2Y5	TA-2280-4
		-V3	TA-2286-1
		-V3Y5	TA-2280-1
Relay output card	39050, 39060	All	TA-2288-2
	39070, 39080	-V2	TA-2288-3
		-V3	TA-2288-1
	39090	All	TA-2288-4
Remote indication card	39050, 39060, 39070, 39080, 39090	-Y4	TA-2287

Table 18. Spare Front Panel Assemblies

Item	For Source-Transfer Control		Catalog Number
	Catalog Number	Suffix	
Front panel assembly	39050, 39060, 39070, 39090	All	TA-2294
	39080	All	TA-2265

When replacing a circuit card or front panel assembly, precautions should be taken to prevent static charges, which can damage not only the existing component but the replacement component as well. Although spare circuit cards and front panel assemblies are furnished in static-shielded bags, the use of a static-dissipative work surface, such as the 3M 8501 Portable Static-Dissipative Field Service Kit, is highly recommended. See Table 19.

Table 19. Static-Dissipative Work Surface

Item	Catalog Number
3M 8501 Portable Static-Dissipative Field Service Kit. Includes a static-dissipative work mat and a ground cord assembly with a wrist strap for connecting the mat—along with the person changing out the component—to the same ground point	9931-218