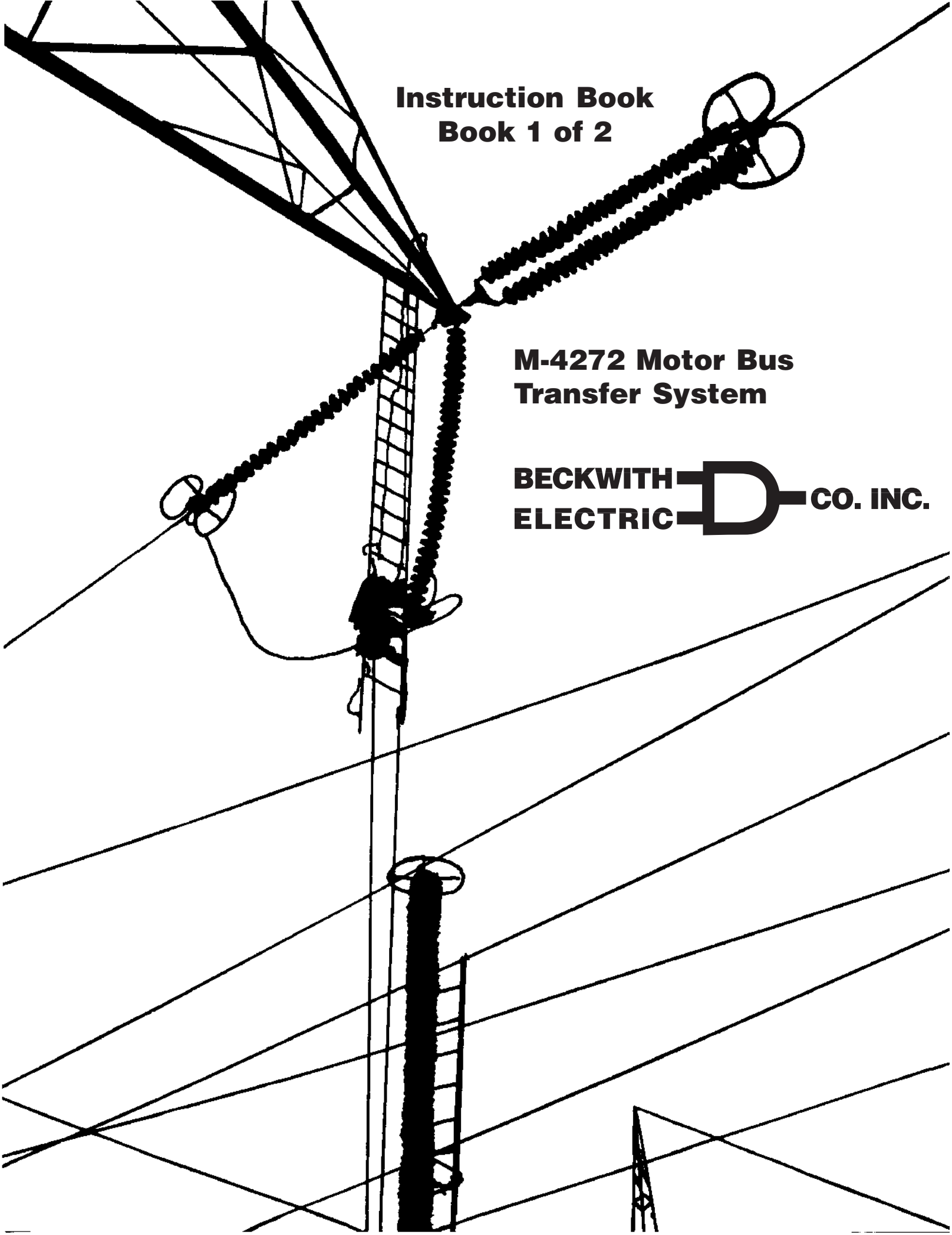
Instruction Book
Book 1 of 2



M-4272 Motor Bus Transfer System

BECKWITH ELECTRIC CO. INC.

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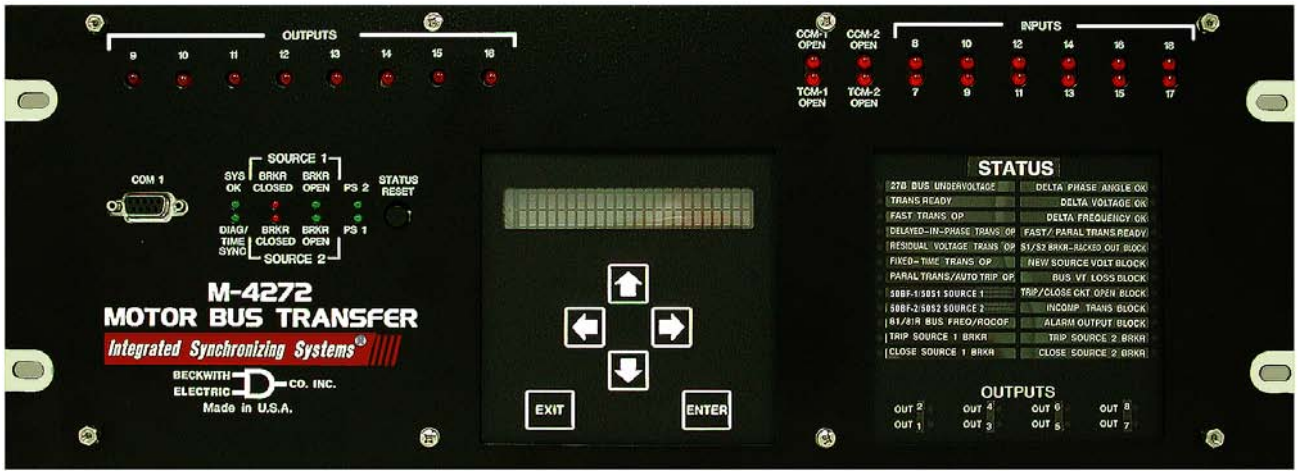
SYNCHRONIZING

Digital Motor Bus Transfer System M-4272

Integrated Synchronizing System®



- Provides Automatic and Manual transfers of motor bus systems in power plants and industrial processing plants to ensure process continuity
- Automatically selects Fast, Delayed In-Phase, Residual Voltage, and Fixed Time motor bus transfers, based on varying system conditions
- Applicable for one way and bi-directional Manual and Automatic transfers
- Can be expanded to accomodate multiple breaker configurations
- Multiple setpoint profiles for various application requirements
- Integrated control, supervisory functions, sequence of events, and oscillograph recording in one device
- Extensive commissioning tools, including ringdown analysis

Standard Features

Automatic Transfer: The digital Motor Bus Transfer System (MBTS) provides the following Automatic Transfer logic and features:

- Transfer initiated by protective relay external to the MBTS
- Automatic Transfer after a loss of the motor bus supply voltage based on the programmable undervoltage element. This provides a selectable backup feature if a manual or protective relay transfer is not initiated.
- Fast Transfer with adjustable phase angle limit
- Delayed In-Phase Transfer at the first phase coincidence if Fast Transfer is not possible
- Residual Voltage Transfer at an adjustable low residual voltage limit if Fast Transfer and Delayed In-Phase Transfer are not possible
- Fixed Time Transfer after an adjustable time delay
- Programmable Load Shedding with no time delay for Fast Transfer
- Programmable load shedding prior to initiating Delayed-in-Phase Transfer, Residual Voltage Transfer, and Fixed Time Transfer
- Adjustable setpoints for delta voltage limit and delta frequency limit
- Verify the new source (the source to which the bus is being transferred) is healthy and within acceptable upper and lower voltage limits

Manual Transfer: When a Manual Transfer is initiated the digital MBTS provides the following:

- Sync check functions with adjustable parameters
- Hot Parallel Transfer if enabled (make-before-break)
- Fast Transfer, Delayed In-Phase Transfer, and Residual Voltage Transfer (if the Hot Parallel Transfer is disabled)
- Programmable Load Shedding with no time delay for Fast Transfer
- Programmable load shedding prior to initiating Delayed In-phase Transfer and Residual Voltage Transfer
- Verify the new source (the source to which the bus is being transferred) is healthy and within acceptable upper and lower voltage limits

Circuit Breaker Control: The digital Motor Bus Transfer System includes the following Circuit Breaker Control features:

- Control of two circuit breakers with two individual programmable breaker closing times
- Three-breaker configuration can be provided by two M-4272 devices
- Breaker status supervision
- Breaker failure monitoring
- Four trip and close circuit monitoring inputs

Additional Standard Features

- Sequential or Simultaneous Transfer Mode
- Bus Phase Undervoltage (27B)
- Frequency (81) and Rate of Change of Frequency (81R) for load shedding
- Instantaneous Phase Overload Detection Source 1 and 2 (50S1) (50S2)
- Breaker Failure (50BF), Source 1 and Source 2
- Bus VT Fuse-Loss Detection (60FL)
- Auto Trip
- Auto Close
- Four dry output contacts (two trip and two close) for Source 1 and Source 2, one lockout/blocking output contact, and 11 programmable output contacts (10 Form 'a' and one Form 'c')
- Six Breaker Status inputs (a, b, and service position) for the Source 1 and Source 2 breakers, twelve programmable digital inputs
- All functions can be enabled or disabled
- Remote/Local control selection
- Device ON/OFF Control Selection
- M-3931 Human-Machine Interface (HMI) Module
- M-3972 Status Module
- IRIG-B time synchronization
- Oscillographic recording
- Two RS-232 ports (front and rear) and one RS-485 port (rear)
- M-3872 ISScom® Communications and Oscillographic Analysis Software

Optional Features

- RJ45 Ethernet Port Utilizing MODBUS over TCP/IP
- 5 A or 1 A models available
- 60 Hz or 50 Hz models available

The M-4272 Digital Motor Bus Transfer System provides Automatic and Manual Transfers. The Fast Transfer, Delayed In-Phase Transfer, and Residual Voltage Transfer methods are activated at the same time, if enabled. If the conditions for the Fast Transfer are not met, then the Delayed In-Phase Transfer or the Residual Voltage Transfer will be attempted. The Fixed Time Transfer is also provided if during a transfer operation, it is not possible to monitor the motor bus voltage (due to Bus VT fuse loss, for example). The Delayed In-Phase Transfer, Residual Voltage Transfer, and Fixed Time Transfer methods can be selectively disabled. The Automatic or Manual Transfer operation can be blocked by control/status input or remote serial communications. See Figure 2 for Typical Application of Motor Bus Transfer Systems.

Automatic Transfer

Automatic Transfer can be initiated by an external protection trip signal (86P) or an external undervoltage function (27) using control/status input to the Motor Bus Transfer System (MBTS) device or triggered by a sudden loss of motor bus supply voltage using the internal bus undervoltage relay (27B Function). Automatic Transfer allows transfer operation in both directions: from Source 1 to Source 2, and vice-versa. The Automatic Transfer provides Fast Transfer, Delayed In-Phase Transfer, Residual Voltage Transfer and Fixed Time Transfer. The Automatic Transfer is blocked when any lockout/blocking condition occurs. The MBTS will not respond to any transfer command and will not send the trip command while in the lockout/blocking condition.

Manual Transfer

Manual transfer can be initiated by using the local Human-Machine Interface (HMI), from a control/status input or through remote serial communications. The Manual Transfer allows transfer operation in either direction: from Source 1 to Source 2, and vice versa. Manual Transfer provides Hot Parallel Transfer or a combination of Fast Transfer, Delayed In-Phase Transfer and Residual Voltage Transfer. The Manual Transfer is blocked when any lockout/blocking condition occurs. The MBTS will not respond to any transfer command and will not send the trip command while in the lockout/blocking condition.

Transfer Modes

There are two transfer modes, Sequential and Simultaneous, in the open transition transfer operation.

Sequential Transfer Mode

Once a transfer is initiated, and if the Sequential Mode is selected, the old source breaker is tripped within 10 ms and closure of the new source* breaker is attempted only upon confirmation by the breaker status contact that the old source breaker has opened. Within 4 ms of receipt of this confirmation, all three methods, Fast, Delayed In-Phase and Residual Voltage Transfer are enabled to supervise closure of the new source* breaker, and the Fixed Time Transfer is enabled 30 cycles later. The new source* breaker is then closed by the Fast Transfer Method if the phase angle between the motor bus and the new source* is within the delta phase angle limit immediately after the old source breaker opens.

If the phase angle between the motor bus and the new source* is not within the delta phase angle limit, the old source breaker is still tripped. When the four methods of transfer are enabled, the new source* breaker then closes either as a result of a subsequent movement into the delta phase angle limit within the Fast Transfer Time Window, a movement through a predicted zero phase coincidence within the Delayed In-Phase Transfer Time Window, or by a drop in the motor bus voltage below the Residual Voltage Transfer limit, or after the fixed time delay of the Fixed Time Transfer. Transfer is completed and the new source* breaker is closed by any of the above methods whose criteria is first satisfied.

Refer to Figure 3 for Timing Sequence of Transfer Logic in Sequential Transfer Mode.

Simultaneous Transfer Mode

Alternatively, once a transfer is initiated, and if the Simultaneous Mode is selected, within 10 ms of transfer initiate, all three methods of transfer, Fast, Delayed In-Phase and Residual Voltage Transfer are immediately enabled to supervise closure of the new source* breaker without waiting for the breaker status contact confirmation that the old source breaker has opened. At the same instant, the commands for the old source breaker and the new source* breaker to trip and close are sent simultaneously if and only if the phase angle between the motor bus and the new source* is within the delta phase angle limit for the Fast Transfer Method immediately upon transfer initiation. However only the Fixed Time Transfer is enabled 30 cycles after the old source breaker has opened.

If the phase angle between the motor bus and the new source* is not within the delta phase angle limit, the old source breaker is still tripped. When the four methods of transfer are enabled, the new source* breaker then

* **NOTE**: The 'new source' is defined as the source to which the bus is being transferred.

closes either as a result of a subsequent movement into the delta phase angle limit within the Fast Transfer Time Window, a movement through a predicted zero phase coincidence within the Delayed In-Phase Transfer Time Window, or by a drop in the motor bus voltage below the Residual Voltage Transfer limit, or after the fixed time delay of the Fixed Time Transfer. Transfer is completed and the new source* breaker is closed by any of the above methods whose criteria is first satisfied.

Refer to Figure 4 for Timing Sequence of Transfer Logic in Simultaneous Transfer Mode.

Bus VT Fuse-Loss Detection (60FL)

A Bus VT Fuse-Loss condition is detected by comparing either the three-phase voltage of the motor bus to the three-phase voltage of the connected source (VT's in three-phase connection) or single phase voltage of the motor bus to a single phase voltages of the connected source (VT's in single phase connection): phase a to phase a, phase b to phase b, and phase c to phase c.

Auto Trip

If an external operation closes the second breaker while leaving the first one closed, and if the Auto Trip feature is enabled, there is a breaker trip option: the MBTS will trip the breaker that was originally closed or the breaker that has just been closed within an adjustable time delay (0 to 50 Cycles in increments of 0.5 Cycle) after the second breaker is closed. This Auto Trip operates to transfer in either direction. The purpose is to allow external parallel transfer but prohibits inadvertent parallel operation. It must be noted that the external operation that closed the second breaker must be supervised by means external to the motor bust transfer system.

Auto Close

If an external operation opens the second breaker while leaving the first one open, and if the Auto Close feature is selected, the MBTS will close the breaker that was originally opened. The originally opened breaker will be closed using the Fast Transfer, Delayed In Phase Transfer, Residual Voltage Transfer or Fixed Time Transfer method depending upon the bus voltage decayed condition. This Auto Close operates to transfer in either direction. The purpose is to permit a transfer when the normally-closed breaker is accidentally/inadvertently tripped resulting in two open breakers. This operation is very similar to the regular transfer process except it does not send out the trip command, since the second breaker is already opened.

Lockout/Blocking

A transfer is blocked when any lockout/blocking condition described below is active:

- Voltage Blocking – If prior to a transfer, the new source* voltage exceeds the Upper or Lower voltage limits, all transfers are blocked as long as the voltage remains outside these limits.
- External Blocking – When this control input contact is closed, all transfers are blocked.
- Incomplete Transfer Lockout – Blocks any transfer initiated by a protective relay initiate or an automatic initiated transfer or manual transfer if the last transfer has not been completed within the time delay. A time delay can be set from 50 to 3000 Cycles. The MBTS remains in the lockout condition until manually reset.
- Bus VT Fuse Loss Blocking – Transfer is blocked if the Bus VT fuse loss is detected and the customer has selected to block transfers when this occurs.
- “Both Breakers Same State” Blocking – If both breaker status contacts are in the open state, due to an external operation that opens the second breaker while leaving the first one open, and if the Auto Close feature is not selected, no transfer sequence is initiated. Furthermore, any subsequent initiation of a transfer sequence while the breakers are in this state is inhibited. Also, if both breaker status contacts are closed due to an external operation that closes the second breaker while leaving the first one closed, and if the auto trip feature is disabled, no transfer sequence is initiated.
- Transfer in Process Blocking – Once a transfer is in process, any other transfer initiate inputs will be ignored until the original transfer is complete.
- Blocking After Transfer – After a transfer has been completed, any additional transfers are blocked for 0 to 8160 cycles, as selected by the user.
- Trip/Close Circuit Open Blocking – Transfer is blocked if the Trip or Close Circuit Open is detected.
- 52a and 52b Position Disagreement Blocking – Transfer is blocked when the 52a and 52b status input positions disagree (applicable when both 52a and 52b status inputs are used).

* **NOTE**: The 'new source' is defined as the source to which the bus is being transferred.

TRANSFER SETTINGS

	Setpoint Ranges	Increment	Accuracy†
Automatic Transfer			
Fast Transfer			
Delta Phase Angle Limit*	0.0 to 90.0 Degrees	0.1 Degree	±0.5 Degree
Delta Voltage Limit	0 to 60 V	1 V	±0.5 V or ±2%
Delta Frequency Limit	0.02 to 2.00 Hz	0.01 Hz	±0.01 Hz or 5%
Time Window**	1 to 10 Cycles	0.5 Cycle	±1 Cycle
Closing Command Time Delay***	0 to 10 Cycles	0.5 Cycle	1 Cycle

** Accuracy defined at a constant frequency with a delta frequency of zero (0).*

*** This timer is used to limit the time window during which a Fast Transfer may be initiated.*

**** This time delay is only used for Fast Transfer in Simultaneous. The trip and close commands are normally issued at the same time. This time delay allows the flexibility to delay the closing command to accomplish the break-before-make mode of operation (open transition).*

Delayed In-Phase Transfer			
Delta Voltage Limit	0 to 120 V	1 V	±0.5 V or ±2%
Delta Frequency Limit*	0.10 to 10.00 Hz	0.05 Hz	±0.02 Hz (±0.1Hz)***
Time Window**	10 to 600 Cycles	1 Cycle	±1 Cycle or ±1%

** The pickup accuracy applies to the 60 Hz model at a range of 57 to 63 Hz, and to the 50 Hz model at a range of 47 to 53 Hz. Beyond these ranges, the accuracy is ±0.1 Hz (3-phase); ±0.4Hz(single phase).*

*** This timer is used to limit the time window during which an in-phase transfer may be initiated.*

**** Value in parenthese applies to single phase unit.*

For Delayed In-Phase Transfer, phase angle accuracy at first phase coincidence is 10.0 degrees with up to 10.0 Hz slip frequency.

Residual Voltage Transfer			
Residual Voltage Limit	5 to 60 V	1 V	±0.5 V or ±2%
Load Shedding Time Delay*	2 to 100 Cycles	1 Cycle	±1 Cycle or ±1%

Enabling the Load Shedding option allows the user to assign an output contact to shed load.

** The load shedding command is issued when bus voltage drops below residual voltage limit. The close command for the Residual Voltage Transfer is sent after the programmed load shedding time delay.*

Fixed Time Transfer			
Fixed Time Delay	30 to 1000 Cycles	1 Cycle	±1 Cycle or ±1%
Load Shedding Time Delay*	2 to 100 Cycles	1 Cycle	±1 Cycle or ±1%

This method is based on time delay only, and does not use the voltage, phase angle, frequency or current to supervise the closing of the new source breaker. The 'new source' is defined as the source to which the bus is being transferred.

Enabling the Load Shedding option allows the user to assign an output contact to shed load.

** The load shedding command is issued when the FixedTime delay has timed out. The Close command for the Fixed Time Transfer is sent after the programmed load shedding time delay.*

†Select the greater of these accuracy values. Accuracy applies to sinusoidal voltage with constant amplitude and frequency.

TRANSFER SETTINGS

	Setpoint Ranges	Increment	Accuracy†
Manual Transfer			
Fast Transfer			
Delta Phase Angle Limit*	0.0 to 90.0 Degrees	0.1 Degree	±0.5 Degree
Delta Voltage Limit	0 to 60 V	1 V	±0.5 V or ±2%
Delta Frequency Limit	0.02 to 2.00 Hz	0.01 Hz	±0.01 Hz or ±5%
Time Window**	1 to 10 Cycles	0.5 Cycle	± 1 Cycle
Closing Command Time Delay***	0 to 10 Cycles	0.5 Cycle	1 Cycle
Delayed In-Phase Transfer			
Delta Voltage Limit	0 to 120 V	1 V	±0.5 V or ±2%
Delta Frequency Limit*	0.10 to 10.00 Hz	0.05 Hz	±0.02 Hz (±0.1Hz)***
Time Window**	10 to 600 Cycles	1 Cycle	±1 Cycle or ±1%
Residual Voltage Transfer			
Residual Voltage Limit	5 to 60 V	1 V	±0.5 V or ±2%
Load Shedding Time Delay*	2 to 100 Cycles	1 Cycle	±1 Cycle or ±1%

* Accuracy defined at a constant frequency with a delta frequency of zero (0).

*** This timer is used to limit the time window during which a Fast Transfer may be initiated.*

**** This time delay is only used for Fast Transfer in Simultaneous mode. The trip and close commands are normally issued at the same time. This time delay allows the flexibility to delay the closing command to accomplish the break-before-make mode of operation (open transition).*

*** The pickup accuracy applies to the 60 Hz model at a range of 57 to 63 Hz, and to the 50 Hz model at a range of 47 to 53 Hz. Beyond these ranges, the accuracy is ±0.1 Hz (3-phase); ±0.4Hz (single phase).*

*** This timer is used to limit the time window during which an in-phase transfer may be initiated.*

**** Value in parenthese applies to single phase unit.*

For Delayed In-Phase Transfer, phase angle accuracy at first phase coincidence is 10.0 degrees with up to 10.0 Hz slip frequency.

*** The load shedding command is issued when bus voltage drops below residual voltage limit. The close command for the Residual Voltage Transfer is sent after the programmed load shedding time delay.*

Enabling load shedding option allows the user to assign an output contact to shed load.

†Select the greater of these accuracy values. Accuracy applies to sinusoidal voltage with constant amplitude and frequency.

TRANSFER SETTINGS

	Setpoint Ranges	Increment	Accuracy†
Manual Transfer (cont.)			
Hot Parallel Transfer			
Delta Phase Angle Limit*	0.0 to 90.0 Degrees	0.1 Degree	±0.5 Degree
Delta Voltage Limit	0 to 60 V	1 V	±0.5 V or ±2%
Delta Frequency Limit	0.02 to 0.50 Hz	0.01 Hz	±0.01 Hz or ±5%
Time Window	1.0 to 50.0 Cycles	0.5 Cycle	±1 Cycle
Tripping Command Time Delay**	0.0 to 30.0 Cycles	0.5 Cycle	1 Cycle
Auto Trip			
Trip Originally Closed Breaker	Enable/Disable	____	____
Trip Breaker Just Closed	Enable/Disable	____	____
Tripping Command Time Delay	0.0 to 50.0 Cycles	0.5 Cycle	1 Cycle

** Accuracy defined at a constant frequency with a delta frequency of zero (0).*

*** This time delay is only used in the Manual Transfer to implement a Hot Parallel Transfer (make-before-break).*

†Select the greater of these accuracy values. Accuracy applies to sinusoidal voltage with constant amplitude and frequency.

TRANSFER SETTINGS

	Setpoint Ranges	Increment	Accuracy†
Common Function Settings			
Upper Voltage Limit New Source	5 to 180 V	1 V	±0.5 V or ±2%
Lower Voltage Limit New Source	5 to 180 V	1 V	±0.5 V or ±2%
Breaker Closing Time #1 (Source 1 Breaker)(1)	0.0 to 12.0 Cycles	0.1 Cycle	0.3 Cycle
Breaker Closing Time #2 (Source 2 Breaker)(1)	0.0 to 12.0 Cycles	0.1 Cycle	0.3 Cycle
Breaker Closing Time Deviation #1 (2)	0.0 to 6.0 Cycles	0.1 Cycle	0.3 Cycle
Breaker Closing Time Deviation #2 (2)	0.0 to 6.0 Cycles	0.1 Cycle	0.3 Cycle
52a and 52b Position Disagreement Pickup Time Delay(3) (Source 1 Breaker)	0 to 30 Cycles	1 Cycle	1 Cycle
Dropout Time Delay(3) (Source 1 Breaker)	0 to 30 Cycles	1 Cycle	1 Cycle
Pickup Time Delay(3) (Source 2 Breaker)	0 to 30 Cycles	1 Cycle	1 Cycle
Dropout Time Delay(3) (Source 2 Breaker)	0 to 30 Cycles	1 Cycle	1 Cycle
Incomplete Transfer Lockout Time(4)	50 to 3000 Cycles	1 Cycle	±1 Cycle or ±1%
Local Manual Transfer Initiate Time Delay(5)	0 to 8160 Cycles	1 Cycle	1 Cycle or 1%
Remote Manual Transfer Initiate Time Delay(7)	0 to 8160 Cycles	1 Cycle	1 Cycle or 1%
Blocking After Transfer Time(6)	0 to 8160 Cycles	1 Cycle	1 Cycle or 1%
Trip Command Pulse Length	15 to 30 Cycles	1 Cycle	±1 Cycle
Close Command Pulse Length	15 to 30 Cycles	1 Cycle	±1 Cycle

(1) This is the time it takes the breaker to close from the issue of a close command to when the breaker status contact closes. The selectable adaptive breaker closing time is also provided.

(2) An alarm is activated if the actual Breaker Closing Time exceeds the programmed closing time by ± this value.

(3) The Time Delays are only applicable when both 52a and 52b Status Inputs of the S1 and S2 breakers are used. The Pickup Time Delay is used to block transfer when the 52a and 52b Status Input positions disagree.

(4) This timer is used for situations where the transfer was not completed. Response to a breaker failure is considered a complete transfer, and resets this timer.

(5) This time delay is only applicable when the manual transfer is initiated from the local front panel via the HMI or Com1 port.

(6) This timer is used to block any additional transfer after a transfer has been completed.

(7) This time delay is only applicable when manual transfer is initiated from the Control/Status input, Com2 Port, Com3 Port or Ethernet Port.

†Select the greater of these accuracy values. Accuracy applies to sinusoidal voltage with constant amplitude and frequency.

FUNCTIONS

		Setpoint Ranges	Increment	Accuracy†
27B Bus Phase Undervoltage				
27B	Pickup #1, #2, #3, #4	5 to 120 V	1 V	±0.5 V or ±2%
	Inhibit Setting**	5 to 120 V	1 V	±0.5 V or ±2%
	Time Delay	1 to 8160 Cycles	1 Cycle	-1 to +3 Cycles or ±0.5%*

** The pickup and time delay accuracies apply to 60 HZ models at a range of 57 to 63 Hz, and to 50 Hz models at a range of 47 to 53 Hz. Beyond these ranges, the time delay accuracy is 6 Cycles or 0.75% for the bus frequency down to 25 Hz. The time delay accuracy is ≦ 20 Cycles or 1% for the bus frequency at a range of 5 to 25 Hz.*

*** The Voltage Inhibit setting can be enabled or disabled.*

27B #1 is the Bus Phase Undervoltage initiate function that is used for Automatic Transfer from S1 to S2 direction.

27B #2 is the Bus Phase Undervoltage initiate function that is used for Automatic Transfer from S2 to S1 direction.

27B #3 can be used for load shedding.

27B #4 can be used for alarm or trip function.

The 27B functions are applicable only when the bus phase voltage input is applied.

50S1 Instantaneous Phase Overload Detection (Source 1)				
50 S1	Pickup #1, #2	1.0 to 100.0 A (0.2 to 20.0 A)*	0.1 A	±0.1 A or ±3% (±0.02 A or ±3%)
	Time Delay	1 to 8160 Cycles	1 Cycle	±2 Cycles or ±1%

** Values in parentheses apply to 1A secondary rating. Since this is only a single phase element, the 50S1 Function can only be used for overload detection and not used for overcurrent protection.*

50S2 Instantaneous Phase Overload Detection (Source 2)				
50 S2	Pickup #1, #2	1.0 to 100.0 A (0.2 to 20.0 A)*	0.1 A	±0.1 A or ±3% (±0.02 A or ±3%)
	Time Delay	1 to 8160 Cycles	1 Cycle	±2 Cycles or ±1%

** Values in parentheses apply to 1A secondary rating. Since this is only a single phase element, the 50S2 Function can only be used for overload detection and not used for overcurrent protection.*

50BF-1 Breaker Failure (Source 1)				
50 BF1	Pickup Current	0.10 to 10.00 A (0.02 to 2.00 A)*	0.01 A	±0.1 A or ±2% (±0.02 A or ±2%)
	Time Delay	1 to 30 Cycles	1 Cycle	±1 Cycle

50BF-1 can be initiated from designated M-4272 output contacts or programmable inputs.

** Value in parentheses apply to 1A Secondary Rating*

50BF-2 Breaker Failure (Source 2)				
50 BF2	Pickup Current	0.10 to 10.00 A (0.02 to 2.00 A)*	0.01 A	±0.1 A or ±2% (±0.02 A or ±2%)
	Time Delay	1 to 30 Cycles	1 Cycle	±1 Cycle

50BF-2 can be initiated from designated M-4272 output contacts or programmable inputs.

** Value in parentheses apply to 1A Secondary Rating*

†Select the greater of these accuracy values. Accuracy applies to sinusoidal voltage with constant amplitude and frequency. Values in parentheses apply to 1 A CT secondary rating.

FUNCTIONS (Cont.)

		Setpoint Ranges	Increment	Accuracy†
Source 1 Breaker Failure (Using breaker status)				
	Time Delay	0 to 30 Cycles	1 Cycle	1 Cycle

The breaker failure time delay is used to monitor breaker failure when using the breaker status inputs only. The breaker is considered failed when the breaker status has not changed state within this programmable time delay after a trip command is issued. A separate time delay is provided for breaker failure function (50BF) when current is present.

Source 2 Breaker Failure (Using breaker status)				
	Time Delay	0 to 30 Cycles	1 Cycle	1 Cycle

The breaker failure time delay is used to monitor breaker failure when using the breaker status inputs only. The breaker is considered failed when the breaker status has not changed state within this programmable time delay after a trip command is issued. A separate time delay is provided for breaker failure function (50BF) when current is present.

81 Frequency (bus voltage)				
81	Pickup #1, #2	50.00 to 67.00 Hz 40.00 to 57.00 Hz*	0.01 Hz	±0.02 Hz (±1.0 Hz)**
	Time Delay #1, #2	5 to 65,500 Cycles	1 Cycle	±3 Cycles or ±1%

The pickup accuracy applies to 60 Hz models at a range of 57 to 63 Hz, and to 50 Hz models at a range of 47 to 53 Hz. Beyond these ranges, the accuracy is ±0.1 Hz (3-phase); ±0.4Hz(single phase).

The 81 #1 Function can be used to initiate Load Shedding. The 81 Function is automatically disabled when the bus phase voltage input is less than 5 to 15 V (Positive Sequence) based on the frequency, or less than 5 V (Single Phase).

** This range applies to 50 Hz nominal frequency model.*

*** Value in parenthese applies to single phase bus voltage frequency.*

81R Rate of Change of Frequency (bus voltage)				
81R	Pickup #1, #2	0.10 to 20.00 Hz/Sec.	0.01 Hz/Sec.	±0.05 Hz/Sec. or ±5%
	Time Delay #1, #2	3 to 8160 Cycles	1 Cycle	+20 Cycles
	Negative Sequence Voltage Inhibit	0 to 99%	1%	±0.5%
	Increasing ROCOF	Enable/Disable		

The 81R #1 Function can be used to initiate Load Shedding. 81R function can only be used when the bus voltage input is three-phase, and for load shedding.

†Select the greater of these accuracy values. Accuracy applies to sinusoidal voltage with constant amplitude and frequency.

FUNCTIONS (Cont.)

		Setpoint Ranges	Increment	Accuracy†
Bus VT Fuse-Loss Detection				
60FL	Delta Pickup*	5 to 25 V	1 V	±.05 V or ±2%
	Time Delay**	1 to 8160 Cycles	1 Cycle	3 Cycles or 1%****
	Blocking Drop Out Time Delay***	1 to 300 Cycles	1 Cycle	3 Cycles or 1%****

** Mismatched voltage of the motor bus in respect to the connected source.*

*** This time delay is for the programmable alarm output.*

**** This is the time it takes to drop out (reset) the block transfer after no Bus VT fuse-loss is detected.*
***** The pickup and time delay accuracies apply to 60 HZ models at a range of 57 to 63 Hz, and to 50 Hz models at a range of 47 to 53 Hz. Beyond these ranges, the time delay accuracy is 6 Cycles or 0.75% for the bus frequency down to 25 Hz. The time delay accuracy is ≤ 20 Cycles or 1% for the bus frequency at a range of 5 to 25 Hz.*

If the bus VT fuse-loss is detected, the user must either select block transfer or initiate the Fixed Time Transfer.

Bus VT fuse-loss output is intiated from internally generated logic.

Trip and Close Circuit Monitor				
	Trip Circuit Monitor			
TCM	TCM-1 Time Delay	1 to 8160 Cycles	1 Cycle	±1 Cycle or ±1%
	TCM-1 Dropout Time Delay	1 to 8160 Cycles	1 Cycle	±1 Cycle or ±1%
	TCM-2 Time Delay	1 to 8160 Cycles	1 Cycle	±1 Cycle or ±1%
	TCM-2 Dropout Time Delay	1 to 8160 Cycles	1 Cycle	±1 Cycle or ±1%
	Close Circuit Monitor			
CCM	CCM-1 Time Delay	1 to 8160 Cycles	1 Cycle	±1 Cycle or ±1%
	CCM-1 Dropout Time Delay	1 to 8160 Cycles	1 Cycle	±1 Cycle or ±1%
	CCM-2 Time Delay	1 to 8160 Cycles	1 Cycle	±1 Cycle or ±1%
	CCM-2 Dropout Time Delay	1 to 8160 Cycles	1 Cycle	±1 Cycle or ±1%

The CCM/TCM inputs are provided for monitoring the continuity of the Source 1 and Source 2 trip and close circuits. The inputs can be used for nominal trip/close coil voltages of 24 V dc – 250 V dc. Trip and closing circuit monitoring are performed in the active breaker status only (trip circuit supervision when breaker is closed and close circuit supervision when breaker is open.) Both the DC supply and continuity for each of the circuits are monitored.

ISSLogic®				
ISSL	ISSLogic uses control/status input status, system status, function status, output contact close signals to develop 6 programmable logic schemes.			
	Time Delay #1-#6	0 to 65500 Cycles	1 Cycle	1 Cycle or 1%
	Dropout/Reset Time Delay #1-#6	0 to 65500 Cycles	1 Cycle	1 Cycle or 1%

†Select the greater of these accuracy values. Accuracy applies to sinusoidal voltage with constant amplitude and frequency.

Multiple Setpoint Profiles (Groups)

The system supports four setpoint profiles. This feature allows multiple setpoint profiles to be defined for the type of transfer initiated (Automatic , Manual or Hot Parallel) and the direction of the next transfer.

Metering

The Digital Motor Bus Transfer System provides metering of voltage and current of the Source 1 and Source 2, and Voltage and Frequency of the Motor Bus.

Metering accuracies are:

Voltage:	±0.5 V or ±0.5%, whichever is greater (from 57 to 63 Hz for 60 Hz models; from 47 to 53 Hz for 50 Hz models) ±1.0 V or ±0.75%, whichever is greater (below 57 Hz or beyond 63 Hz for 60 Hz models; below 47 Hz or beyond 53 Hz for 50 Hz models)
Current:	5 A rating, ±0.1 A or ±3%, whichever is greater 1 A rating, ±0.02 A or ±3%, whichever is greater
Frequency:	±0.02 Hz (from 57 to 63 Hz for 60 Hz models; from 47 to 53 Hz for 50 Hz models) ±0.1 Hz (below 57 Hz or beyond 63 Hz for 60 Hz models; below 47 Hz or beyond 53 Hz for 50 Hz models)
Phase Angle:	±0.5 degree or ±0.5%, whichever is greater

Oscillographic Recorder

The oscillographic recorder provides comprehensive data recording of all monitored waveforms, and status inputs storing up to 248 cycles of data. The total record length is user-configurable from 1 to 16 partitions. The number of samples per cycle used to store the data is user selectable. The number of samples per cycle that can be selected is 16 or 32 (50 or 60 Hz). The number of samples selected effects the length of the data that can be saved and its resolution. The lower the number of samples, the longer the record length that can be stored (but at a lower resolution).

The oscillographic recorder is triggered by a designated control/status input (usually a protective relay initiate input), an automatically initiated signal, a trip output, a manual transfer signal or from serial communications.

When untriggered, the recorder continuously stores waveform data, thereby keeping the most recent data in memory. When triggered, the recorder stores pre-trigger data, then continues to store data in memory for a user-defined, post-trigger delay period. The records may be analyzed using Beckwith Electric ISScom® Communications and Oscillographic Analysis Software, and are also available in COMTRADE file format.

Transfer Event Log

A transfer event log is considered complete when one of following occurs:

1. When the breaker from the old source opens and the breaker to the new source* closes.
2. When a breaker failure occurs.
3. When the incomplete transfer timer times out.

Depending on transfer type, up to four transfers will be stored. When 16 events are stored, any subsequent event will cause the oldest event to be lost. Each Transfer Event Log parameter is time stamped with the date and time in 1 ms increments.

The trigger and complete events are used to define the time frame during which the transfer event log is storing information. A reset feature is provided to clear this log through the serial communications. The Transfer Event Log is available for viewing utilizing the M-3872 ISScom Communications Software.

Sequence of Events Recording

In addition to the Transfer Event Log the Digital Motor Bus Transfer System provides Sequence of Events Recording. The Sequence of Events Recording stores every change in the input status, trip commands, close commands, any signal to initiate a transfer, type of transfer, change in any breaker status, and status reset.

*__NOTE__: The 'new source' is defined as the source to which the bus is being transferred.

Each of these Running Events are time stamped with the date and time in 1 ms increments. The Running Event Log stores the last 512 events, when a new event occurs the oldest event is removed. A reset feature is provided to clear this log through the serial communications. The events and the associated data are available for viewing utilizing the M-3872 ISScom® Communications Software.

Calculations

Current and Voltage Values: The Digital Motor Bus Transfer System uses discrete Fourier Transform (DFT) and RMS calculation algorithm on sampled voltage and current signals to extract fundamental amplitude, phase and frequency for the M-4272.

Power Input Options

Nominal 110/120/230/240 V ac, 50/60 Hz, or nominal 110/125/220/250 V dc. Operates properly from 85 V ac to 265 V ac and from 80 V dc to 312.5 V dc. Withstands 315 V dc or 300 V ac for 1 second. Burden 20 VA at 120 V ac/125 V dc.

Nominal 24/48 V dc, Operates properly from 18 V dc to 56 V dc. Withstands 65 V dc for 1 second. Burden 46 VA at 24 V dc and 30 VA at 48 V dc.

This unit includes two power supplies which are not redundant.

Sensing Inputs

Nine Voltage Inputs – Rated for a nominal voltage of 50 V ac to 140 V ac (user configurable) at 60 Hz or 50 Hz. Will withstand 240 V continuous voltage and 360 V for 10 seconds. Voltage transformer burden is less than 0.2 VA at 120 V. Source voltage may be phase-to ground or phase-to-phase connected. For proper operation of M-4272 MBTS, the connections for the Source 1, Source 2 and Bus voltages must match each other. The unit may have up to three voltage inputs for each of the Source 1, Source 2, and Bus Voltages. Typical connection diagrams are illustrated in Figures 10 through 15.

One Source 1 Current Input – Rated for a current (I_R) of 5.0 A or 1.0 A (optional) at 60 Hz or 50 Hz. Will withstand 4 I_R continuous current and 100 I_R for 1 second. Current transformer burden is less than 0.5 VA at 5 A (5 A option), or 0.3 VA at 1 A (1 A option).

One Source 2 Current Input – Rated for a current (I_R) of 5.0 A or 1.0 A (optional) at 60 Hz or 50 Hz. Will withstand 4 I_R continuous current and 100 I_R for 1 second. Current transformer burden is less than 0.5 VA at 5 A (5 A option), or 0.3 VA at 1 A (1 A option).

Control/Status Inputs

To provide proper operation and breaker status LED indication on the front panel, the INPUT1 through INPUT 6 status inputs must be connected to the 52a, 52b, 52a/b and 52SP (service position) breaker status contacts. The control/status inputs, INPUT7 through INPUT18, can be programmed to initiate the transfer or block the transfer operation, trigger the oscillographic recorder, or to operate one or more outputs. The control/status inputs are designed to be connected to dry contacts and are internally wetted with a 24 V dc power supply.The four Aux Inputs must be connected to the trip and close circuit monitoring.

Output Contacts

Output contacts OUTPUT1 through OUTPUT4 are available to Trip and Close the Source 1 and Source 2 breakers and are closed for a defined pulse length (pulse length can be programmed from 15 to 30 Cycles). The power supply alarm output contact (form 'b') and the self-test alarm output contact (form 'c'), and one output contact for lockout or blocking status (form 'c'). These outputs are pre-defined.

The eleven programmable output contacts (ten form ‘a’ and one form ‘c’), the Lockout/Block alarm output contact (form 'c'), the power supply alarm output contact (form 'b') and the self-test alarm output contact (form ‘c’), are all rated as per ANSI/IEEE C37.90-1989 for tripping. (Make 30 A for 0.2 seconds, carry 8 A, break 6 A @ 120 V ac, break 0.5A @ 48 V dc; 0.3A @ 125 V dc; 0.2A @ 250 V dc with L/R = 40 mSec.)

Any of the MBTS functions can be individually programmed to activate any one or more of the programmable output contacts (Outputs 5 to 16). Any output contact can also be selected as pulsed or latched. ISSLogic can also be used to activate an output contact.

*__NOTE__: The 'new source' is defined as the source to which the bus is being transferred.

Breaker Closing Time and Breaker Failure Monitoring

The Breaker Closing Time Monitoring feature measures the breaker closing time each time a transfer occurs. If this time varies by more than a selectable breaker closing time deviation of the programmed time, an alarm is activated. The breaker closing time is measured from the time the close command is sent until the breaker status indicates that the breaker is closed.

The selectable Adaptive Breaker Closing Time is provided. If it is enabled, a new setpoint of the breaker closing time will be automatically updated to an average value of 8 breaker closing time's measurements; however the setpoints of the breaker closing time are not permitted to write and change unless this feature is disabled.

The breaker status inputs are also monitored for breaker failure. The breaker is considered failed when the breaker status has not changed state within a programmable time after a trip command is issued. When Simultaneous Transfer mode is selected and a breaker failure occurs on the breaker that should have tripped, the breaker that was just closed will be tripped. This prevents the new source* from being continuously connected with the failed breaker, which could have a fault.

In addition to using the breaker status in determining when a breaker has failed, the current through the breaker can also be used to determine if the breaker has operated. The loss of current after a trip can be selected to provide a more positive indication of breaker operation. An instantaneous overcurrent breaker failure element with a time delay (50BF) is provided to minimize breaker failure coordination margins.

Power up Self-Test and Continuous On-Line Testing

The system performs self test verifications when power is first applied to the unit. These include verifying the operation of the multiplexer, programmable gain amplifier, analog to digital converter, DSP chip, Host processor and all RAM chips. After the initial self test is complete and the system is operating normally, continuous self check verification continues to check for correct operation of the system. The continuous self check verification tests are performed in the background and do not effect the response time of the unit to emergency conditions. In addition to the background tests, there are tests that can be performed in the diagnostic mode during periodic off line system testing. These additional tests can exercise the relay outputs, check front panel LED operation, verify input status operation, check pushbutton operation and communication operation.

Target/Status Indicators and Controls

The **SYS OK** LED reveals proper cycling of the microcomputer; it can be programmed to flash or to be illuminated continuously. The **SOURCE 1 BRKR CLOSED** and **SOURCE 2 BRKR CLOSED** red LEDs illuminate when the breaker is closed (when the 52a contact is closed). The **SOURCE 1 BRKR OPEN** and **SOURCE 2 BRKR OPEN** green LEDs illuminate when the breaker is open (when the 52a contact is open). The 52 contact input can be configured for either “a”, “b” or "a/b" inputs. The corresponding **BRKR status** LED will illuminate when any of the conditions, events or unit functions activate.

Pressing and releasing the **STATUS RESET** pushbutton resets the **STATUS** LEDs if the conditions causing the operation have been removed. Pressing and holding the **STATUS RESET** pushbutton will allow conditions, events or functions that are picked up to be displayed. The **PS1** and **PS2** LEDs will remain illuminated as long as power is applied to the unit and the power supply is operating properly. **TIME SYNC** LED illuminates when a valid IRIG-B signal is applied and time synchronization has been established. The **TRIP SOURCE 1, CLOSE SOURCE 1, TRIP SOURCE 2** and **CLOSE SOURCE 2** status indicators are latched due to the pulsed nature of these commands. To provide information about which outputs were operated during the last transfer the appropriate **TRIP SOURCE 1, CLOSE SOURCE 1, TRIP SOURCE 2** or **CLOSE SOURCE 2** LEDs in the **Status** module are latched until reset or the next transfer.

*__NOTE__: The 'new source' is defined as the source to which the bus is being transferred.

Communication

Communication ports include rear RS-232 and RS-485 ports, a front RS-232 port, a rear IRIG-B port, and an Ethernet port (optional). The communications protocol implements serial, byte-oriented, asynchronous communication, providing the following functions when used with the Windows™-compatible M-3872 ISScom® Communications and Oscillographic Analysis Software. MODBUS protocol is supported, providing:

- Interrogation and modification of setpoints and configuration
- Time-stamped status information for the 4 most recent Transfer Event logs
- Time-stamped status information for the 512 most recent events in the Sequence of Events log
- Real-time metering of all measured quantities, control status inputs, and outputs
- Downloading of recorded oscillographic data and Sequence of Events recorder data
- Initiate manual transfer and Sequence of Events recorder

The M-3872 ISScom Communications and Oscillographic Analysis Software enables the plotting and printing of M-4272 waveform data downloaded from the unit to any IBM-PC compatible computer. The ISScom Communications and Oscillograph Analysis Software can also be used to analyze the operation of the system, determine timing of the trip and close commands, breaker times and to evaluate “bus ringdown” test data. The evaluation of “bus ringdown” data eliminates the requirement for separate recording equipment during commissioning.

IRIG-B

The M-4272 accepts either modulated or demodulated IRIG-B time clock synchronization signals. The IRIG-B time synchronization information is used to correct the local calendar/clock and provide greater system wide synchronization for status and oscillograph time tagging.

HMI Module

Local access to the M-4272 is provided through the M-3931 Human-Machine Interface (HMI) Module, allowing for easy-to-use, menu-driven access to all functions using a 6-pushbutton keyboard and a 2-line by 24 character alphanumeric display. The M-3931 module includes the following features:

- User-definable access codes providing three levels of security
- Real-time metering of all measured quantities, control status inputs, and outputs
- Initiate Manual Transfer
- Remote/Local control
- Device On/Off control

Status Module

An M-3972 Status Module provides 24 status and 8 output LEDs. Appropriate status LEDs illuminate when the corresponding M-4272 conditions, event or function activates. The status indicators can be reset with the **STATUS RESET** pushbutton if the activated conditions have been removed. The **OUTPUT** LEDs indicate the status of the programmable output contacts. There are an additional 4 status LEDs, 8 output LEDs and 12 input LEDs located on the front panel.

ISSLogic®

This feature can be programmed utilizing the M-3872 ISScom Communications Software. ISScom takes the control/status input status, system status and function status, and by employing (OR, AND, NOR and NAND) boolean logic and timers, can activate an output, change active setting profiles, initiate transfer, or block transfer.

There are six ISSLogic Functions per setting profile, depending on the number of different MBTS settings defined, the scheme may provide up to 24 different logic schemes. The ISSLogic Function Diagram is illustrated in Figure 1.

*__NOTE__: The 'new source' is defined as the source to which the bus is being transferred.

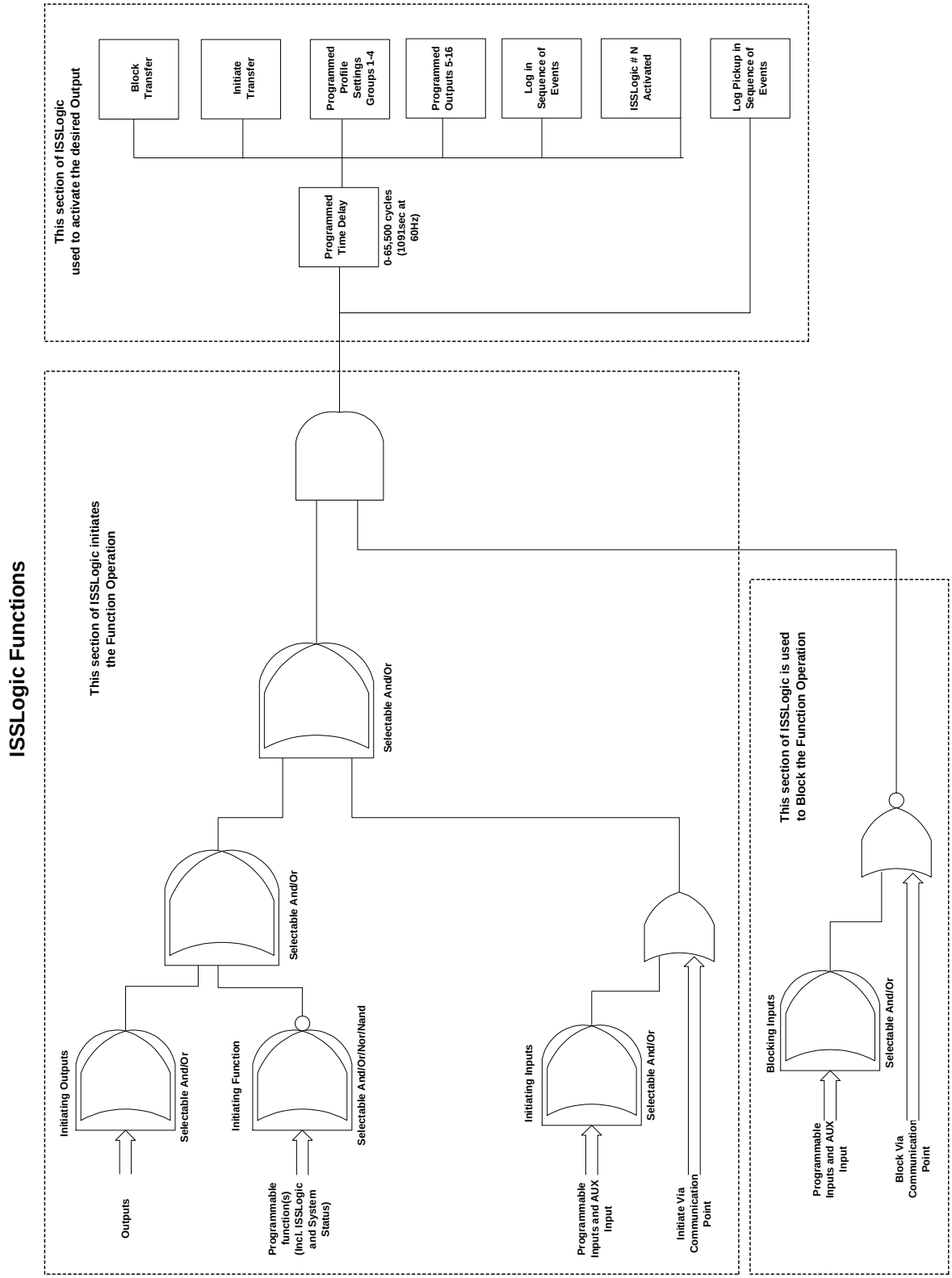


Figure 1 ISSLogic® Function Diagram

Tests and Standards

M-4272 Digital Motor Bus Transfer System complies with the following type tests and standards:

Voltage Withstand

Dielectric Withstand

IEC 60255-5	3,500 V dc for 1 minute applied to each independent circuit to earth
	3,500 V dc for 1 minute applied between each independent circuit
	1,500 V dc for 1 minute applied to IRIG-B circuit to earth
	1,500 V dc for 1 minute applied between IRIG-B to each independent circuit
	1,500 V dc for 1 minute applied between RS-485 to each independent circuit

Impulse Voltage

IEC 60255-5	5,000 V pk, +/- polarity applied to each independent circuit to earth
	5,000 V pk, +/- polarity applied between each independent circuit
	1.2 by 50 μs, 500 ohms impedance, three surges at 1 every 5 seconds
IEC 60255-5	> 100 Megaohms

Electrical Environment

Electrostatic Discharge Test

EN 60255-22-2	Class 4 (8 kV)—point contact discharge
EN 60255-22-2	Class 4 (15kV)–air discharge

Fast Transient Disturbance Test

EN 60255-22-4	Class A (4 kV, 2.5 kHz)

Surge Withstand Capability

ANSI/IEEE C37.90.1-1989	2,500 V pk-pk oscillatory applied to each independent circuit to earth
	2,500 V pk-pk oscillatory applied between each independent circuit
	5,000 V pk Fast Transient applied to each independent circuit to earth
	5,000 V pk Fast Transient applied between each independent circuit
ANSI/IEEE C37.90.1-2002	2,500 V pk-pk oscillatory applied to each independent circuit to earth
	2,500 V pk-pk oscillatory applied between each independent circuit
	4,000 V pk Fast Transient burst applied to each independent circuit to earth
	4,000 V pk Fast Transient burst applied between each independent circuit

■ **NOTE**: The signal is applied to the digital data circuits (RS-232, RS-485, IRIG-B, Ethernet communication port coupling port) through capacitive coupling clamp.

ANSI/IEEE C37.90.2	80-1000 Mhz @ 35 V/m

Output Contacts

ANSI/IEEE C37.90.0	Make 30 A for 0.2 seconds, off for 15 seconds for 2,000 operations, per Section 6.7.1, Tripping Output Performance Requirements

Atmospheric Environment

Temperature

IEC 60068-2-1	Cold, –20° C
IEC 60068-2-2	Dry Heat, +70° C
IEC 60068-2-78	Damp Heat, +40° C @ 93% RH

Mechanical Environment

Vibration

IEC 60255-21-1	Vibration response Class 1, 0.5 g
	Vibration endurance Class 1, 1.0 g
IEC 60255-21-2	Shock Response Class 1, 5.0g
	Shock Withstand Class 1, 15.0g
	Bump Response Class 1, 10.0g

Compliance

cULus-Listed per 508 – Industrial Control Equipment

– Industrial Control Equipment Certified for Canada CAN/CSA C22.2 No. 14-M91

cULus-Listed Component per 508A Table SA1.1 Industrial Control Panels

European Safety - EN 61010-1:2001, CAT II, Pollution Degree 2

Physical

Size: 19.00" wide x 6.96" high x 10.20" deep (48.3 cm x 17.7 cm x 25.9 cm)

Mounting: The unit is a standard 19", semiflush, 4-unit high, rack-mount panel design, conforming to ANSI/EIA RS-310C and DIN 41494 Part 5 specifications. Optional mounting is available.

Approximate Weight: 20 lbs (9.1 kg)

Approximate Shipping Weight: 30 lbs (13.6 kg)

Recommended Storage Parameters

Temperature: 5° C to 40° C

Humidity: Maximum relative humidity 80% for temperatures up to 31° C, decreasing to 31° C linearly to 50% relative humidity at 40° C.

Environment: Storage area to be free of dust, corrosive gases, flammable materials, dew, percolating water, rain and solar radiation.

See M-4272 Instruction Book, Appendix G, Layup and Storage for additional information.

Patent & Warranty

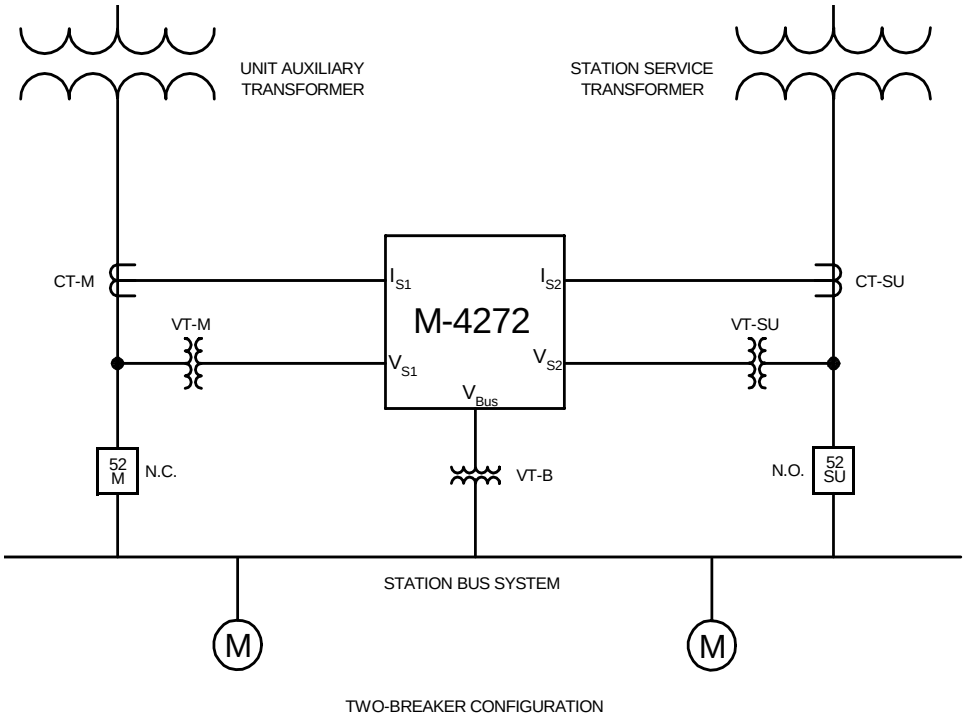
The M-4272 Digital Motor Bus Transfer System has patents pending.

The M-4272 Digital Motor Bus Transfer System is covered by a five year warranty from date of shipment.

External Connections

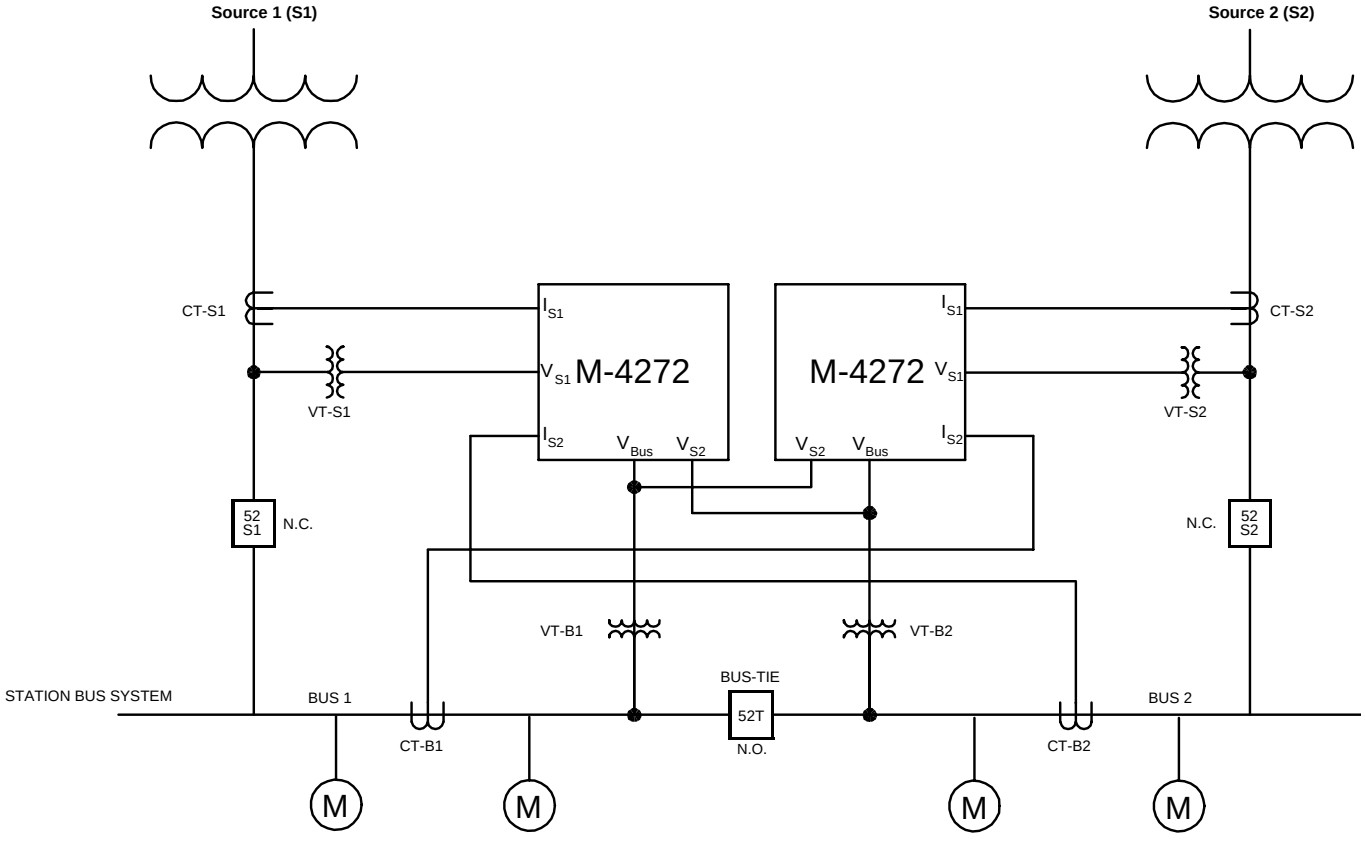
M-4272 external connection points are illustrated in Figure 5, External Connections.

Specification subject to change without notice.



TWO-BREAKER CONFIGURATION

TWO-BREAKER CONFIGURATION



THREE-BREAKER CONFIGURATION

■ **NOTE**: Current Transformers are used for the M-4272, 50BF Function, they are not required for transfer operation.

Figure 2 Typical Applications of Motor Bus Transfer Systems

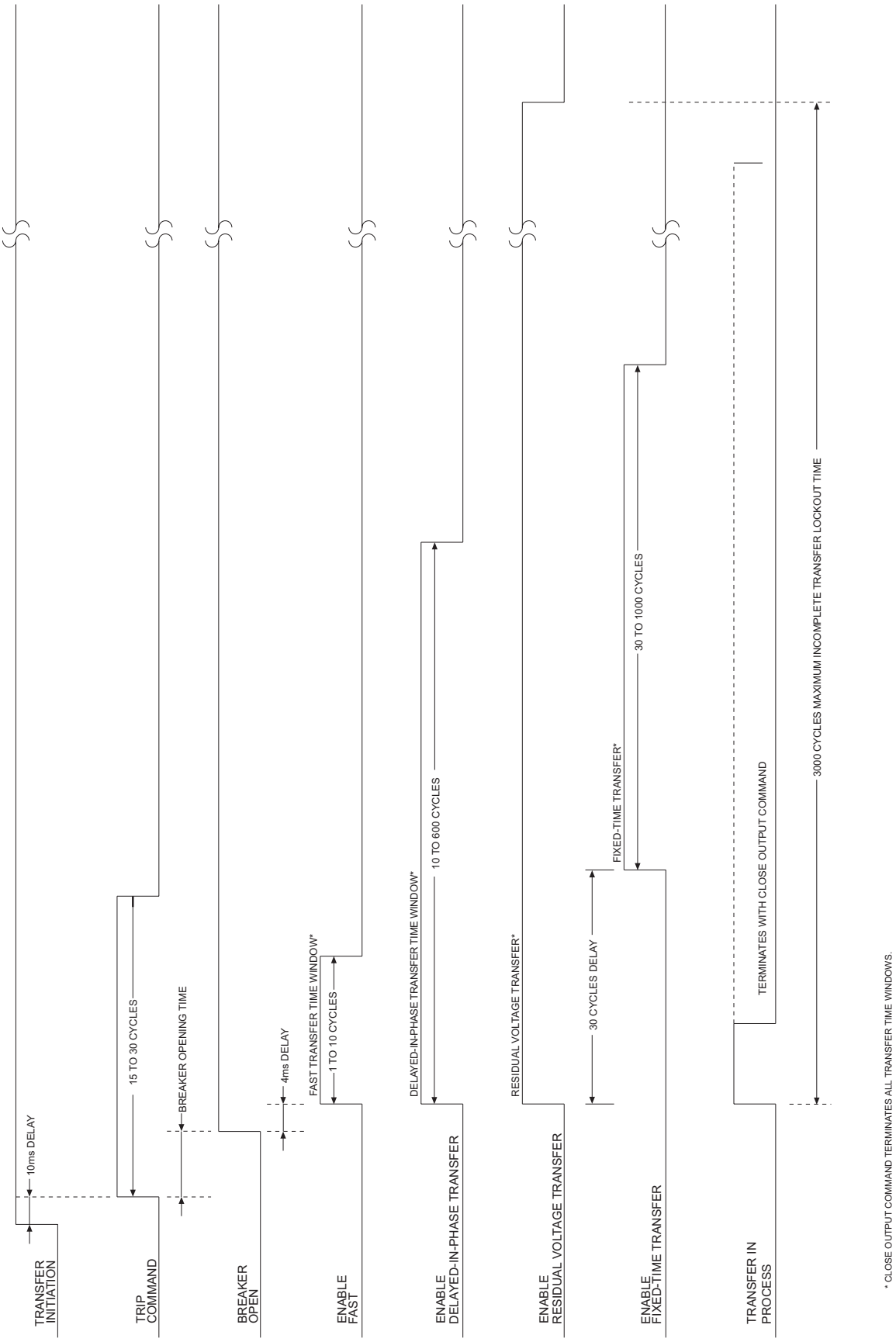


Figure 3 Time Sequence of Transfer Logic in Sequential Transfer Mode

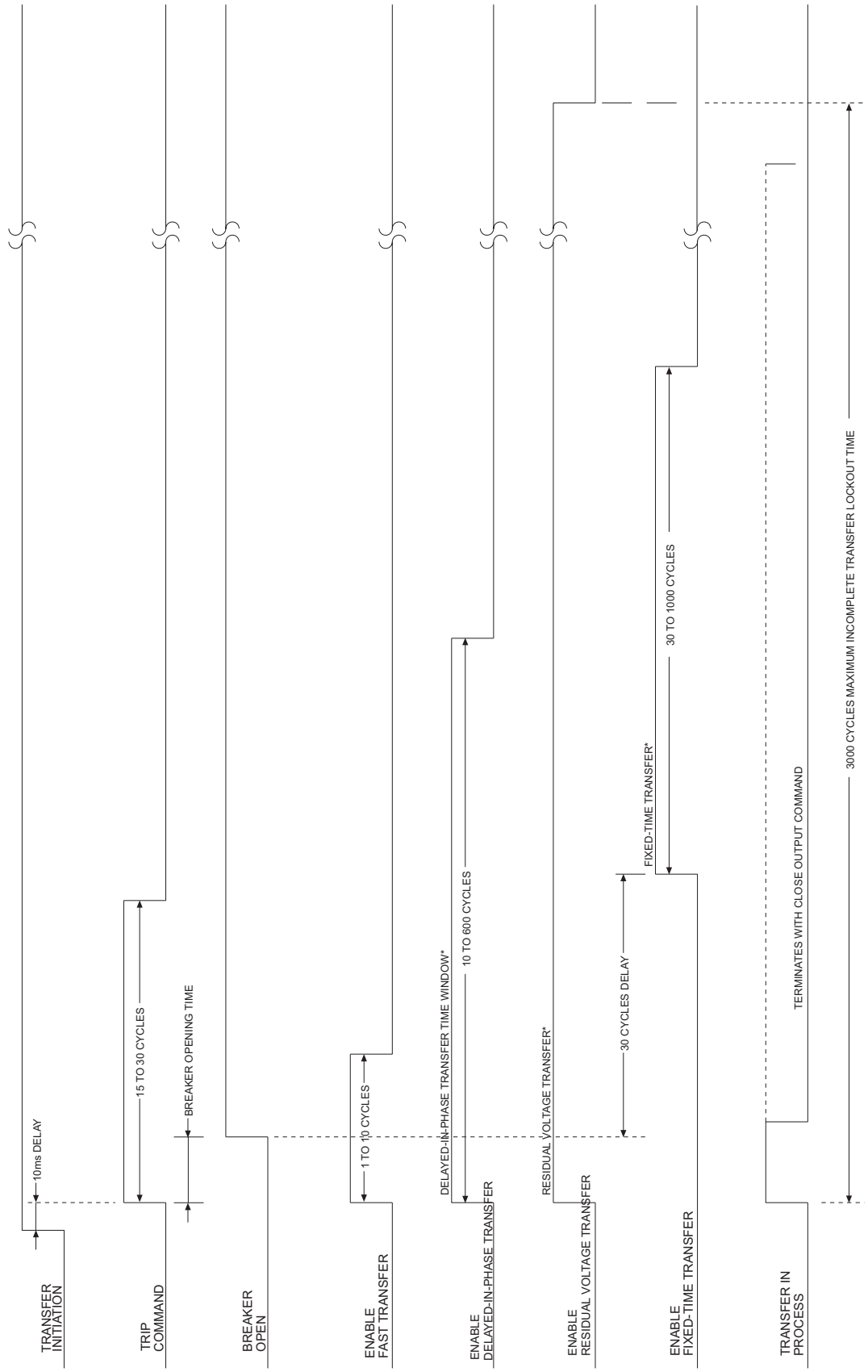


Figure 4 Time Sequence of Transfer Logic in Simultaneous Transfer Mode

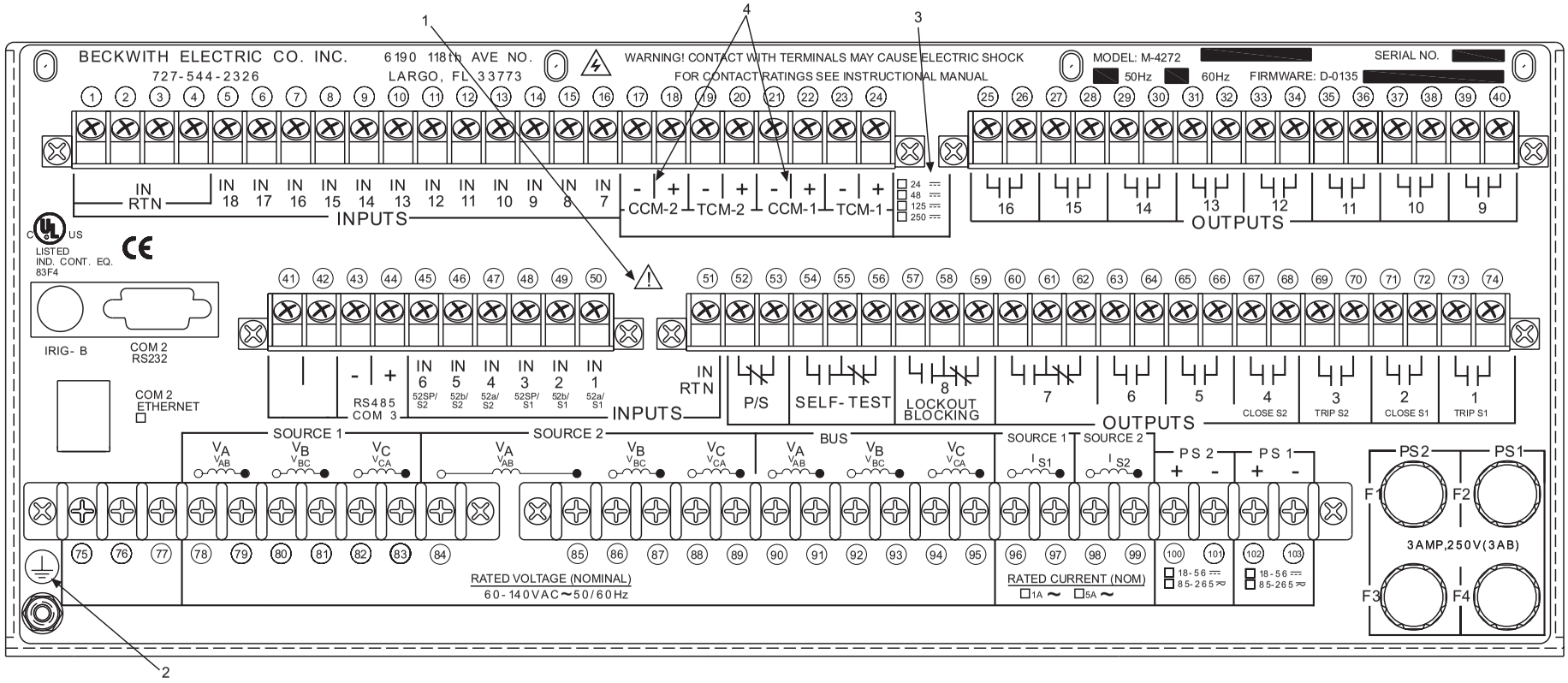


Figure 5 External Connections

1. **WARNING: ONLY DRY CONTACTS must be connected to inputs (terminals 45 through 50 with 51 common and terminals 5 through 16 with 1 through 4 common) because these contact inputs are internally wetted with 24 V dc. Application of external voltage on these inputs may result in damage to the units.**
2. **WARNING: The protective grounding terminal must be connected to an earthed ground any time external connections have been made to the unit.**
3. **▲CAUTION:** Before making connections to the Trip/Close Circuit Monitoring input, see M-4272 Instruction Book Section 5.5, Circuit Board Switches and Jumpers, for the information regarding setting Trip/Close Circuit Monitoring input voltage. Connecting a voltage other than the voltage that the unit is configured to may result in mis-operation or permanent damage to the unit.
4. **▲CAUTION:** Connecting the M-4272 Close Coil Monitor (CCM) in parallel with other relay CCMs in the Close Coil Circuit where the anti-pump "Y" relay is not bypassed may not provide reliable breaker closing operation.

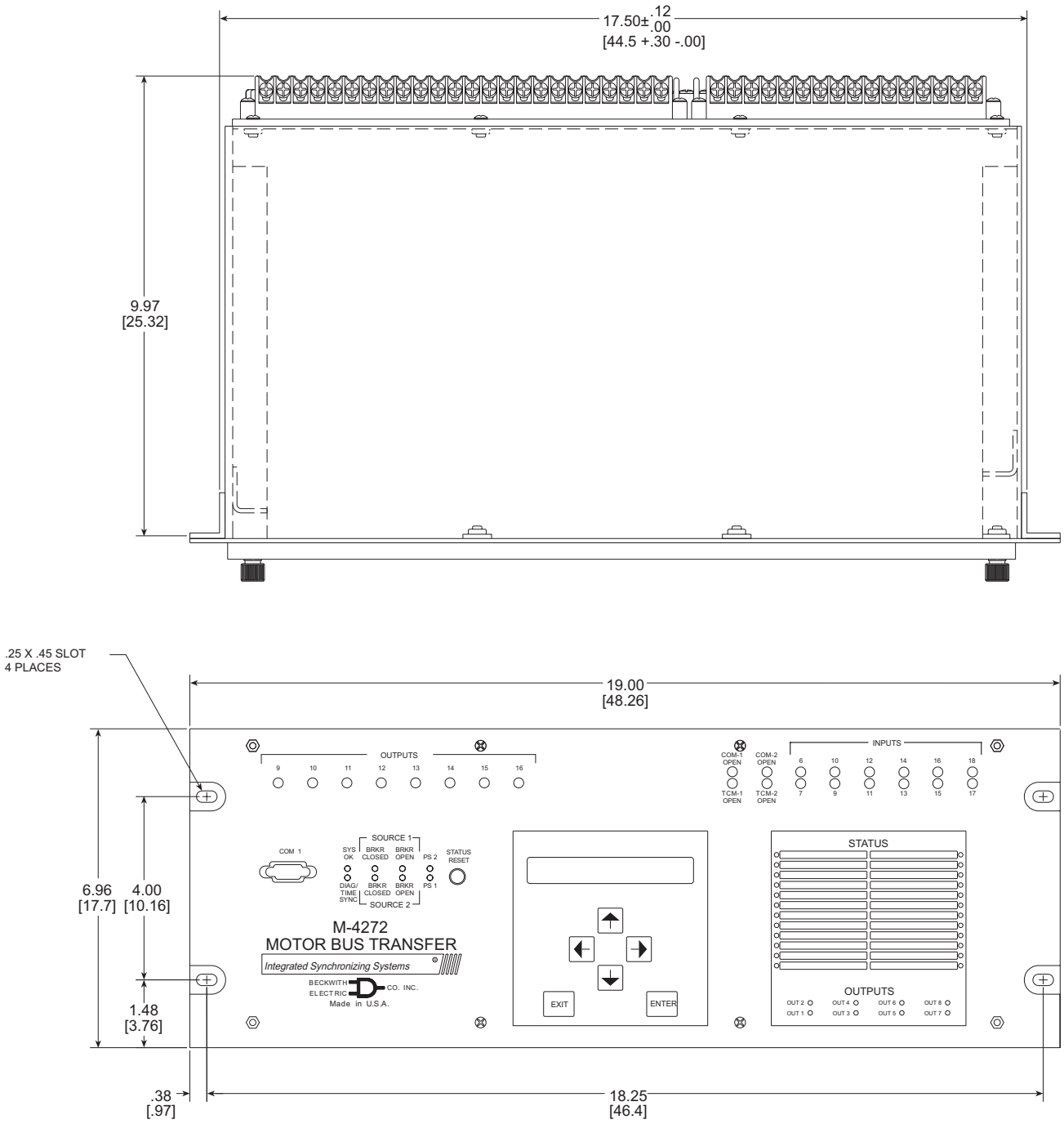


Figure 6 Horizontal Mounting Dimensions

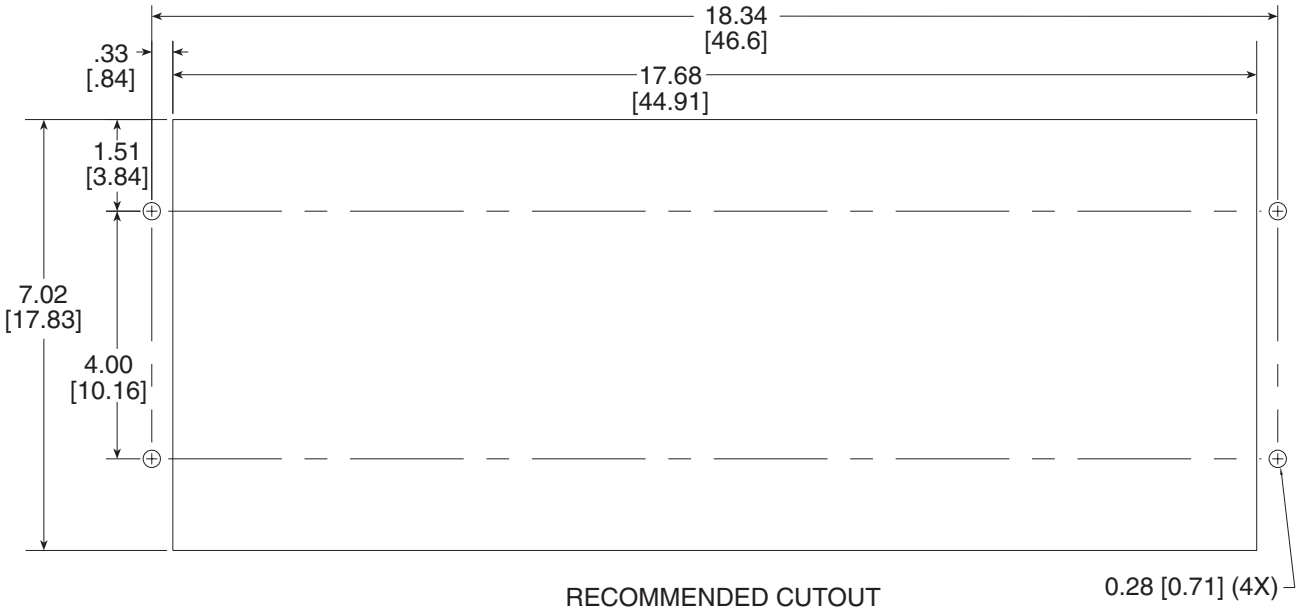


Figure 7 Panel Mount Cutout Dimensions

BECKWITH ELECTRIC CO., INC.
6190 - 118th Avenue North • Largo, Florida 33773-3724 U.S.A.
PHONE (727) 544-2326 • FAX (727) 546-0121
E-MAIL marketing@beckwithelectric.com
WEB PAGE www.beckwithelectric.com

WARNING

DANGEROUS VOLTAGES, capable of causing death or serious injury, are present on the external terminals and inside the equipment. Use extreme caution and follow all safety rules when handling, testing or adjusting the equipment. However, these internal voltage levels are no greater than the voltages applied to the external terminals.

DANGER! HIGH VOLTAGE

– This sign warns that the area is connected to a dangerous high voltage, and you must never touch it.

PERSONNEL SAFETY PRECAUTIONS

The following general rules and other specific warnings throughout the manual must be followed during application, test or repair of this equipment. Failure to do so will violate standards for safety in the design, manufacture, and intended use of the product. Qualified personnel should be the only ones who operate and maintain this equipment. Beckwith Electric Co., Inc. assumes no liability for the customer's failure to comply with these requirements.

– This sign means that you should refer to the corresponding section of the operation manual for important information before proceeding.

Always Ground the Equipment

To avoid possible shock hazard, the chassis must be connected to an electrical ground. When servicing equipment in a test area, the Protective Earth Terminal must be attached to a separate ground securely by use of a tool, since it is not grounded by external connectors.

Do NOT operate in an explosive environment

Do not operate this equipment in the presence of flammable or explosive gases or fumes. To do so would risk a possible fire or explosion.

Keep away from live circuits

Operating personnel must not remove the cover or expose the printed circuit board while power is applied. In no case may components be replaced with power applied. In some instances, dangerous voltages may exist even when power is disconnected. To avoid electrical shock, always disconnect power and discharge circuits before working on the unit.

Exercise care during installation, operation, & maintenance procedures

The equipment described in this manual contains voltages high enough to cause serious injury or death. Only qualified personnel should install, operate, test, and maintain this equipment. Be sure that all personnel safety procedures are carefully followed. Exercise due care when operating or servicing alone.

Do not modify equipment

Do not perform any unauthorized modifications on this instrument. Return of the unit to a Beckwith Electric repair facility is preferred. If authorized modifications are to be attempted, be sure to follow replacement procedures carefully to assure that safety features are maintained.

PRODUCT CAUTIONS

Before attempting any test, calibration, or maintenance procedure, personnel must be completely familiar with the particular circuitry of this unit, and have an adequate understanding of field effect devices. If a component is found to be defective, always follow replacement procedures carefully to that assure safety features are maintained. Always replace components with those of equal or better quality as shown in the Parts List of the Instruction Book.

Avoid static charge

This unit contains MOS circuitry, which can be damaged by improper test or rework procedures. Care should be taken to avoid static charge on work surfaces and service personnel.

Use caution when measuring resistances

Any attempt to measure resistances between points on the printed circuit board, unless otherwise noted in the Instruction Book, is likely to cause damage to the unit.

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Chapter 5

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1 Introduction

1.1 Instruction Book Contents

This instruction book includes six Chapters and six Appendices.

Chapter 1: Introduction

Chapter One summarizes the devices' capabilities, introduces the instruction book contents and describes the application of an MBTS.

Chapter 2: Operation

Chapter Two provides the necessary instructions regarding manual operation of the MBTS. Manual operation of the MBTS is accomplished by utilizing either the unit's front panel controls and indicators, which include the M-3931 Human Machine Interface (HMI) and M-3972 Status Module or through the M-3872 ISScom® Communications and Oscillographic Analysis Software.

Chapter 3: ISScom

Chapter 3 provides a description of each element of the M-3872 ISScom Communications and Oscillographic Analysis Software. The ISScom menu structure and commands are described in detail for each feature and function.

Chapter 4: System Setup and Setpoints

Chapter Four is designed for the person(s) responsible for the direct setting and configuration of the system. It describes the procedures for entering all required data into the MBTS. Included in this chapter are functional and connection diagrams for a typical application for the system; and describes the configuration process for the unit (choosing active functions), output contact assignment and input blocking designation. It also illustrates the definition of system quantities and equipment characteristics required by the MBTS, and describes the individual function settings.

Chapter 5: Installation

The person or group responsible for the installation of the MTBS will find herein all mechanical information required for physical installation, equipment ratings, and all external connections in this chapter. For reference, the Three-Line Connection Diagram is repeated from Chapter 4, **System Setup and Setpoints**. Further, a commissioning checkout procedure is outlined to check the external CT and VT connections. Additional tests which may be desirable at the time of installation are described in Chapter 6, **Testing**.

Chapter 6: Testing

This chapter provides step-by-step test procedures for each function, as well as diagnostic mode and auto-calibration procedures.

Appendix A: Configuration Record Forms

This Appendix supplies a set of forms to record and document the settings required for the proper operation of the MBTS.

Appendix B: Communications

This Appendix describes communication port signals and various topologies and equipment required for remote communication.

Appendix C: Self-Test Error Codes

This Appendix lists all the error codes and their definitions.

Appendix D: Transfer Event Log Sample Printout

This Appendix provides a sample Transfer Event Log printout.

Appendix E: Sequence of Events Sample Printout

This Appendix provides a sample Sequence of Events printout.

Appendix F: Transfer Logic Time Sequence

This Appendix includes the Transfer Logic Time Sequence for each transfer.

Appendix G: Layup and Storage

This Appendix includes the recommended storage parameters, periodic surveillance activities and layup configuration for the M-4272 Motor Bus Transfer System.

Appendix H: Index

This Appendix includes the Index for the M-4272 Instruction Book.

Appendix I: Declaration of Conformity

This Appendix includes the Declaration of Conformity in accordance to ISO/IEC 17050-1:2004.

1.2 M-4272 Motor Bus Transfer System

The M-4272 Motor Bus Transfer System (MBTS) is a microprocessor-based unit that uses digital signal processing technology to provide automatic and manual transfer modes.

The available internal functions of the system are listed in Table 1-1. The nomenclature follows the standards of ANSI/IEEE Std. C37.2, Standard Electric Power Systems Device Function Numbers where applicable. The available MBTS Transfer Functions are listed in Table 1-2.

MODE		TRANSFER FUNCTION
AUTO	MANUAL	
X	X	Fast Transfer
X	X	Delayed In-Phase Transfer
X	X	Residual Voltage Transfer
X		Fixed Time Transfer
	X	Hot Parallel

Table 1-1 M-4272 Transfer Functions

The control/status inputs can be programmed to block and/or to trigger the oscillograph recorder. Any of the functions or the control/status inputs can be individually programmed to activate any one or more of the programmable outputs, each with a contact.

■ **NOTE**: See Section 1.3, **Application** for Transfer Function descriptions.

The M-3931 Human Machine Interface (HMI) Module allows the user to access the following features and functions from the M-4272 front panel using a menu-driven, 2 line by 24 character alphanumeric display:

Settings

- Enable and Disable Manual Transfer
- Enable and Disable Auto Transfer
- Set MBTS to either Local or Remote
- Enter Comm settings
- Set Access Codes
- Set User Control Number
- Set display User Lines 1 and 2
- Set Date/Time

Functions

- Initiate a Manual Transfer
- Clear Alarm Counter
- Enter Diagnostic Mode
- Clear Error Codes

Status

- Metering of various quantities, including voltage, current, frequency and phase-angle
- I/O Status
- Alarm Counter
- MBTS Unit Last Power Up Date and Time
- MBTS Unit Firmware Version and Serial Number
- Error Codes
- Checksums

FUNCTION	DESCRIPTION
27	Phase Undervoltage
50	Instantaneous Phase Overload
50BF	Breaker Failure
SBF	Source Breaker Failure Using Breaker Status
60FL	VT Fuse-Loss Detection
81	Frequency
81R	Rate of Change of Frequency
ISSL	ISSlogic
CCM	Closed Circuit Monitoring
TCM	Trip Circuit Monitoring

Table 1-2 M-4272 Device Functions

The MBTS stores time-tagged transfer information for the four most recent transfers. The M-3972 Status Module LEDs are used to provide a detailed visual indication of function operation for the most recent event.

The MBTS retains up to 248 cycles of oscillograph waveform data. This data can be downloaded and analyzed using the M-3872 ISScom® Communications and Oscillograph Analysis Software.

The unit is powered from two wide input range switch mode power supplies.

The MBTS includes self-test, auto calibration, and diagnostic capabilities, in addition to IRIG-B time-sync capability for accurate time-tagging of events.

Communication Ports

There are three physical communication ports provided on the M-4272. If the optional RJ45 Ethernet port is purchased, then the MBTS shares COM2.

- COM1, located on the system front panel, is a standard 9-pin RS-232 DTE-configured port. COM1 is used to locally set and interrogate the MBTS using a portable computer.
- COM2, located on the rear of the MBTS, is a standard 9-pin RS-232 DTE-configured port. When the optional RJ45 Ethernet Port is enabled, the COM2 port is disabled for communications. However, the Demodulated IRIG-B may still be used through the COM2 Port when Ethernet is enabled. When COM2 Port is enabled the Ethernet Port is not available.

  The RJ45 Ethernet port uses a 10Base-T type connection that accepts an RJ45 connector using CAT5 twisted pair cable. The Ethernet port supports MODBUS over TCP/IP. The IP address can be obtained automatically when using the DHCP protocol if enabled, or a static IP address can be manually entered, using the HMI.
- COM3, located on the rear terminal block of the MBTS, is a 2-wire RS-485 communications port.

The system may be remotely set and interrogated utilizing either a hard-wired RS-232 serial connection or modem (COM2 when activated as RS-232, or COM3), or when purchased, the ethernet connection (RJ45 activated).

M-3872 ISScom Communications and Oscillograph Analysis Software

ISScom is shipped with every MBTS. This software runs on a PC-compatible computer operating under Microsoft Windows® 98 or later. When properly connected using either a direct serial connection, modem or ethernet network connection, ISScom can provide the following functions:

- Setpoint interrogation and modification
- Bus, Source 1 and Source 2 status real-time monitoring
- Recorded oscillograph data downloading
- Display Oscillograph Data
- Initiate Transfer

See Chapter 3, **ISScom** for a detailed description of all ISScom features.

M-3972 Status Module

The status module (Figure 1-1), includes 24 individually labelled **STATUS** LEDs to indicate operation of the functions on the front panel. Eight individually labelled **OUTPUT** LEDs will be lit as long as the corresponding output contact is picked up.

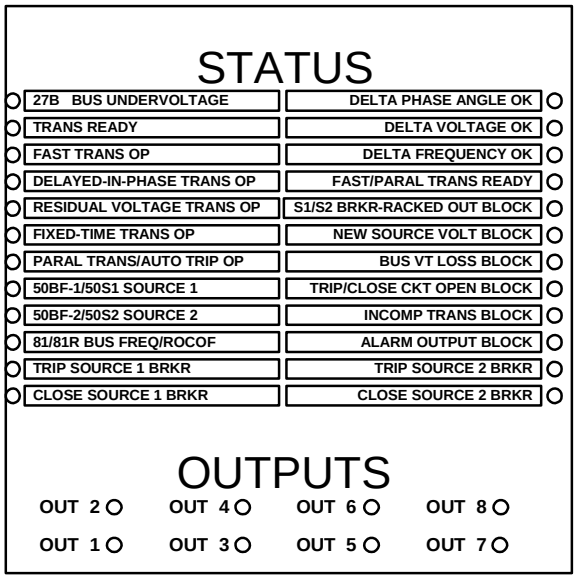


Figure 1-1 M-3972 Status Module

M-3933/M-0423 Serial Communication Cables

The M-3933 cable is a 10-foot RS-232 cable for use between the MBTS rear panel (COM2) port and a modem. This cable includes a DB25 (25-pin) connector (modem) and a DB9 (9-pin) at the MBTS end.

The M-0423 cable is a 10-foot null-modem RS-232 cable for direct connection between a PC and the MBTS front panel COM1 port, or the rear COM2 port. This cable includes a DB9 (9-pin) connector at each end.

M-3931 Human-Machine Interface (HMI) Module

The HMI module provides the means to interrogate the MBTS and to input a limited number of settings, access data, etc. directly from the front of the MBTS. Its operation is described in detail in Section 2.1, Front Panel Controls and Indications.

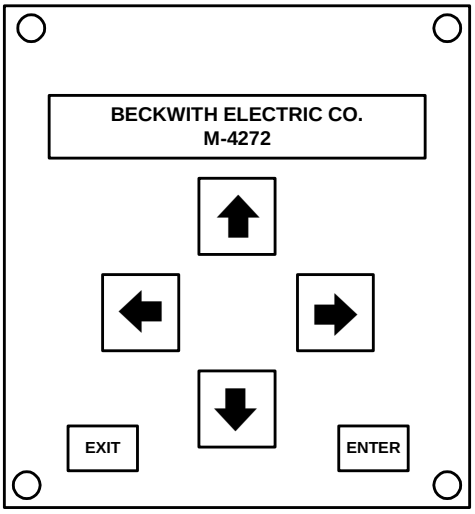


Figure 1-2 M-3931 Human-Machine Interface (HMI) Module

1.3 Application

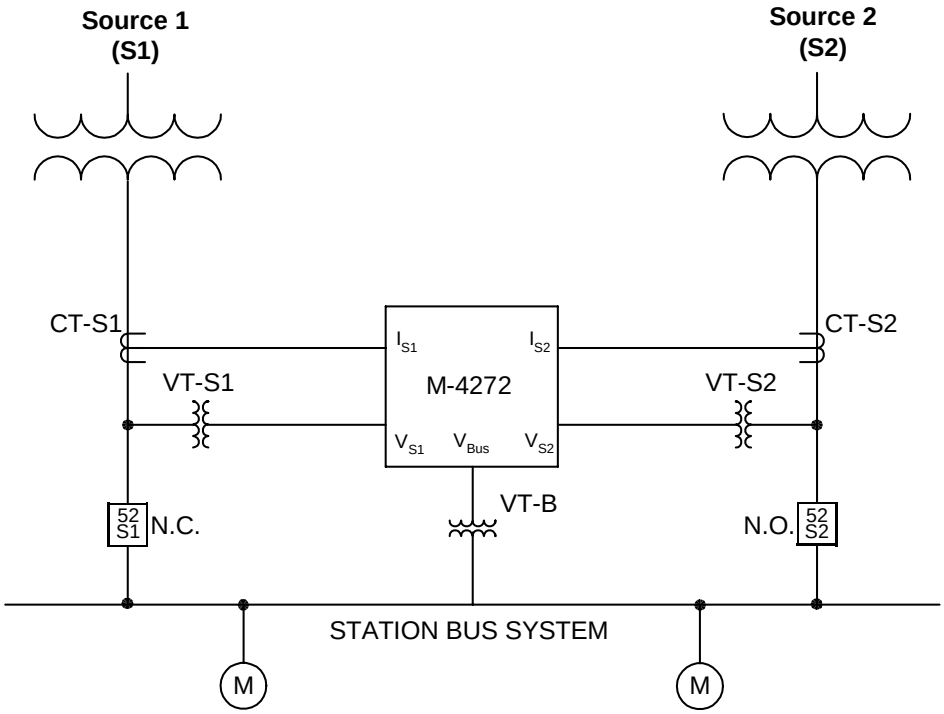
Typically most power plant and industrial plants have motors that must remain operational in the event of a loss of the power source. There are many reasons to initiate a transfer:

- For fault clearing on the present source
- Interruption of present source
- Planned deliberate transfer to an on-site source during periods of storms or for rate savings
- Maintenance
- Normal plant startup/shutdown
- Auxiliary system transfer.

To address this requirement, facilities employ two power sources to supply these auxiliary systems. In a power plant these two power sources are normally the station service transformer and the auxiliary startup transformer which is usually also connected to the utility. In a processing plant there are two independent power sources which power separate portions of the plant.

The purpose of a Motor Bus Transfer System (MBTS) is to quickly and safely transfer the bus motor load from one source to another source to maintain power plant or process plant continuity. Motor bus transfer systems are used to perform the transfer of large motors or aggregates of smaller and larger motors. A typical configuration is shown in Figure 1-3.

The M-4272 MBTS monitors the Source 1 voltage, the Motor Bus voltage and the Source 2 voltage. The M-4272 also controls the Source 1 and Source 2 breakers. In a normal transfer a protective MBTS recognizes an abnormal condition and operates an 86 lockout MBTS which will trip the Source 1 breaker and also initiates a transfer. The M-4272 MBTS will issue a trip command to the Source 1 breaker and then it will issue a close command to the Source 2 breaker. This will transfer the Motor Bus load from the troubled Source 1 to Source 2, keeping the motors on the bus running and the process continuing to operate. Figure 1-4 illustrates a conventional unit-connected generator one-line diagram. This application uses the unit auxiliary transformer as one source and the startup transformer as the second source.



■ **NOTE**: Current transformers are used for the M-4272 function 50BF, they are not required for transfer operation.

Figure 1-3 Typical Two Breaker Configuration

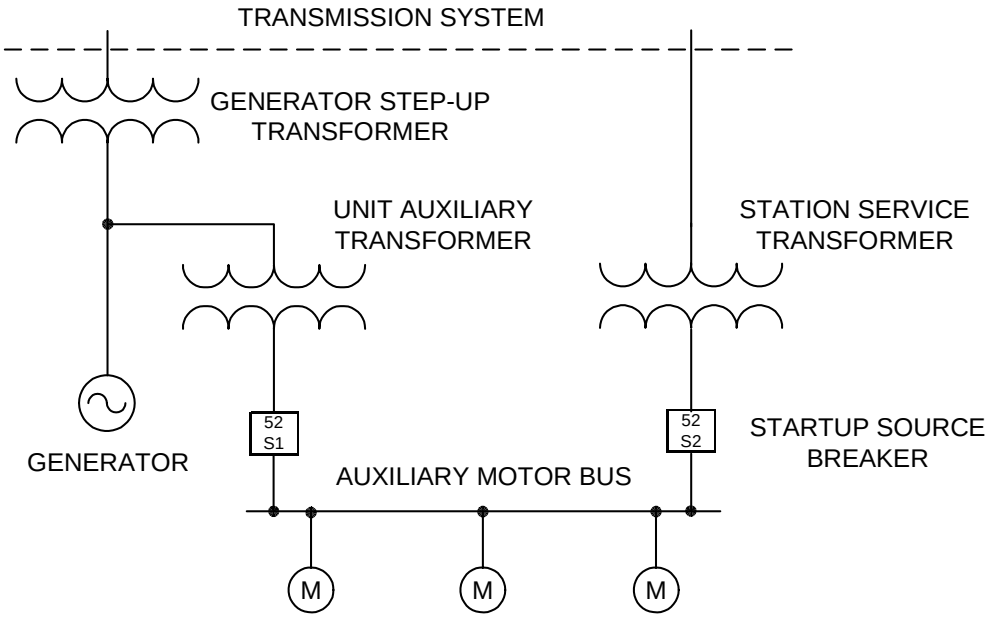


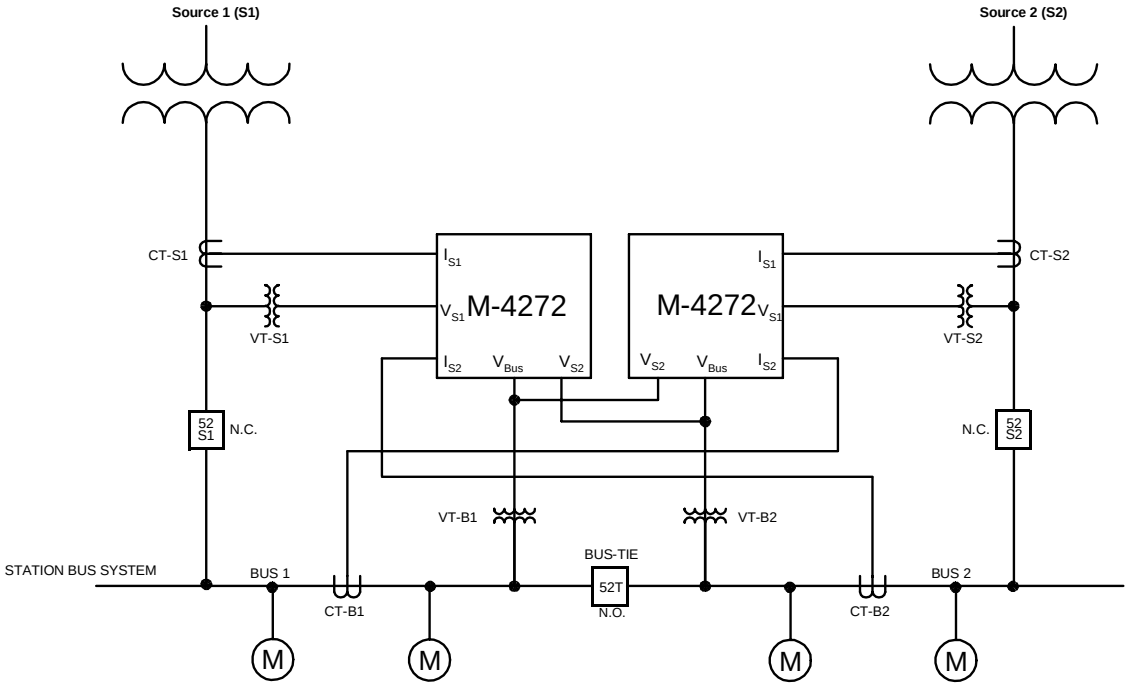
Figure 1-4 Unit-Connected Generator Motor Bus transfer One-line

Figure 1-5 illustrates a typical industrial plant one-line diagram. This application has two independent sources, with each half of the processing plant operated by each source. There is normally an open tie breaker between the two motor buses. In this application two M-4272 MBTS are used. Each system controls a source breaker and the tie breaker. Whichever source fails has its breaker tripped and the tie breaker is closed, this transfers the motor bus load to the remaining source which now supplies power to the entire plant.

In general, the voltage characteristic of a motor bus during a transfer is governed by the motor loads operating at the time of transfer. The majority of auxiliary system motors are induction motors with few synchronous motors used in isolated cases. The types of motors in use will, to a great degree, determine the voltage characteristics of the auxiliary system buses. When the bus is disconnected from the source, the motors will maintain a voltage due to the energy stored in the motor fields. The intital magnitude of the voltage depends on the integrity of the power source prior to being disconnected.

A three phase fault in the Unit Auxiliary Generator Step-up transformer or on the high voltage bus near the plant may completely deenergize the motor fields and the resultant voltage will be minimal. However, for all other cases a significant voltage will be induced on the motor bus. The induced voltage will have a dynamic amplitude and phase charateristic that will depend on the inertia of the motor loads and the field energy stored in the motors.

The charactersistics for synchronous and induction motors are shown in Figures 1-6 and 1-7 respectively. Figure 1-6 represents a 6000 hp I.D. fan motor operating at 25% load proior to transfer. This is an example of a characteristic for a large motor driving a high inertia load. The voltage magnitude requires 42 cycles to drop 50% of it's initial value and the angle takes more than 60 cycles to complete a 360 degree rotation. The 960 hp boiler circulating pump motor used for Figure 1-7 data shows a dramatic variation in characteristics. The voltage magnitude drops to 50% within 10 cycles and the phase completes a 360 degree rotation in less than eight cycles.



■ **NOTE**: Current transformers are used for the M-4272 function 50BF, they are not required for transfer operation.

Figure 1-5 Industrial Processing Plant Bus transfer One-line

Referring to Figures 1-6 and 1-7, a few generalizations can be made regarding the inertia of motor loads, motor size, and the mix of synchronous and induction motors.

- Inertia — The higher the inertia of the aggregate motor loads on the motor bus, the more slowly the motor bus frequency will decay during the disconnected coastdown period. That has a direct impact on how fast the phase angle changes. Low inertia loads will cause the phase angle to change quickly, as the frequency of the motor bus decays quickly, and the slip frequency between the motor bus and the new source quickly increases.
- Motor Size — The larger the motor size, the longer the time the voltage will take to decay on an induction motor.
- Mix of Synchronous and Induction Motors — Voltage will tend to decay much more rapidly on a motor bus with all induction motors. On a motor bus with a mix of synchronous and induction motors, the synchronous motors will attempt to hold up the voltage during the transfer interval.
- Loading — The higher the load on the motors, the faster the motor bus frequency will decay.

These parameters are key to analyzing the motor bus transfer issue and developing schemes to accomplish transfers that promote process continuity while causing no damage to the motors or the loads.

An important value to decide the viability of MBT is the resultant volts per hertz (V/Hz) across the breaker. The resultant V/Hz is derived from the V/Hz vectors of the motor bus and the new source at the instant just prior to connection and must not exceed 1.33 V/Hz [1]. Pursuant to phase angle and voltage, and their effect on resultant V/Hz, some generalizations can be made:

- Phase Angle — As the phase angle increases between the two sources, assuming the two source voltages are the same, the V/Hz will increase.
- Voltage — As the voltage difference between the two sources increases, assuming the phase angle between the sources remains the same, the V/Hz will increase.

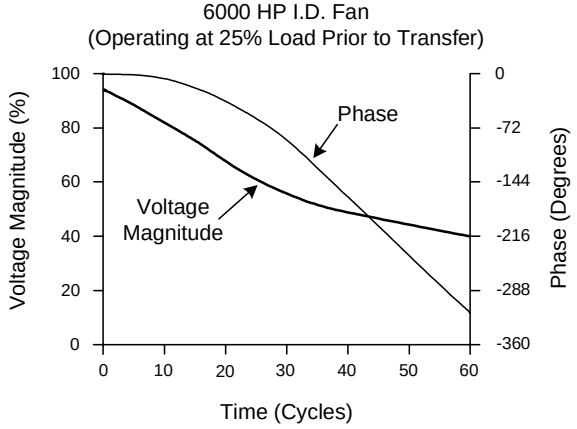


Figure 1-6 Coastdown of High Inertia Load On a Large Synchronous Motor

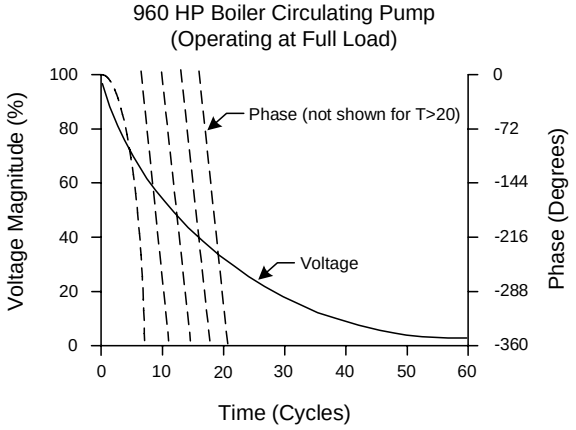


Figure 1-7 Coastdown of Low Inertia Load On a Large Induction Motor

The resultant V/Hz issue is exacerbated when the phase angle difference increases and the voltage difference increases as shown in Figure 1-8. The following relationship in equation 1 defines this condition:

$$E_R = \sqrt{E_S^2 + E_M^2 - 2 E_S E_M \cos \theta} \quad [1]$$

where

E_S System equivalent V/Hz

E_M Motor residual V/Hz (on system base)

E_R Resultant vectorial V/Hz

q Phase angle between the motor bus and new source at the instant prior to connection

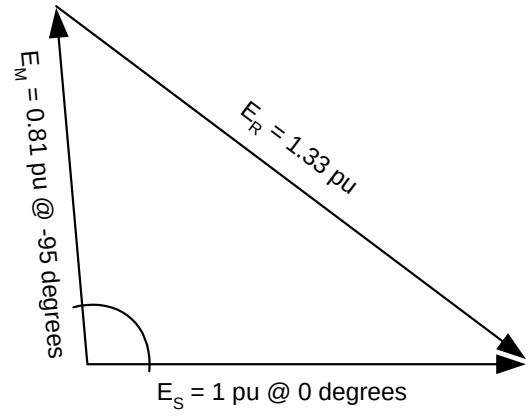


Figure 1-8 V/Hz Resultant Between E_S and E_M

Hot Parallel, Fast, In-Phase, Residual and Fixed Time Transfer Methods

MBTs can be categorized as closed or open transition [2]. The closed transition involves brief paralleling of the sources. The closed transition transfer is commonly referred to as a hot parallel transfer. Open transition transfers do not parallel the sources, and include fast, in-phase, residual and fixed time. The fast transfer can be subcategorized as simultaneous or sequential. All other transfers are sequential.

Hot Parallel Transfer

In a hot parallel transfer, the new source is connected to the motor bus before the old source is tripped. The intent is to transfer sources without interruption. The phase angle, delta voltage and delta frequency from the motor bus and the new source are evaluated prior to the transfer to assure that the motor bus and the new source are in synchronism. This method has gained wide acceptance for routine source transfers because transients on the motor bus are eliminated.

There may be instances where the two sources may not be derived from the same primary source and a large standing phase angle may be present between them, precluding a hot parallel transfer. Assuming the two sources' phase angle relationship is acceptable, with the two sources paralleled, currents flowing into and through the bus may violate the interrupt rating for the circuit breakers and the short term withstand ratings of the source transformers. A fault occurring either on the bus or on one of the sources during the time the sources are paralleled can overstress the components of the bus system. The probability of this happening may be viewed as small; however, the consequences of such a fault occurring during the source paralleled operating interval should be thoroughly understood before the hot parallel transfer system is used.

Fast Simultaneous Transfer

In a fast simultaneous transfer, a trip command is issued to the present source breaker and a close command is issued to the new source breaker at the same instant. The phase angle, delta voltage and delta frequency from the motor bus and the new source are evaluated prior to the transfer to assure that the motor bus and the new source are in synchronism. This is the fastest transfer type that does not deliberately parallel the sources. Due to breaker operating time variations and control voltage variations, brief unintentional paralleling of the sources may occur.

The M-4272 includes settings that allow delaying the close command to avoid any paralelling of the source.

Close commands used in the fast simultaneous transfers make certain assumptions about the phase angle and slip frequency between the decelerating motors and the new source:

- The transfer is affected before the phase angle between the new source and the motor bus increases to an undesirable value.
- A fault occurs on the present source, which may affect the phase angle at the instant the transfer sequence starts.
- There will be little change in the phase angle between the motor bus and new source once the present source has been disconnected.
- Any preconceived notions about the deceleration characteristics of the motor bus have not changed. Key characteristics would be changes in the combined inertia of the motor loads and changes in the mix of synchronous and induction motors.

When Fast Simultaneous Transfer is selected, a breaker failure function is required in the event the breaker does not trip. The M-4272 includes two Breaker Failure methods (see Section 4.4, **System Setpoints**).

Fast Sequential Transfer

In a fast sequential transfer, the present source is tripped, and as soon as the present source breaker has started to open (typically indicated by an “early b” contact), a close command is issued to the new source breaker. The phase angle, delta voltage and delta frequency from the motor bus and the new source are evaluated prior to the transfer to assure that the motor bus and the new source are in synchronism. This is the second fastest transfer type that does not deliberately parallel the sources.

A close command used in the fast sequential transfers can be dynamically blocked, just after the present source is disconnected, if any of the following occur:

- A fault occurs on the present or new source, which may affect the phase angle at the instant the transfer sequence starts.
- There is a large change in the phase angle between the motor bus and new source once the present source has been disconnected [2].
- Any preconceived notions about the deceleration characteristics of the motor bus have changed in that the deceleration has increased, therefore causing the phase angle to change rapidly. This would occur from a decrease in the inertia of the motor loads.

There is a type of sequential transfer that may be applied if a fast transfer cannot be made, but before a residual or fixed time transfer. It is called an in-phase transfer and offers an additional opportunity to transfer while the motors are still spinning and the likelihood of process interruption is minimized.

In-Phase Transfer

An *in-phase transfer* is defined as connecting a motor bus and the new source that have a slip frequency between them at the first (zero degrees) phase coincidence (the motor bus is coasting down). It is essentially a specialized type of automatic synchronizing under high slip frequency (typically from 0.5 to 10 hertz), and a rapidly decelerating motor bus frequency (rapidly growing slip frequency). This requires the use of very fast measurement and output command techniques. As the slip frequency is changing rapidly due to the deceleration of the motor bus, calculation of the rate of change of frequency may be required in addition to examination of the instantaneous slip frequency when making the new source closing command decision [3].

Residual Voltage Transfer

In a residual voltage transfer, the motor bus is connected to the new source after the voltage on the coasting motor bus falls to less than 0.33 pu. In this manner, no matter what the phase angle, the resultant V/Hz will not exceed 1.33 V/Hz. This is the third type of transfer type that does not parallel the sources. This type of transfer, however, typically is not fast enough to maintain process continuity, as certain motor loads that cause rapid stalling may necessitate a restart of the motors on the bus.

Fixed Time Transfer

In a fixed time transfer, the motor bus is connected to the new source after a time delay that would reflect that the voltage on the coasting motor bus has fallen to less than 0.33 pu. In this manner, no matter what the phase angle, the resultant V/Hz will not exceed 1.33 V/Hz. This is the fourth type of transfer type that does not parallel the sources. This type transfer, however, will not be able maintain process continuity, as certain motor loads that cause rapid stalling may necessitate a restart of the motors on the bus.

These open transition transfers would be attempted in the order they are presented, as shown in Figure 1-9. The first possible transfer would be the fast transfer which would be made if the phase angle between the motor bus and the new source is not too large. If that transfer was not made, an in-phase, residual or fixed time transfer would be initiated. Obviously, the fast transfer offers the greatest chance of process continuity, as the interruption period to the motors is short. The in-phase transfer provides one more opportunity to transfer with a good possibilty to keep process continuity. By the time a residual or fixed time transfer is initiated, the motors may have stopped against low inertia loads, such as positive displacement pumps or conveyors, and a process interruption may occur. In addition, if many motors must be started to restart the process, load shedding and staggered starting of the motors may have to be undertaken so as not to overload the capacity of the new source and cause unacceptable voltage sags during the restarting procedure.

References

[1] ANSI C50.41-2000, American Nation Standard for Polyphase Induction Motors for Power generating Stations.

[2] A.P. Gabba and D.S. Hill, “Make Automatic Power Source Transfers a Success for Your Plants,” *IEEE Transactions on Industry Applications,* Vol. 37, No. 2, Mar/Apr 2001.

[3] W.G. Hartmann, “Automatic Synchronizing for Generation and Tie Lines,” 18th Annual Georgia Tech Protective MBTSing Conference, Atlanta, GA, May 1999.

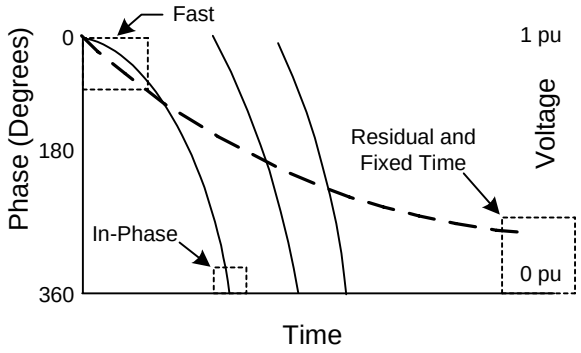


Figure 1-9 Order of Possible Open Transition MBTS

2 Operation

This chapter contains information that describes the operation of the Motor Bus Transfer System (MBTS). M-4272 operation includes the following:

- Front Panel Controls and Indicators
- Initiate Transfer
- Remote/Local Control
- Auto Transfer Enable/Disable
- Manual Transfer Enable/Disable
- Status Monitoring/Metering
- Reset Error Codes
- Reset Alarm Counters
- Device On/Off

2.1 Front Panel Controls and Indicators

This section describes the operation of the M-4272 as a function of the M-3931 Human Machine Interface Module (HMI) and the M-3972 Status module.

The MBTS can be interrogated locally with the HMI panel. An integral part of the design is the layout and function of the front panel indicators and controls, illustrated in Figure 2-1.

Alphanumeric Display

To assist the operator in operating and interrogating the MBTS locally, the HMI displays menus which guide the operator to the desired function or status value. These menus consist of two lines. The bottom line lists lower case abbreviations of each menu selection with the chosen menu selection shown in uppercase. The top menu line provides a description of the chosen menu selection.

Screen Blanking

The display will automatically blank if there are no events in the Transfer Event Log after exiting from the Main Menu, or from any screen after five (5) minutes of unattended operation. To wake up the display, the user must press any key except **EXIT**.

If there are Transfer Events in the Transfer Event Log, they must be cleared (RESET pushbutton) before the screen will Auto Blank. See Transfer Event Log/Clear Status in Section 3.1, **ISScom Functional Description**.

Arrow Pushbuttons

The left and right arrow pushbuttons are used to choose among the displayed menu selections. When entering values, the left and right arrow pushbuttons are used to select the digit (by moving the cursor) of the displayed setpoint that will be increased or decreased by the use of the up and down pushbuttons.

The up and down arrow pushbuttons increase or decrease input values or change between upper and lower case inputs. If the up or down pushbutton is pressed and held when adjusting numerical values, the speed of increment or decrement is increased.

EXIT Pushbutton

The **EXIT** pushbutton is used to exit from a displayed screen and move up the menu tree. Any changed setpoint in the displayed screen will *not* be saved if the selection is aborted using the **EXIT** pushbutton.

ENTER Pushbutton

The **ENTER** pushbutton is used to choose a highlighted menu selection, to replace a setting or other programmable value with the currently displayed value, or to move down within the menu tree.

System OK LED

The Green **SYSTEM OK** LED is controlled by the unit's microprocessor. A flashing **SYSTEM OK** LED indicates proper program cycling. The LED can also be programmed to be continuously illuminated to indicate proper program cycling.

Diagnostic/Time Sync LED

The Green **DIAG/TIME SYNC** LED will illuminate to indicate that the IRIG-B time signal is received and the internal clock is synchronized with the IRIG-B time signal. IRIG-B time information is used to accurately tag target and oscillograph events.

The LED will flash when a self-test error is detected. The LED will flash the Error Code number; for example, for Error Code 32, the LED will flash 3 times, followed by a short pause, and then flash 2 times, followed by a long pause, then repeat LED flash sequence. The Error Code number is also displayed on the M-3931 HMI screen.

Breaker Status LEDs

The Red **SOURCE 1 BRKR CLOSED**, **SOURCE 2 BRKR CLOSED** LEDs and the Green **SOURCE 1 BRKR OPEN**, **SOURCE 2 BRKR OPEN** LEDs will illuminate when the selected breaker status input is closed. Table 2-1 presents the available input configurations for the Breaker Status LEDs.

SOURCE 1 BREAKER STATUS LEDs RED (CLOSED)		
S1 52a Closed (Input 1)	S1 52b Open (Input 2)	S1 52a and S1 52b (Inputs 1 and 2)
GREEN (OPEN)		
S1 52a Open (Input 1)	S1 52b Closed (Input 2)	S1 52a and S1 52b (Inputs 1 and 2)
SOURCE 2 BREAKER STATUS LEDs RED (CLOSED)		
S2 52a Closed (Input 4)	S2 52b Open (Input 5)	S2 52a and S2 52b (Inputs 4 and 5)
GREEN (OPEN)		
S2 52a Open (Input 4)	S2 52b Closed (Input 5)	S2 52a and S2 52b (Inputs 4 and 5)

Table 2-1 Breaker Status LED Input Configurations

Power Supply #1 & #2 LED

The Green **PS** LED indicator will remain illuminated for the appropriate power supply whenever power is applied to the unit and the power supply is operating correctly. The two power supplies are not redundant and the unit requires both supplies to operate for correct unit functioning.

M-3972 Status Module

The Status module includes 24 Status LEDs, and 8 Output Status LEDs. The 24 Status LEDs are preassigned to provide the status of specific functions and features. The Status LEDs provide the following indication:

- When a function is in a "Picked Up" (exceeded the setpoint value) condition, the assigned Status Indicator will illuminate when the "Status Reset" pushbutton is depressed and held.
- When a function is in a "Picked Up" (exceeded the setpoint value) condition, and the Time Delay timer has timed out the assigned Status Indicator will illuminate as well as any assigned Output LEDs.
- Transfer Conditions

When a condition exists that causes the operation of Outputs 1 through 8, the assigned STATUS LED on the M-3872 Status Module will illuminate. Status Module LEDs will remain illuminated until the condition causing the trip is cleared, and the operator presses the "STATUS RESET" pushbutton.

Output and Input Status LEDs

When a condition exists that causes the operation of Outputs 9 through 16 or Inputs 7 through 18 the assigned Status LED on the M-4272 Front Panel will illuminate. The Status LEDs will remain illuminated until the condition causing the operation is cleared, and the operator presses the "STATUS RESET" pushbutton.

Trip (TCM) and Close (CCM) Circuit Monitor Status LEDs

The Trip and Close Circuit Monitor LEDs provide the status of the Trip and Close circuits. If a Trip or Close circuit is open (cannot perform either trip or close function) the corresponding LED will be illuminated until the open circuit is corrected.

Figure 2-1 M-4272 Front Panel

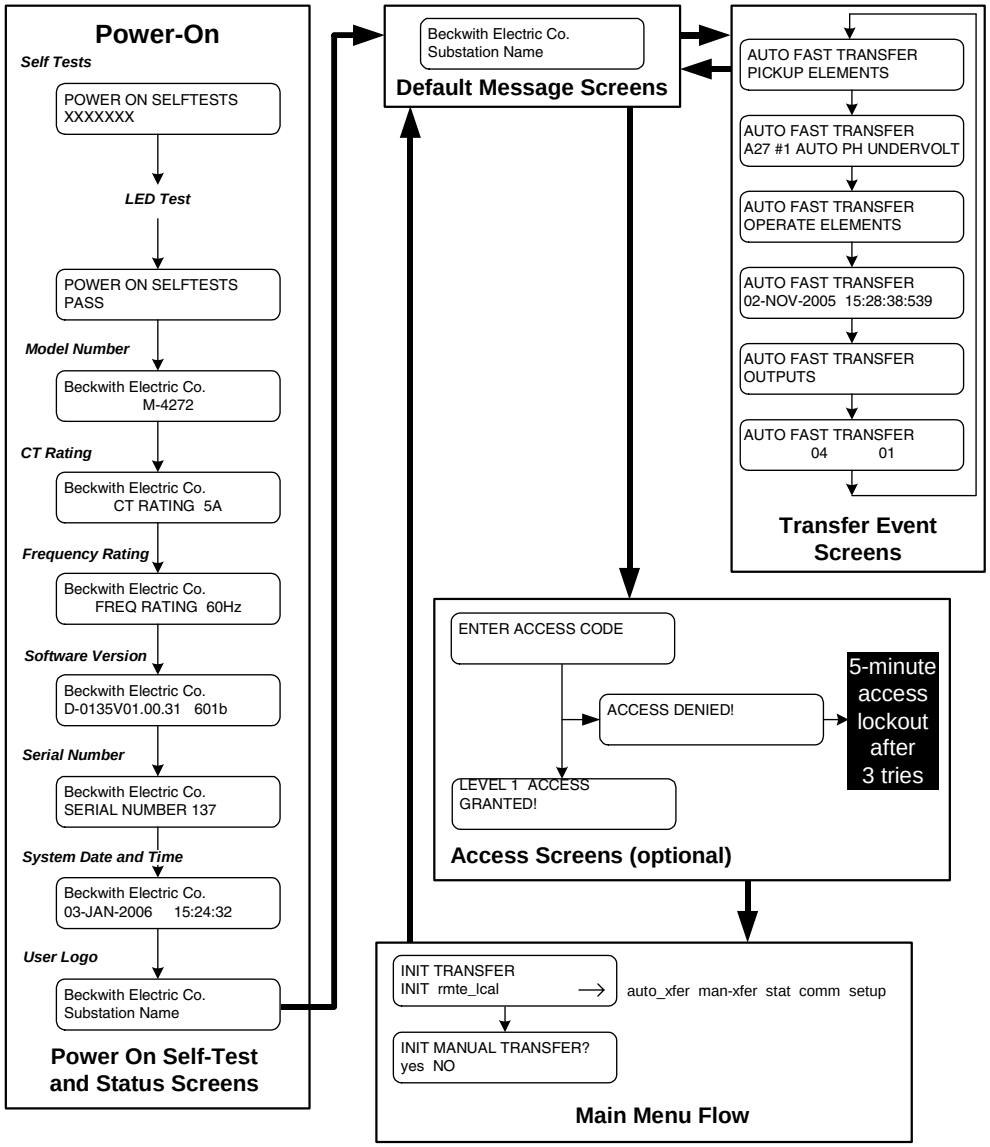


Figure 2-2 Screen Message Menu Flow

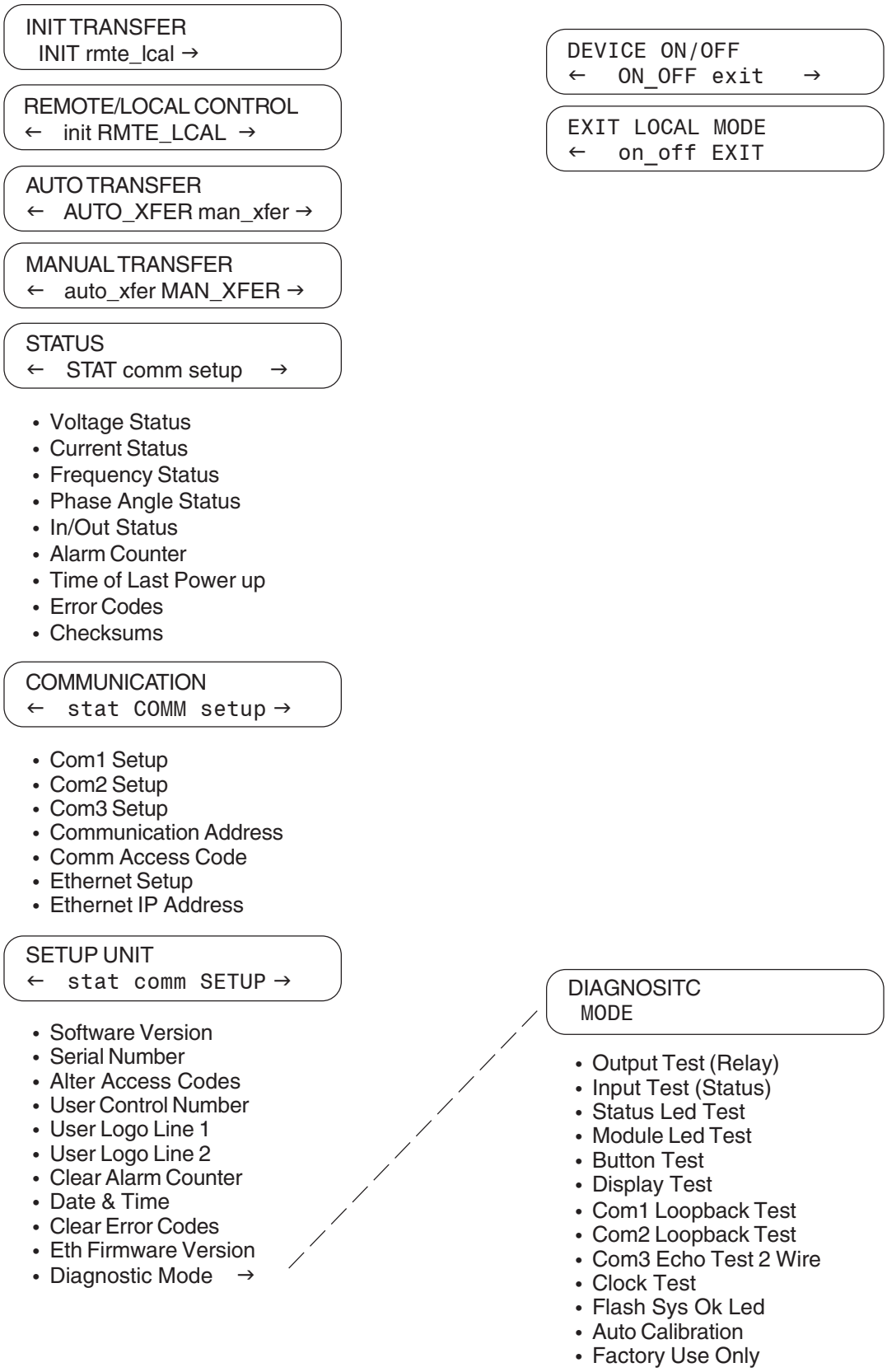


Figure 2-3 Main Menu Flow

STATUS RESET Pushbutton

Pressing and holding the **STATUS RESET** pushbutton performs four functions:

- Resets all Status LEDs if the condition causing the condition is no longer present.
- Displays the present pickup status of all functions available on the status module. This is a valuable diagnostic tool which may be used during commissioning and testing.
- Resets Latched Outputs
- Resets HMI display of last transfer

2.2 Manual Operation

Overview of Manual Transfer Methods and Transfer Modes

A Manual transfer can be initiated utilizing either:

- The Human Machine Interface (HMI)
- Through Local Serial Connections
- A Control/Status Input
- Through remote serial communications

The Manual Transfer allows transfer operation in either direction, from Source 1 to Source 2 or from Source 2 to Source 1.

Manual Transfer provides Hot Parallel Transfer or Fast Transfer, Delayed In-Phase Transfer and Residual Voltage Transfer. The Manual Transfer is blocked when any lockout/blocking condition occurs. The MBTS will not respond to any transfer command and will not send the trip command while in the lockout/blocking condition.

Transfer Modes

There are two transfer modes, Sequential and Simultaneous, in the open transition transfer operation.

Sequential Transfer Mode

When a transfer is initiated with Sequential Mode selected, the old source breaker is tripped within 10 ms and closure of the new source breaker is attempted only upon confirmation by the breaker status contact that the old source breaker has opened. Within 4 ms of receipt of this confirmation, all three transfer methods, Fast, Delayed In-Phase and Residual Voltage Transfer are enabled to supervise closure of the new source breaker. The Fixed Time Transfer is enabled 30 cycles later. The new source breaker is then closed by the Fast Transfer Method if the phase angle between the motor bus and the new source is within the delta phase angle limit immediately after the old source breaker opens.

If the phase angle between the motor bus and the new source is not within the delta phase angle limit, the old source breaker is still tripped. When the four methods of transfer are enabled, the new source breaker then closes either as a result of a subsequent movement into the delta phase angle limit within the Fast Transfer Time Window, a movement through a predicted zero phase coincidence within the Delayed In-Phase Transfer Time Window, or by a drop in the motor bus voltage below the Residual Voltage Transfer limit, or after the fixed time delay of the Fixed Time Transfer. Transfer is completed and the new source breaker is closed by any of the previously listed methods whose criteria is first satisfied.

Refer to **Appendix F**, Transfer Logic Time Sequence for Timing Sequence of Transfer Logic in Sequential Transfer Mode.

Simultaneous Transfer Mode

When a transfer is initiated with Simultaneous Mode selected, within 10 ms of transfer initiate, all three methods of transfer, Fast, Delayed In-Phase and Residual Voltage Transfer are immediately enabled to supervise closure of the new source breaker without waiting for the breaker status contact confirmation that the old source breaker has opened. At the same instant, the commands for the old source breaker to trip and the new source breaker to open are sent simultaneously if the phase angle between the motor bus and the new source is within the delta phase angle limit for the Fast Transfer Method immediately upon transfer initiation. However only the Fixed Time Transfer is enabled 30 cycles after the old source breaker has opened.

If the phase angle between the motor bus and the new source is not within the delta phase angle limit, the old source breaker is still tripped. Since the four methods of transfer are enabled, the new source breaker then closes either as a result of a subsequent movement into the delta phase angle limit within the Fast Transfer Time Window, a movement through a predicted zero phase coincidence within the Delayed In-Phase Transfer Time Window, or by a drop in the motor bus voltage below the Residual Voltage Transfer limit, or after the fixed time delay of the Fixed Time Transfer. The new source breaker is closed by any of the above methods whose criteria is first satisfied and the transfer is completed.

Refer to **Appendix F**, Transfer Logic Time Sequence for Timing Sequence of Transfer Logic in Simultaneous Transfer Mode.

Transfer Methods

The type of transfer that occurs when a Manual Transfer is initiated is determined by the Manual Transfer settings. Whenever the Hot Parallel Transfer is enabled the Manual Fast, Delayed In-phase and Residual Voltage Transfers are disabled. Only when the Hot Parallel Transfer is disabled can the Manual Fast, Delayed In-phase and Residual Voltage Transfers be enabled.

Fast Transfer

The conditions that are necessary to execute a Fast Transfer are:

- No lockout/blocking conditions exist.
- The phase angle between the motor bus and the new source is within the limit setting.
- The delta voltage between the motor bus and the new source is within the limit setting. (If this setting is enabled)
- The delta frequency between the motor bus and the new source is within the limit setting. (If this setting is enabled)
- The transfer must be completed within the Fast Transfer time window of 1 to 10 cycles.

Delayed In-Phase Transfer

The conditions that are necessary to execute a Delayed In-Phase Transfer are:

- No lockout/blocking conditions exist.
- The conditions for Fast Transfer have not been met. (If this setting is enabled)
- The delta voltage between the motor bus and the new source is within the limit setting. (If this setting is enabled)
- The delta frequency between the motor bus and the new source is within the limit setting.
- The phase angle between the motor bus and the new source is changing and must enter the first phase coincidence (first zero degree crossing) within the Delayed In-Phase Transfer time window (adjustable from 10 to 600 cycles).

  The Delayed In-Phase Transfer feature includes two programmable advanced breaker closing times for Source 1 and Source 2 breakers to coordinate the closing at the first phase coincidence. Programmable breaker closing time is from 0 to 12 cycles.

Residual Voltage Transfer

The conditions that are necessary to execute a Residual Voltage Transfer are:

- No lockout/blocking conditions exist.
- The conditions for a Fast Transfer have not been met. (If this setting is enabled)
- The conditions for Delayed In-Phase transfer have not been met. (If this setting is enabled)
- The motor bus voltage decreases to less than the Residual Voltage Transfer limit setting (adjustable from 5 to 60 V) within the incomplete transfer lockout time limit setting (50 to 3000 cycles).

Hot Parallel Transfer

When the transfer operation is from *Source 1 to Source 2*, the close command to the Source 2 circuit breaker is issued first. Then after receipt of the breaker status contact confirmation that the Source 2 circuit breaker has closed and the tripping command time delay (0 to 30 cycles), the trip command to the Source 1 breaker is issued.

When the transfer operation is from *Source 2 to Source 1*, the close command to the Source 1 circuit breaker is issued first. Then after receipt of the breaker status contact confirmation that the Source 1 circuit breaker has closed and the tripping command time delay (0 to 30 cycles), the trip command to the Source 2 breaker is issued.

In hot parallel transfer, it is necessary to confirm that the circuit breaker has been closed after a close command is issued to that circuit breaker. This will prevent the motor bus voltage from becoming dead if the circuit breaker fails to close and the other breaker is tripped. This failure of the breaker to close could be caused by electrical or mechanical problems.

In hot parallel transfer, an auto-decoupling feature is included to trip the breaker that was closed by the transfer if the breaker requested to open has not opened within the predefined paralleling time.

The conditions that are necessary to execute a Hot Parallel Transfer are:

- No lockout/blocking conditions exist.
- The phase angle between the motor bus and the new source is within the limit setting.
- The delta voltage between the motor bus and the new source is within the limit setting. (If this setting is enabled)

- The delta frequency between the motor bus and the new source is within the limit setting. (If this setting is enabled)
- The Hot Parallel Transfer must be completed within the time window of 1 to 50 cycles.

Initiate Manual Transfer (ISScom®)

To initiate a Manual Transfer of the Motor Bus utilizing ISScom perform the following:

■ **NOTE**: Communication must be established with the target MBTS for this procedure.

1. From the ISScom Main Screen menu bar select **Monitor**. ISScom will display the Secondary Metering and Status screen (Figure 3-17).
2. Verify that the MBTS is in **Remote** by observing the Remote Mode/Local Mode status indicator (System Status).
3. Verify that the **Transfer Ready (**System Status) indicator is Green.
4. If the **Transfer Ready (**System Status) indicator is not Green, then clear the condition(s) blocking the transfer.
5. From the ISScom Main Screen menu select **Initiate**. ISScom will display the Initiate Manual Transfer Confirmation screen (Figure 2-4).

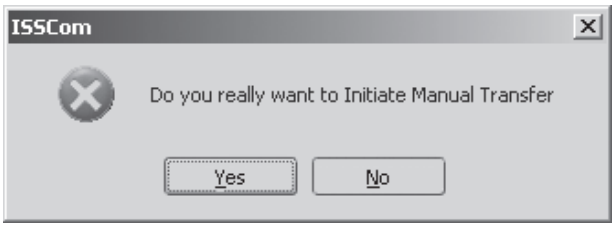


Figure 2-4 Initiate Manual Transfer Confirmation Screen

6. Select **YES**, ISScom will display the Initiate Manual Transfer Command Sent confirmation screen (Figure 2-5).

Figure 2-5 Initiate Manual Transfer Command Sent Confirmation Screen

The MBTS will start the Manual Transfer based on the system parameters present and MBTS settings.

7. If the Manual Transfer cannot be completed the **Incomplete Transfer Blocked** indicator will be illuminated (System Status).

   The MBTS is blocked from issuing operation commands.

8. If the MBTS completes the Manual Transfer successfully, then the following will be indicated in the System Status section of the Secondary Metering and Status screen:
   - Transfer Completed
   - What type of transfer was completed
   - Close S1(S2) Breaker Command
   - Trip S2(S1) Breaker Command
   - S1(S2) Breaker Closed
   - S2(S1) Breaker Opened
   - Source 1(S2) (New Source)
9. Select the **RESET** button from the ISScom comand bar or locally press and release the **Status Reset** pushbutton to reset the status indicators.

Initiate Manual Transfer (MBTS Front Panel)

To initiate a Manual Transfer of the Motor Bus from the MBTS Front Panel perform the following:

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.
   b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT  rmte_lcal
```

   c. Go to Step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT  rmte_lcal
```

4. Verify that the **Transfer Ready (**Status Module) indicator is Green.
5. If the **Transfer Ready (**Status Module) indicator is not Green, then clear the condition(s) blocking the transfer.
6. Verify the HMI display indicates the following:

```
INIT TRANSFER
INIT  rmte_lcal
```

7. Press **ENTER,** the following will be displayed:

```
INIT MANUAL TRANSFER?
yes NO
```

8. Press the Left arrow pushbutton once to select **YES**.
9. Initiate a Manual transfer by pressing **ENTER**. The following will be displayed:

```
INIT TRANSFER
INIT  rmte_lcal
```

10. If the Manual Transfer cannot be completed, then **INCOMP TRANS BLOCK** will be illuminated on the Status Module.

    The MBTS is blocked from performing another transfer until reset.

11. If the MBTS completes the Manual Transfer successfully, then the following will be indicated:

    Status Module

    - What type of transfer was completed
    - Close S1(S2) Breaker
    - Trip S2(S1) Breaker

    Front Panel LEDs

    - S2(S1) Breaker Closed LED
    - S1(S2) Breaker Opened LED

    HMI will display (scroll) the following screens:

```
MANUAL FAST TRANSFER
08-NOV-2005   10:11:49.948
```

```
MANUAL FAST TRANSFER
--OUTPUTS--
```

```
MANUAL FAST TRANSFER
            04     01
```

```
MANUAL FAST TRANSFER
--PICKUP ELEMENTS--
```

```
MANUAL FAST TRANSFER
--OPERATE ELEMENTS--
```

12. Press and release the **Status Reset** pushbutton to reset the status indicators.

Remote/Local Control

The Remote/Local selection feature provides control of the MBTS from Local mode (COM1 or HMI) and remote mode (COM2, RS485, Ethernet or external input). Remote/Local feature is configured from Local mode (COM1 or HMI) only.

When Local mode is selected manually, initiated transfers or settings changes through the COM1 or HMI are allowed. Any Remote manually initiated transfers or settings changes of the MBTS is blocked.

When Remote mode is selected manually, initiated transfers or settings changes through the COM1, HMI, COM2, RS485, Ethernet or external input is allowed.

Remote/Local Control (ISScom)

To switch Control Method utilizing ISScom® perform the following:

■ **NOTE**: Communication must be established with the target MBTS for this procedure.

1. From the ISScom Main Screen menu bar select **Remote/Local**. ISScom will display the Remote/Local Mode dialog screen (Figure 2-6).

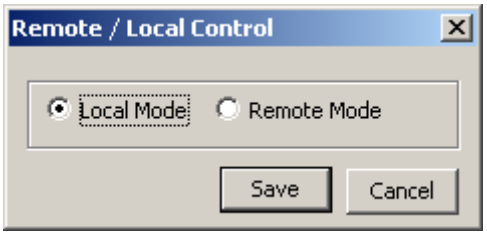


Figure 2-6 Remote/Local Mode Dialog Screen

2. Select the desired control mode, then select **Save**.
3. Verify that the MBTS is in the desired mode by observing the Remote Mode/ Local Mode status indicator on the Secondary Metering and Status screen (System Status).

Remote/Local Control (MBTS Front Panel)

To switch Control Method from the MBTS Front Panel perform the following:

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.
   b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT  rmte_lcal
```

   c. Go to Step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT  rmte_lcal
```

4. Press the Right arrow pushbutton until the following is displayed:

```
REMOTE/LOCAL CONTORL
init RMTE_LCAL
```

5. Press **ENTER,** the following will be displayed:

```
CONTROL METHOD
LOCAL remote
```

6. Press the Left or Right arrow pushbutton as necessary to select the desired Control Mode (upper case).
7. Press **ENTER**. The following will be displayed:

```
REMOTE/LOCAL CONTROL
init RMTE_LCAL
```

8. The MBTS is now in the selected Control Method. Press **EXIT** as necessary to return to the Main Menu.

Device ON/OFF

The Device ON/OFF feature allows the operator to place the MBTS in a lockout condition. When "Device OFF" is selected, no auto or manual transfers can be executed either through Local mode or Remote mode and all output relays are deactivated. The "Device ON" selection returns the MBTS back to normal operation.

When selecting Device ON/OFF feature through Local mode (COM1 or HMI) the MBTS Local mode must be selected. Any Remote attempt is blocked.

When selecting Device ON/OFF feature through Remote mode (COM2, RS485 or Ethernet), the MBTS Remote mode must be selected. Any Local attempt is blocked.

Upon saving the "Device OFF" selection, the Self-Test relay contact terminals 55 & 56 close, the front panel System OK and Transfer Ready Status LED indicators extinguish. All output relays are deactivated.

Upon saving the "Device ON" selection, the Self-Test relay contact terminals 55 & 56 open, front panel System OK and Transfer Ready Status LED indicators illuminate for normal operation. All output relays return to activated states.

Device ON/OFF (ISScom)

To switch the MBTS ON or OFF utilizing ISScom perform the following:

■ **NOTE**: Communication must be established with the target MBTS for this procedure.

1. From the ISScom Main Screen menu bar select **Device ON/OFF**. ISScom will display the Device On/OFF dialog screen (Figure 2-7).

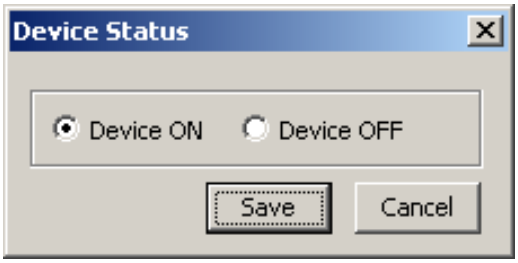


Figure 2-7 Device On/Off Dialog Box

2. Select either **Device ON** or **Device OFF**, then select **Save**.
3. Verify that the MBTS is in the desired mode by observing the Device On/Off Mode status indicator on the Secondary Metering and Status screen (System Status).

Device ON/OFF (MBTS Front Panel)

To switch the MBTS On or OFF from the Front Panel perform the following:

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.
   b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT    rmte_lcal
```

   c. Go to Step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT    rmte_lcal
```

4. Press the Right arrow pushbutton until the following is displayed:

```
DEVICE ON/OFF
ON_OFF exit
```

5. Press **ENTER,** the following will be displayed:

```
DEVICE MODE
ON off
```

6. Press the Left or Right arrow pushbutton as necessary to select the desired Device Mode (upper case).
7. Press **ENTER**. The following will be displayed:

```
DEVICE ON/OFF
ON_OFF exit
```

8. The MBTS is now in the selected Device Mode. Press **EXIT** as necessary to return to the Main Menu.

System Error Codes and Output Counters

The System Error Codes and Output Counters feature provides the user with the ability to view and clear system Error Codes, Processor Resets, Alarm Counters, Power Loss Counter and Output Counters. Also, Checksums can be viewed for Calibration and Setpoints.

Reset/View System Error Codes and Output Counters (ISScom®)

To view and/or Reset System Error Codes and Output Counters utilizing ISScom™ perform the following:

■ **NOTE**: Communication must be established with the target MBTS for this procedure.

1. From the ISScom Main Screen menu bar select **Tools/System Error Codes/ Counters**. ISScom will display the System Error Codes and Output Counters dialog screen (Figure 2-8).
2. Select the desired System Error Code, Processor Reset, Alarm Counter, Power Loss Counter to be reset, then select **OK**. ISScom will return to the Main Menu.

Clear Alarm Counters (MBTS Front Panel)

To reset Alarm Counters from the Front Panel perform the following:

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.

b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT    rmte_lcal
```

c. Go to Step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT  rmte_lcal
```

4. Press the Right arrow pushbutton until the following is displayed:

```
SETUP UNIT
stat comm SETUP
```

5. Press **ENTER,** the following will be displayed:

```
SOFTWARE VERSION
VERS sn access number
```

6. Press the Right arrow pushbutton until the following is displayed:

```
CLEAR ALARM COUNTER
logo1 logo2 ALARM
```

7. Press **ENTER,** the following will be displayed:

```
CLEAR ALARM COUNTER
PRESS ENTER KEY TO CLEAR
```

8. Press **ENTER,** the following will be displayed:

```
CLEAR ALARM COUNTER
-ALARM COUNTER CLEARED-
```

9. Press **EXIT** as necessary to return to the Main Menu.

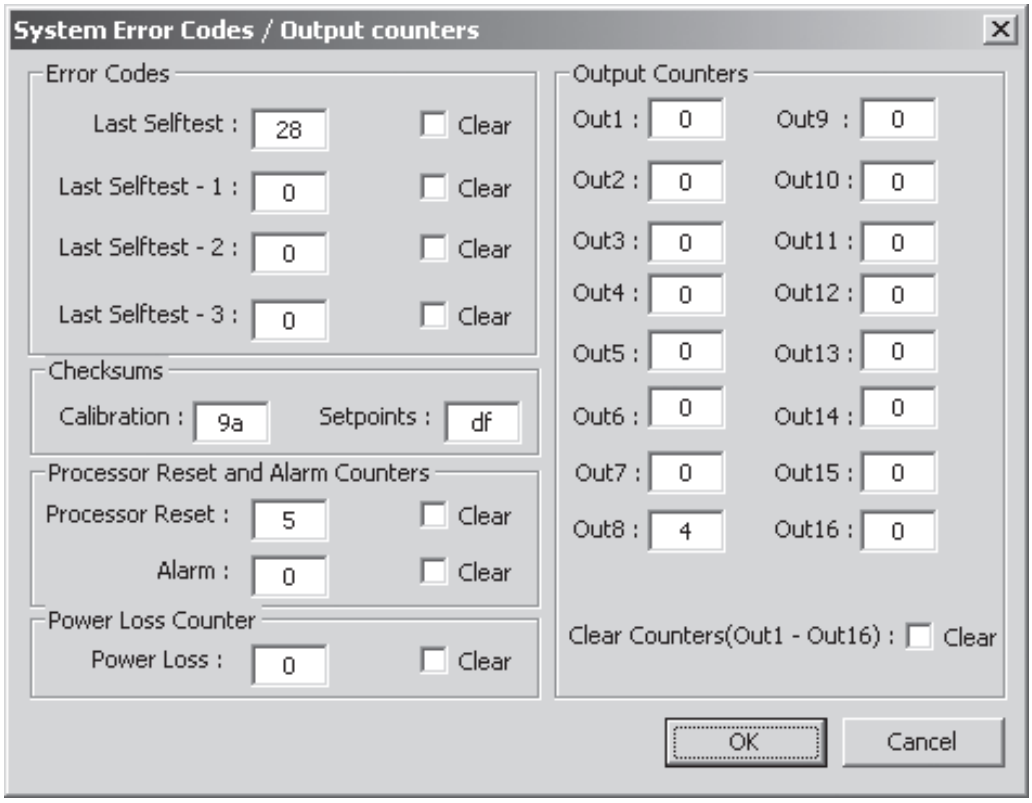


Figure 2-8 System Error Codes and Output Counters Dialog Screen

Clear Error Codes (MBTS Front Panel)

To clear Error Codes from the Front Panel perform the following:

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.
   b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT   rmte_lcal
```

   c. Go to Step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT  rmte_lcal
```

4. Press the Right arrow pushbutton until the following is displayed:

```
SETUP UNIT
stat comm SETUP
```

5. Press **ENTER,** the following will be displayed:

```
SOFTWARE VERSION
VERS sn access number
```

6. Press the Right arrow pushbutton until the following is displayed:

```
CLEAR ERROR CODES
time ERROR eth diag
```

7. Press **ENTER,** the following will be displayed:

```
CLEAR ERROR CODES
PRESS ENTER KEY TO CLEAR
```

8. Press **ENTER,** the following will be displayed:

```
CLEAR ERROR CODES
-ERROR CODES CLEARED-
```

   All Error codes have been cleared.

9. Press **EXIT** as necessary to return to the Main Menu.

2.3 Status Monitoring and Metering

ISScom®

System/Monitor/Primary Metering

The Primary Metering screen (Figure 2-9) includes the Source 1 and Source 2, Primary Voltage, Primary Current, Bus Primary Voltage, Bus Frequency, Positive and Negative Sequence.

System/Monitor/Secondary Metering and Status

The Secondary Metering and Status screen (Figure 2-10) includes the Source 1 and Source 2, Secondary Voltage, Secondary Current and Bus Frequency.

The Secondary Metering section also displays Bus New Source information that includes Delta Phase Angle, Delta Frequency, Delta Voltage and the New Source identity (Source 1 or Source 2). The Secondary Metering and Status screen also includes the individual sections for Input/Output Status, Function Status, Oscillograph Triggered Status, Transfer Event Log Stored Status, Sequence of Event Stored Status and System Status information.

The Voltages portion of the metering screen displays the Phase Voltages for the three voltage inputs to the MBTS. It also displays the Bus Positive Sequence (V_{PS}) and Bus Negative Sequence (V_{NS}) when three phase voltages are applied. When Single-phase is selected for S1, S2 and Bus the screen will display values for the Single-phase. The currents portion of the metering screen displays the single phase currents flowing through the Source 1 and Source 2 breakers. The current is used for the Breaker Failure (50BF) feature only. The displayed Frequency is the frequency of the bus. The Bus-New Source portion displays the difference in phase angle, frequency and voltage across the open breaker between the Bus and the New Source. The Source that is presently defined as the New Source is also displayed. The remainder of the screen presents the Input/Output, Function, Oscillograph Trigger and System status.

▲ **CAUTION:** Do not use the Delta Phase Angle OK, Delta Voltage OK or Delta Frequency OK status indicators of the ISScom® software to determine when to manually initiate a transfer. There is sufficient delay in the communications between the MBTS and the ISScom such that these indications do not provide "live" information.

Always use the status indicators of the MBTS front panel. These indicators use the manual transfer settings to determine when a parameter is OK.

▲ **CAUTION:** Do not use the Manual Initiate of ISScom when Delta Phase Angle and Delta Voltage are constantly changing. Use the Manual Initiate of the MBTS Front Panel.

The Function Status window displays the status of various functions, with "T" representing the function which has timed out, and "P" representing the function which has picked up and is timing.

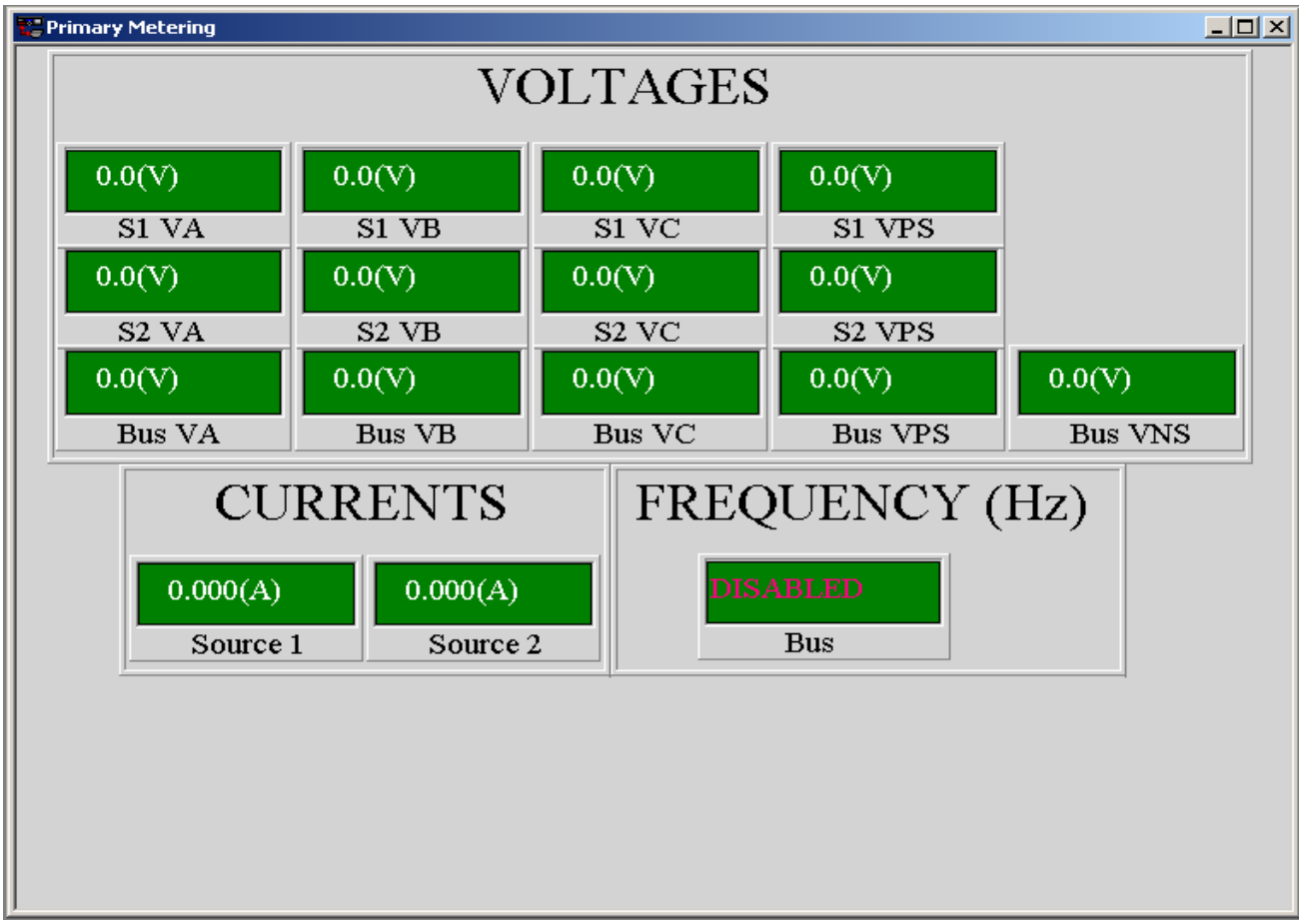
System/Monitor/Phasor Diagram and Sync Scope

▲ **CAUTION:** Do not use the Delta Phase Angle, Delta Voltage, Delta Frequency or Sync Scope Pointer of the ISScom Sync Scope screen to determine when to manually initiate a transfer. There is sufficient delay in the communications between the MBTS and the ISScom such that these indications do not provide "live" information.

▲ **CAUTION:** Do not use the Manual Initiate of ISScom when Delta Phase Angle and Delta Voltage are constantly changing. Use the Manual Initiate of the MBTS Front Panel.

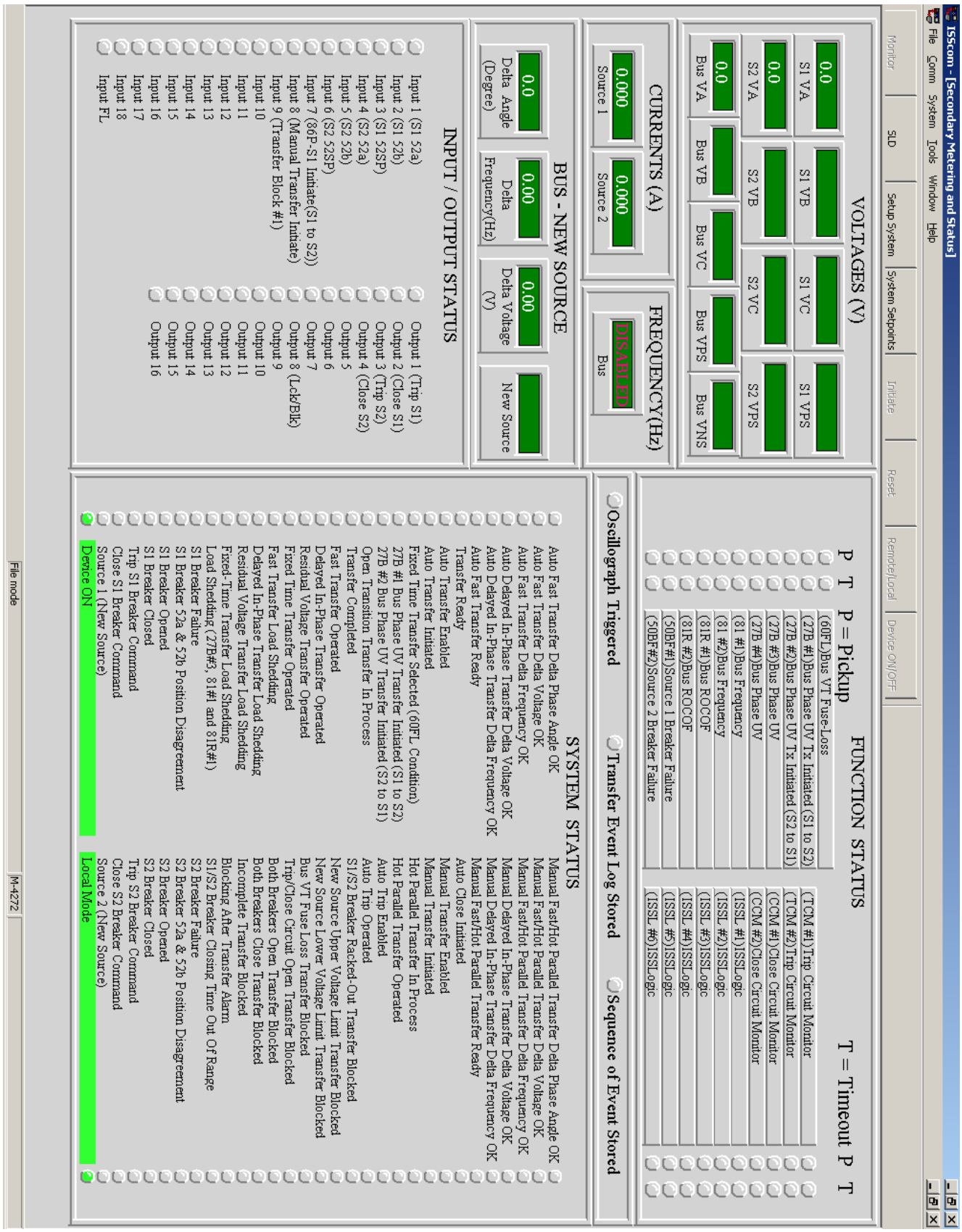
The Phasor Diagram (Figure 3-18) provides selected reference Phase Angle to Phase Angle data from other sources. The Phasor Diagram also includes a Freeze capability to freeze the data displayed on the Phasor Diagram.

The Sync Scope screen (Figure 3-19) provides the Delta Frequency relationship between the Bus and the New Source, illustrated in a Fast or Slow direction based on Delta Frequency.



Path: System / Setup / Monitor / Primary Metering

Figure 2-9 Primary Metering Screen



Path: System / Setup / Monitor / Secondary Metering and Status

Figure 2-10 Secondary Metering and Status Screen

MBTS Front Panel

Monitor Status/Metering

The HMI menu categories for monitored values are:

- **Voltage Status** — S1, S2 and Bus phase voltages, Bus positive sequence voltage, Bus negative sequence voltage, delta voltage (referenced to new source)
- **Current Status** — S1 and S2 phase currents (A–B–C/a-b-c)
- **Frequency Status** — Bus Frequency, Delta Frequency and Rate of Change of Frequency (referenced to new source)
- **Phase Angle Status**
- **I/O Status** — Status of input and output contacts
- **Alarm Counter**
- **Time of Last Power up**
- **Error Codes**
- **Checksums** — setpoints, calibration, ROM

To access the **STATUS** menu and begin monitoring, proceed as follows:

1. Press the **ENTER,** the following will be displayed:

```
INIT TRANSFER
INIT  rmte_lcal
```

2. Press the Right arrow pushbutton until the following is displayed:

```
STATUS
STAT comm setup
```

3. Press the **ENTER,** the following will be displayed:

```
VOLTAGE STATUS
VOLT curr freq phang
```

4. Press the Right or Left arrow pushbutton until the desired parameter is selected (upper case), then press **ENTER**. The MBTS will display the selected parameter.
5. Press the **ENTER** pushbutton to move down within the **STATUS** menu to the desired category. To exit a specific category and continue to the next menu category, press the **EXIT** pushbutton.

Transfer Event Log

The initiating event that starts the Transfer Event Log is the “Start” signal for any transfer. A Transfer Event Log is considered complete when one of following occurs:

- When the breaker from the Old Source trips and the breaker to the New Source closes.
- When a breaker failure occurs.
- When the incomplete transfer timer times out.

The trigger and complete events are used to define the time frame during which the transfer event log is storing information. One transfer can have up to 4 records. After 16 records have been stored, any new record will cause the oldest existing record to be lost. Each Transfer Event Log parameter is time stamped with the date and time in 1 ms increments.

A reset feature is provided to clear this log through the serial communications. See Chapter 3, **ISScom®**, subsection **System/Transfer Event Log** for Transfer Event Log **Download**, **View**, **Clear Status** and **Clear History** selections.

Sequence of Events Recorder

The Sequence of Events Recorder stores every change in the input status, trip commands, close commands, any signal to initiate a transfer, type of transfer, change in any breaker status, and status reset.

Each of these Running Events are time stamped with the date and time in 1 ms increments. The Running Event Log stores the last 512 events, when a new event occurs the oldest event is removed.

A reset feature is provided to clear this log through the serial communications. See Chapter 3, **ISScom**, subsection **System/Sequence of Events** for Sequence of Events Recorder **Download**, **View** and **Clear** selections.

Oscillograph

The Oscillographic Recorder provides comprehensive data recording of all monitored waveforms, and status inputs storing up to 248 cycles of data.

The Oscillographic Recorder is triggered by a designated control/status input (usually a MBTS initiate input), an automatically initiated signal, a trip output, a manual transfer signal or from serial communications. The Oscillograph Recorder settings are not considered to be part of the Setpoint Profile. Recorder settings are common to all profiles.

See Chapter 3, **ISScom®**, subsection **System/ Oscillograph** for Oscillograph Recorder **Retrieve**, **Trigger** and **Clear** selections.

3 ISScom®

This chapter is designed for the person or group responsible for the operation and setup of the MBTS. The M-3872 ISScom Communications and Oscillographic Analysis Software is required to successfully communicate system settings and operational commands to the MBTS as well as access the extensive monitoring and status reporting features. Figure 3-2, represents the ISScom Main Screen menu structure. This chapter provides a general description of each ISScom menu selection and command in the same order as they are displayed in the software program. Those ISScom features and functions that are covered in other sections of this Instruction Book will be noted and referenced.

3.1 ISScom Functional Description

The ISScom installation and establishing initial local communications are covered in Section 5.5, ISScom Communications and Oscillographic Analysis Software Installation, and Section 5.6, Activating Initial Local Communications.

Selecting the ISScom Program from the Becoware Folder or selecting the ISScom Program Icon (Figure 3-1) from the Desktop will open the program and display the ISScom Main Screen (Figure 3-5).

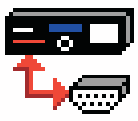


Figure 3-1 ISScom Program Icon

Shortcut Command Buttons

When the ISScom software opens, there are also 7 shortcut command buttons for the most common operations performed by ISScom. The first three buttons, **Monitor**, **Setup System** and **System Setpoints** are also found under the System drop down menu.

Initiate and Reset Buttons

The Initiate and Reset buttons are used to control the MBTS. The Initiate button is used to initiate a Manual Transfer and the Reset Button Resets the Output Status of Latched Outputs, Timed Out Function Statuses that are Latched, the System Status and Latched Lockout indicators (if the condition is no longer present).

Remote/Local Button

The Remote/Local button opens a dialog screen (Figure 3-3), that provides a selection between Remote and Local control of the MBTS. If Local is selected only locally initiated transfers will be performed, then Remote Control (manual initiate transfer) of the MBTS is blocked. Local mode also blocks remote setpoint changes. Remote Control is defined as those manual transfers that initiate through any serial port (except for the RS-232 port on the front panel) and any externally connected manual initiate command through inputs; blocking inputs are still allowed.

Figure 3-3 Remote/Local Mode Dialog Screen

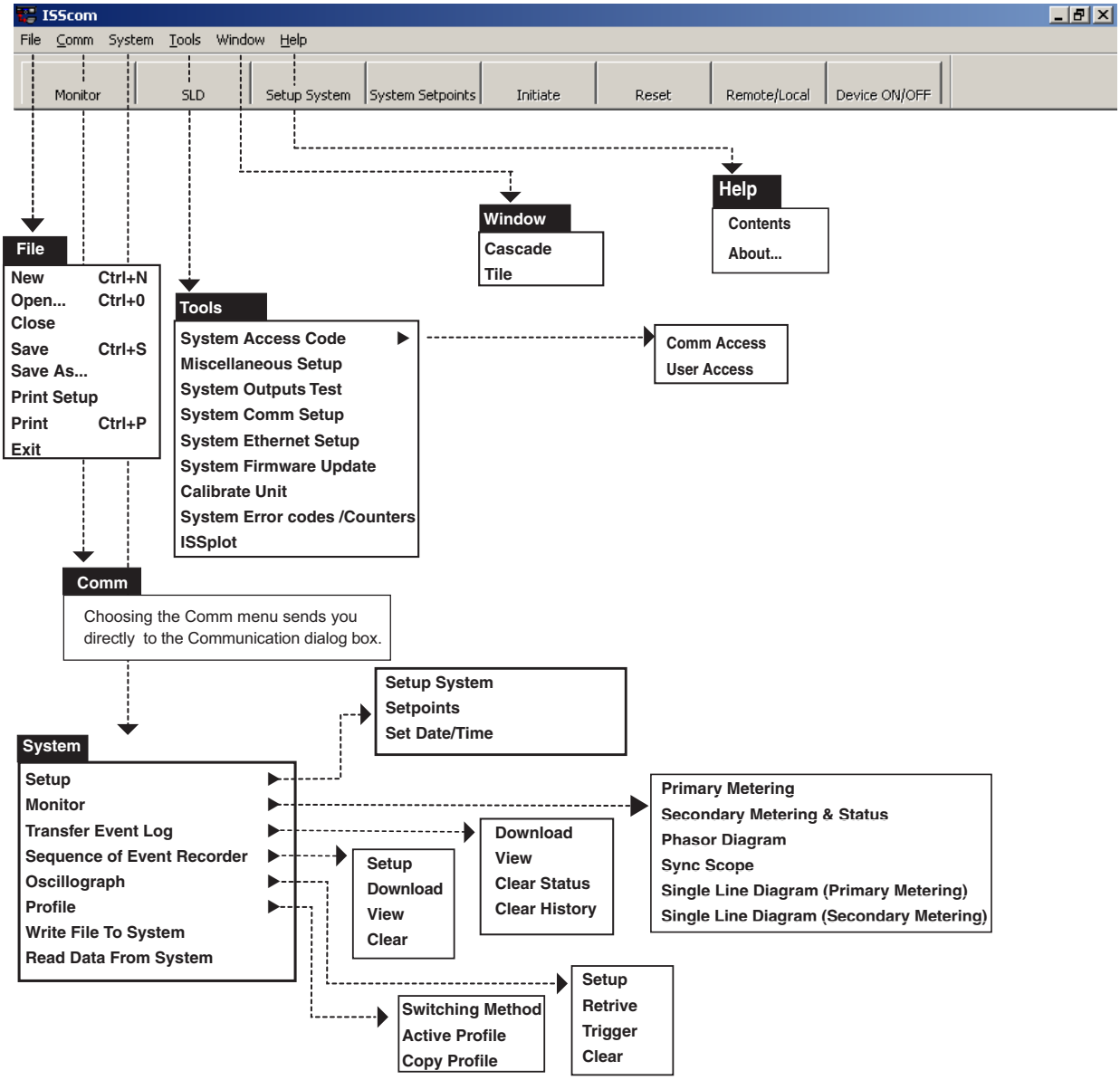


Figure 3-2 ISScom® Main Menu Structure

Local is defined as originating from the HMI of the MBTS or the RS-232 port COM1 on the front panel. This setting prevents a transfer from being initiated remotely when personnel are on-site “Locally” operating the MBTS. Remote communications is still possible and all the status information can still be read, only manual transfer initiate control and settings changes are blocked. When in Local control the state of this selection cannot be changed remotely, this means someone cannot remotely change back to Remote Control. However, the Remote/Local selection can always be changed locally, personnel on-site have priority. If Remote Control is selected, then manual transfers can be initiated either remotely or locally. This applies to manually initiated transfers. The Automatic Transfer can still be initiated by internal undervoltage initiate, ISSlogic®, 86P-S1 Initiate, 86P-S2 Initiate, 27-S1 or 27-S2 initiates. The Automatic Transfer operates independently from Remote/Local control.

Device ON/OFF

The Device ON/OFF button opens a dialog screen (Figure 3-4), that provides a selection between “Device ON” and “Device OFF”. If “Device OFF” is selected, then the MBTS is placed in a lockout condition and no transfers can be executed either remotely, locally, automatically or manually. Monitoring of all status conditions with ISScom is still possible, either locally (HMI or COM1) or remotely in “Device OFF” state. The “Device ON” selection allows normal operation.

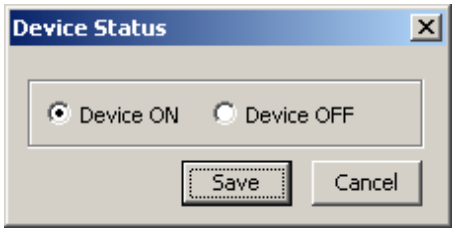


Figure 3-4 Device On/Off Dialog Box

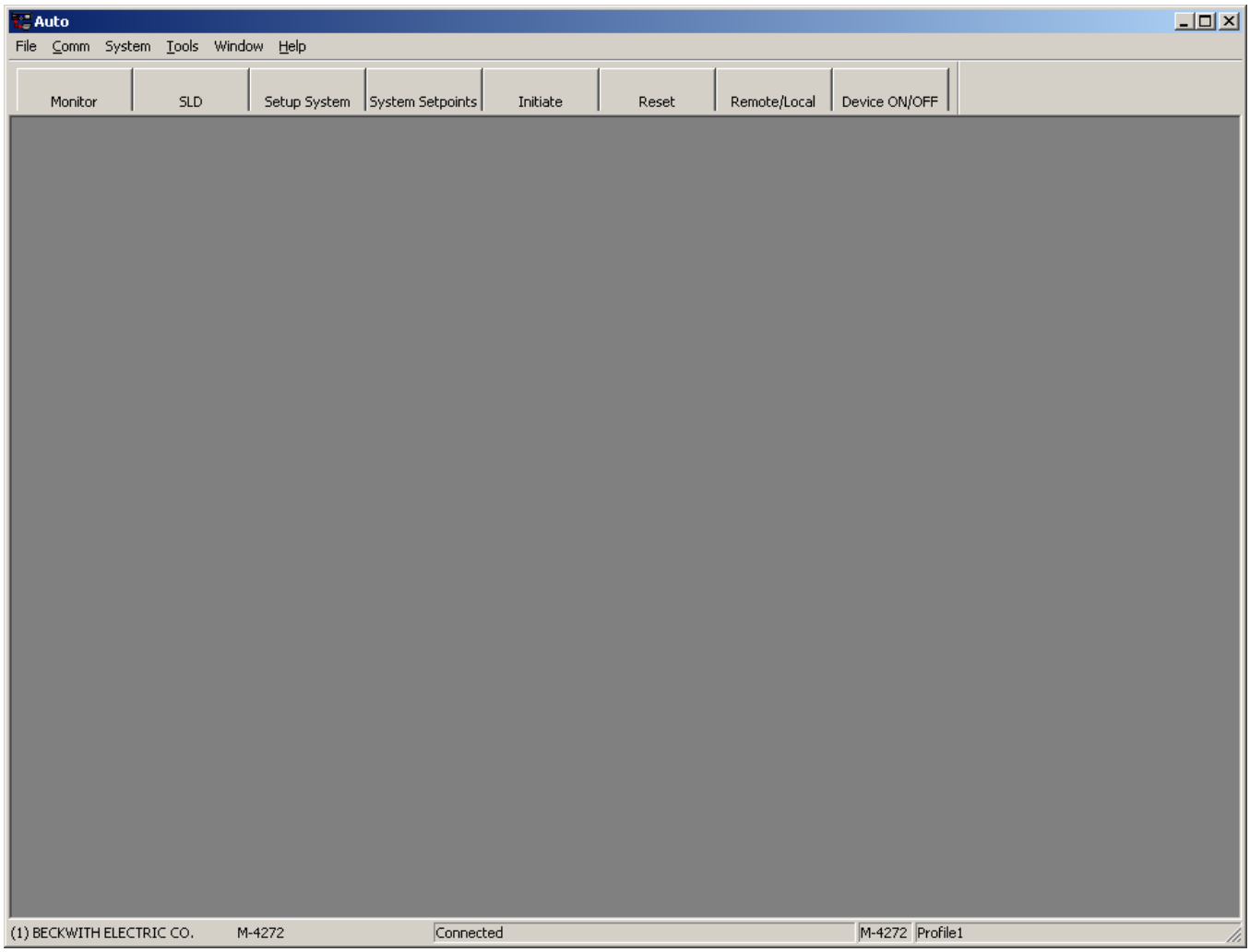
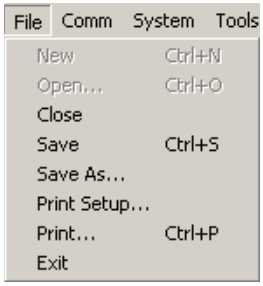


Figure 3-5 ISScom® Main Screen

File Menu

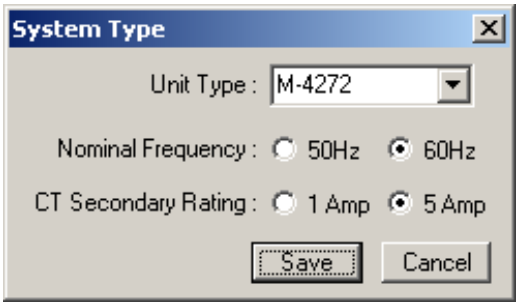


The **File** menu enables the user to create a new data file, open a previously created data file, close, save, save as, print preview, print and printer setup. The ISScom® program can also be exited through the **File** menu.

File/New Command

When not connected to the MBTS, using the **New** command, a new file is established with the New System dialog screen (Figure 3-6). Selecting **Save** allows the new data file to be named by using the **Save** or **Save As**... commands.

■ **NOTE**: By choosing the **NEW** command, unit and setpoint configuration values are based on factory settings specified for the profiled MBTS.



Path: File menu / New command

Figure 3-6 New System Dialog Screen

COMMAND BUTTONS

SAVE Saves the currently displayed information.

Cancel Returns to the ISScom main screen; any changes to the displayed information are lost.

File/Save and Save As Command

The Save and Save As... commands allow saving a file or renaming a file, respectively.

File/Open Command

The open command allows opening a previously created data file. With an opened data file, use the System... Setup... menu items to access the setpoint windows.

If communication can be established with a MBTS, it is always preferred to use the **Read Data From System** command in the System menu to update the PC's data file with the MBTS data. This file now contains the proper system type information, eliminating the need to set the information manually.

File/Print and Print Setup Command

The Print and Printer Setup commands allow user to select printer options and print out setpoint data from the open data file or directly from the MBTS, if an MBTS is communicating with the PC.

File/Exit Command

The Exit command quits the ISScom program.

Comm Menu

The Communication dialog screens allow selection of the ISScom communication parameters to coordinate with the MBTS. Selecting "Serial COM Port" displays the PC Comm Port Settings section (Figure 3-7). Selecting "TCP/IP" displays the PC TCP/IP Settings section (Figure 3-8) for Ethernet communication. Selecting "Modem" displays an expanded Communication Dialog screen (Figure 3-9), to establish contact with remote locations. The expanded Communication Dialog screen also includes a "Bring up terminal window after dialing" option. When selected ISScom will open a terminal window to allow modem commands to be sent to the target modem. When communicating by way of a fiber optic loop network, echo cancelling is available by checking the Echo Cancel box. This command masks the sender's returned echo.

If the modem was not used to establish communication (direct connection), select **Open COM** to start. If the MBTS has a default communication access code of 9999, a message window will be displayed showing Access Level #3 was granted. Otherwise, another dialog screen will be displayed to prompt the user to enter the access code in order to establish communication. **Close COM** discontinues communication.

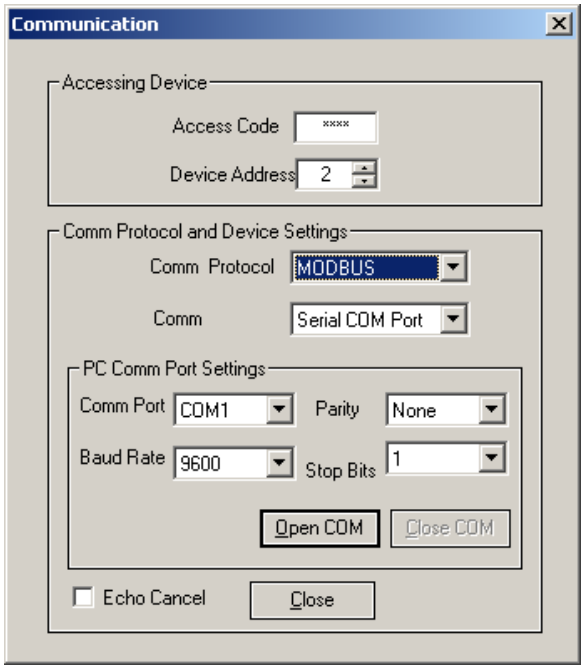


Figure 3-7 ISScom® Serial Communication Dialog Screen

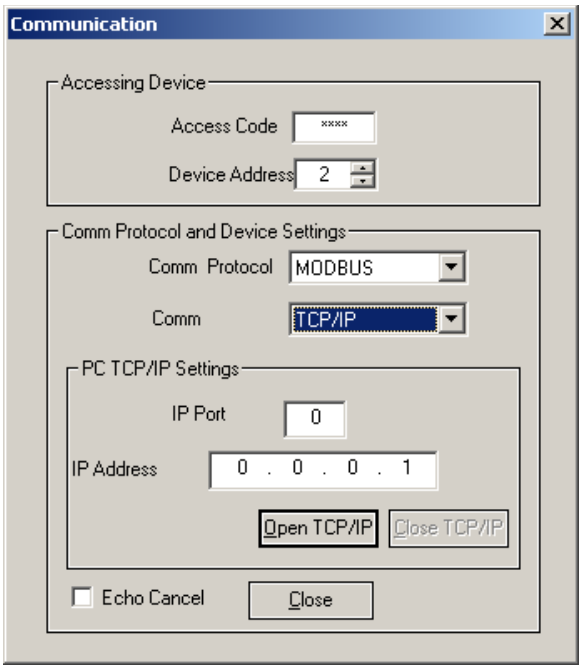


Figure 3-8 ISScom TCP/IP Ethernet Communication Dialog Screen

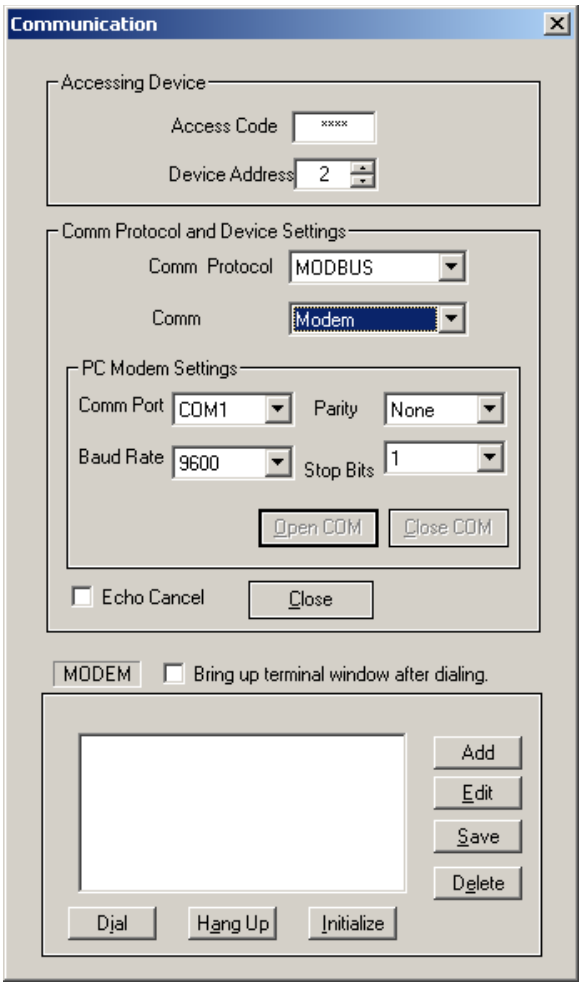
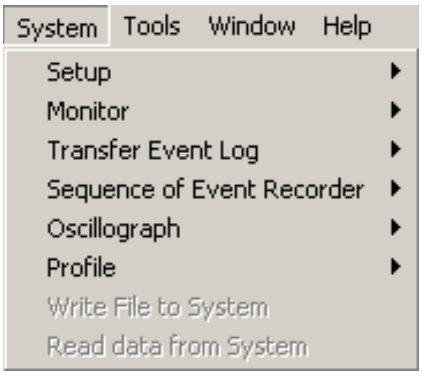


Figure 3-9 ISScom Modem Expanded Communication Dialog Screen

System Menu



The **System** menu provides access to the screens used to set, monitor, or interrogate the MBTS. Six submenus are provided: **Setup, Monitor, Transfer Event Log** , **Sequence of Event Recorder**, **Oscillograph** and **Profile** as well as two commands, **Write File to System,** and **Read Data From System**.

System/Setup

The **Setup** submenu includes the **Setup System**, **Setpoints**, and **Set Date/Time** selections.

System/Setup/Setup System

The **Setup System** selection displays the Setup System dialog screen (Figure 3-10) allowing the user to input the pertinent information regarding the system on which the MBTS is applied (see Section 4.2, **System Setup**, for detailed information regarding the specific elements of the Setup System dialog screen).

■ **NOTE:** Checking the inputs for the Active Input Open parameter designates the "operated" state established by an *opening* rather than a closing external contact.

COMMAND BUTTONS

Save — When connected to a MBTS, sends the currently displayed information to the unit. Otherwise, saves the currently displayed information to file and returns to the ISScom Main screen.

Cancel — Returns to the ISScom® Main screen; any changes to the displayed information are lost.

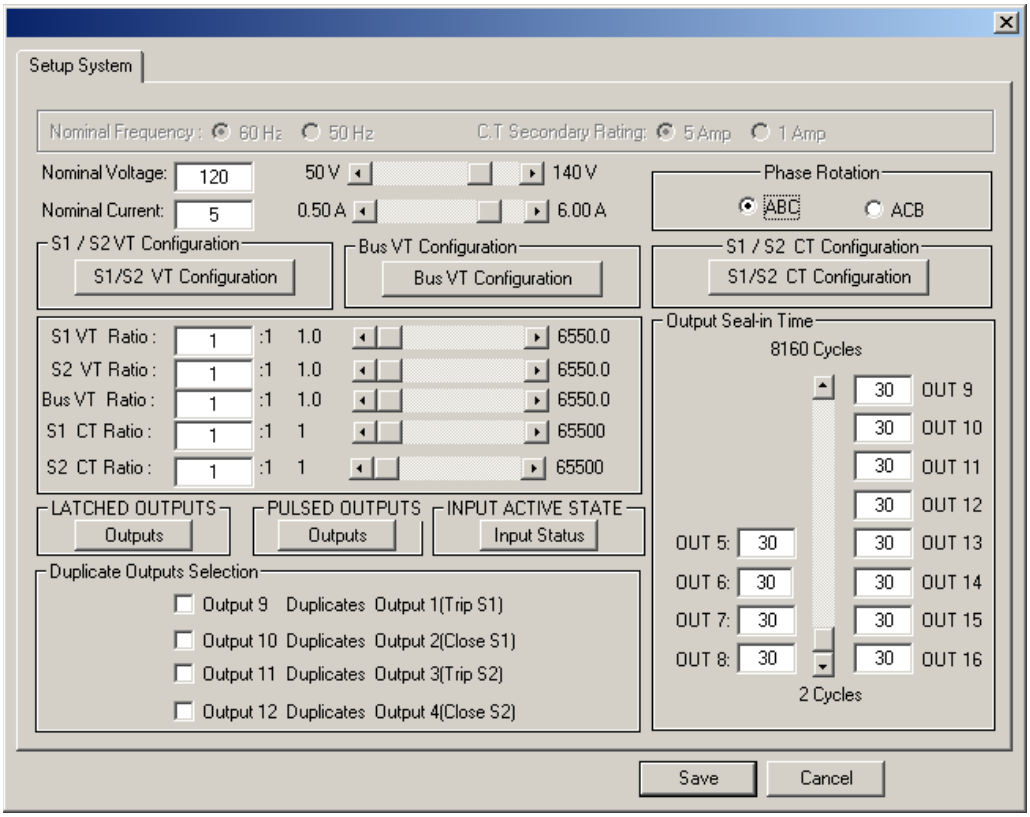


Figure 3-10 Setup System Dialog Screen

System/Setup/Setpoints

The **Setpoints** menu selection displays the M-4272 System Setpoints dialog screen (Figure 3-11) from which the individual Transfer Setting and Function Setting dialog screens can be accessed. Selecting a Transfer Setting or Function Setting button will display the corresponding function dialog screen (See Figure 3-12 as an example).

COMMAND BUTTONS

Display All Opens the All Setpoints Table dialog screen for the specified range of functions.

Configure Opens the Configure dialog screen.

Exit Exits the screen and returns to the ISScom® main screen.

COMMAND BUTTONS

Save When connected to a MBTS, sends the currently displayed information to the unit. Otherwise, saves the currently displayed information and returns to the System Setpoints screen or All Setpoints Table.

Cancel Returns to the System Setpoints screen or All Setpoints Table; any changes to the displayed information are lost.

FEATURE AND FUNCTION SELECTION BUTTONS

The individual Feature and Function selection buttons are described in the applicable sections.

System/Setup/Setpoints/Display All

Selecting the **Display All** button displays the **All Setpoints Table** dialog screen (Figure 3-13). This dialog screen contains the settings for each MBTS function within a single window to allow scrolling through all MBTS setpoint and configuration values.

Both dialog screens (All Setpoint Table and Configure), feature Jump Command Buttons which allow the user to jump from a scrolling dialog screen to an individual MBTS function dialog screen and return to the scrolling dialog screen. All available parameters can be reviewed or changed when jumping to an MBTS configuration dialog screen from either scrolling dialog screen.

DISPLAY ALL JUMP COMMAND BUTTONS

This screen includes Jump Command Buttons, that take the user to the corresponding MBTS dialog screen or Setup System dialog screen. Exiting any of these dialog screens will return the user to the All Setpoints Table dialog screen.

System/Setup/Setpoints/Configure

Selecting the **Configure** button displays the Configure dialog screen (Figure 3-14), which contains a chart of programmed input and output contacts, in order to allow scrolling through all MBTS output and blocking input configurations.

Both dialog screens (All Setpoint Table and Configure), feature Jump Command Buttons which allow the user to jump from a scrolling dialog screen to an individual MBTS function dialog screen and return to the scrolling dialog screen. All available parameters can be reviewed or changed when jumping to a MBTS configuration dialog screen from either scrolling dialog screen.

CONFIGURE JUMP COMMAND BUTTONS

This screen includes Jump Command Buttons, that take the user to the corresponding MBTS dialog screen or Setup System dialog screen. Exiting any of these dialog screens will return the user to the Configure dialog screen.

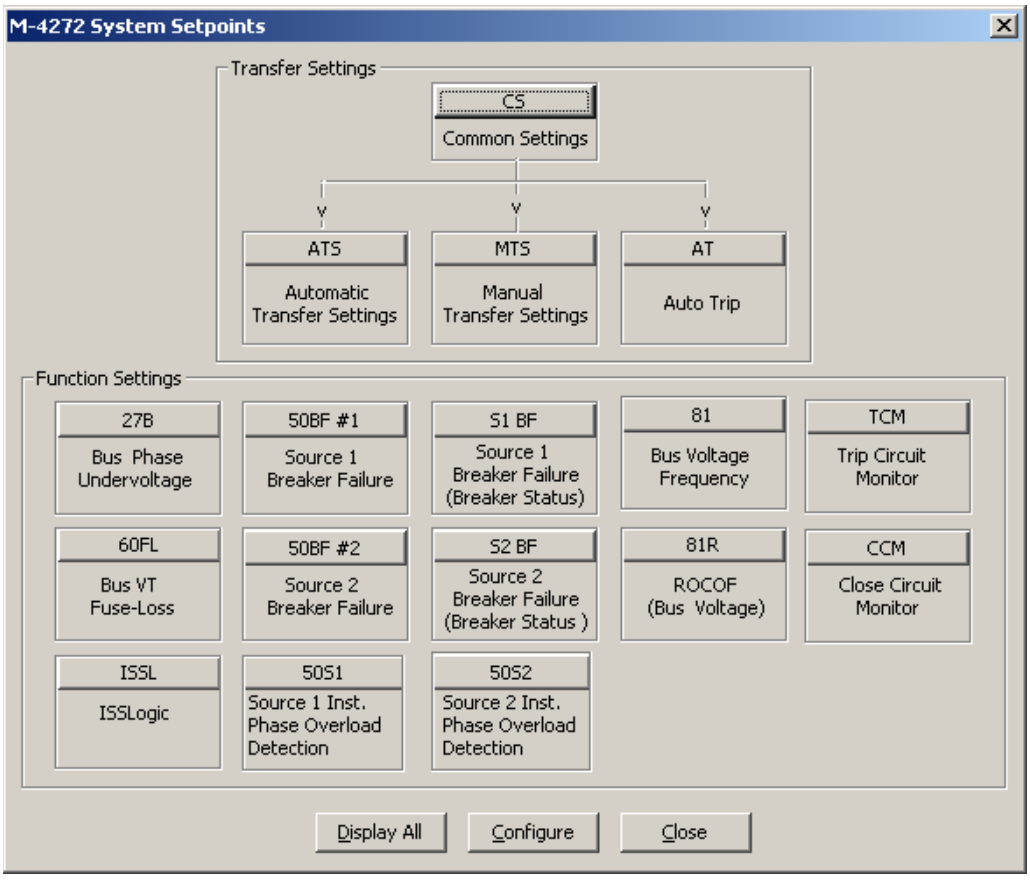
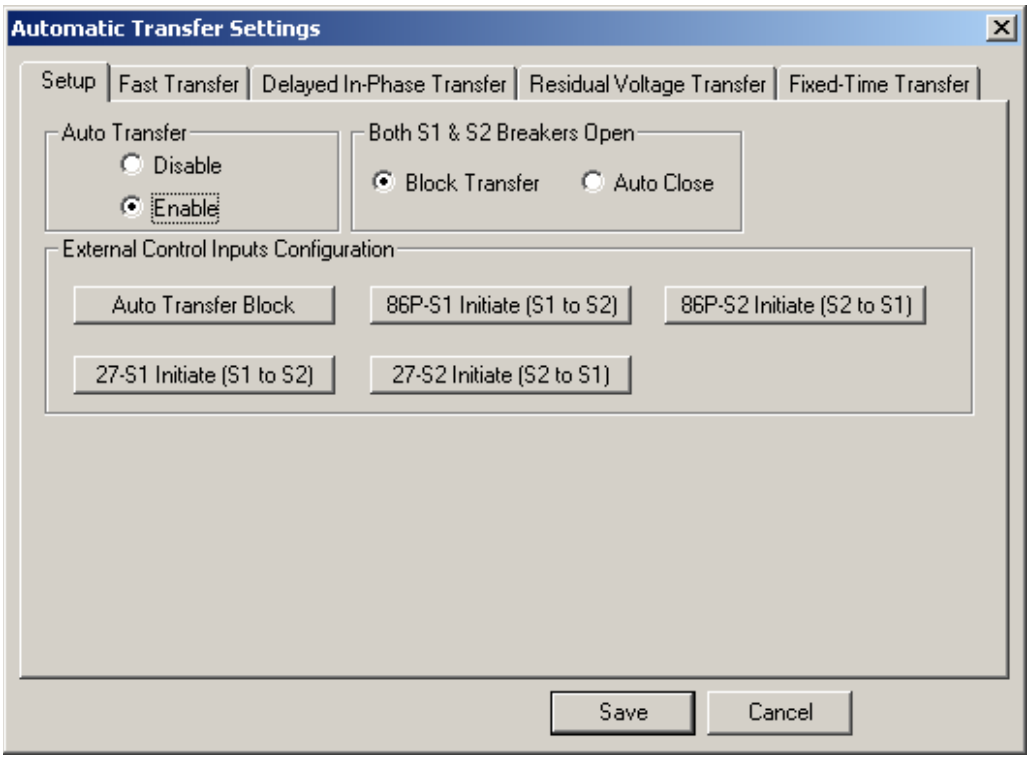
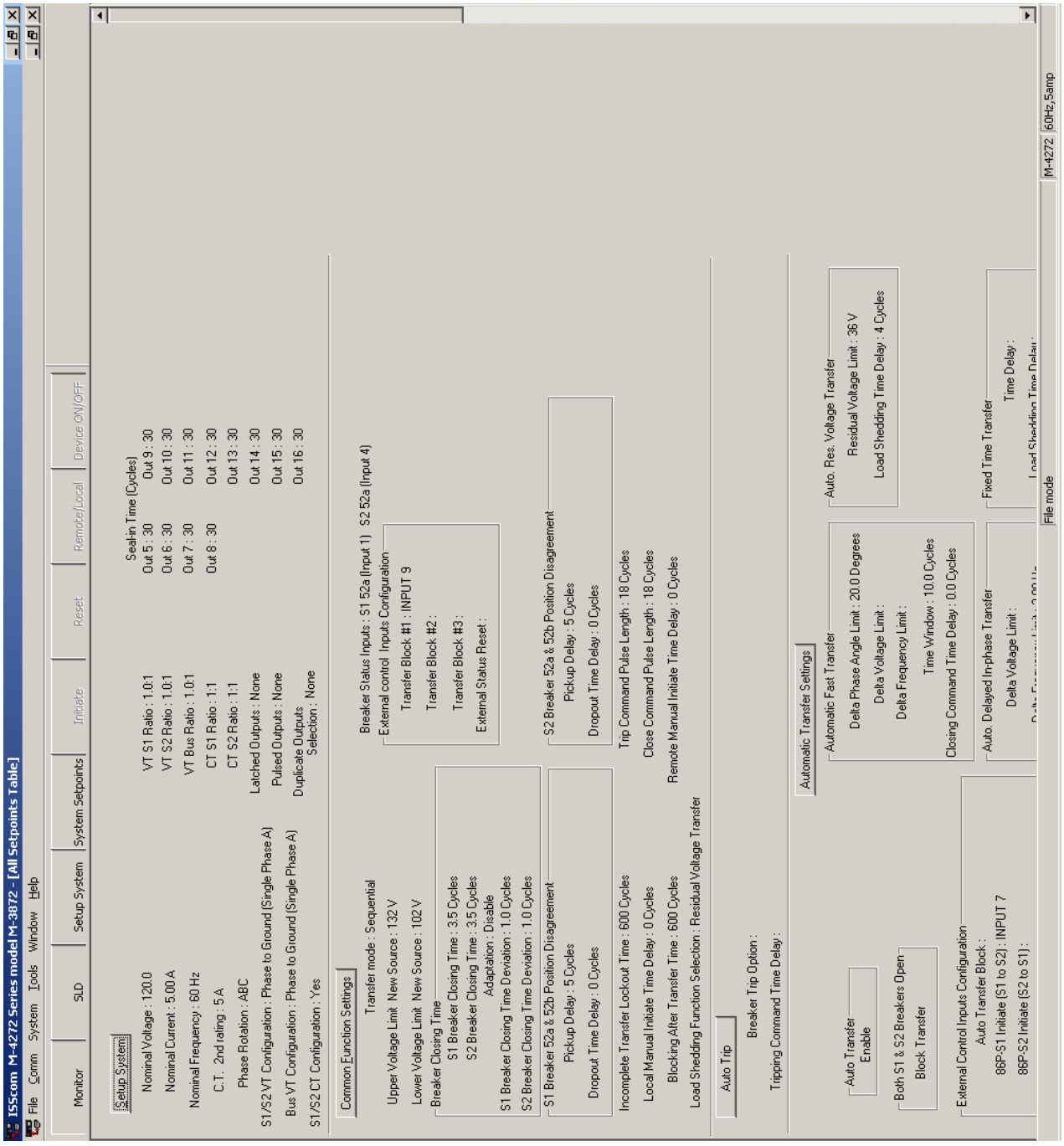


Figure 3-11 MBTS Setpoints Dialog Screen



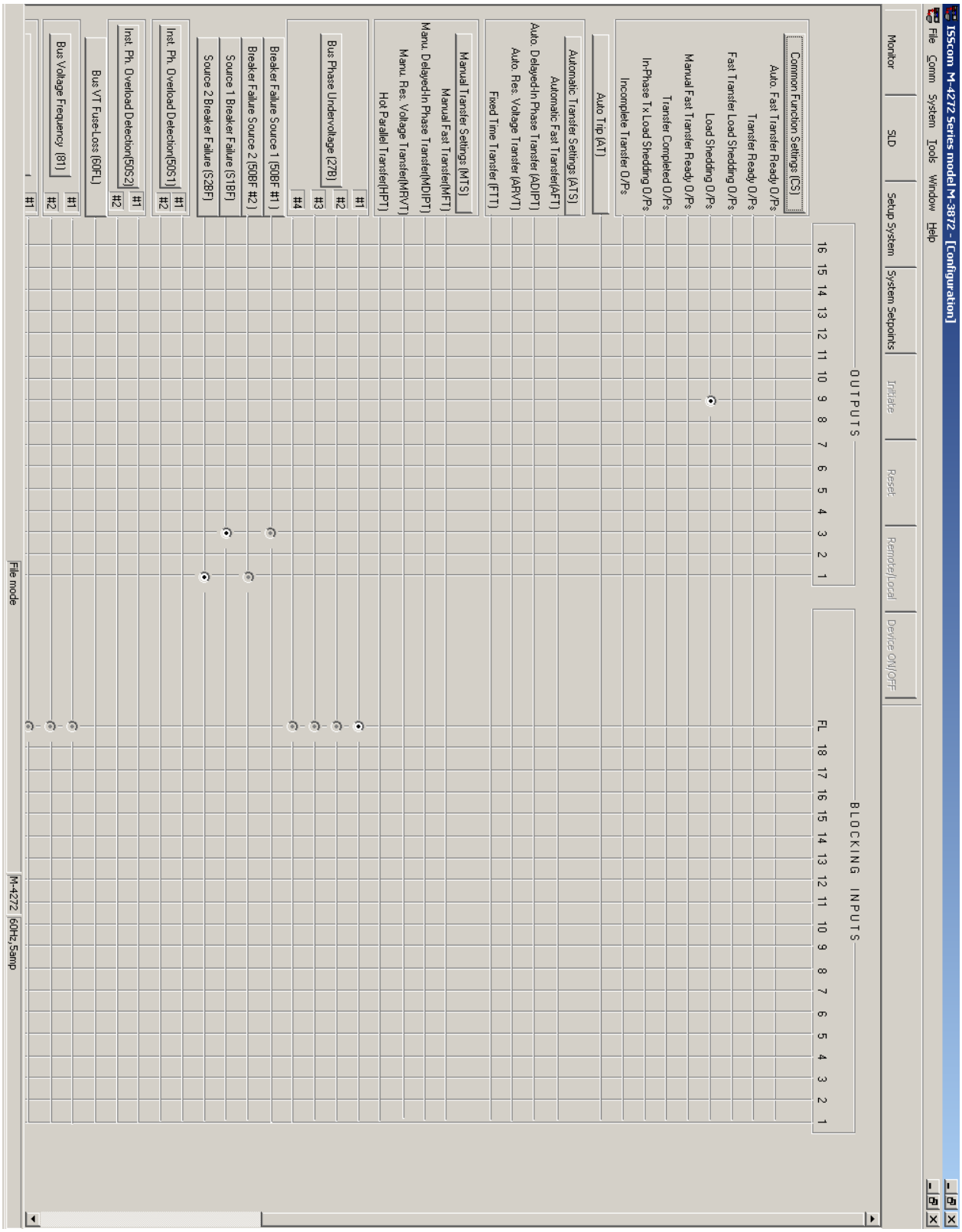
Path: System / Setup / system Setpoints / ATS command button OR ATS jump hotspot within All Setpoints Table

Figure 3-12 Typical Setpoint Dialog Screen



Path: System menu / Setup submenu / Setpoints screen/ Display All button

Figure 3-13 All Setpoints Table Dialog Screen (Partial)



Path: System / Setup submenu / Setpoints screen / Configure button

Figure 3-14 Configure Dialog Screen (Partial)

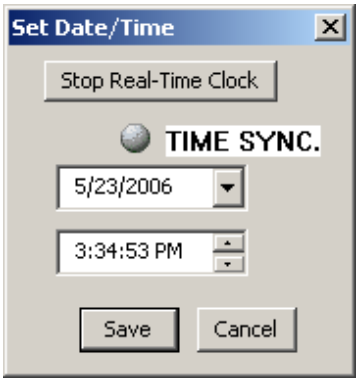
Set Date/Time Command

The **Set Date/Time** command (Figure 3-15) allows the system date and time to be set, or system clock to be stopped. This dialog screen also displays an LED mimic to identify when the Time Sync is in use (preventing date/time from being changed by user).

The time field in the dialog box is not updated continuously. The time at which the dialog box was opened is the time that is displayed and remains as such. This is true whether the MBTS is synchronized with the IRIGB signal or not.

There is a green Time Sync LED mimic in this dialog box (the LED is displayed as different shading on a monochrome monitor). When this LED is green, the MBTS is synchronized with the IRIG-B signal and the Time field is grayed out, indicating that this field can't be changed. But the Date field can be changed (by editing and pressing **Save**).

When the LED is *not* blue, the MBTS is not time-synchronized and therefore, both the Date and Time fields can be changed.



Path: System/ Setup / Set Date/Time

Figure 3-15 Date/Time Dialog Screen

SET DATE AND TIME COMMAND BUTTONS

Start/Stop Clock	This toggles between start/stop, the MBTS clock. 'Stop' pauses, 'Start' resumes.
Save	Saves Time and Date settings to the MBTS when applicable.
Cancel	Returns to the ISScom main window. Any changes to the displayed information is lost.

System/Monitor

The **Monitor** submenu provides the user with access to the present status of the MBTS measured and calculated values, other real-time parameters and conditions. The **Monitor** submenu provides four commands:

- Primary Metering
- Secondary Metering/Function/System Status
- Phasor Diagram
- Sync Scope

■ **NOTE**: Displayed parameters in monitor/status screens will vary depending on unit configuration.

System/Monitor/Primary Metering

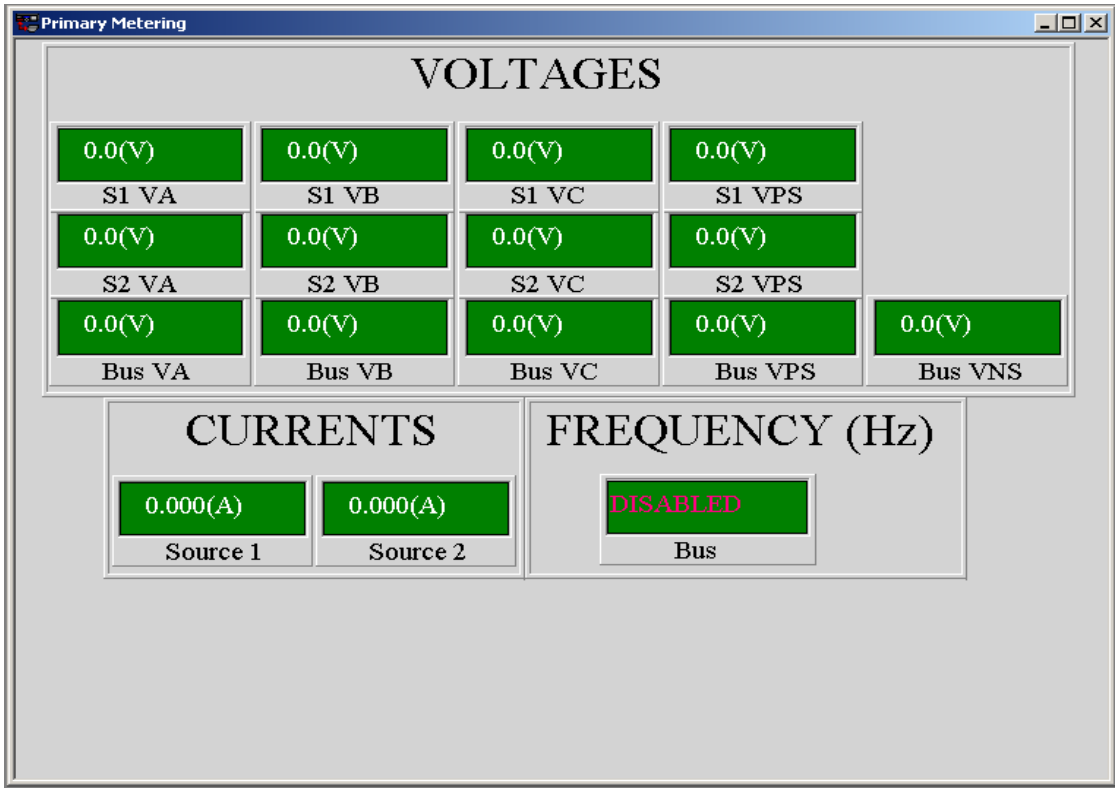
The Primary Metering screen (Figure 3-16) allows the user to review the Source 1 and Source 2, Primary Voltage, Primary Current, Bus Primary Voltage, Bus Frequency, Positive and Negative Sequence.

System/Monitor/Secondary Metering and Status

The Secondary Metering and Status screen (Figure 3-17) allows the user to review the Source 1 and Source 2, Secondary Voltage, Secondary Current Bus Frequency and Bus Voltage.

The Secondary Metering section also displays Bus-New Source information that includes Delta Phase Angle, Delta Frequency, Delta Voltage and the New Source identity (Source 1 or Source 2). The Secondary Metering and Status screen also includes the individual sections for Input/Output Status, Function Status, Oscillograph Trigger Status and System Status information.

The Voltages portion of the metering screen displays the Phase Voltages for the three voltage inputs to the MBTS. It also displays the Bus Positive Sequence (V_{PS}) and Bus Negative Sequence (V_{NS}) when three phase voltages are applied. S1V, S2V, and Bus V for the selected single phase will be displayed. The currents portion of the Secondary Metering and Status screen displays the single phase currents flowing through the Source 1 and Source 2 breakers. The current is used for the Breaker Failure (50BF) feature only. The displayed Frequency is the frequency of the bus. The Bus-New Source portion displays the difference in phase angle, frequency and voltage across the open breaker between the Bus and the New Source. The Source that is presently defined as the New Source is also displayed. The remainder of the screen presents the Input/Output, Function, Oscillograph Trigger and System status.

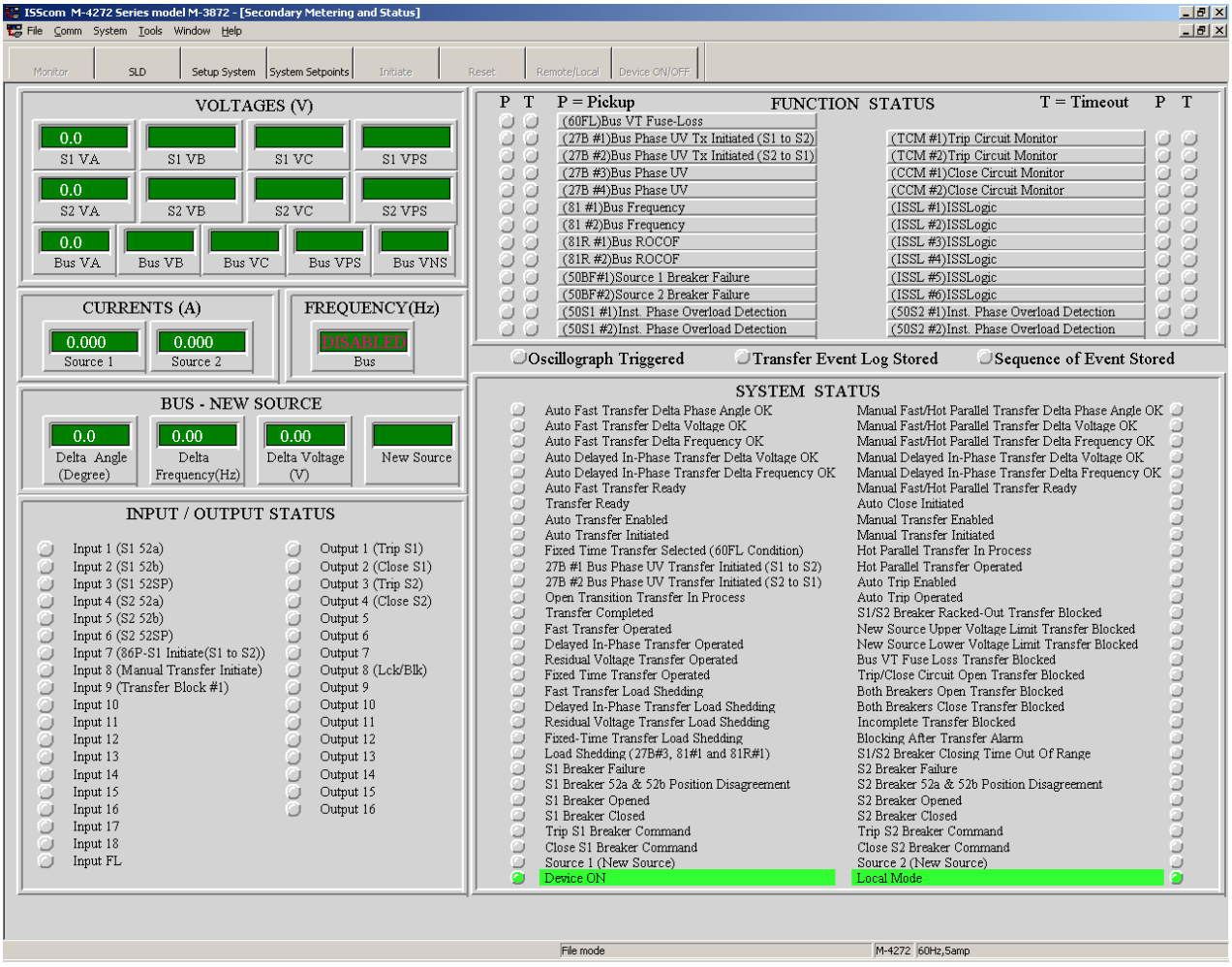


Path: System / Setup / Monitor / Primary Metering

Figure 3-16 Primary Metering Screen

▲ **CAUTION:** Do not use the Delta Phase Angle OK, Delta Voltage OK or Delta Frequency OK status indicators of the ISScom® software to determine when to manually initiate a transfer. There is sufficient delay in the communications between the MBTS and the ISScom such that these indications do not provide “live” information. Always use the status indicators of the MBTS front panel. These indicators use the manual transfer settings to determine when a parameter is OK. If manual transfer is disabled a warning message “Manual Transfer Blocked” will be displayed and no transfer will occur.

The Function Status window displays the status of various functions, with “T” representing the function which has timed out, and “P” representing the function which has picked up and is timing.



Path: System / Setup / Monitor / Secondary Metering and Status

Figure 3-17 Secondary Metering and Status Screen

System/Monitor/Phasor Diagram

The Phasor Diagram (Figure 3-18) provides the user with the ability to evaluate a source reference Phase Angle to Phase Angle data from other sources. The Phasor Diagram also includes a menu that is accessed by executing a right mouse click which allows the user to select/deselect sources to be displayed and Freeze capability to freeze the data displayed on the Phasor Diagram.

System/Monitor/Sync Scope

The Sync Scope screen (Figure 3-19) provides the user with the ability to observe the Delta Frequency relationship between the Bus and the New Source, illustrated in a Fast or Slow direction based on Delta Frequency.

▲ **CAUTION:** Do not use the Delta Phase Angle, Delta Voltage, Delta Frequency or Sync Scope Pointer of the ISScom® Sync Scope screen to determine when to manually initiate a transfer. There is sufficient delay in the communications between the MBTS and the ISScom such that these indications do not provide "live" information.

System/Monitor/Single Line Diagram

The Single Line Diagram screen (Figure 3-20) is a mimic display that allows the user to observe the Source 1 (S1) and Source 2 (S2)'s Secondary Voltage, Current and Bus Secondary Voltage. All of these metering values can be selected to be primary or secondary values.

The screen displays the Phase Voltages for the three voltage inputs to the M-4272 MBT System. The voltages of S1, S2 and Bus for the selected single phase will be displayed. The screen displays the single phase currents flowing through the Source 1 and Source 2 breakers. The current is used for the Breaker Failure (50BF) feature only. If the S1/S2 CT Configuration is set to "No" (S1 & S2 CT not connected to the rear terminals) (Figure 4-22), then the Single Line Diagram will not display current values.

The Single Line Diagram screen also displays Delta Phase Angle, Delta Frequency and Delta Voltage between the motor bus and the new source (the new source is defined as the source to which the bus is being transferred).

In addition the screen displays the status of Source 1 and Source 2 breakers. The CB-S1 and CB-S2 indicators display RED color when the Source 1 breaker (CB-S1) or Source 2 breaker is in the closed position. The CB-S1 and CB-S2 indicators display GREEN color when the Source 1 breaker (CB-S1) or Source 2 breaker (CB-S2) is in the open position.

In the M-4272 MBT System portion of the screen the 52-S1 In-Service and 52-S2 In-Service indicators display GREEN color when the Source 1 or Source 2 breakers are in the service position; the 52-S1 In-Service and 52-S2 In-Service indicators will not be illuminated when the Source 1 or Source 2 breakers are not in service or in test position.

The M-4272 MBT System portion of the screen also displays the Manual Transfer Ready status, Lockout/Blocking status, the Remote/Local control status and the Device ON/Device OFF status.

The Manual Transfer Ready indicator displays GREEN color when the Manual Fast Transfer Ready or Manual Hot Parallel Transfer Ready condition is met.

The Manual Transfer Ready indicator is not illuminated when the Manual Fast Transfer Ready or Manual Hot Parallel Transfer Ready condition is not met.

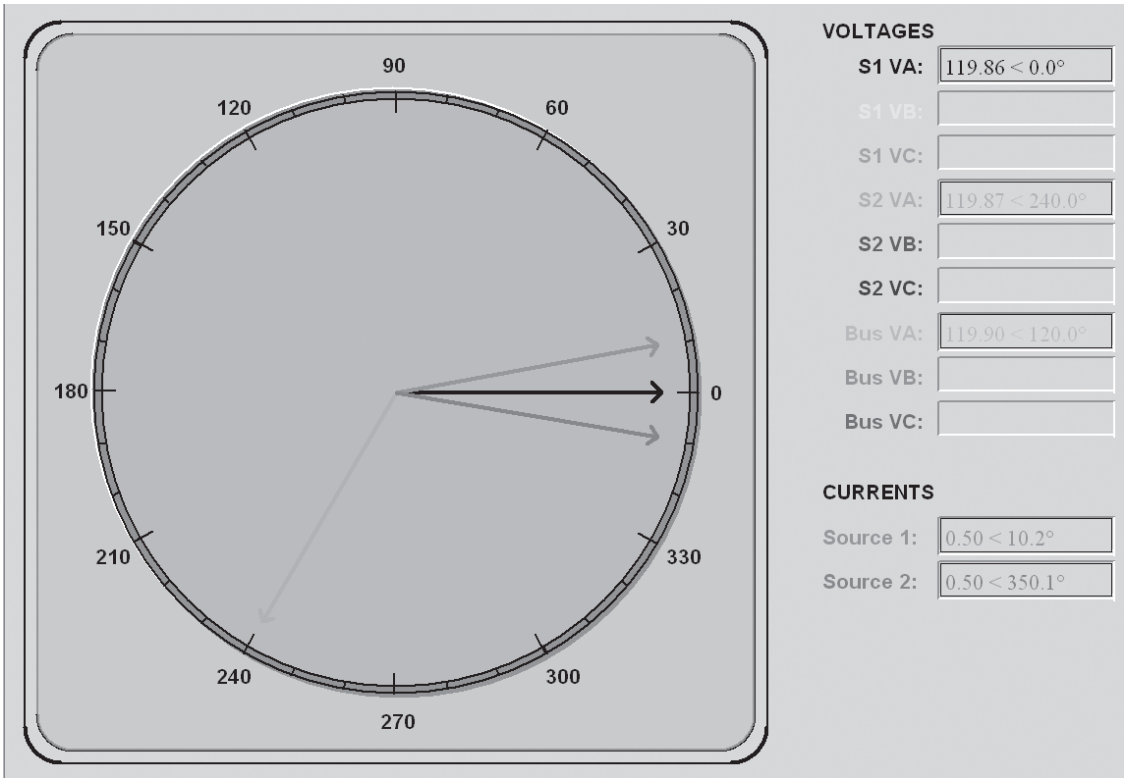
The Lockout/Blocking indicator displays RED color when the Lockout/Blocking condition occurs. The Lockout/Blocking indicator is not illuminated when no Lockout/Blocking condition occurs.

The Remote indicator displays GREEN color and Local indicator is not illuminated when the Remote/Local control is selected to the Remote position.

The Remote indicator is not illuminated and Local indicator displays GREEN color when the Remote/Local control is selected to Local position.

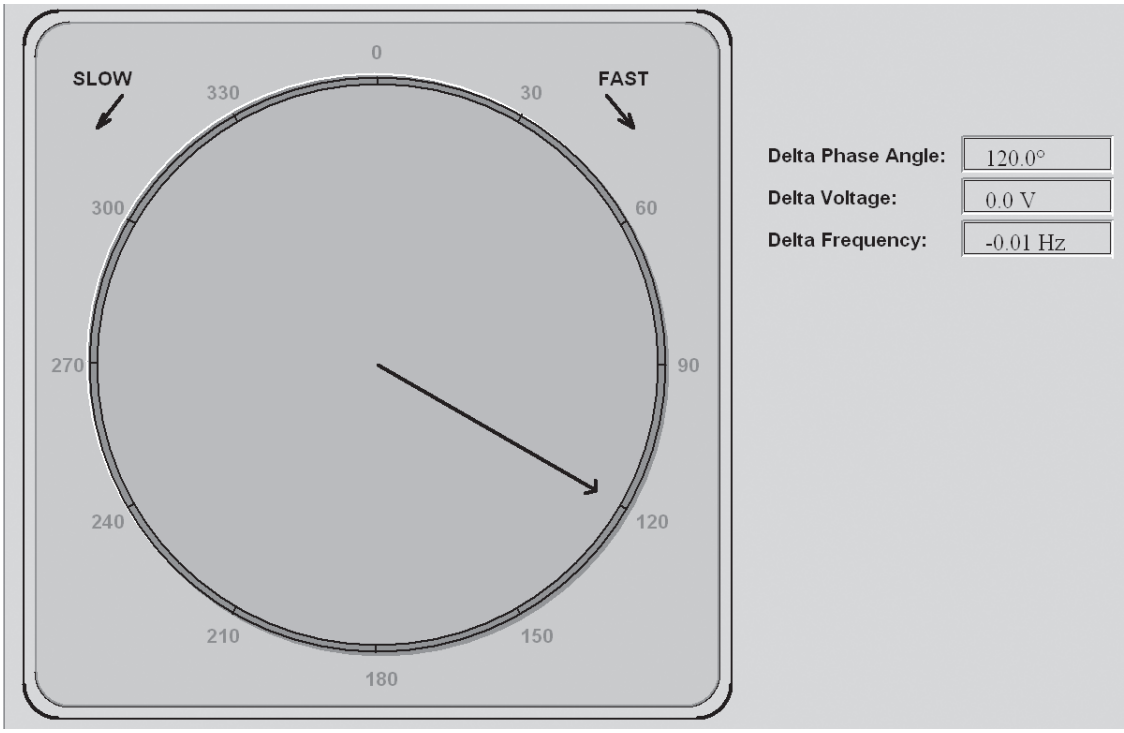
The Device ON indicator displays GREEN color and Device OFF indicator is not illuminated when the Device On/Off control is selected to Device On position.

The Device ON indicator is not illuminated and Device OFF indicator displays RED color when the Device On/Off control is selected to Device Off position.



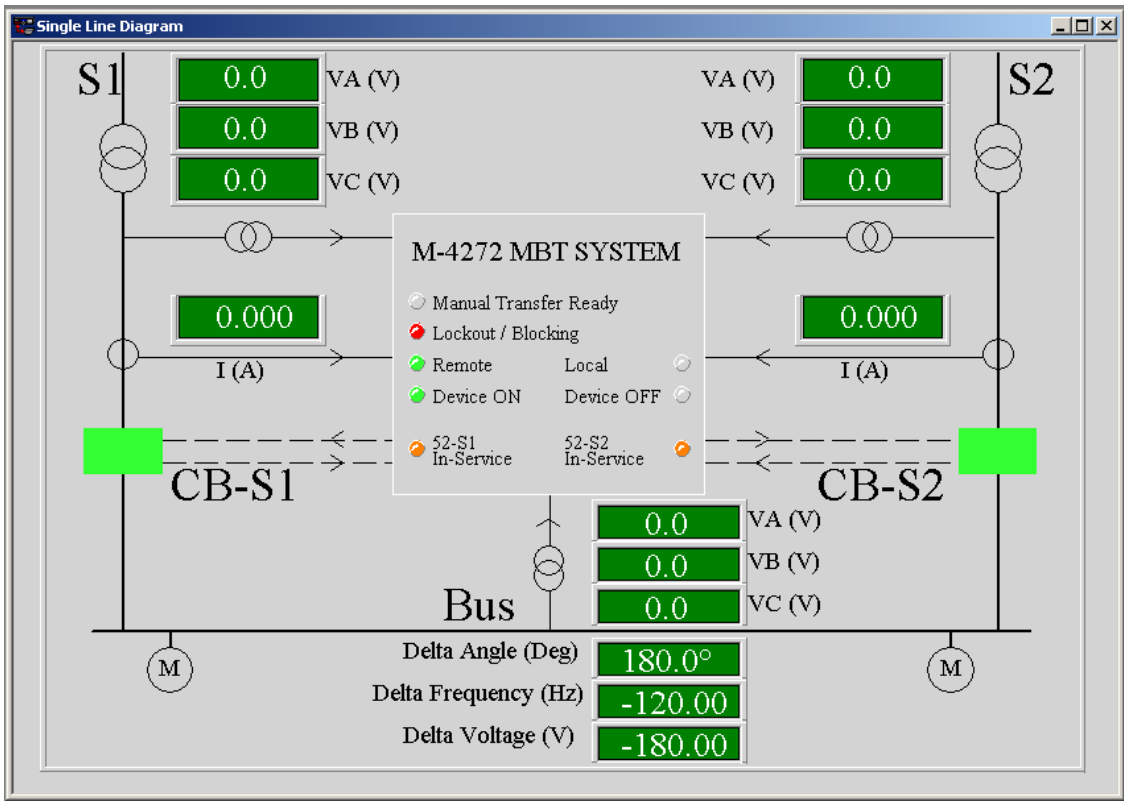
Path: System / Monitor / Phasor Diagram

Figure 3-18 Phasor Diagram



Path: System / Monitor / Sync Scope

Figure 3-19 Sync Scope Screen



■ **NOTES**:

1. If the S1/S2 CT Configuration is set to “No” (S1 & S2 not connected to the rear terminals) (Figure 4-22), then the Single Line Diagram will not display current values.
2. The user may select either the primary or secondary values on the Single Line Diagram.

Path: System / Monitor / Single Line Diagram

Figure 3-20 Single Line Diagram (Primary Metering) or (Secondary Metering) Screen

System/Transfer Event Log

The Transfer Event Log feature captures the following parameters:

- Start signal. The signals that trigger a transfer are an external protective relay initiate, external undervoltage relay initiate, internal automatic bus undervoltage relay initiate, and manual initiate (either local, remote or through serial communications).
- Source 1 voltage and current at time of trip (or close)
- Source 2 voltage and current at time of close (or trip)
- Bus voltage at time of close (or trip)
- Delta Voltage between bus and new source at time of close command (or trip command)
- Delta Voltage between bus and new source at the time of actual breaker close (or breaker open)
- Bus frequency, at time of close (or trip)
- Bus rate of change of frequency at time of close (or trip)
- Resultant Volts/Hertz at time of actual breaker close
- Element(s) Timed Out, for example: 27B, 81, 81R, 50BF, TCM and CCM Functions
- Element(s) picked up, for example: 27B, 81, 81R, 50BF, TCM and CCM Functions
- Input/output contact status changes
- Trip and close commands
- Delta phase angle between bus and new source at time of close command (or trip command)
- Delta phase angle between bus and new source at time of actual breaker close (or breaker open)
- Delta frequency between bus and new source at time of close command (or trip command)
- Delta frequency between bus and new source at time of actual breaker close (or breaker open)
- Breaker closing time (the time period from when the close command is issued to when the new source's breaker status contact closes
- Breaker Opening Time
- Open transition time (the time period from when the old source breaker status contact opens to when the new source breaker status contact closes)
- Close transition time in Hot Parallel Transfer only (the time period from when the new source breaker status contact closes to when the old source breaker status contact opens)
- Transfer completed: Fast, Delayed In-Phase, Residual Voltage, Fixed Time or Hot Parallel

A transfer can have up to four records. After 16 records have been stored, any new record will cause the oldest existing record to be lost. Each Transfer Event Log parameter is time stamped with the date and time in 1 ms increments.

The initiating event that starts the Transfer Event Log is the "Start" signal for any transfer. A Transfer Event Log is considered complete when one of following occurs:

- When the breaker from the Old Source trips and the breaker to the New Source closes.
- When a breaker failure occurs.
- When the incomplete transfer timer times out.

The trigger and complete events are used to define the time frame during which the transfer event log is storing information. The Secondary Metering and Status Screen (Figure 3-17) will display a status when a complete Transfer Event Log has been stored. A reset feature is provided to clear this log through the serial communications. The Transfer Event Log is available for viewing utilizing the M-3872 ISScom® Communications and Oscillograph Analysis Software.

The Transfer Event Log menu selection opens a submenu that includes the **Download**, **View**, **Clear Status** and **Clear History** selections.

System/Transfer Event Log/Download

To download available Transfer Event Logs perform the following:

1. From the ISScom Main Screen menu select **System/Transfer Event Log/Download**. ISScom® will display the Transfer Event Log Record Download screen (Figure 3-21) and indicate the number of Transfer Events available for download.

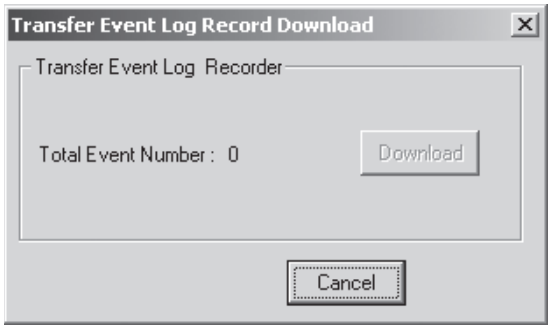


Figure 3-21 Transfer Event Log Record Download Screen

2. Select **Download**. The Transfer Event Log Record Download screen will display a bar indicating the status of the download. When the download is complete the **Save As** screen will be displayed with a default ".log" file extension.
3. Select the destination folder and name the file, then select **Save** to save the Transfer Event Log Record or **Cancel**.

System/Transfer Event Log/View

To view available Transfer Event Log Records perform the following:

1. From the ISScom Main Screen menu select **System/Transfer Event Log/View**. ISScom will display the Transfer Event Log Viewer screen (Figure 3-22).
2. Select **Open**. ISScom will display the **Open** screen with a default ".log" file extension.
3. Select the location of the ".log" files, then select the file to be viewed.

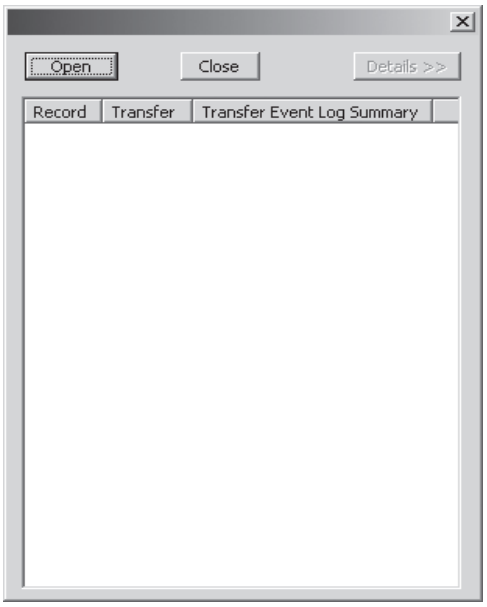


Figure 3-22 Transfer Event Log Viewer

4. Select **Open**. ISScom will **Open** the target file in the Transfer Event Log Viewer **Summary** screen (Figure 3-23).
5. Select **Details**. ISScom will expand the Transfer Event Log Viewer screen to include the **Details** section (Figure 3-24) which includes additional Transfer Event information.
6. To print the Transfer Event Log Summary information select **Print Summary**. ISScom will print the Summary information to the default printer connected to the computer. See Appendix D, **Transfer Event Log Printout Sample**.
7. To print the Transfer Event Log Detail information select **Print Detail**. ISScom will print both the Summary and Detail information to the default printer connected to the computer. See Appendix D, **Transfer Event Log Printout Sample**.
8. To view the System Status and Transfer Start Signal information select **System Status and Transfer Start Signal**. ISScom will display the System Status and Transfer Start Signal Status screen (Figure 3-25).

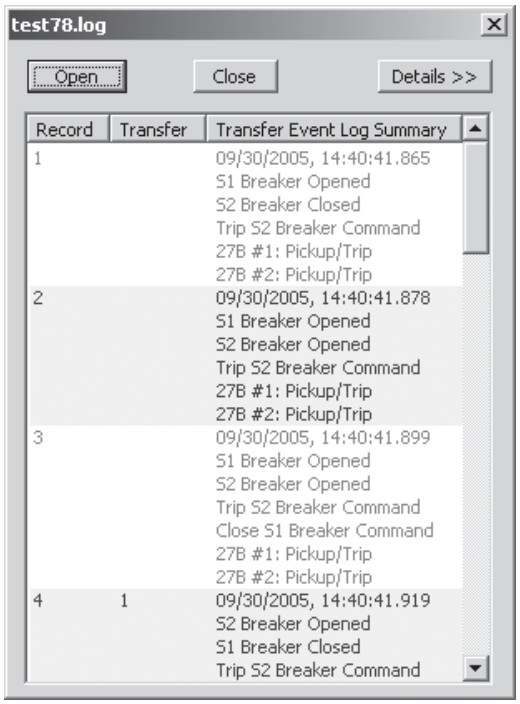


Figure 3-23 Transfer Event Log File Summary Screen

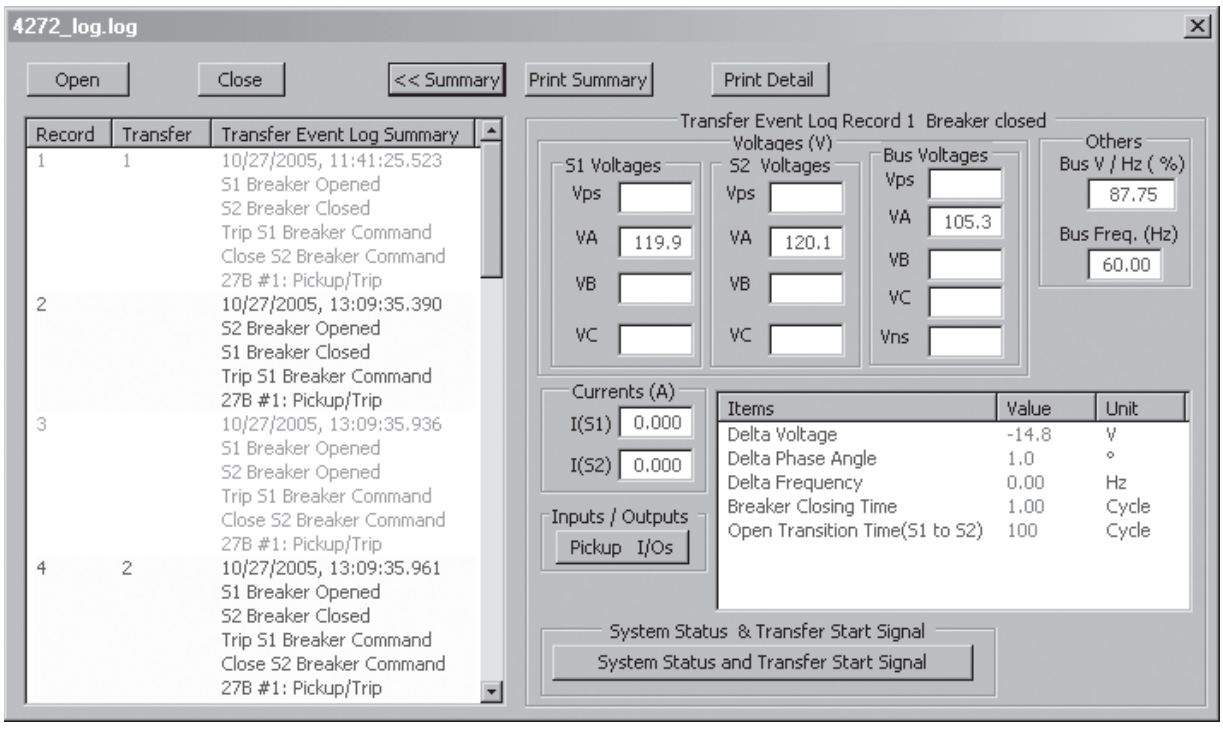


Figure 3-24 Transfer Event Log File Summary and Details Screen

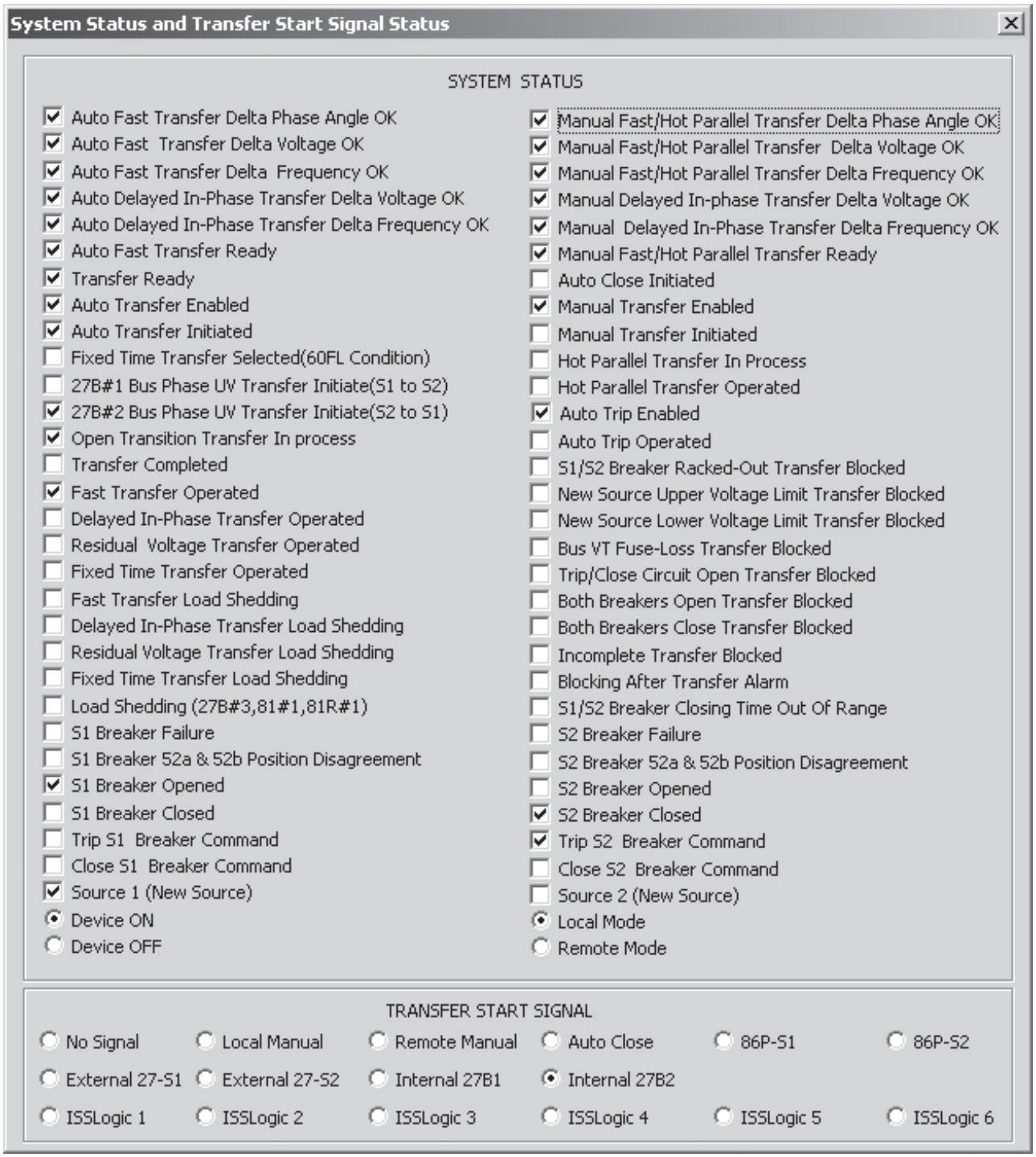


Figure 3-25 System Status and Transfer Start Signal Status Screen

9. To view the Transfer Event Log Pickup Input and Output information, select **Pickup I/Os**. ISScom® will display the Pickup I/Os Status screen (Figure 3-26).

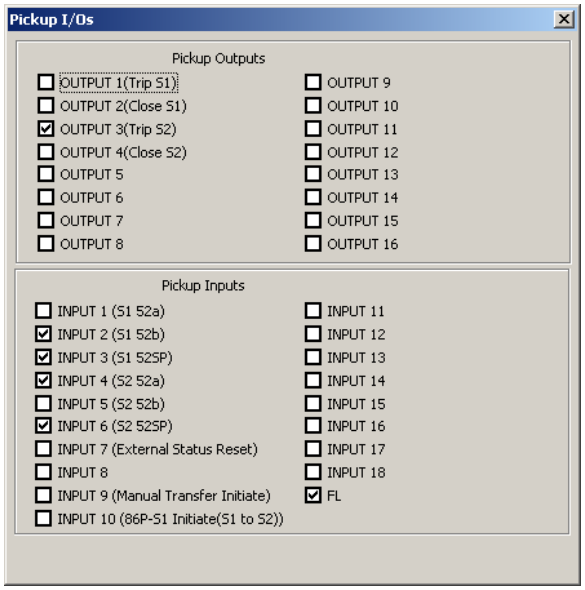


Figure 3-26 Transfer Event Log Pickup I/Os Status Screen

System/Transfer Event Log/Clear Status

The Clear Status feature resets the Transfer Event Log status.

To Clear the Transfer Event Log Status perform the following:

1. From the ISScom Main Screen menu select **System/Transfer Event Log/Clear Status**. ISScom will display the Clear Transfer Event Log Status confirmation screen (Figure 3-27).

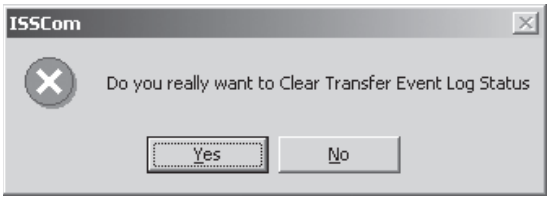


Figure 3-27 Clear Transfer Event Log Status Command Confirmation Screen

2. Select **YES**, ISScom will respond with the Clear Transfer Event Log Status Cleared confirmation Screen (Figure 3-28).

Figure 3-28 Transfer Event Log Status Cleared Confirmation Screen

3. Select **OK**, ISScom will return to the ISScom Main Screen (Figure 3-5).

System/Transfer Event Log/Clear History

The Clear History feature clears all Transfer Event Logs stored on the MBTS.

To Clear the Transfer Event Log perform the following:

1. From the ISScom Main Screen menu select **System/Transfer Event Log/Clear History**. ISScom will display the Clear Sequence of Events Records confirmation screen (Figure 3-29).

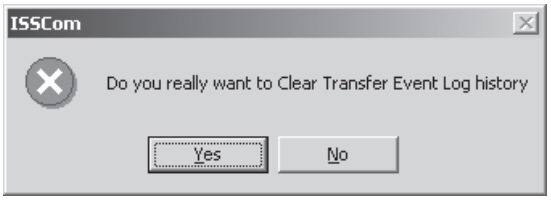


Figure 3-29 Transfer Event Log Clear History Command Confirmation Screen

2. Select **YES**, ISScom will respond with the Transfer Event Log Clear History confirmation Screen (Figure 3-30).

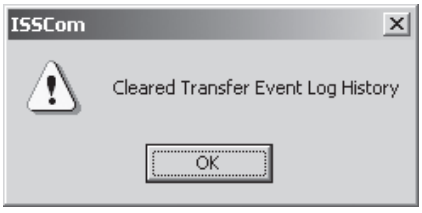


Figure 3-30 Transfer Event Log History Cleared Confirmation Screen

3. Select **OK**, ISScom will return to the ISScom Main Screen (Figure 3-5).

System/Sequence of Events Recorder

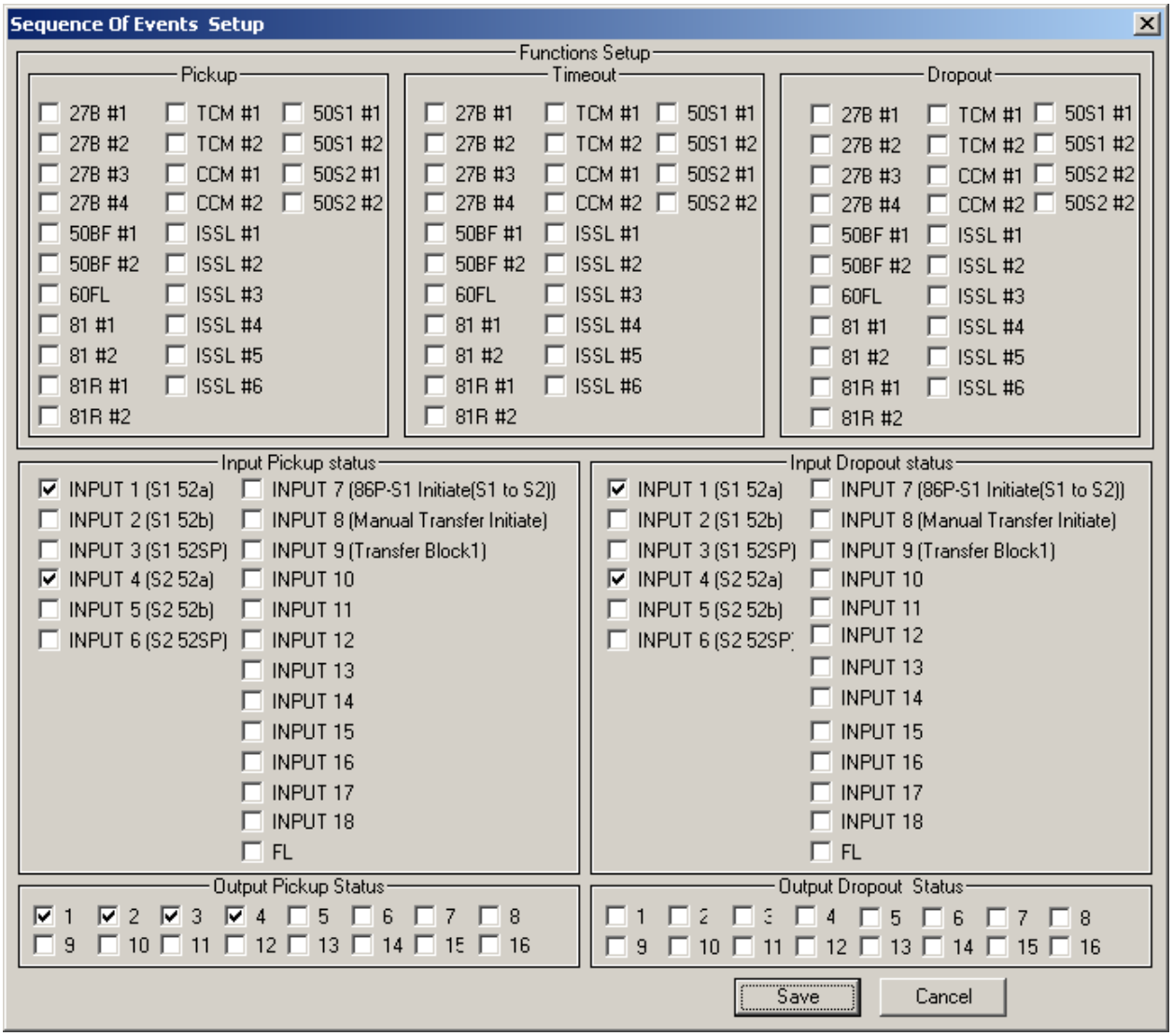
The Sequence of Events Recorder stores every change in the input status, trip commands, close commands, any signal to initiate a transfer, type of transfer, change in any breaker status, and status reset. Each of these Running Events are time stamped with the date and time in 1 ms increments. The Running Event Log stores the last 512 events, when a new event occurs the oldest event is removed. The Secondary Metering and Status Screen (Figure 3-17) will display a status when a Sequence of Events recorded event has been stored. A reset feature is provided to clear this log through the serial communications. The events and the associated data are available for viewing utilizing the M-3872 ISScom® Communications and Oscillographic Analysis Software.

The **Sequence of Events Recorder** submenu allows the user to **Setup** the events that trigger the Sequence of Events Recorder, **Download** events from the MBTS, **View** the parameters captured at the time of the event and **Clear** the event recorder.

System/Sequence of EventsRecorder/Setup

The **Setup** menu item displays the Sequence of Events Setup screen (Figure 3-31). See Section 4.1, **Unit Setup** for detailed setup instructions.

Protective function Pickup, Time Out, Dropout and/or Output/Input Pickup or Dropout are selected to trigger the Sequence of Events Recorder. Selecting **Save** transmits the Sequence of Event settings to the MBTS. When not connected to the MBTS the Send selection saves the Sequence of Event settings to the open file.



Path: System / Sequence of Events Recorder / Setup

Figure 3-31 Sequence Of Events Setup

System/Sequence of Events Recorder/ Download

The **Download** selection downloads the events from the currently connected MBTS (events must be retrieved from the MBTS and stored in a file in order to view them).

To download available Sequence of Events perform the following:

1. From the ISScom® Main Screen menu select **System/Sequence of Events Recorder/ Download**. ISScom will display the Sequence of Events Recorder Download screen (Figure 3-32) and indicate the number of Sequence of Events Recorder Events available for download.

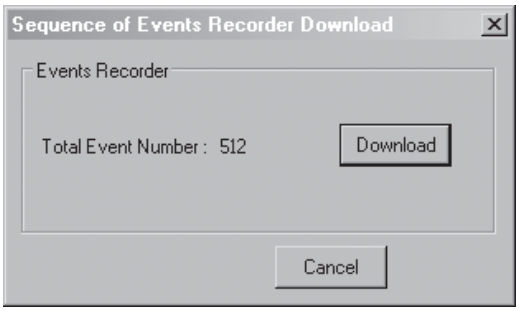


Figure 3-32 Sequence of Events Recorder Download Screen

2. Select **Download**, The Sequence of Events Recorder Download screen will display a bar indicating the status of the download. When the download is complete the **Save As** screen will be displayed with a default ".evt" file extension.
3. Select the destination folder and name the file, then select **Save** to save the Sequence of Events Record or **Cancel**.

System/Sequence of Events Recorder/View

The Sequence of Events viewer screen includes the commands **Open**, **Close**, **Print Summary**, and **Print Detail**. **Open** opens a saved sequence of events file. **Close** closes the print file. **Print Summary** prints an event summary, and **Print Detai**l prints the detailed event report. **Clear** deletes event history from the control.

To view available Sequence of Events Records perform the following:

1. From the ISScom Main Screen menu select **System/Sequence of Events/View**. ISScom will display the Sequence of Events Viewer screen (Figure 3-33).

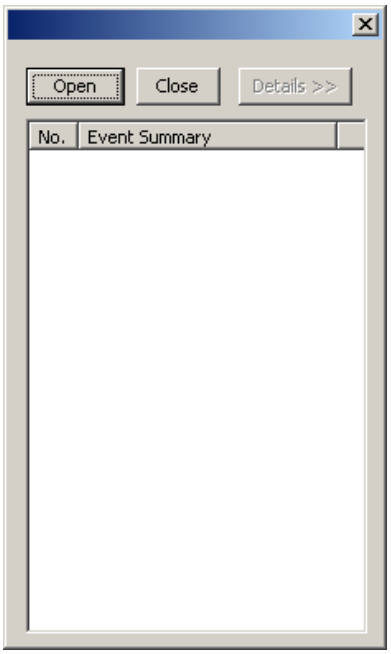


Figure 3-33 Sequence of Events Viewer

2. Select **Open**. ISScom will display the **Open** screen with a default ".evt" file extension.
3. Select the location of the ".evt" files, then select the file to be viewed.
4. Select **Open**. ISScom will **Open** the target file in the Sequence of Events Viewer **Summary** screen (Figure 3-34).

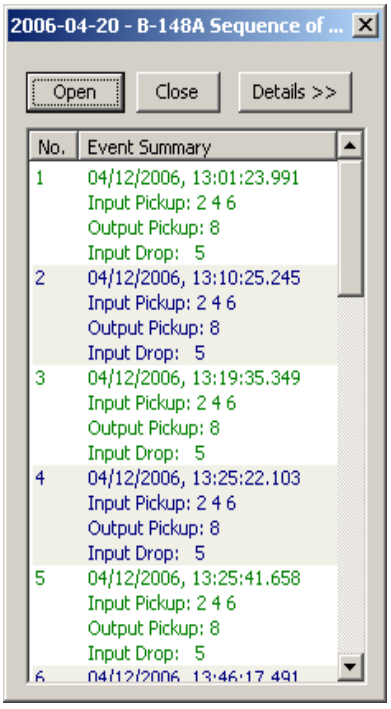


Figure 3-34 Sequence of Events Summary Screen

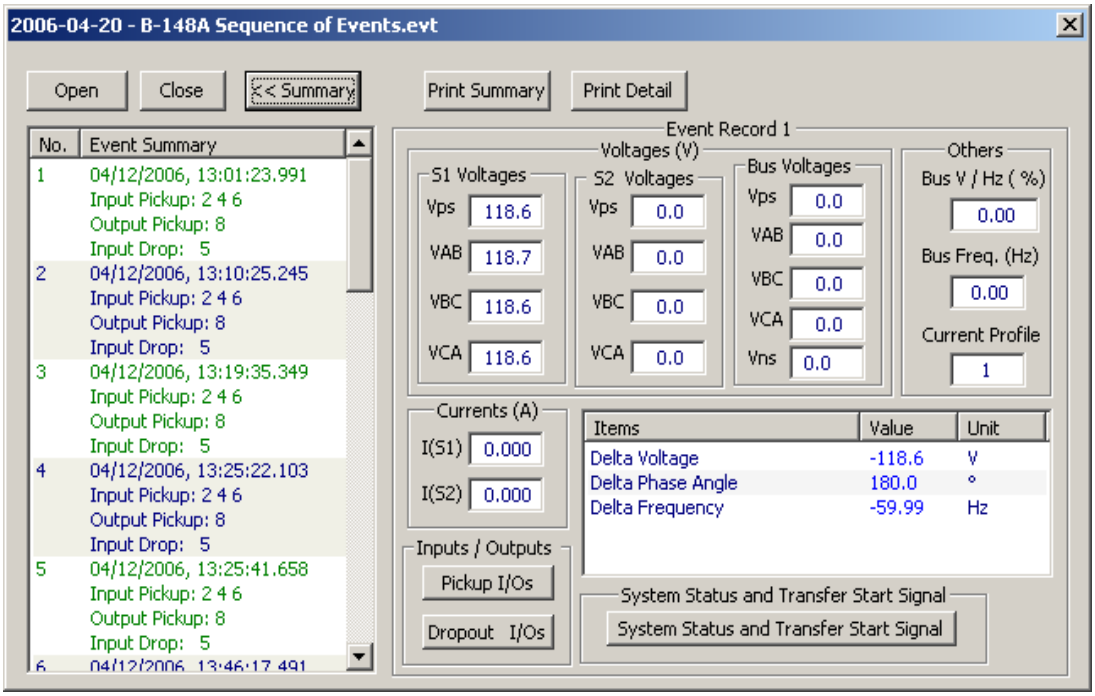


Figure 3-35 Sequence of Events File Summary and Details Screen

5. Select **Details**. ISScom® will expand the Sequence of Events Viewer screen to include the **Details** section (Figure 3-35) which includes additional Sequence of Events information.
6. To print the Sequence of Events Summary information select **Print Summary**. ISScom will print the Summary information to the default printer connected to the computer. See **Appendix E**, Sequence of Events Printout Sample.
7. To print the Sequence of Events Detail information select **Print Detail**. ISScom will print both the Summary and Detail information to the default printer connected to the computer. See **Appendix E**, Sequence of Events Printout Sample.
8. To view the Sequence of Events Pickup Input and Output information select **Pickup I/Os**. ISScom will display the Pickup I/Os Status screen (Figure 3-36).

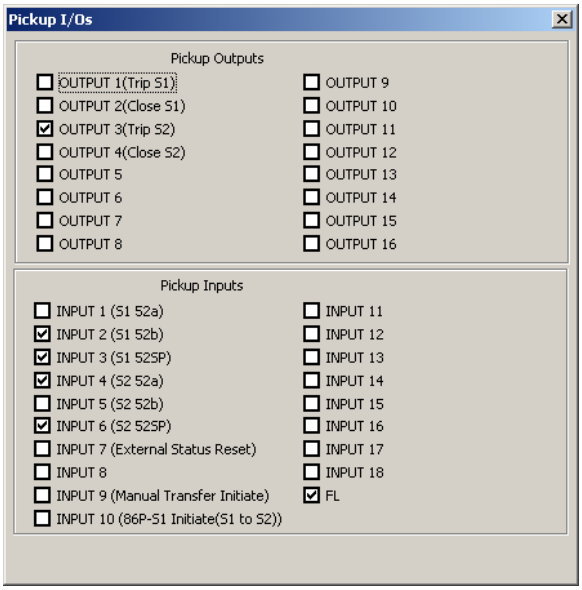


Figure 3-36 Sequence of Events Pickup I/Os Status Screen

9. To view the Sequence of Events Dropout Input and Output information select **Dropout I/Os**. ISScom® will display the Dropout I/Os Status screen (Figure 3-37).

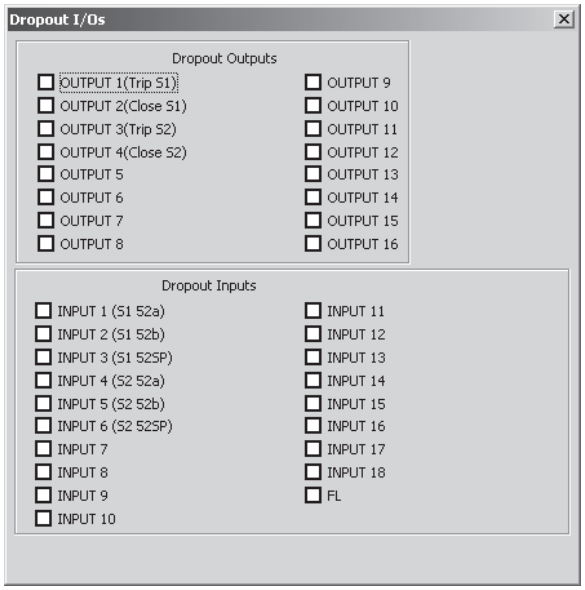


Figure 3-37 Sequence of Events Dropout I/Os Status Screen

10. To view the System Status and Transfer Start Signal information select **System Status and Transfer Start Signal**. ISScom will display the System Status and Transfer Start Signal Status screen (Figure 3-38).

System/Sequence of Events/Clear

The Clear feature clears all Sequence of Events Records stored on the MBTS.

To Clear all Sequence of Events Records perform the following:

1. From the ISScom Main Screen menu select **System/Sequence of Events/Clear**. ISScom will display the Clear Sequence of Events Records confirmation screen (Figure 3-39).

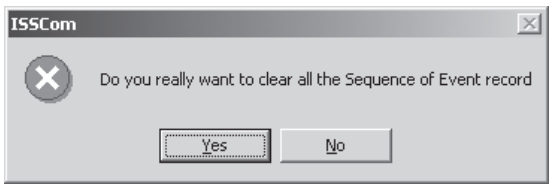


Figure 3-39 Clear Sequence of Events Record Command Confirmation Screen

2. Select **YES**, ISScom will respond with the Sequence of Events Records Cleared confirmation Screen (Figure 3-40).

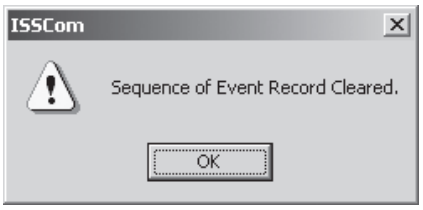


Figure 3-40 Sequence of Events Record Cleared Confirmation Screen

3. Select **OK**, ISScom will return to the ISScom Main Screen (Figure 3-5).

System/Oscillograph

The oscillographic recorder provides comprehensive data recording of all monitored waveforms, and status inputs storing up to 248 cycles of data. The total record length is user-configurable from 1 to 16 partitions. The number of samples per cycle used to store the data is user selectable. The number of samples per cycle that can be selected is 16 or 32 (50 or 60 Hz). The number of samples selected effects the length of the data that can be saved and its resolution. The lower the number of samples, the longer the record length that can be stored (but at a lower resolution).

The oscillographic recorder is triggered by a designated control/status input (usually a MBTS initiate input), a trip output or from serial communications.

When untriggered, the recorder continuously stores waveform data, thereby keeping the most recent data in memory. When triggered, the recorder stores pre-trigger data, then continues to store data in memory for a user-defined, post-trigger delay period. The records may be analyzed using ISScom, and are also available in COMTRADE file format.

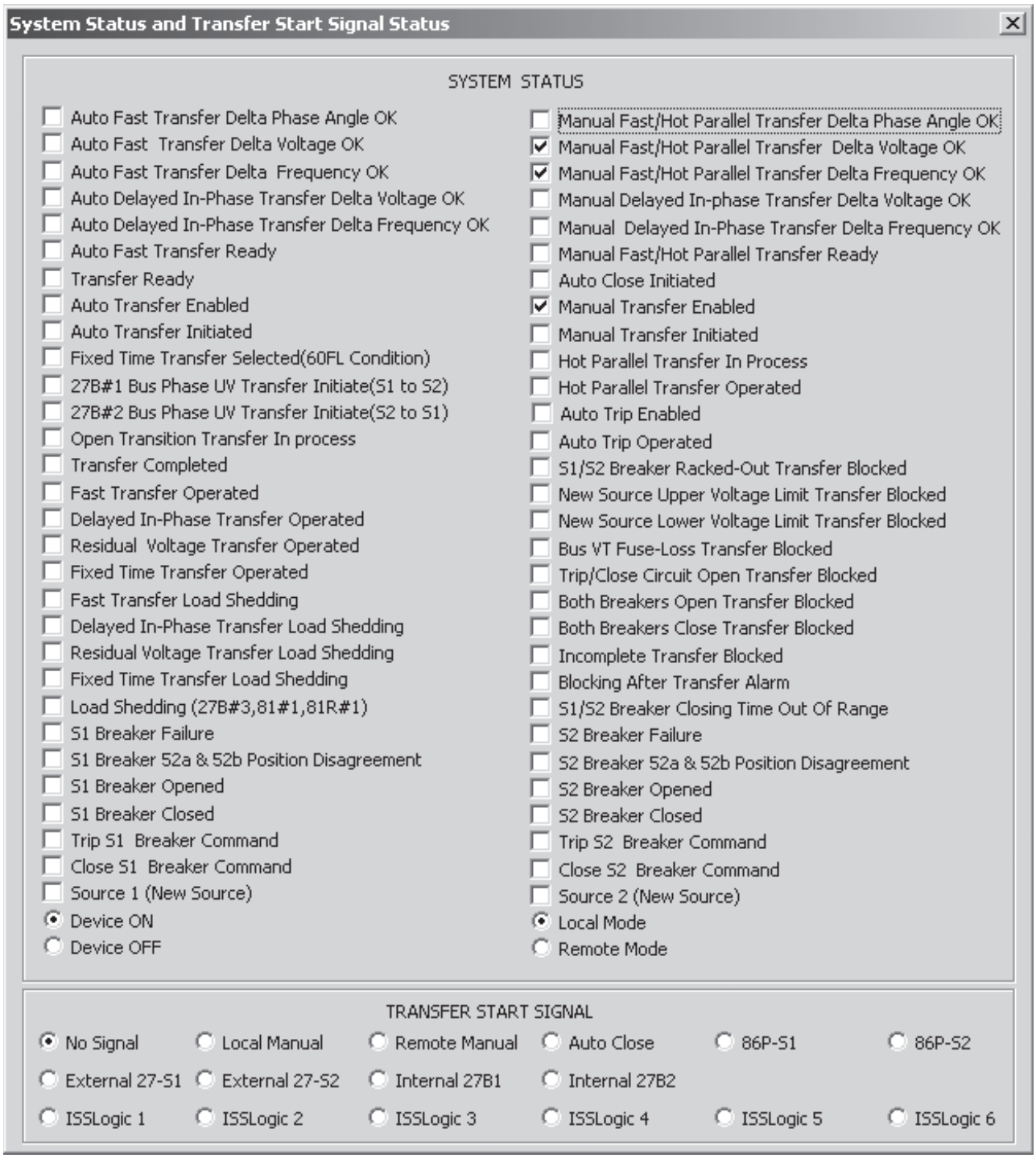


Figure 3-38 Sequence of Events System Status and Transfer Start Signal Status Screen

The following parameters are captured by the Oscillographic Recorder:

- MBTS start (initiate) signal. It can be manual transfer initiate, protective relay initiate, or bus phase undervoltage initiate.
- Source 1 and Source 2 breaker status (Closed or Open)
- Trip and close commands to the Source 1 breaker
- Trip and close commands to the Source 2 breaker
- Source 1 voltage waveforms, single-phase or three-phase
- Source 2 voltage waveforms, single-phase or three-phase
- Source 1 current waveforms, single-phase if available
- Source 2 current waveforms, single-phase if available
- Bus voltage waveforms, single-phase or three-phase
- Delta Phase Angle
- Delta frequency
- Trip Circuit Monitor (TCM) or Close Circuit Monitor (CCM) open signal.
- Inputs 1—18
- Outputs 1—16

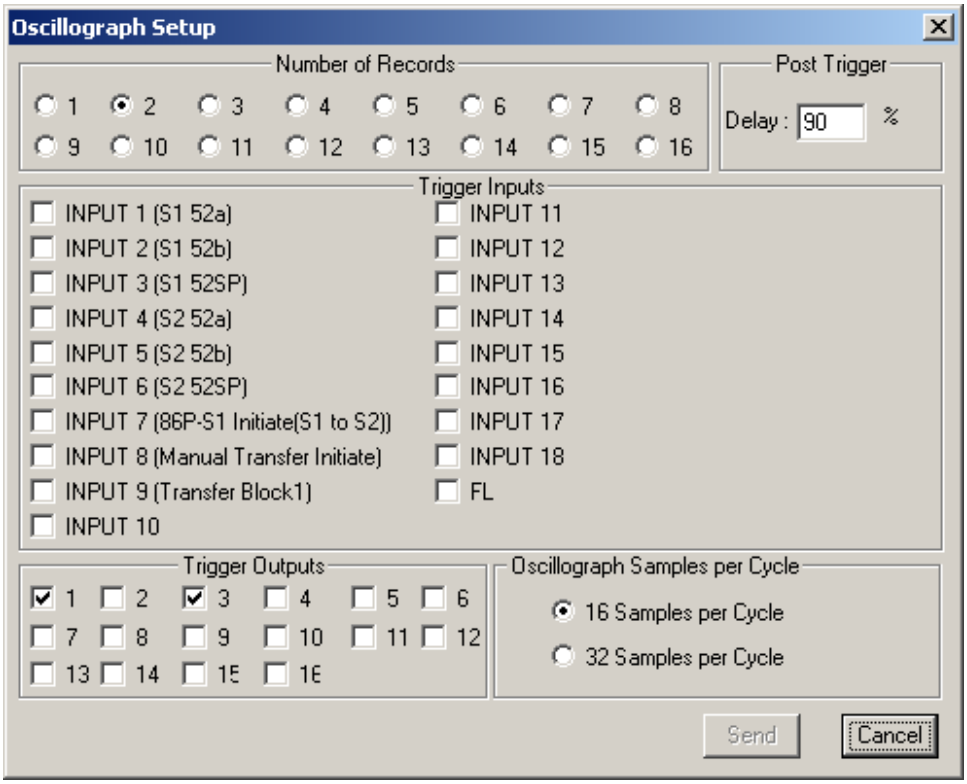
The **Oscillograph** submenu includes the **Setup**, **Retrieve**, **Trigger** and **Clear** selections. The Oscillograph recorder settings are not considered to be part of the Setpoint Profile. Recorder settings are common to all profiles.

System/Oscillograph/Setup

The **Setup** selection displays the Oscillograph Setup screen (Figure 3-41) which allows the user to set the number of records and triggering designations to be made. See Section 4.1, **Unit Setup** for detailed setup instructions.

System/Oscillograph/Retrieve

The **Retrieve** feature allows the user select the Oscillograph records to be retrieved (downloaded) and to determine the save location on the PC.



Path: System / Oscillograph / Setup

Figure 3-41 Setup Oscillograph Recorder

To Retrieve Oscillograph recorders perform the following:

1. From the ISScom® Main Screen menu select **System/Oscillograph/Retrieve**. ISScom will display the Retrieve Oscillograph Records screen (Figure 3-42).
2. Select the Oscillograph record to be Retrieved (downloaded).
3. Select the destination folder (Browse) and name the file, then select **Save,** the path for the file will be displayed in the "File Name Destination" window.
4. Select **Retrieve**, The screen will display a bar indicating the status of the Retrieval. When the download is complete ISScom will display a Oscillograph Record Retrieval complete message.

System/Oscillograph/Trigger

The **Trigger** selection allows the user to manually trigger the Oscillograph. This can be confirmed by observing the Secondary Metering and Status screen (Figure 3-17).

To manually Trigger the Oscillograph Recorder perform the following:

1. From the ISScom Main Screen menu select **System/Oscillograph/Trigger**. ISScom will display the Oscillograph Manual Trigger confirmation screen (Figure 3-43).

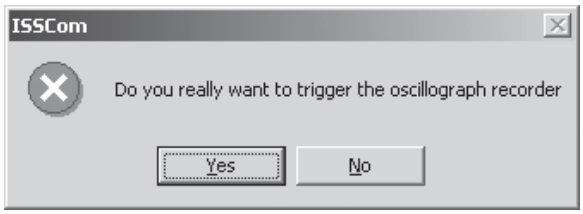
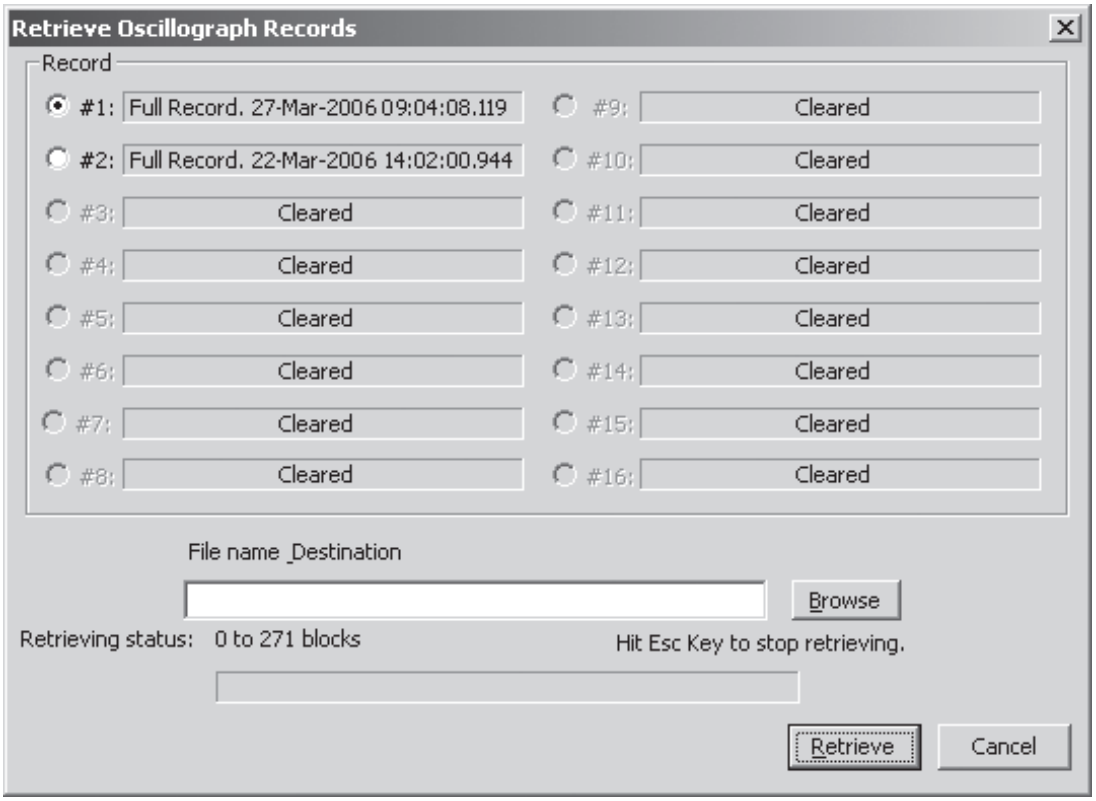


Figure 3-43 Oscillograph Manual Trigger Command Confirmation Screen

2. Select **YES**, ISScom will respond with the Trigger Oscillograph Recorder Command Sent Screen (Figure 3-44).



Path: System / Oscillograph / Retrieve

Figure 3-42 Retrieve Oscillograph Record Screen

Figure 3-44 Trigger Oscillograph Recorder Command Sent Screen

3. Select **OK**, ISScom® will return to the ISScom Main Screen (Figure 3-5)

System/Oscillograph/Clear

The Clear feature clears all Oscillograph Records stored on the MBTS.

To Clear all Oscillograph Recorder records perform the following:

1. From the ISScom Main Screen menu select **System/Oscillograph/Clear**. ISScom will display the Clear Oscillograph Record confirmation screen (Figure 3-45).

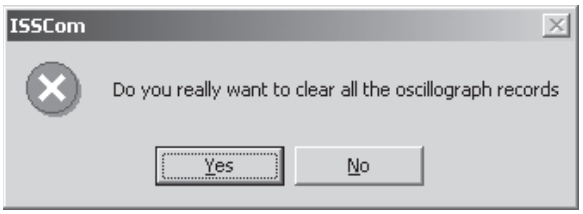


Figure 3-45 Clear Oscillograph Records Command Confirmation Screen

2. Select **YES**, ISScom will respond with the Trigger Oscillograph Recorder Command Sent Screen (Figure 3-46)

Figure 3-46 Oscillograph Records Cleared Screen

3. Select **OK**, ISScom will return to the ISScom Main Screen (Figure 3-5)

System/Profile

The system supports four setpoint profiles. This feature allows multiple setpoint profiles to be defined for the type of transfer initiated (Automatic, Manual or Hot Parallel) and the direction of the next transfer. The **Profile** submenu provides three selections: **Switching Method, Active Profile,** and **Copy Profile.**

System/Profile/Switching Method

■ **NOTE**: During Profile Switching, relay operation is disabled for approximately 1 second.

The Profile Switching Method feature (Figure 3-47) allows the user to select either Manual or Input contact. When the Switching Profile Method is set to Manual, ISScom, remote communications or one of the ISSlogic® elements will select the Active Profile.

When the Switching Method is set to Input Contact, the profile is selected by the input contacts. When Input Contact is selected, only the input contacts can switch the system's profile, and none of the Manual methods will switch the profile.

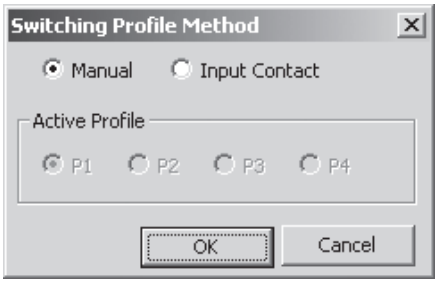


Figure 3-47 Profile Switching Method Dialog Screen

System/Profile/Active Profile

Active Profile (Figure 3-48) allows user to designate active profile. The user can select between four profiles. If a profile is not saved into a profile the profile will contain factory default settings.

▲ **CAUTION**: Switching the active profile when the MBTS is on-line may cause unexpected operation if the wrong profile is selected.

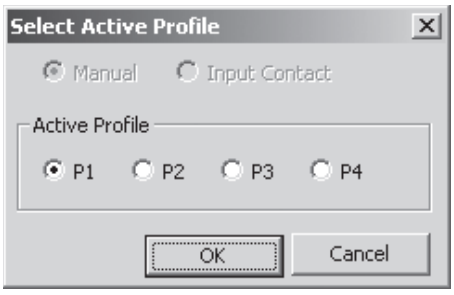


Figure 3-48 Select Active Profile Dialog Screen

System/Profile/Copy Profile

The Copy Profile (Figure 3-49) feature copies the active profile to one of four profiles (user should allow approximately 2 minutes for copying.)

Figure 3-49 Copy Profile Dialog Screen

System/Write File To System

The Write File To System command is used to write a saved data file to the MBTS.

To perform a Write File To System command perform the following:

1. From the ISScom Main Screen select **System/Write File To System**. ISScom® will display an **OPEN** dialog screen with the default file extension of ".dat".
2. Browse to the location of the file to be written to the MBTS, then select the target file.
3. Select **OPEN**, ISScom will write the file contents to the target MBTS. When the file has been successfully written to the MBTS ISScom will display a File Written Confirmation (Figure 3-50)
4. Select **OK**, ISScom will return the ISScom Main Screen Figure 3-5.

System/Read Data From System

The Read Data From System command is used to read the data contained in the MBTS settings and configuration to the ISScom program running on the PC.

To perform a Read Data From System command proceed as follows:

1. From the ISScom Main Screen select **System/Read Data From System**. ISScom will read the data from the target MBTS and when complete display a confirmation screen (Figure 3-51).

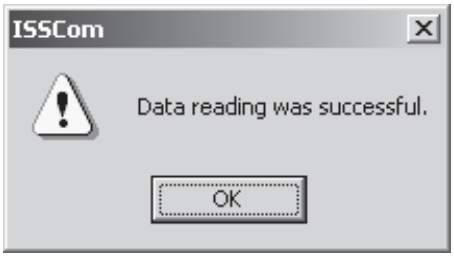


Figure 3-51 ISScom Data Reading Successful Confirmation Screen

2. Select **OK**, ISScom will return the ISScom Main Screen Figure 3-5.

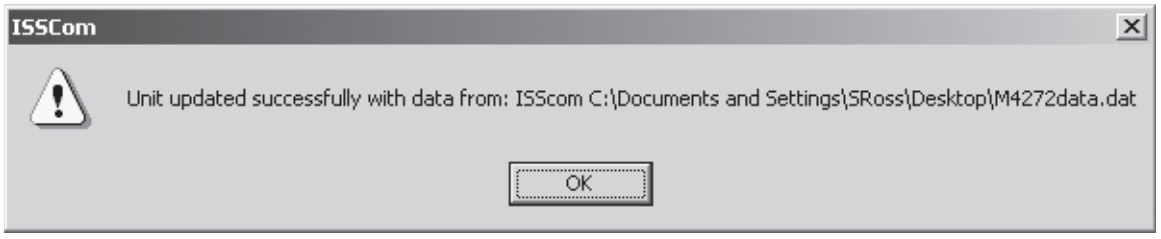
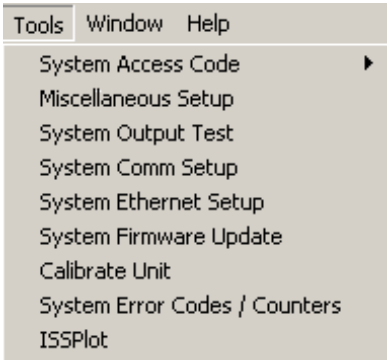


Figure 3-50 ISScom File Written to MBTS Confirmation

Tools Menu



The **Tools** menu provides the user with access to ISScom® MBTS support features and Functions.

Tools/System Access Codes

The System Access Codes menu item includes the **Comm Access** and **User Access** code submenus.

Tools/System Access Codes/Comm Access

The **Comm Access** selection displays the Communication Access Code Reset screen (Figure 3-52) which allows the user to reset the MBTS Comm Access Code. See Section 4.1, **Unit Setup** for detailed setup instructions.

If additional link security is desired, a communication access code can be programmed. Like the user access codes, if the communication access code is set to 9999 (default), communication security is disabled.

Figure 3-52 Communication Access Code Reset Dialog Screen

Tools/System Access Codes/User Access

The **User Access** selection displays the User Access Codes Reset screen (Figure 3-53) which allows the user to reset the MBTS User Access Codes. See Section 4.1, **Unit Setup** for detailed setup instructions.

The MBTS includes three levels of access codes. Depending on their assigned code, users have varying levels of access to the installed functions.

1. **Level 1 Access** = Read setpoints, monitor status, view status history.
2. **Level 2 Access** = All of level 1 privileges, plus read & change setpoints, target history, set time clock.
3. **Level 3 Access** = All of level 2 privileges, plus access to all configuration functions and settings.

Each access code is a user-defined one-to four-digit number. Access codes can only be altered by a level 3 user.

If the level 3 access code is set to 9999, the access code feature is disabled. When access codes are disabled, the access screens are bypassed, and all users have full access to all the MBTS menus. The device is shipped from the factory with the access code feature disabled.

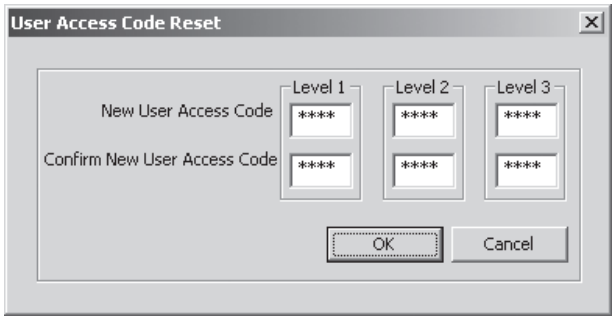


Figure 3-53 User Access Codes Reset Dialog Screen

Tools/Miscellaneous Setup

The Miscellaneous Setup menu selection displays the Miscellaneous Setup screen (Figure 3-54) which provides the user with the ability to edit/input the User Logo lines of the HMI display, enter/edit the User Control Number and set the operating mode of the System OK LED. See Section 4.1, **Unit Setup** for detailed setup instructions.

User Logo Line

The user logo is a programmable, two-line by 24-character string, which can be used to identify the MBTS, and which is displayed locally during power up after Self Test completion. This information is also available in ISScom.

User Control Number

The User Control Number is a user-defined value which can be used for inventory or identification. The unit does not use this value, but it can be accessed through the HMI or the communications interface, and can be read remotely.

System OK LED

The green SYSTEM OK LED is controlled by the unit's microprocessor. A flashing SYSTEM OK LED indicates proper program cycling. The LED can also be programmed to be continuously illuminated.

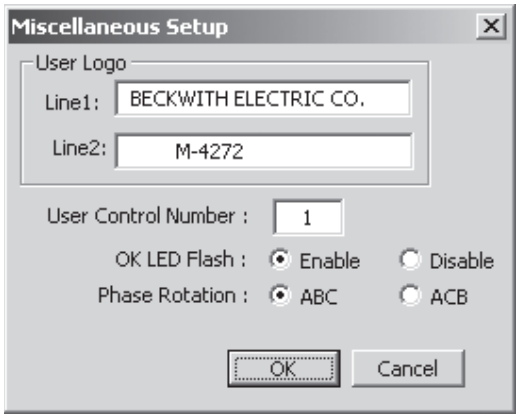


Figure 3-54 Miscellaneous Dialog Screen

Tools/System Outputs Test

The System Outputs Test menu selection displays the System Outputs Test screen (Figure 3-55) which provides the user with the ability to test each ouput relay. See Section 6, **Testing** for detailed testing instructions.

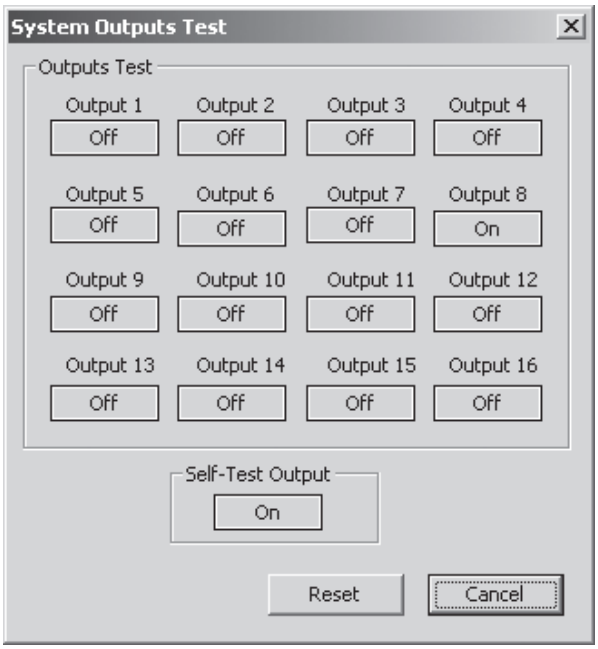


Figure 3-55 System Outputs Test Dialog Screen

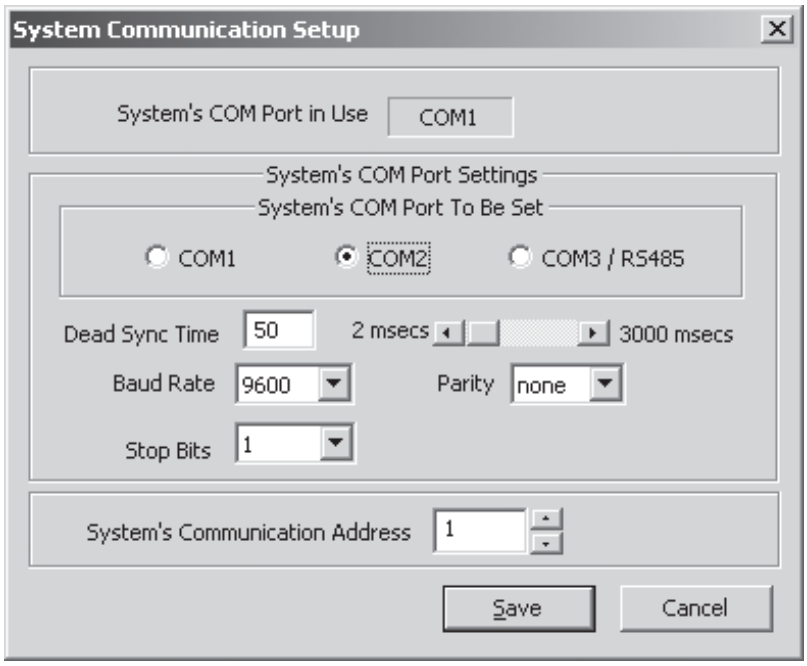


Figure 3-56 System Communication Setup Dialog Screen

Tools/System Comm Setup

The System Comm Setup menu selection displays the System Communication Setup screen (Figure 3-56) which provides the user with the ability to set the System's COM Port communication parameters. Also, when selected ISScom® will display a message identifying which COM Port is currently being used. See Section 4.1, **Unit Setup** for detailed communication setup instructions.

Tools/System Ethernet Setup

The System Ethernet Setup menu selection displays the Ethernet Setup screen (Figure 3-57) which provides the user with the ability to set the System's Ethernet Port communication parameters. See Section 4.1, **Unit Setup** for detailed communication setup instructions.

Tools/System Firmware Update

The **System Firmware Update** selection allows the user to update MBTS firmware version in the field.

Detailed step by step instructions will be provided by Beckwith Electric regarding Field Firmware Updates.

Tools/Calibrate Unit

The **Calibrate Unit** menu selection provides the user with instructions to recalibrate Nominal Voltage, Current and Frequency. See Section 6, **Testing** for detailed MBTS calibration instructions.

Tools/System Error Codes / Counters

The System Error Codes / Counters menu selection displays the System Error Codes / Output Counters screen (Figure 3-58) which provides the user with the ability to view and clear system Error Codes, Processor Resets, Alarm Counters, Power Loss Counter and Output Counters. Also, Checksums can be viewed for Calibration and Setpoints. See Section 2.2, **Manual Operation** for detailed instructions.

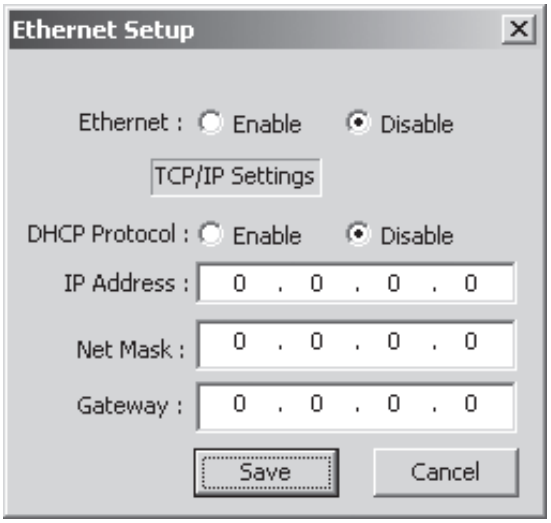


Figure 3-57 Ethernet Settings

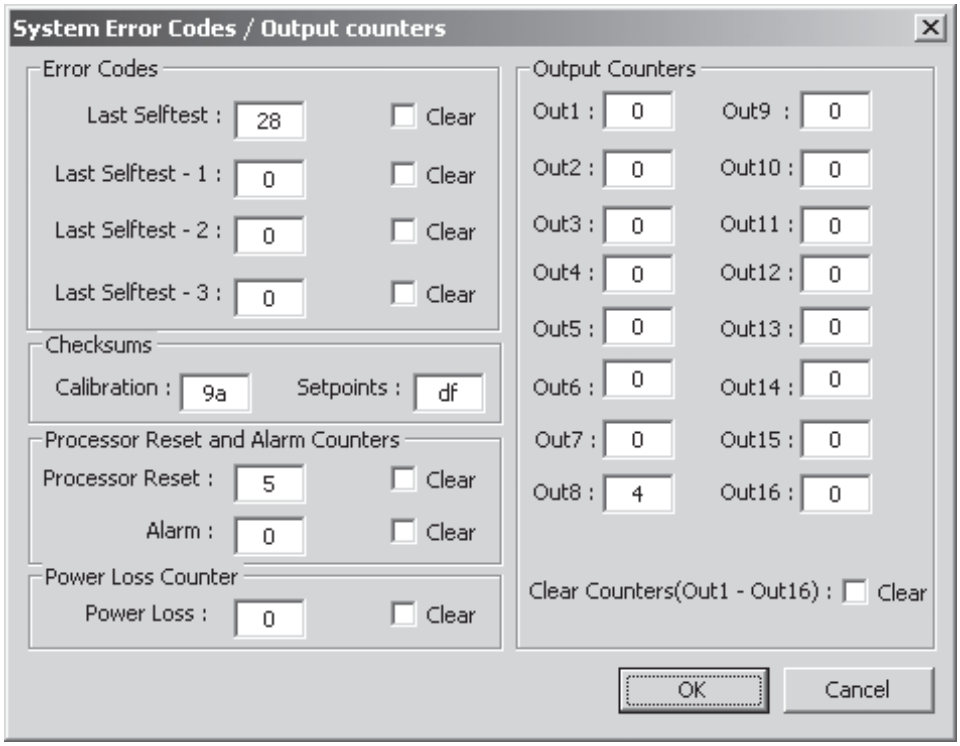


Figure 3-58 System Error Codes / Output Counters Dialog Screen

3.2 ISSplot™

ISSplot allows the user to plot and print waveform data downloaded from Beckwith Electric MBTSs. The ISSplot feature is also capable of plotting and printing waveform data files that are in COMTRADE format.

When the ISSplot menu item is selected, ISSplot is launched in an independent Windows™ Window. The ISSplot Main Screen and menu bar is displayed (Figure 3-59). The ISSplot Menu Structure and Submenu Callouts are illustrated in Figure 3-60.

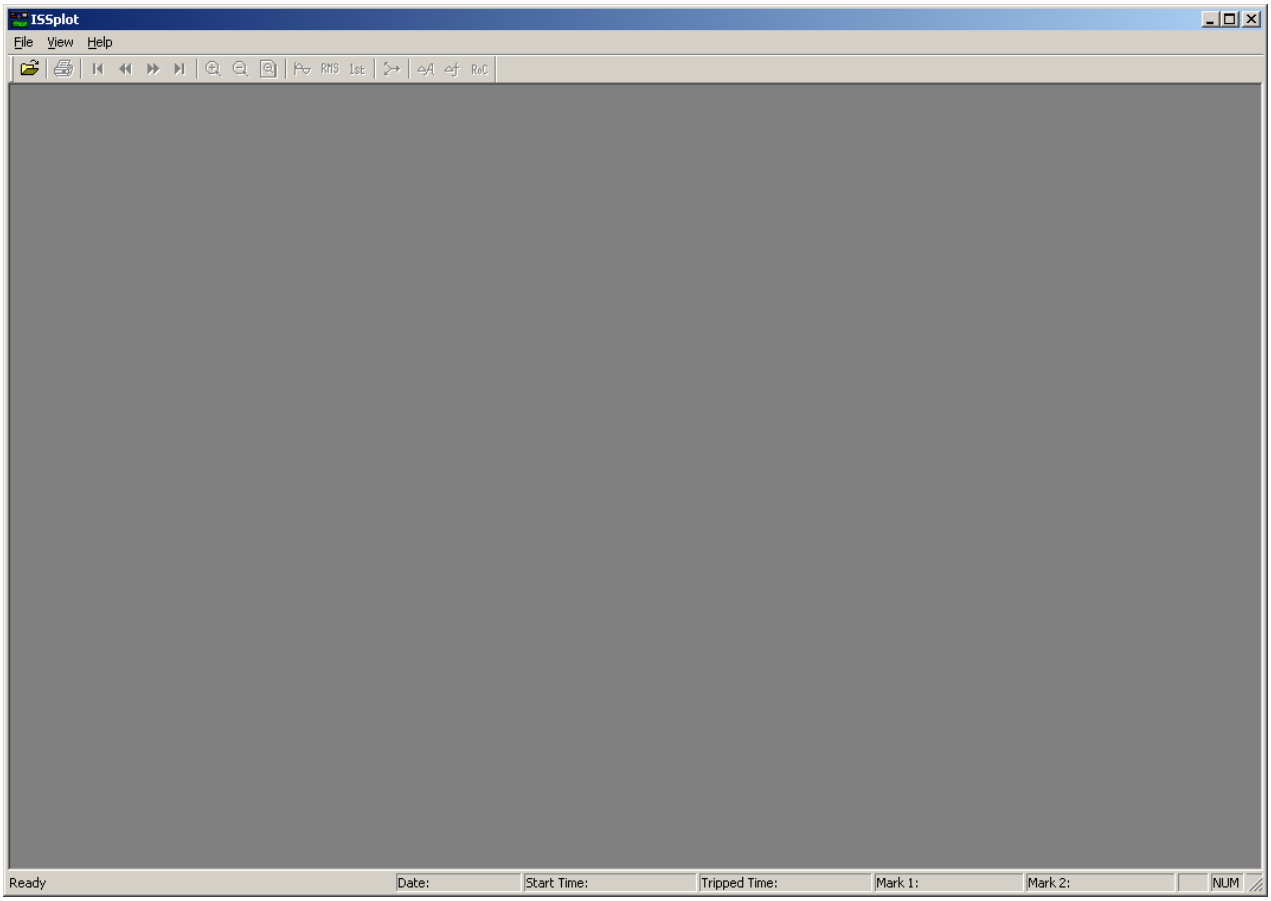


Figure 3-59 ISSplot Main Screen

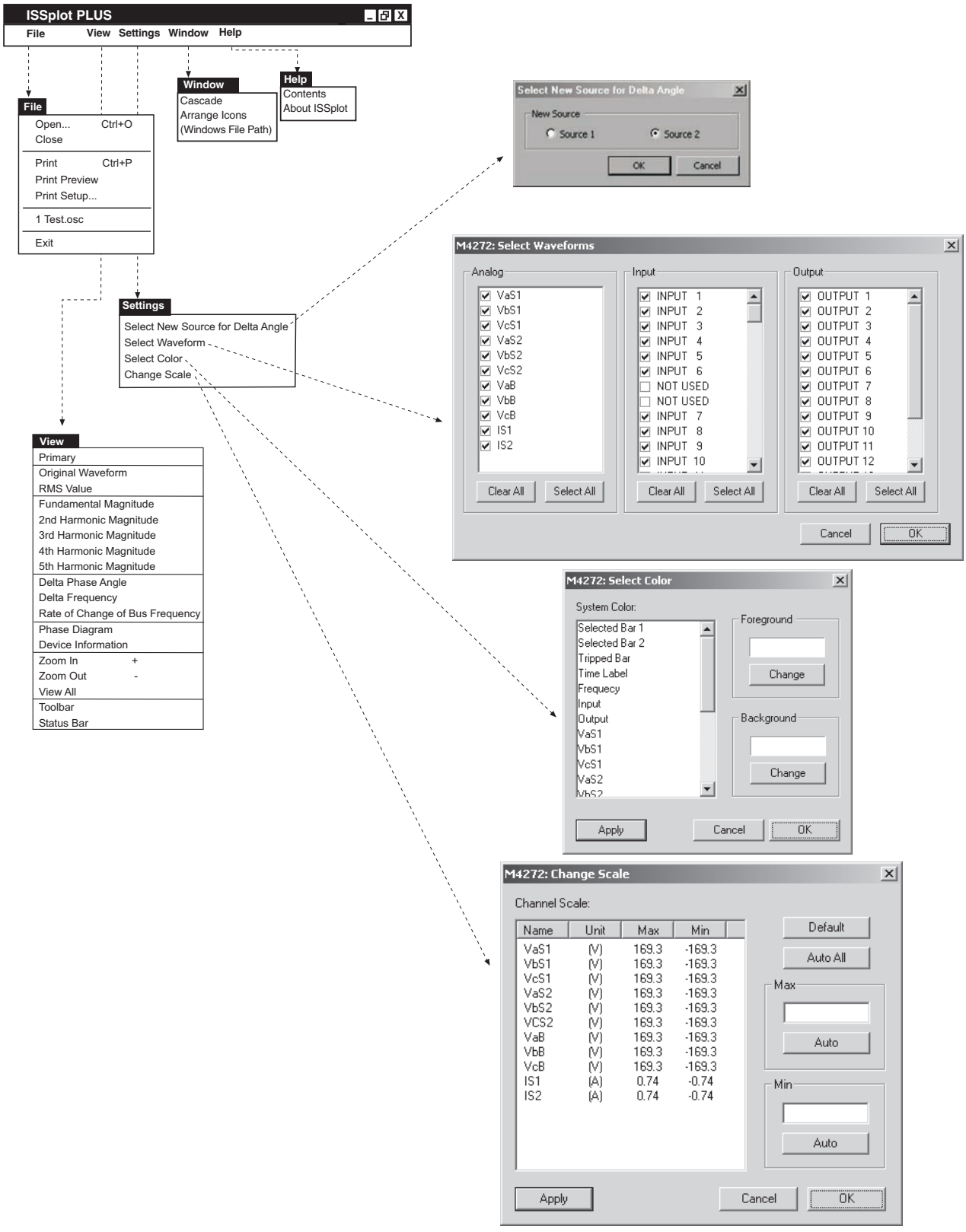


Figure 3-60 ISSplot Menu Structure and Submenu Callouts

ISSplot™ File Menu

The **ISSplot File** menu allows the user to open an oscillograph file previously downloaded by ISScom®. ISScom supports COMTRADE format data files (file extension *.cfg). The **File** menu also permits the user to preview and print selected oscillographs. **Exit** closes the ISSplot program.

ISSplot View Menu

View
Primary
Original Waveform RMS Value
Fundamental Magnitude 2nd Harmonic Magnitude 3rd Harmonic Magnitude 4th Harmonic Magnitude 5th Harmonic Magnitude
Delta Phase Angle Delta Frequency Rate of Change of Bus Frequency
Phase Diagram Device Information
Zoom In + Zoom Out - View All
Toolbar Status Bar

The **View** menu allows the user to select Toolbar and Status Bar for display.

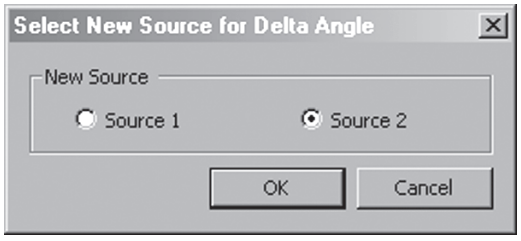
ISSplot Settings Menu

Settings
Select New Source for Delta Angle
Select Waveform
Select Color
Change Scale

The Settings menu allows the selection of the new source (1 or 2) for Delta Angle, waveforms to be displayed, the formatting of display colors, and the ability to change the waveform scaling.

ISSplot Select New Source for Delta Angle

Allows the user to select Source 1 or Source 2.



ISSplot Select Waveforms

Allows the selection of voltages, currents, inputs, and outputs to be plotted or printed.

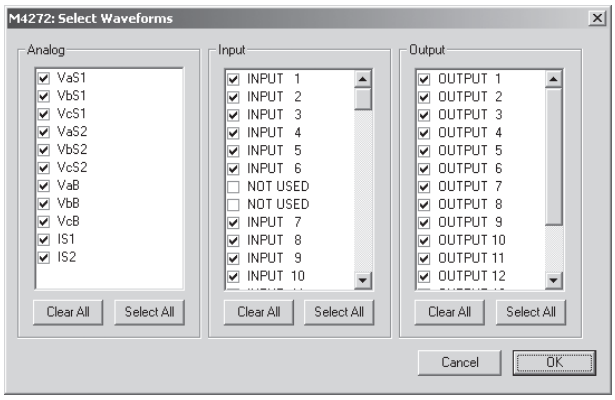


Figure 3-61 Select Waveforms Dialog Screen

ISSplot Change Colors

Allows the user to change waveform colors for customized plotting.

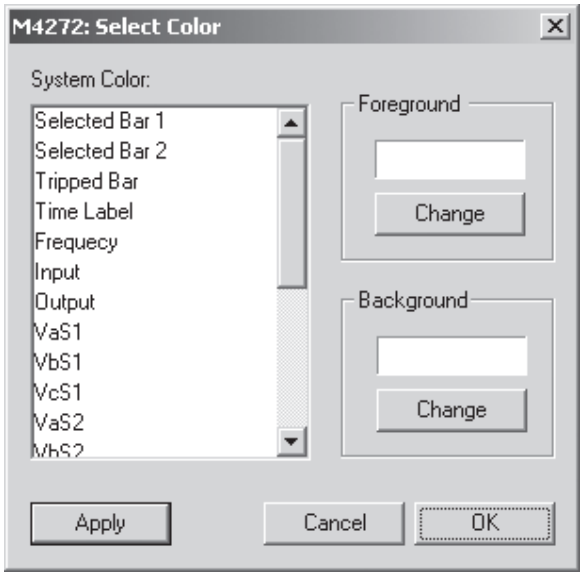
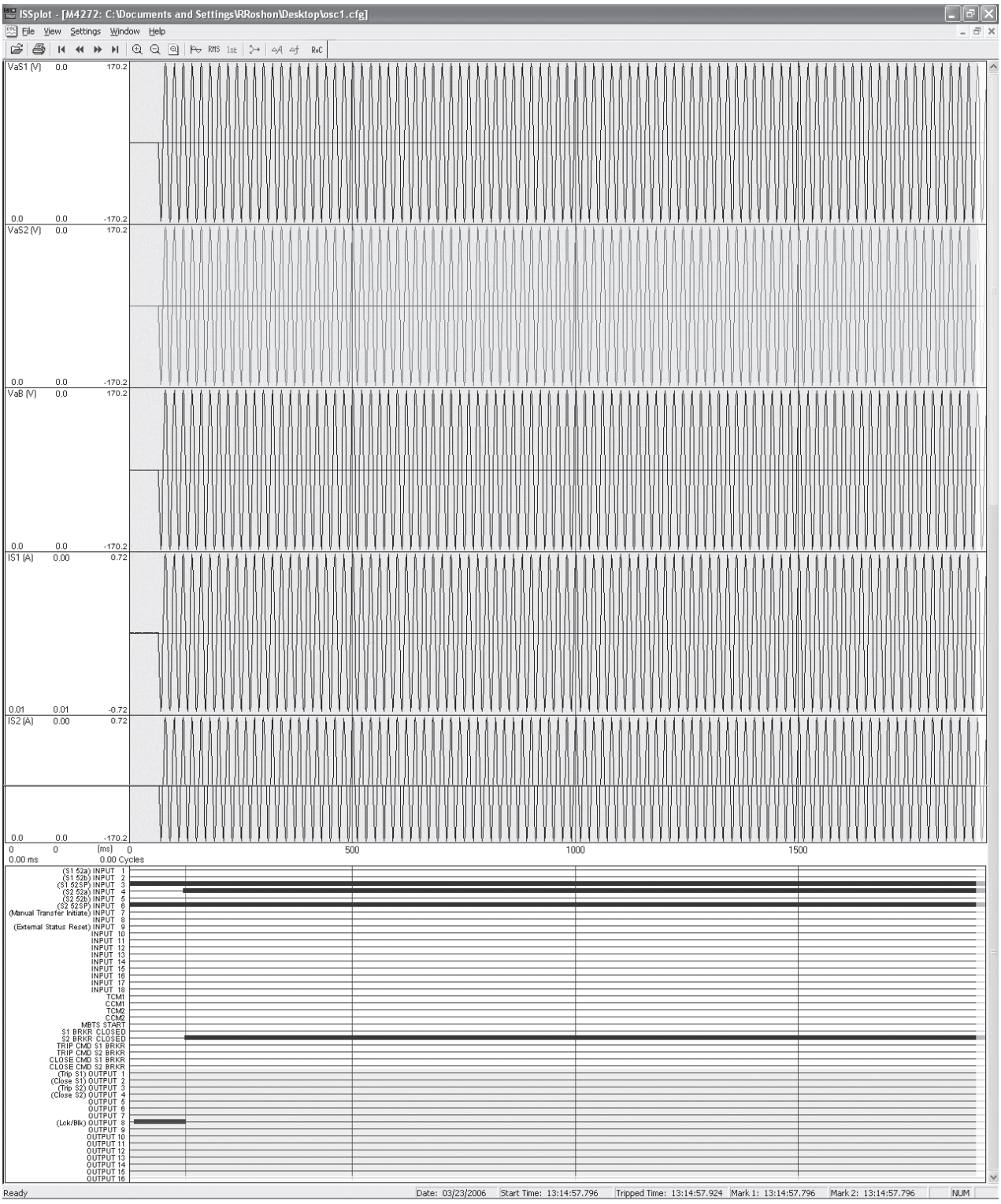


Figure 3-62 Change Colors Dialog Screen



■ **NOTE**: Cursor bars may be dragged to any location by positioning the cursor arrow on a bar and dragging the mouse. Double click the left key to position one cursor bar and Shift-Double Click or left mouse down and click the right key to position the other cursor bar at the current cursor arrow time position.

Figure 3-63 Example of ISSplot™ Oscillographic Data

ISSplot™ Change Scale

Allows the individual designation of a magnitude scale for voltage and current traces.

ISSplot Default

Sets all similar waveforms to the same scale (largest).

ISSplot Auto All

Allows ISSplot to set the scale for each individual waveform.

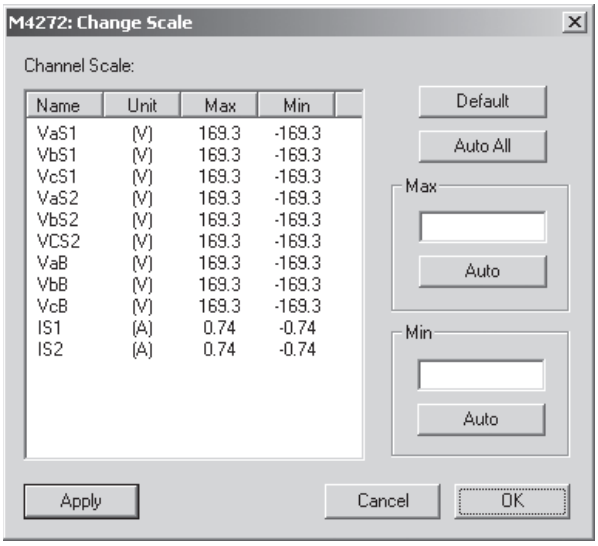
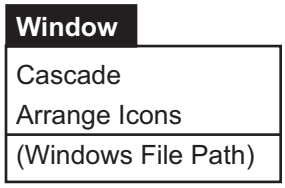
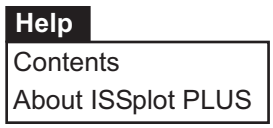


Figure 3-64 Change Scale Dialog Screen

ISSplot Window Menu/Help Menu



The **Window** menu enables the positioning and arrangement of multiple ISSplot windows at the same time. Selecting any displayed window activates that frame, allowing manipulation of the data.



The **Help** menu provides information about ISSplot menus and commands. The **About** command provides version information for ISSplot.

ISSplot makes use of shortcut key commands for many functions, making ISSplot as easy as clicking your mouse and touching a few keys.

Key Strokes	Action
Left-Mouse button down and drag, or select zoom in icon on toolbar menu	Magnify the selected area in main display, impedance diagram, PQ diagram, and phasor diagrams
Left-mouse double click	Move Marker #1 to current position in main display
Shift + Left-mouse double-click or left-mouse down and right-mouse double click	Move Marker #2 to current position in main display
Align cursor on Marker #1 and drag	Drag Marker #1 in main display
Align cursor on Marker #2 and drag	Drag Marker #2 in main display
Right-mouse down	Current and voltage selection menu in main display and phasor diagrams Impedance in the Impedance diagram Voltage and Current in the Phase diagram Real and Reactive Power in PQ diagram
Left key or select left scroll icon in toolbar menu	Move left in main display
Right key or select right scroll icon in toolbar menu	Move right in main display
Home key or select move to beginning icon in toolbar menu	Move to the beginning of the record in the main display
End key or select move to end icon in toolbar menu	Move to the end of the record in the main display

Table 3-1 ISSplot Shortcut Keys

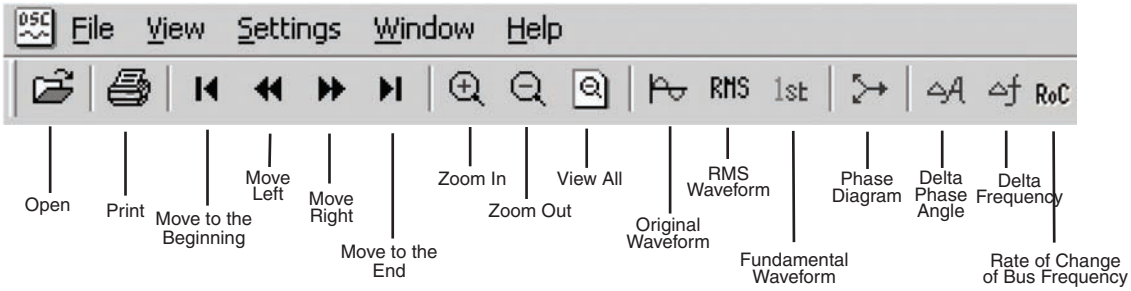
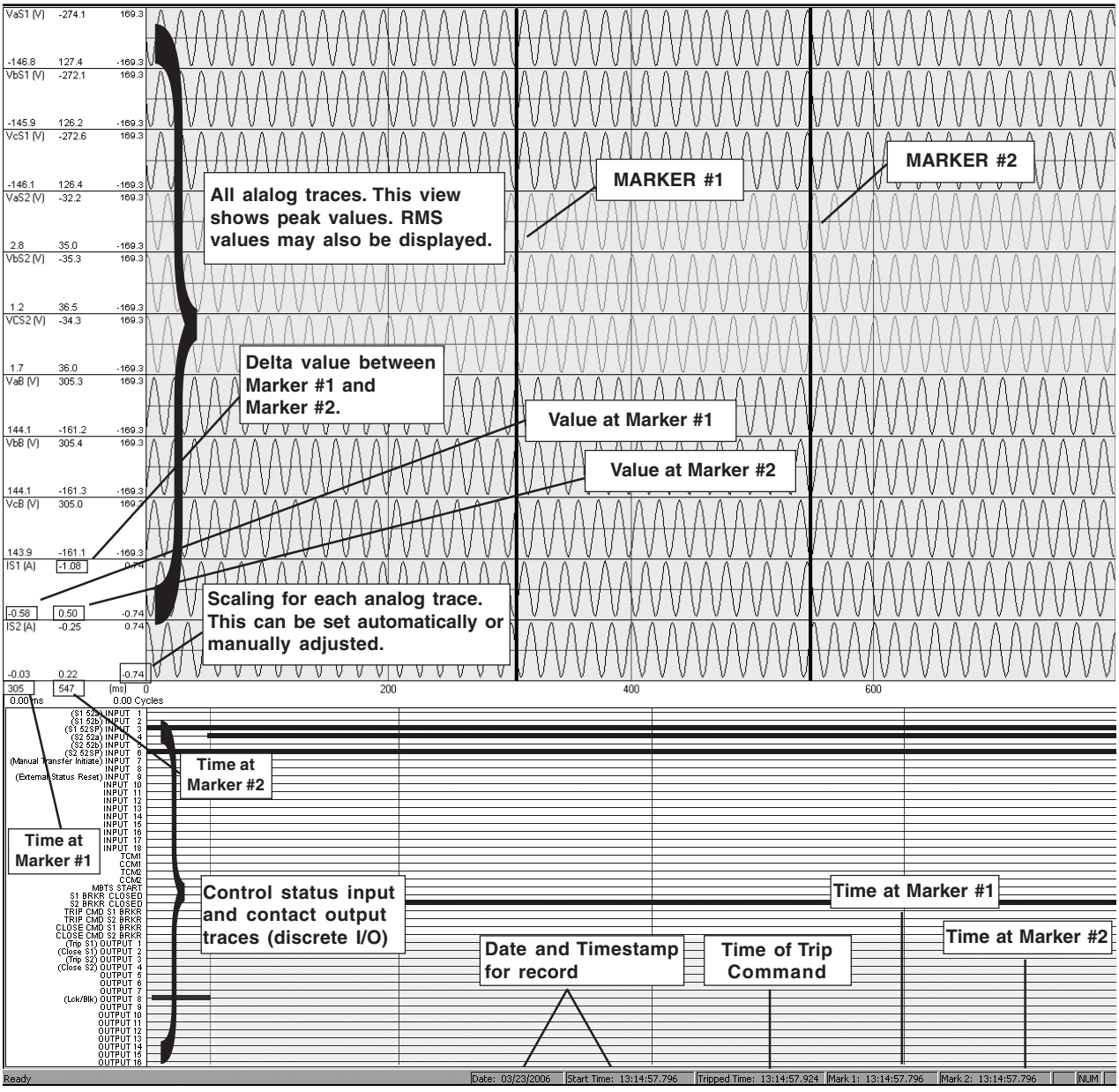


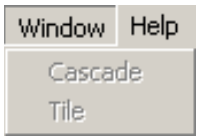
Figure 3-65 ISSplot™ Toolbar



■ **NOTE**: Cursor bars may be dragged to any location by positioning the cursor arrow on a bar and dragging the mouse. Double click the left key to position one cursor bar and Shift-Double Click or double click the right key to position the other cursor bar at the current cursor arrow time position.

Figure 3-66 ISSplot Screen with Callouts

Window Menu/Help Menu



The **Window** menu enables the positioning and arrangement of all ISScom windows so that there is better access to available functions. This feature allows the display of several windows at the same time. Clicking on an inactive window activates that window.

The **Help** menu provides two commands. The **Contents** command initiates a link to a PDF (Portable Document File) version of this instruction book for easy reference. An Adobe Acrobat® reader is required to view this document. The M-4272 Instruction Book has been Bookmarked. By selecting the "Navigator pane' in Adobe Acrobat Reader, the user can directly access selected topics.

The **About ISScom®** command displays ISScom version and development information (Figure 3-67). Also, this screen displays unit information.

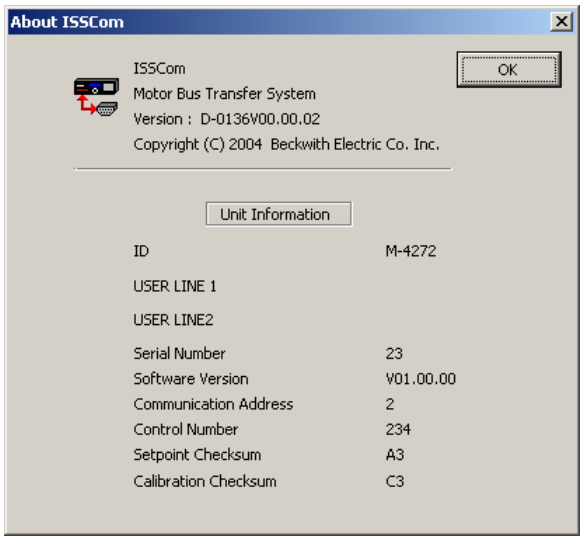


Figure 3-67 About ISScom Dialog Box

4 System Setup and Setpoints

Chapter four is designed for the person or group responsible for the Unit Setup, System Setup and System Setpoints of the M-4272 Digital Motor Bus Transfer System (MBTS).

Chapter 4 consists of:

- Functional and connection diagrams for a typical application of the MBTS.
- The Unit Setup Section, which consists of general unit setup information, Communications setup, Oscillograph setup and Transfer Event Log setup.
- The System Setup Section provides the definitions of system quantities and equipment characteristics required by the MBTS which include CT, VT configuration selection and Input and Output assignments.
- A System Setpoints Section which describes the unit transfer settings, enabling functions and setpoints, output contact assignments and digital input assignments.

The selection of the MBTS System Setup parameters and Setpoints is performed using the M-3872 ISScom® Communications and Oscillographic Analysis Software. However, some setup information can also be entered from the unit's M-3931 Front Panel Human Machine Interface (HMI), and will be included where applicable.

4.1 Unit Setup

■ **NOTE**: Setup Record Forms are contained in **Appendix A**. The Setup Record Form tables list the MBTS parameter settings choices for each feature and function.

GENERAL UNIT SETUP

The General Unit setup consists of the setup of the following features and functions:

- Comm Access Code
- User Access Codes
- User Logo Lines
- User Control Number
- OK LED Flash
- Time and Date

COMM ACCESS CODE

If additional link security is desired, a communication access code can be programmed. Like the user access codes, if the communication access code is set to 9999 (default), communication security is disabled.

ISScom® Comm Access Code Setup

To set the MBTS Comm Access Code perform the following:

■ **NOTE**: Communication must be established with the target MBTS for this procedure.

1. From the ISScom Main Screen menu select **Tools/System Access Code/ Comm Access**. ISScom will display the Communication Access Code Reset dialog screen (Figure 4-1).

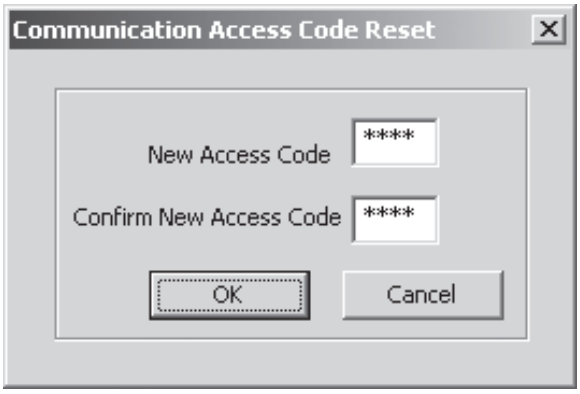


Figure 4-1 Communication Access Code Reset Dialog Screen

2. Enter the desired New Communication Access Code (1-9999), then re-enter (confirmation) the New Access Code.
3. Select **OK**, ISScom will display a Communication Access Code Sent Confirmation Screen (Figure 4-2).

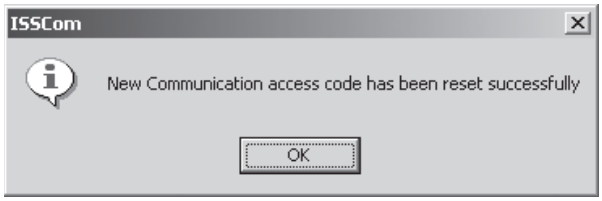


Figure 4-2 Communication Access Code Sent Confirmation Screen

4. Select **OK**, ISScom will return to the Main Screen.

   The new Communication Access Code will not be in affect until communications have been closed with the MBTS for approximately 2.5 minutes.

HMI Comm Access Code Setup

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.

   b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT  rmte_lcal
```

   c. Go to step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT  rmte_lcal
```

4. Press the Right arrow pushbutton until the following is displayed:

```
COMMUNICATION
stat COMM setup
```

5. Press **ENTER,** the following will be displayed:

```
COM1 SETUP
COM1 com2 com3 com_adr
```

6. Press the Right arrow pushbutton until the following is displayed:

```
COMM ACCESS CODE
ACCSS eth eth_ip
```

7. Press **ENTER,** the following will be displayed:

```
COMM ACCESS CODE
      9999
```

8. Input the desired Comm Access Code as follows:
   a. Utilizing the Up and Down arrow pushbuttons select the desired first digit.
   b. Press the Left arrow pushbutton once, then repeat the previous step as necessary to input the desired Comm Access Code digits.
   c. When the desired Comm Access Code has been input, then press **ENTER**. The following will be displayed:

```
COMM ACCESS CODE
ACCESS eth eth_ip
```

9. Press **Exit.**

USER ACCESS CODES

The MBTS includes three levels of access codes. Depending on their assigned code, users have varying levels of access to the installed functions.

1. **Level 1 Access** = Read setpoints, monitor status, view status history.
2. **Level 2 Access** = All of level 1 privileges, plus read & change setpoints, target history, set time clock.
3. **Level 3 Access** = All of level 2 privileges, plus access to all configuration functions and settings.

Each access code is a user-defined one-to four-digit number. Access codes can only be altered by a level 3 user.

If the level 3 access code is set to 9999, the access code feature is disabled. When access codes are disabled, the access screens are bypassed, and all users have full access to all the MBTS menus. The device is shipped from the factory with the access code feature disabled.

ISScom® User Access Codes Setup

To set the MBTS User Access Codes perform the following:

■ **NOTE**: Communication must be established with the target MBTS for this procedure.

1. From the ISScom Main Screen menu select **Tools/System Access Code/ User Access**. ISScom will display the User Access Code Reset dialog screen (Figure 4-3).

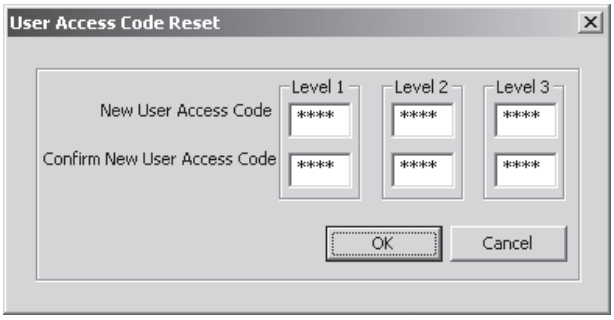


Figure 4-3 User Access Codes Reset Dialog Screen

2. Enter the desired New User Access Code (1-9999), then re-enter (confirmation) the New User Access Code.
3. Select **OK**, ISScom will display a New User Access Code Sent Confirmation Screen (Figure 4-2).

Figure 4-4 New User Access Code Sent Confirmation Screen

4. Select **OK**, ISScom will return to the Main Screen.

HMI User Access Codes Setup

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.
   b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT  rmte_lcal
```

   c. Go to step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT  rmte_lcal
```

4. Press the Right arrow pushbutton until the following is displayed:

```
SETUP UNIT
stat comm SETUP
```

5. If User Access Codes are to be set, then use the RIGHT arrow pushbutton to select ALTER ACCESS CODES. The following will be displayed:

```
ALTER ACCESS CODES
vers sn ACCESS number
```

6. Press **ENTER,** the following will be displayed:

```
ENTER ACCESS CODE
LEVEL#1 level#2 level#3
```

7. Press **ENTER**, the following will be displayed:

```
LEVEL #1
      9999
```

8. Input the desired User Access Code as follows:
   a. Utilizing the Up and Down arrow pushbuttons select the desired first digit.
   b. Press the Left arrow pushbutton once, then repeat the previous step as necessary to input the desired Access Code.
   c. When the desired Access Code has been input, then press **ENTER**. The following will be displayed:

```
ENTER ACCESS CODE
LEVEL#1 level#2 level#3
```

9. To set User Access Code Level #2 press the RIGHT arrow pushbutton to select LEVEL #2, then press **ENTER** the following will be displayed:

```
LEVEL #2
      9999
```

10. Repeat Step 8 to enter the desired Level #2 User Access Code.
11. To set User Access Code Level #3 press the RIGHT arrow pushbutton to select LEVEL #3, then press **ENTER** the following will be displayed:

```
LEVEL #3
      9999
```

12. Repeat Step 8 to enter the desired Level #3 User Access Code.
13. Press the **EXIT** pushbutton will return to the previous selection screen:

```
ALTER ACCESS CODES
vers sn ACCESS number
```

USER LOGO LINE

The user logo is a programmable, two-line by 24-character string, which can be used to identify the MBTS, and which is displayed locally when the unit is idle. This information is also available in ISScom®.

USER CONTROL NUMBER

This is a user-defined value which can be used for inventory or identification. The unit does not use this value, but it can be accessed through the HMI or the communications interface, and can be read remotely.

SYSTEM OK LED

The green **SYSTEM OK** LED is controlled by the unit's microprocessor. A flashing **SYSTEM OK** LED indicates proper program cycling. The LED can also be programmed to be continuously illuminated.

ISScom User Logo Line, User control Number and System OK LED Setup

To set the MBTS User Logo Line, User Control Number and System OK LED perform the following:

■ **NOTE**: Communication must be established with the target MBTS for this procedure.

1. From the ISScom Main Screen menu select **Tools/Miscellaneous Setup**. ISScom will display the Miscellaneous Setup dialog screen (Figure 4-5).

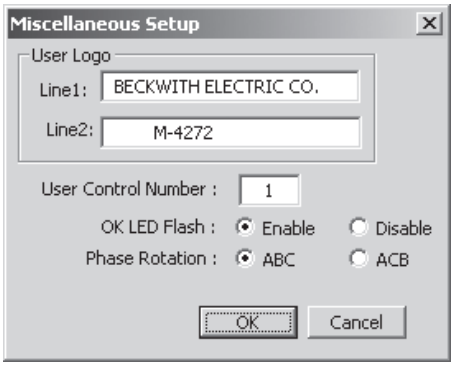


Figure 4-5 Miscellaneous Dialog Screen

2. If entering/editing the User Logo lines, then enter the desired User Logo Lines.
3. If changing the User Control Number, then enter the desired User Control Number.
4. If enabling/disabling the System OK LED Flash operation, then select either **Enable** of **Disable**.
5. Select **OK**, ISScom will return to the Main Screen.

HMI User Logo Line Setup

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.
   b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT  rmte_lcal
```

   c. Go to step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT  rmte_lcal
```

4. Press the Right arrow pushbutton until the following is displayed:

```
SETUP UNIT
stat comm SETUP
```

5. Press **ENTER**, the following will be displayed:

```
SOFTWARE VERSION
VERS sn access number
```

6. Press the Right arrow pushbutton until the following is displayed:

```
USER LOGO LINE 1
LOGO 1 logo 2 alrm
```

7. Press **ENTER,** the following will be displayed:

```
USER LOGO LINE 1
_BECKWITH ELECTRIC CO.
```

8. Input the desired User Logo Line 1 as follows:
   a. Utilizing the Up and Down arrow pushbuttons select the desired first letter/symbol/digit/blank space.
   b. Press the Right arrow pushbutton once, then repeat the previous step as necessary to input the desired User Logo Line 1.
   c. When the desired User Logo Line 1 has been input, then press **ENTER**. The following will be displayed:

```
USER LOGO LINE 1
—WAIT—
```

```
USER LOGO LINE 1
LOGO 1 logo 2 alrm
```

9. To enter a User Logo Line 2 press the RIGHT arrow pushbutton once, the following will be displayed:

```
USER LOGO LINE 2
logo 1 LOGO 2 alrm
```

10. Press **ENTER,** the following will be displayed:

```
USER LOGO LINE 2
_         M-4272
```

11. Input the desired User Logo Line 2 as follows:
   a. Utilizing the Up and Down arrow pushbuttons select the desired first letter/symbol/digit/blank space.
   b. Press the RIGHT arrow pushbutton once, then repeat the previous step as necessary to input the desired User Logo Line 2.
   c. When the desired User Logo Line 2 has been input, then press **ENTER**. The following will be displayed:

```
USER LOGO LINE 2
—WAIT—
```

```
USER LOGO LINE 2
logo 1 LOGO 2 alrm
```

12. Press **Exit.**

HMI User Control Number Setup

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.
   b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT  rmte_lcal
```

   c. Go to step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT  rmte_lcal
```

4. Press the Right arrow pushbutton until the following is displayed:

```
SETUP UNIT
stat comm SETUP
```

5. Press **ENTER**, the following will be displayed:

```
SOFTWARE VERSION
VERS sn access number
```

6. Press the Right arrow pushbutton until the following is displayed:

```
USER CONTROL NUMBER
vers sn access NUMBER
```

7. Press **ENTER**, the following will be displayed:

```
USER CONTROL NUMBER
      1
```

8. Input the desired User Control Number as follows:
   a. Utilizing the Up and Down arrow pushbuttons select the desired first digit.
   b. Press the Left arrow pushbutton once, then repeat the previous step as necessary to input the desired User Control Number.
   c. When the desired User Control Number has been input, then press **ENTER**. The following will be displayed:

```
USER CONTROL NUMBER
vers sn access NUMBER
```

9. Press **Exit.**

HMI System OK LED Setup

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.
   b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT  rmte_lcal
```

   c. Go to step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT  rmte_lcal
```

▲ **CAUTION:** Do not enter DIAGNOSTIC MODE when protected equipment is in service. Entering DIAGNOSTIC MODE when protected equipment is in service removes all protective functions of the MBTS.

4. Press the right arrow pushbutton until the following is displayed:

```
SETUP UNIT
←  stat comm SETUP →
```

5. Press **ENTER,** the following will be displayed:

```
SOFTWARE VERSION
VERS sn access number →
```

6. Press the right arrow pushbutton until the following is displayed:

```
DIAGNOSTIC MODE
←  time error eth DIAG
```

7. Press **ENTER**, the following warning will be displayed:

```
PROCESSOR WILL RESET!
ENTER KEY TO CONTINUE
```

▲ **CAUTION:** Do not enter DIAGNOSTIC MODE when protected equipment is in service. Entering DIAGNOSTIC MODE when protected equipment is in service removes all protective functions of the MBTS.

8. Press **ENTER**, the relay will reset and **DIAGNOSTIC MODE** will be temporarily displayed followed by:

```
OUTPUT TEST (RELAY)
OUTPUT input led module →
```

9. Press the Right arrow pushbutton until the following is displayed:

```
FLASH SYS OK LED
com3  clock  LED  cal  →
```

10. Press **ENTER**, the following will be displayed:

```
FLASH SYS OK LED
off  ON
```

11. Utilizing the Right or Left arrow pushbuttons select either ON or OFF.

12. Press **ENTER**, the following will be displayed:

```
FLASH SYS OK LED
–DONE–
```

13. Press **ENTER**, the following will be displayed:

```
FLASH SYS OK LED
com3  clock  LED  cal  →
```

14. Press **EXIT**, the following will be displayed:

```
PRESS EXIT TO
EXIT DIAGNOSTIC MODE
```

15. Press **EXIT**, the unit will cycle through the Power Self Tests.

SYSTEM CLOCK

This feature allows the user to set the MBTS internal clock. The clock is used to time stamp system events such as transfers and oscillograph operations.

The clock is disabled when shipped from the factory (indicated by "80" seconds appearing on the clock) to preserve battery life. If the MBTS is to be unpowered for an extended length of time, the clock should be stopped (from Diagnostic Mode or ISScom® Figure 4-6). If the IRIG-B interface is used, the hours, minutes, and seconds information in the clock will be synchronized with IRIG-B time information every hour.

The MBTS can accept a modulated IRIG-B signal using the rear panel BNC connector, or a demodulated TTL level signal using extra pins on the rear panel COM2 RS-232 interface connector (see Figure B-4 for COM2 pinout.) If the TTL signal is to be used, then Jumper 5 will be required to be positioned (see Section 5.4, Circuit Board Switches and Jumpers).

ISScom Set Date/Time

To set the MBTS Date/Time perform the following:

■ **NOTE**: Communication must be established with the target MBTS for this procedure.

1. From the ISScom Main Screen menu select **System/Setup/Set Date/Time**. ISScom will display the Set Date/Time dialog screen (Figure 4-6).

Figure 4-6 Set Date/Time Dialog Screen

2. Enter the desired Date and/or Time.
3. Select **SAVE**, ISScom will return to the Main Screen.

HMI SET DATE and TIME

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.
   b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT  rmte_lcal
```

   c. Go to step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT  rmte_lcal
```

4. Press the RIGHT arrow pushbutton until the following is displayed:

```
SETUP UNIT
stat comm SETUP
```

5. Press **ENTER**, then press the RIGHT arrow pushbutton until the following is displayed:

```
DATE & TIME
← TIME  error  eth  diag
```

6. Press **ENTER**, the following will be displayed:

```
DATE & TIME
08-Jan-2001 00:00:80
```

7. Press **ENTER**, the following will be displayed:

```
DATE & TIME
     01 Year
```

8. Input the desired Year as follows:
   a. Utilizing the Up and Down arrow pushbuttons select the desired first digit.
   b. Press the Left arrow pushbutton once, then repeat the previous step as necessary to input the desired Year.
   c. When the desired Year has been input, then press **ENTER**. The following will be displayed:

```
DATE & TIME
JAN feb mar apr may →
```

9. Input the desired Month as follows:
   a. Utilizing the Right or Left arrow pushbuttons select the desired Month.
   b. When the desired Month has been selected, then press **ENTER**. The following will be displayed:

```
DATE & TIME
      8 Date
```

10. Input the desired Date as follows:
   a. Utilizing the Up and Down arrow pushbuttons select the desired Date first digit.
   b. Press the Left arrow pushbutton once, then repeat the previous step as necessary to input the desired date.
   c. When the desired Date has been input, then press **ENTER**. The following will be displayed:

```
DATE & TIME
SUN  mon  tue  wed  thu →
```

11. Input the desired Day as follows:
   a. Utilizing the Right or Left arrow pushbuttons select the desired Day.
   b. When the desired Day has been selected, then press **ENTER**. The following will be displayed:

```
DATE & TIME
     01 Hour
```

12. Input the desired Hour as follows:
   a. Utilizing the Up and Down arrow pushbuttons select the desired first digit.
   b. Press the Left arrow pushbutton once, then repeat the previous step as necessary to input the desired Hour.
   c. When the desired Hour has been input, then press **ENTER**. The following will be displayed:

```
DATE & TIME
     13 Minutes
```

13. Input the desired Minutes as follows:
   a. Utilizing the Up and Down arrow pushbuttons select the desired first digit.

b. Press the Left arrow pushbutton once, then repeat the previous step as necessary to input the desired Minute(s).

c. When the desired Minutes have been input, then press **ENTER**. The following will be displayed:

```
DATE & TIME
     16 Seconds
```

14. Input the desired Seconds as follows:

a. Utilizing the Up and Down arrow pushbuttons select the desired first digit.

b. Press the Left arrow pushbutton once, then repeat the previous step as necessary to input the desired Seconds.

c. When the desired Seconds have been input, then press **ENTER**. The following will be displayed:

```
DATE & TIME
← TIME  error  eth  diag
```

COMMUNICATION SETUP

Communication setup can be accomplished utilizing either ISScom® or the HMI. The Communication setup consists of the setup of the following features and functions:

- COM Port definitions and Device Address
- Ethernet Port Settings
- Installing Modems

Serial Ports (RS-232)

Two serial interface ports, COM1 and COM2, are standard 9-pin, RS-232, DTE-configured ports. The front-panel port, COM1, can be used to locally set and interrogate the MBTS using a temporary connection to a PC or laptop computer. The second RS-232 port, COM2, is provided at the rear of the unit. COM2 is unavailable for communications when the optional ethernet port is enabled. However, the Demodulated IRIG-B may still be used through the COM2 Port when Ethernet is enabled.

Serial Port (RS-485)

COM3 located on the rear terminal block of the M-4272 is an RS-485, 2-wire connection. **Appendix B**, Figure B-3 illustrates a 2-wire RS-485 network.

Individual remote addressing also allows for communications through a serial multidrop network. Up to 32 MBTSs can be connected using the same 2 wire RS-485 communications line.

Direct Connection

In order for ISScom to communicate with the relay using direct serial connection, a serial “null modem” cable is required, with a 9-pin connector (DB9P) for the system, and an applicable connector for the computer (usually DB9S or DB25S). Pin-outs for a null modem adapter are provided in Appendix B, **Communications**.

An optional 10 foot null modem cable (M-0423) is available from the factory, for direct connection between a PC and the relay’s front panel COM port, or the rear COM2 port.

When fabricating communication cables, every effort should be made to keep cabling as short as possible. Low capacitance cable is recommended. The RS-232 standard specifies a maximum cable length of 50 feet for RS-232 connections. If over 50 feet of cable length is required, other technologies should be investigated.

Other communication topologies are possible using the M-4272 Digital Motor Bus Transfer System. An Application Note, “*Serial Communication with Beckwith Electric’s Integrated Protection System Relays*” is available from the factory or from our website at www.beckwithelectric.com.

Device Address

Individual MBTS Device Addresses should be between 1 and 255. The default Device Address is 1.

ISScom COM Port Definitions and System's Communication Address

To setup the COM Ports and Communication Addresses perform the following:

■ **NOTE**: Communication must be established with the target MBTS for this procedure.

1. From the ISScom® Main Screen menu select **Tools/System Comm Setup**. ISScom will display the System Communication Setup dialog screen (Figure 4-7).

   The System COM Port that is in use will be indicated at the top of the display.

2. Select the desired COM Port to be setup (1, 2 or 3).

3. Enter the desired "Dead Sync Time" (2 to 3000 msec).

   This delay establishes the line idle time to re-sync packet communication. Dead sync time should be programmed based on the channel's baud rate.

Baud Rate	Dead-Sync Time
9600	4 ms
4800	8 ms
2400	16 ms
1200	32 ms

Table 4-1 Dead-Sync Time

4. Enter the desired "Baud Rate" (1200 to 9600). COM2 and COM3 share the same baud rate (see Section 5.4, **Circuit Board Switches and Jumpers**).

5. Enter the desired "Stop Bits" value (1 or 2).

6. Enter the desired "Parity" (None, odd or even).

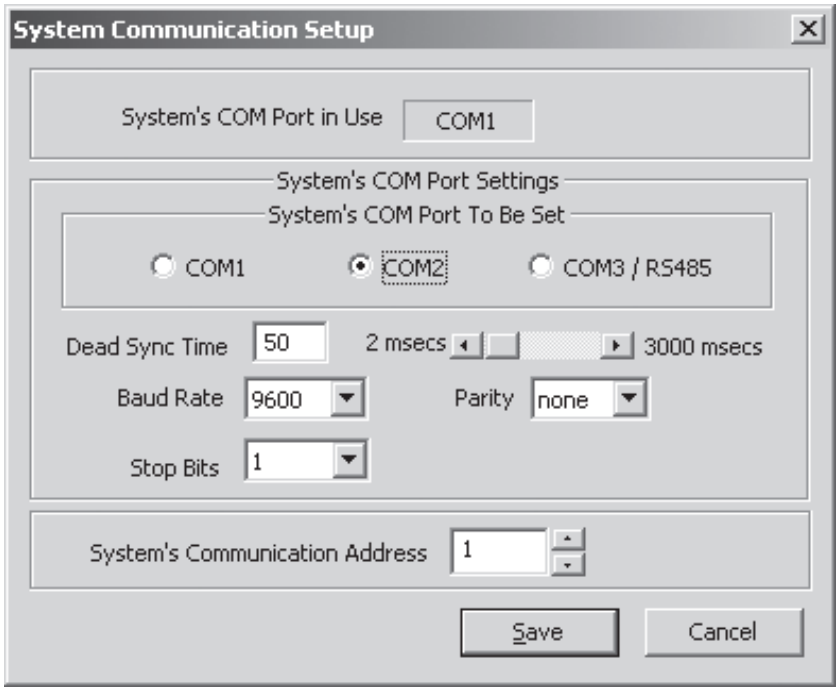


Figure 4-7 System Communication Setup Dialog Screen

7. Enter the desired "System's Communication Address" (1 to 255).

   The individual addressing capability of ISScom® and the MBTS allows multiple systems to share a direct or modem connection when connected through COM2 using a communications-line splitter (Figure 4-8). One such device enables 2 to 6 units to share one communications line. **Appendix B**, Figure B2 illustrates a setup of RS-232 Fiber Optic network.

8. When the COM Port settings have been entered, then select **Save**. ISScom will display the COM Port Settings Warning Screen (Figure 4-9).

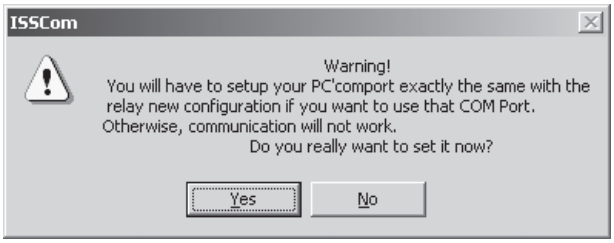


Figure 4-9 COM Port Settings Warning Screen

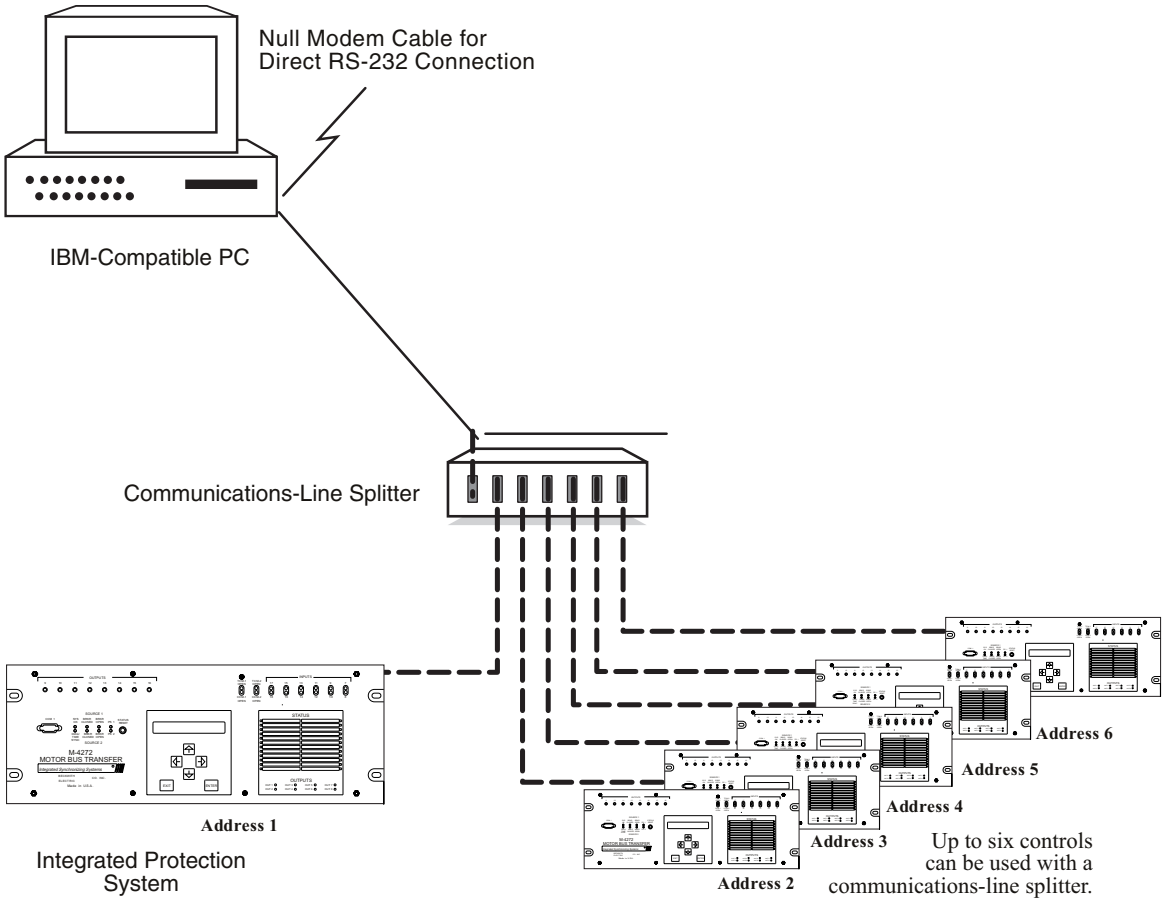


Figure 4-8 Multiple Systems Addressing Using Communications-Line Splitter

9. Select **Yes**, ISScom® will display the COM Port Setting Verification screen (Figure 4-10).

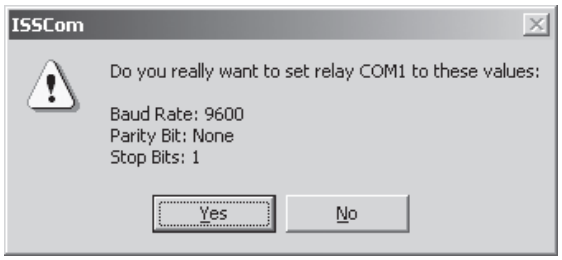


Figure 4-10 COM Port Setting Verification Screen

10. Verify the settings, then select **Yes**, ISScom will display the COM Port Settings Confirmation screen (Figure 4-11).

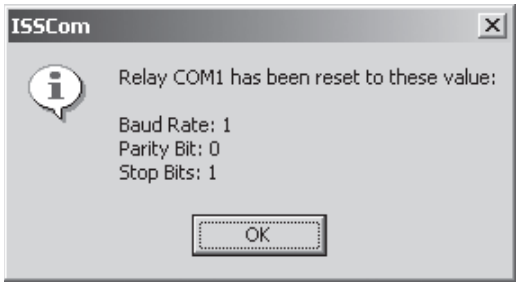


Figure 4-11 COM Port Settings Confirmation Screen

11. Select **OK**, ISScom will return to the Main Screen.

HMI COM Port Definitions and Device Address

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.
   b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT  rmte_lcal
```

   c. Go to step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT  rmte_lcal
```

4. Press the Right arrow pushbutton until the following is displayed:

```
Communication
stat COMM setup
```

5. Press ENTER, the following will be displayed:

```
COM1 SETUP
COM1 com2 com3 com_adr
```

6. Press **ENTER** and the following is displayed:

```
COM1 BAUD RATE
baud_4800 BAUD_9600
```

7. Press the Left or Right arrow pushbutton as necessary to select the desired baud rate.
8. Press **ENTER**, the following will be displayed:

```
COM1 DEAD SYNC TIME
      50 ms
```

9. Input the desired Dead Sync Time as follows:
   a. Utilizing the Up and Down arrow pushbuttons select the desired first digit.
   b. Press the Left arrow pushbutton once, then repeat the previous step as necessary to input the desired Dead Sync Time.
   c. When the desired Dead Sync Time has been input, then press **ENTER**. The following will be displayed:

```
COM1  PARITY
NONE odd even
```

10. Press the Left or Right arrow pushbutton as necessary to select the desired Parity setting.

11. Press **ENTER**, the following will be displayed:

```
COM1 STOP BITS
      1
```

12. Utilizing the Up or Down arrow pushbuttons select the desired Stop Bits.

13. Press ENTER, the following will be displayed:

```
COM1 SETUP
COM1 com2 com3 com_adr
```

14. Selecting COM2 or COM 3 will activate the same menu choices as displayed with the selection of COM1. Repeat as necessary to setup the remaining COM Ports.

ETHERNET COMMUNICATION SETTINGS

The optional RJ45 ethernet port can be enabled utilizing either ISScom® from the Ethernet Settings menu or from the HMI Communication menu. When the ethernet port is enabled the COM2 Serial Port is not available for communications. However, the Demodulated IRIG-B may still be used through the COM2 Port when ethernet is enabled.

The following parameters must be set for proper ethernet communication:

DHCP PROTOCOL

ENABLE: If the network server supports the DHCP protocol the network server will assign the IP Address, Net Mask and Gateway Address.

DISABLE: If the network server does not support the DHCP protocol or the user chooses to manually input ethernet settings, then obtain the IP Address, Net Mask and Gateway address from the Network Administrator and enter the settings.

ETHERNET PROTOCOLS

The Standard Port Number for the MODBUS over TCP/IP protocol is 502. The master device may require the entry of the Standard Port Number.

ISScom Ethernet Port Setup with DHCP

■ **NOTE**: Communication must be established with the target MBTS for this procedure.

1. From the ISScom Main Screen menu select **Tools/System Ethernet Setup**. . ISScom will display the Ethernet Setup screen (Figure 4-12).

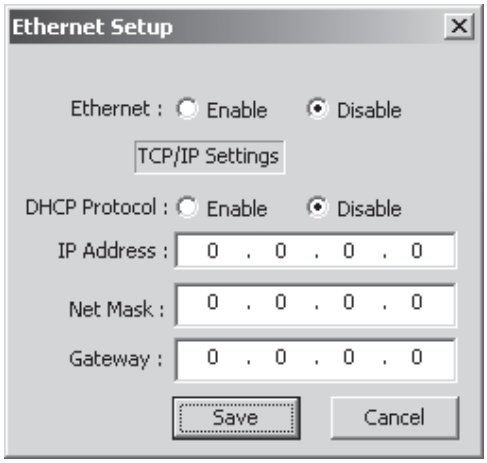


Figure 4-12 Ethernet Setup Screen

3. Select Ethernet **Enable**.
4. Select DHCP Protocol **Enable**.
5. Select **Save.** The ethernet board is now configured for use and may be accessed through a network.

ISScom Ethernet Port Setup without DHCP

■ **NOTE**: Communication must be established with the target MBTS for this procedure.

1. From the ISScom Main Screen menu select **Tools/System Ethernet Setup**. . ISScom will display the Ethernet Setup screen (Figure 4-12).
3. Select Ethernet **Enable**.
4. Select DHCP Protocol **Disable**.
5. Enter values for IP Address, Net Mask and Gateway.
6. Select **Save**. The ethernet board is now configured for use and may be accessed through a network.

HMI Ethernet Port Setup

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.
   b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT  rmte_lcal
```

   c. Go to step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT  rmte_lcal
```

4. Press the Right arrow pushbutton until the following is displayed:

```
COMMUNICATION
stat COMM setup
```

5. Press **ENTER**, the following will be displayed:

```
COM1 SETUP
COM1 com2 com3 com_adr →
```

6. Use the Right arrow pushbutton to select ETH (Upper Case).

```
ETHERNET SETUP
← access  ETH  eth_ip
```

7. Press **ENTER**, the following will be displayed:

```
ETHERNET
DISABLE enable
```

8. Use the Right arrow pushbutton to select ENABLE (Upper Case), then press **ENTER**, the following will be displayed:

```
TCP/IP SETTINGS
TCP_SETTINGS
```

9. Press **ENTER**, the following will be displayed:

```
DHCP PROTOCOL
DISABLE enable
```

10. If the network does not support the DHCP protocol, then go to Manual Configuration of Ethernet Board (following page) to manually configure the ethernet board.
11. If the DHCP Protocol is to be enabled, then use the Right/Left arrow pushbutton to select ENABLE (Upper Case), then press **ENTER**, the following will be displayed:

```
TCP/IP SETTINGS
TCP_SETTINGS
```

12. Press **EXIT**, the ethernet board will reconfigure and the following will be displayed:

```
CONFIGURING ETH...
```

    If the ethernet board successfully obtains an IP Address the following will be displayed for approximately 2 seconds:

ETHERNET IP ADDRESS

xx.xx.xx.xx

The ethernet board is now configured for use and may be accessed through a network. The display will return to the following:

```
ETHERNET SETUP
← access  ETH  eth_ip
```

If the ethernet board fails to obtain an IP Address within 15 seconds the following will be displayed (for approximately 2 seconds):

```
CONFIGURING ETH...
ETH BOARD ERROR
```

Contact the Network Administrator to determine the cause of the configuration failure.

HMI Manual Configuration of Ethernet Board

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.
   b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT  rmte_lcal
```

   c. Go to step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT  rmte_lcal
```

4. Press the Right arrow pushbutton until the following is displayed:

```
COMMUNICATION
stat COMM setup
```

5. Press **ENTER**, the following will be displayed:

```
COM1 SETUP
COM1 com2 com3 com_adr →
```

6. Use the Right arrow pushbutton to select ETH (Upper Case).

```
ETHERNET SETUP
← access  ETH  eth_ip
```

7. Press **ENTER**, the following will be displayed:

```
ETHERNET
DISABLE enable
```

8. Ensure that ENABLE is selected (Upper Case).

   If ENABLE is not selected (Upper Case), then use the Left arrow pushbutton to select ENABLE.

9. Press **ENTER**, the following will be displayed:

```
DHCP PROTOCOL
DISABE enable
```

10. Ensure that DISABLE is selected (upper case). If DISABLE is not selected, then use the left arrow pushbutton to select DISABLE.
11. Press **ENTER**, the following will be displayed:

```
IP ADDRESS
XX.XX.XX.XX
```

12. Enter the desired IP Address, then press **ENTER**, the following will be displayed:

```
NET MASK
XX.XX.XX.XX
```

13. Enter the desired Net Mask, then press **ENTER**, the following will be displayed:

```
GATEWAY
XX.XX.XX.XX
```

14. Enter the desired Gateway, then press **ENTER**, the following will be displayed:

```
TCP/IP SETTINGS
TCP_SETTINGS
```

15. Press **EXIT**, the ethernet board will reconfigure and the following will be displayed:

```
CONFIGURING ETH...
```

If the ethernet board is successfully configured, then the entered IP Address will be displayed for approximately 2 seconds:

ETHERNET IP ADDRESS

xx.xx.xx.xx

The ethernet board is now configured for use and may be accessed through a network.

INSTALLING THE MODEMS

Using ISScom® to interrogate, set or monitor the MBTS using a modem requires both a remote modem connected at the MBTS location and a local modem connected to the computer with ISScom installed.

■ **NOTE**: Any compatible modem may be used; however, the unit only communicates at 1200 to 9600 baud.

In order to use ISScom to communicate with the MBTS using a modem, the following must be provided with the MBTS:

- An external modem (1200 baud or higher), capable of understanding standard AT commands.
- Serial modem cable with 9-pin connector for the MBTS and the applicable connector for the modem.

Similarly, the computer running ISScom must also have access to a compatible internal or external modem.

Connecting the PC Modem

1. If the computer has an external modem, then use a standard straight-through RS-232 modem cable (M-3933) to connect the computer to the modem.
2. If the computer has an internal modem, then refer to the modem's instruction book to determine which communications port should be selected.
3. Verify that the modem is attached to (if external) or assigned to (if internal) the same serial port as assigned in ISScom.

   While ISScom can use any of the 255 serial ports (COM1 through COM255), most computers support only COM1 and COM2.
4. Connect the modem to a telephone line, then energize the modem.

Initializing the PC Modem

1. Verify that the modem is connected as described in "Connecting the PC Modem".
2. Open ISScom, then select the **COMM** menu item.
3. ISScom will display the Communication Dialog screen (Figure 4-13).
4. Select **COMM DEVICE/MODEM,** ISScom will display the Expanded Communication Dialog screen (Figure 4-14) to include modem setup information.
5. Enter the required information in the PC Modem Settings section of the Communication screen
6. Select **INITIALIZE** from the expanded Communications dialog box.

COMMAND BUTTONS

Serial COM Port	The Serial COM Port selection allows the user to select the COM Port, Baud Rate, Parity and Stop Bits.
Open COM	Initiates contact with the MBTS, either by direct serial or modem communication.
Close COM	Breaks communication with the protective system, for both direct serial or modem communication.
TCP_IP	Opens the ethernet applicable communication screen selections to allow user to enter a TCP_IP address (if necessary), and opening and closing communication with the target relay.
Modem	Displays the expanded Communication dialog box.
Cancel	Returns you to the ISScom main window; any changes to the displayed information are lost.

Open TCP_IP Initiates contact with the protective system by ethernet connection.

Close TCP_IP Closes Ethernet Connection

COMMAND BUTTONS

Bring Up Terminal Window When selected, following connection to the target modem, allows the user to send commands to the modem.

After Dialing Add Displays the Add/Edit dialog box, allowing you to type a protective system's unit identifier, phone number, and communication address.

Edit Displays the Add/Edit dialog box, allowing you to review and change the user lines (unit identifier), phone number, and communication address of a selected entry.

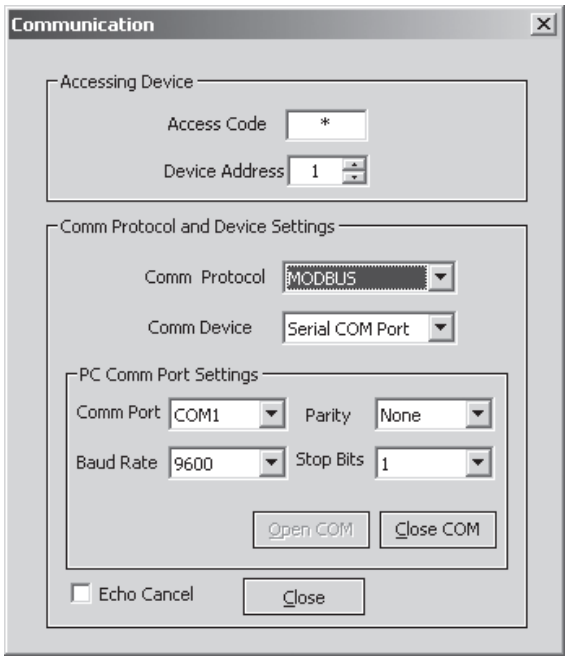
Delete Deletes a selected entry.

Save Saves any changes to the displayed information

Initialize Allows the user to send special setup or other AT commands directly to the modem.

Dial Dials the entry selected from the directory.

Hang Up Ends modem communication, allowing the user to dial again.



Path: Comm menu

Figure 4-13 Communications Dialog Screen

Connecting the Local Modem to the MBTS

Setup of the modem attached to the MBTS may be slightly complicated. It involves programming parameters (using the AT command set), and storing this profile in the modem's nonvolatile memory.

After programming, the modem will power up in the proper state for communicating with the MBTS. Programming may be accomplished by using the "Bring Up Terminal Window after dialing" selection (Figure 4-14). Refer to your modem manual for further information.

■ **NOTE:** The MBTS does not issue or understand any modem commands. It will not adjust the baud rate and should be considered a "dumb" peripheral. It communicates with 1 start, 8 data, and 0, 1 or 2 stop bits.

Connect the Modem to the MBTS as follows:

1. Connect the unit to an external modem by attaching a standard RS-232 modem cable to the appropriate serial communications port on both the unit and the modem.
2. Connect the modem to a telephone line, then energize the modem.

The modem attached to the MBTS must have the following AT command configuration:

E0	No Echo
Q1	Don't return result code
&D3	On to OFF DTR, hangup and reset
&S0	DSR always on
&C1	DCD ON when detected
S0=2	Answer on second ring

The following commands may also be required at the modem:

&Q6	Constant DTE to DCE
N0	Answer only at specified speed
W	Disable serial data rate adjust
\Q3	Bidirectional RTS/CTS relay
&B1	Fixed serial port rate
S37	Desired line connection speed

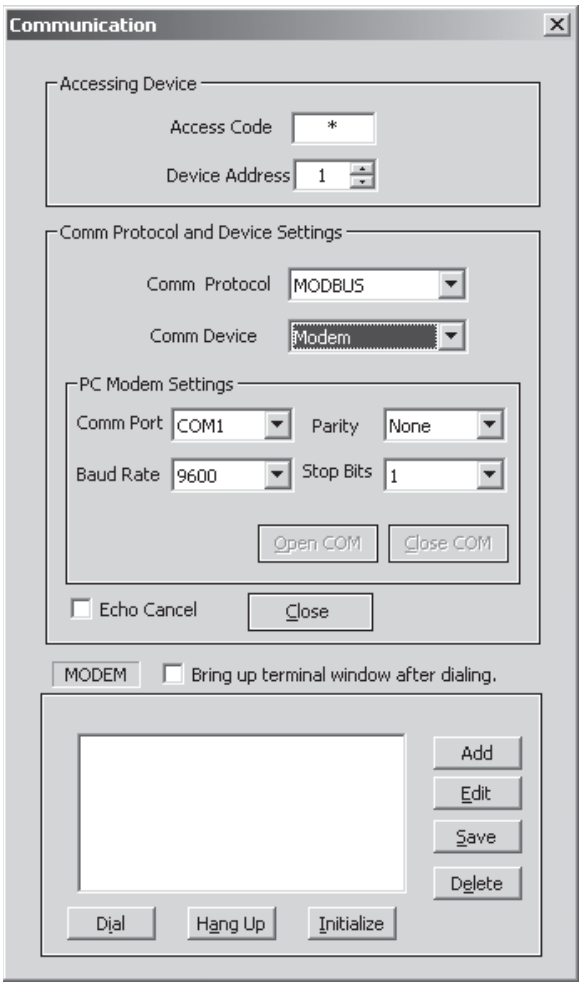


Figure 4-14 Expanded Communication Dialog Screen

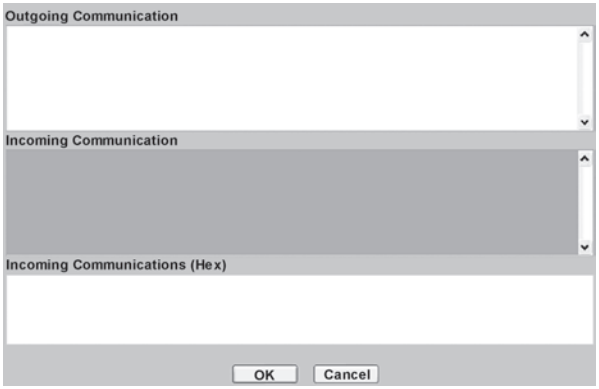


Figure 4-15 Terminal Window

When connected to another terminal device, the Terminal Window allows the user to send messages or commands. Outgoing communications are displayed in the top pane and incoming messages are displayed in the bottom two panes, in ASCII text and HEX format.

There are some variations in the AT commands supported by modem manufacturers. Refer to the hardware user documentation for a list of supported AT commands and direction on issuing these commands.

OSCILLOGRAPH SETUP

The oscillographic recorder provides comprehensive data recording of all monitored waveforms, and status inputs storing up to 248 cycles of data. The total record length is user-configurable from 1 to 16 partitions.

The number of samples per cycle used to store the data is user selectable. The number of samples per cycle that can be selected are 16 or 32 (50 or 60 Hz). The number of samples selected effects the length of the data that can be saved and its resolution. The lower the number of samples, the longer the record length that can be stored (but at a lower resolution).

The oscillographic recorder can be triggered by a designated control/status input (usually a MBTS initiate input), an automatically initiated signal, a trip output, a manual transfer signal, serial communications or manually by the user.

When untriggered, the recorder continuously stores waveform data, thereby keeping the most recent data in memory. When triggered, the recorder stores pre-trigger data, then continues to store data in memory for a user-defined, post-trigger delay period. The records may be analyzed using ISScom®, and are also available in COMTRADE file format.

Setup Oscillograph Recorder

■ **NOTE**: Communication must be established with the target MBTS for this procedure. When not connected to the MBTS the Send selection does not save the Oscillograph Recorder settings to an open file.

To setup the Oscillograph Recorder perform the following:

1. From the ISScom Main Screen menu select **System/Oscillograph/Setup**. ISScom will display the Oscillograph Setup screen (Figure 4-16).

2. Select the **Number of Records (Partitions).**

   The recorder's memory may be partitioned into 1 to 16 partitions. The MBTS Oscillograph Recorder memory buffer is fixed and contains room for a finite number of cycles of recorded data. Consider Table 4-2 when determining the number of Oscillograph records, The number of cycles of recorded data is directly related to the number of records selected.

■ **NOTE**: Table 4-2 is based on 32 samples per second. For other sample rates the number of cycles per partition has to be scaled accordingly.

3. Select the desired **Trigger Inputs** and **Trigger Outputs**.

   The recorder can be triggered remotely through serial communications using ISScom®, or automatically using programmed status inputs or outputs.

4. Select the **Post Trigger Delay**.

   A post-trigger delay of 5% to 95% must be specified. After triggering, the recorder will continue to store data for the programmed portion of the total record before re-arming for the next record. For example, a setting of 80% will result in a record with 20% pre-trigger data, and 80% post-trigger data.

5. Select the **Oscillograph Samples per Cycle**.

   The number of data samples per cycle can be selected either 16 or 32 samples per cycle.

6. Select **Send**, ISScom will display a Oscillograph Setup Sent Confirmation Screen (Figure 4-16).

7. Select **OK**, ISScom will return to the Main Screen.

Number of Partitions	Number of Cycles per Each Partition
1	124 Cycles
2	80 Cycles
3	60 Cycles
4	48 Cycles
5	40 Cycles
6	32 Cycles
7	28 Cycles
8	24 Cycles
9	24 Cycles
10	20 Cycles
11	20 Cycles
12	16 Cycles
13	16 Cycles
14	16 Cycles
15	12 Cycles
16	12 Cycles

Table 4-2 Recorder Partitions

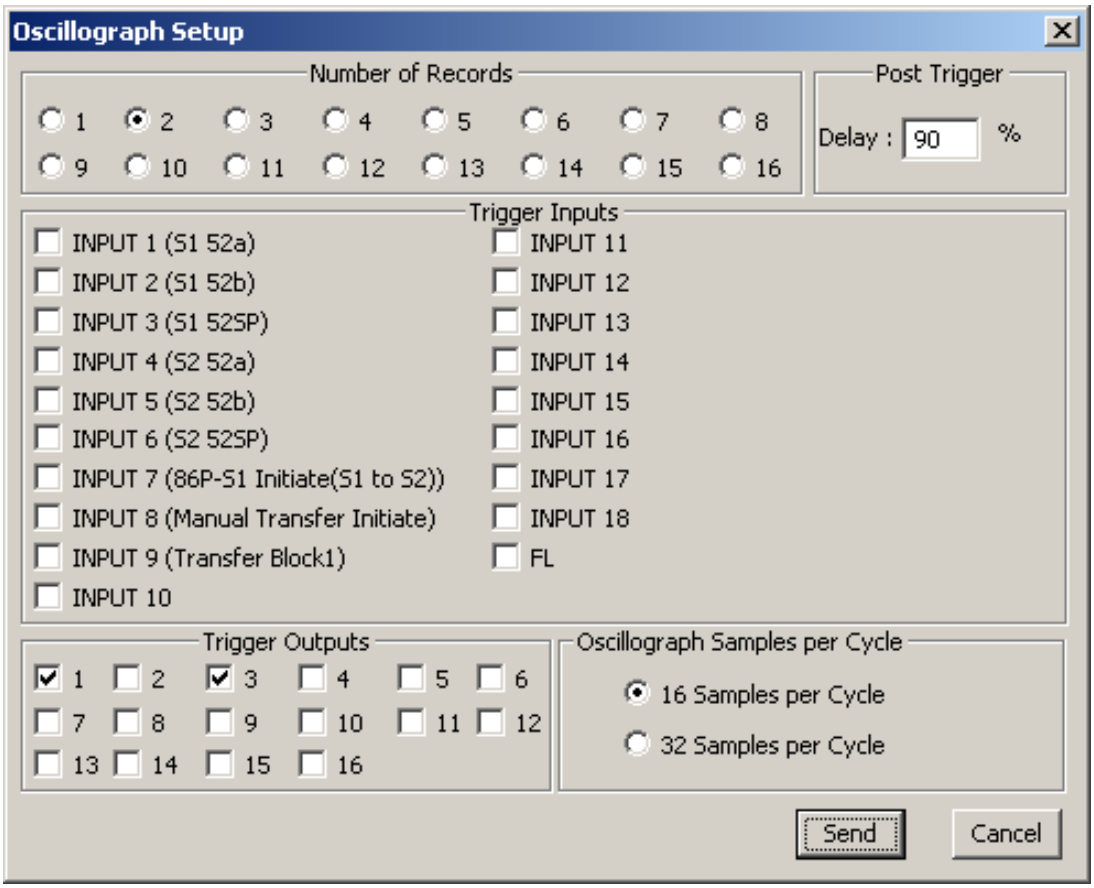


Figure 4-16 Setup Oscillograph Recorder

Figure 4-17 Oscillograph Setup Sent Confirmation Screen

SEQUENCE OF EVENTS RECORDER SETUP

Protective function Pickup, Trip, Dropout and/or Output/Input Pickup or Dropout are selected to trigger the Sequence of Events Recorder.

Setup Sequence of Events Recorder

■ **NOTE**: Communication must be established with the target MBTS for this procedure. When not connected to the MBTS the Save selection does not save the Sequence of Event settings to the open file.

To setup the Sequence of Events Recorder perform the following:

1. From the ISScom® Main Screen menu select **System/Sequence of Event Recorder/Setup**. ISScom will display the Sequence of Events Setup screen (Figure 4-18).
2. Select the desired Inputs and Outputs, then select **Save**. ISScom will display a Send Changes to Unit Screen (Figure 4-19).

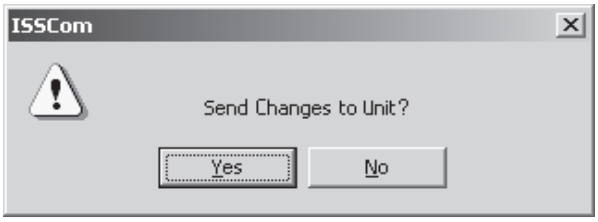


Figure 4-19 Sequence of Events Send Changes to Unit Screen

3. Select **OK**, ISScom will return to the Main Screen.

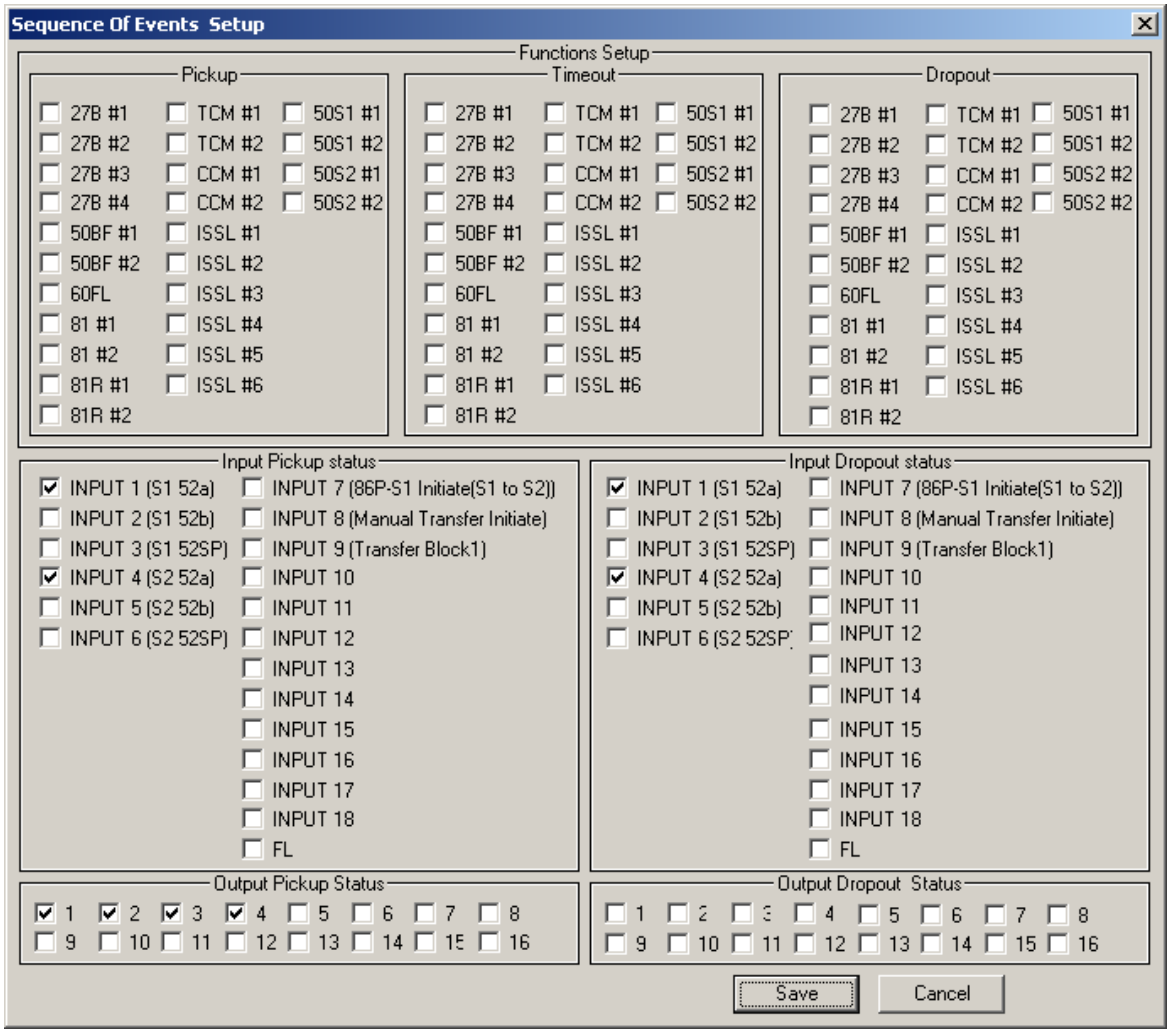


Figure 4-18 Sequence Of Events Setup

4.2 System Setup

■ **NOTE**: Setup Record Forms are contained in **Appendix A**. The Setup Record Form tables list the MBTS parameter settings choices for each feature and function.

The System Setup consists of defining all pertinent information regarding the system quantities. The Setup System dialog screen (Figure 4-20) is accessed through the **System** menu (**System/Setup/ Setup System)**. Regardless of the functions that are enabled or disabled, all Setup System values are required to be entered. Several MBTS functions require the proper setting of these values for correct operation.

MBTS Setup System

The Nominal Frequency of 50 or 60 Hz and the CT Secondary Rating (1 or 5 Amp) has been configured at the factory and is indicated (grayed out and can not be changed). However, when an ISScom® "New File" is opened, the Nominal Frequency and CT Secondary Rating may be selected. Attempting to write a file to an MBTS that is not configured the same, will result in ISScom returning an error message.

■ **NOTE**: Communication must be established with the target MBTS for this procedure.

To setup the MBTS System perform the following:

1. From the ISScom Main Screen menu select **System/Setup/Setup System**. ISScom will display the Setup System screen (Figure 4-20).

■ **NOTE**: See Section 4.3, System Diagrams for Typical VT Three-Line Connection Diagrams.

2. Enter the Nominal Voltage.

   The Nominal Voltage setting (50 to 140 V) is needed for proper normalization of per unit quantities. Nominal Voltage for the following voltage connections is as follows:

   - Line-to-Line VT connections

   $V_{Nominal}$ = V Bus / VT Ratio

   - Line-to-Ground VT connections

   $V_{Nominal}$ = V Bus / ($\sqrt{3}$ VT Ratio)

3. Enter the Nominal Current. The secondary CT current of the phase CTS.
4. Select the Phase Rotation. (ABC or ACB).

■ **NOTE**: See Section 4.3, **System Diagrams** for Typical VT Three-Line Connection Diagrams.

5. Select the **S1/S2 VT Configuration** button. ISScom displays the S1/S2 VT Configuration selection screen (Figure 4-21).

   The S1/S2 VT Configuration allows the selection of the Source 1 and Source 2 voltage transformer configuration. When phase-ground (three-phase) is selected, the phase-to-phase single phase choices are grayed out and only one phase to ground choice can be made. When phase-to-phase (three-phase) is selected, the phase-to-ground single-phase choices are grayed-out and only one phase-to-phase choice can be made. Both Source 1 and Source 2 must have the same VT Configuration.

6. Select the desired S1 and S2 VT Configuration, then select **OK**, ISScom returns to the Setup System screen.
7. Select the **Bus VT Configuration** button. ISScom displays the Bus VT Configuration selection screen (Figure 4-23).

   Some selections are grayed-out depending on the Source 1/Source 2 selection. The Bus VT Configuration must have the same phase-to-ground or phase-to-phase selection as the Source 1/Source 2 configuration. If either of three-phase selections are chosen for the Source 1/ Source 2, then the bus must have the same configuration. However, if the Source 1/Source 2 single-phase selection is chosen then the bus configuration can be either the same single-phase or the three-phase.

   For example, if the Source 1/Source 2 selection is phase-to-phase (three phase), then the bus must use the same phase-to-phase (three-phase) configuration. If the Source 1/Source 2 selection is phase-to-phase (single phase BC), then the bus choices will be phase-to-phase (single phase BC) or phase-to-phase (three phase).

8. Select the desired Bus VT Configuration, then select **OK**, ISScom will return to the Setup System screen.

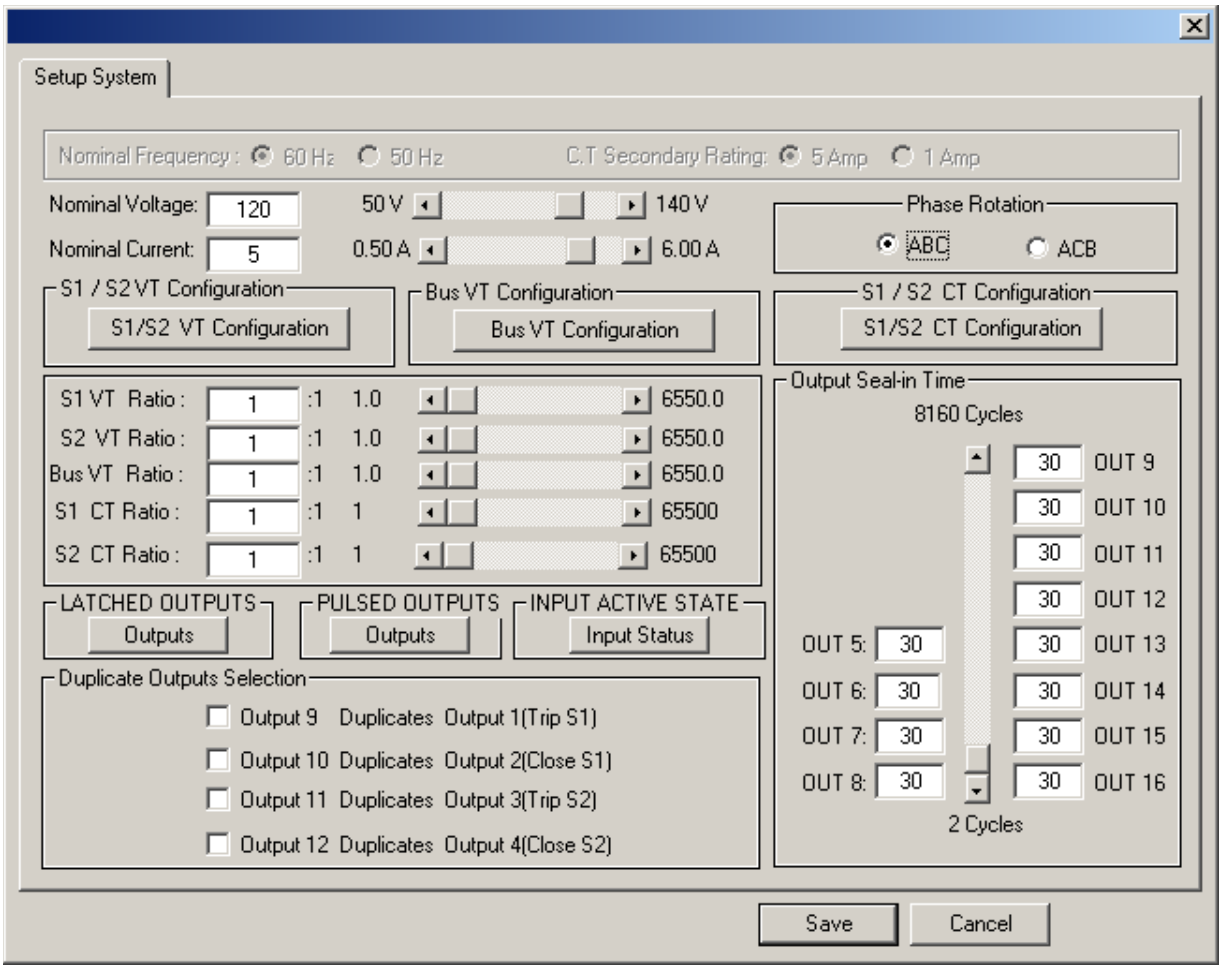


Figure 4-20 Setup System Dialog Screen

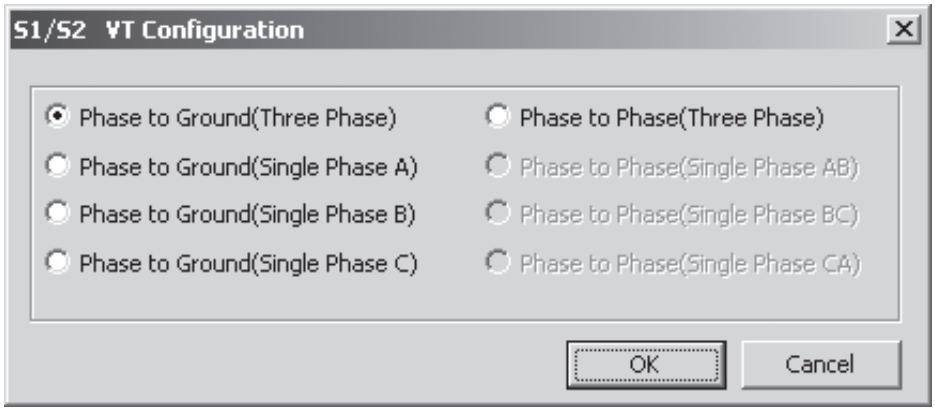


Figure 4-21 S1/S2 VT Configuration Selection Screen

9. Select the **S1/S2 CT Configuration** button. ISScom displays the S1/S2 CT Configuration Selection screen (Figure 4-22). The S1/S2 CT Confguration Selection is based on whether the S1 and S2 CTs are connected to the rear terminals of the MBTS. The default selection is “Yes” which includes the current values for S1 and S2 on the Single Line Diagram (Figure 3-20). Selecting “No” removes the S1 and S2 current elements from the Single Line Diagram.

10. Enter the VT and CT ratios.

    The VT and CT ratios are used only for monitoring and displaying system primary quantities.

    - Ratio of the Phase VTs
      Example: 13,800 V : 120 V = 13,800/120 = 115 : 1
    - Ratio of Phase CTs
      Example: 3,000 : 5 = 3000/5 = 600 : 1

■ **NOTE:** If neither pulsed or latched output is enabled, then the output contact will default to the Normal Mode. Normal Mode maintains the output contact energized as long as the condition that caused it to operate exists. After the actuating condition is cleared, the contact will reset after the programmed seal-in time has elapsed.

11. Select **Outputs** from the **LATCHED OUTPUTS** section of the System Setup screen. ISScom® will display the Latched Outputs Selection Screen (Figure 4-24).

    The Latched Outputs selection screen allows the user to select which outputs are latched when they are activated. Outputs 1 through 4 are the Trip and Close command outputs for the breakers and cannot be latched (the pulse length of these outputs are set in the Common Settings screen Figure 4-35). These outputs remain latched until reset by an ISScom command or by the HMI of the MBTS. When selected as Latched the output will be grayed out in the Pulsed Output Selection screen.

12. Select the desired outputs to be Latched, then select **OK**, ISScom will return to the Setup System screen.

■ **NOTE:** If neither pulsed or latched output is enabled, then the output contact will default to the Normal Mode. Normal Mode maintains the output contact energized as long as the condition that caused it to operate exists. After the actuating condition is cleared, the contact will reset after the programmed seal-in time has elapsed.

13. Select **Outputs** from the **PULSED OUTPUTS** section of the System Setup screen. ISScom will display the Pulsed Outputs Selection Screen (Figure 4-25).

    The Pulsed Outputs selection screen allows the user to select which outputs are pulsed when they are activated. The pulse width is defined in the Output Seal in time section of Figure 4-20, Setup System Dialog Screen. If pulse MBTS operation is selected, output will dropout after the seal-in delay expires, even if the condition which caused the MBTS to pick up is still out of band. When selected as Pulsed the output will be grayed out in the Latched Output Selection screen.

Outputs 1 through 4 are the trip and close command outputs for the breakers, the pulse length of these outputs are set in the Common Settings screen (Figure 4-35).

14. Select the desired outputs to be Pulsed, then select **OK**, ISScom will return to the Setup System screen.

15. Select **Input Status** from the **INPUT ACTIVE STATE** section of the System Setup screen. ISScom will display the Input Active States Selection Screen (Figure 4-26).

    This Input Active States selection screen allows the user to select the active input state for each input. Inputs 1, 2, 4 and 5 are the breaker status inputs which have predefined terminals for “a” and “b” contacts. Checking the inputs for the Active Input Open parameter designates the “operated” state established by an opening rather than closing an external contact.

For example: Checking Inputs 3 and 6 for the Active Input Close parameter designated the operated state of the breaker TOC, 52PS or 52H intelligence contact that is closed when the breaker is fully racked-in. If the breaker is not fully racked-in (in test position), the M-4272 will block any type of transfer.

16. Select the desired Active Input State for each Input, then select **OK**, ISScom will return to the Setup System screen.

17. Select the desired Duplicate Outputs.

    The Duplicate Outputs Selection feature (Figure 4-20) allows an additional output to be selected that will operate at the same time as the trip or close commands are issued to their assigned outputs. The duplicate output can provide additional trip and close outputs as needed.

18. Select the Output Seal In Time for each Output (2 to 8160 Cycles).

    The Output Seal-in Time provides the user with the ability to individually enter the seal-in time of each output. This setting is only used if the output has not been selected as a latched output. The seal-in time defines the time period that the output is closed even if the condition no longer exists.

19. When all Setup System parameters have been entered/selected, then select **Save**.

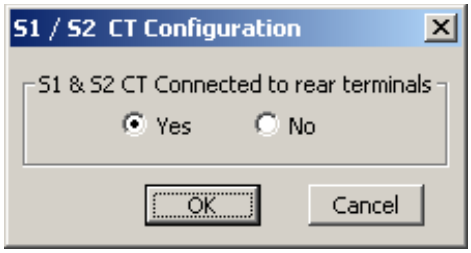


Figure 4-22 S1/S2 CT Configuration Selection Screen

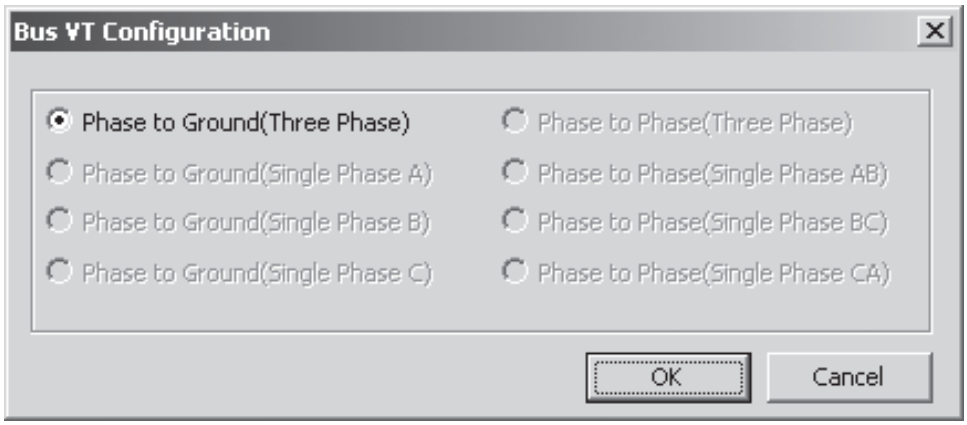


Figure 4-23 Bus VT Configuration Selection Screen

■ **NOTE:** If neither pulsed or latched output is enabled, then the output contact will default to the Normal Mode. Normal Mode maintains the output contact energized as long as the condition that caused it to operate exists. After the actuating condition is cleared, the contact will reset after the programmed seal-in time has elapsed.

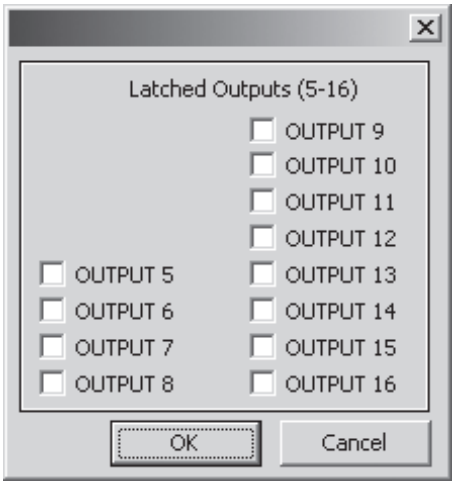


Figure 4-24 Latched Outputs Selection Screen

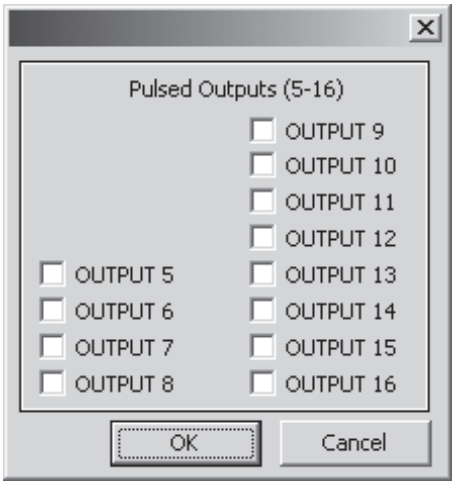


Figure 4-25 Pulsed Outputs Selection Screen

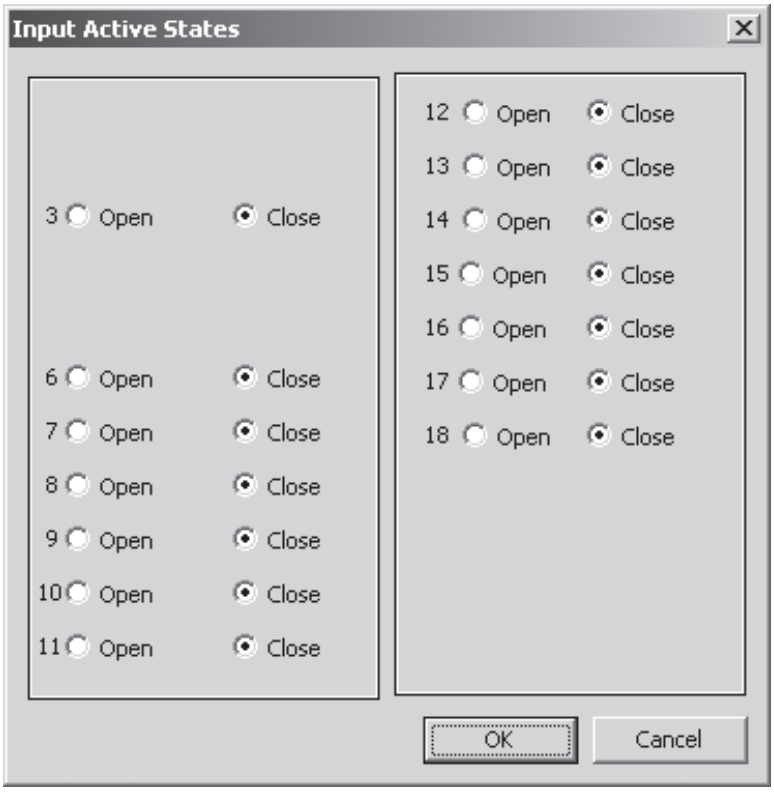
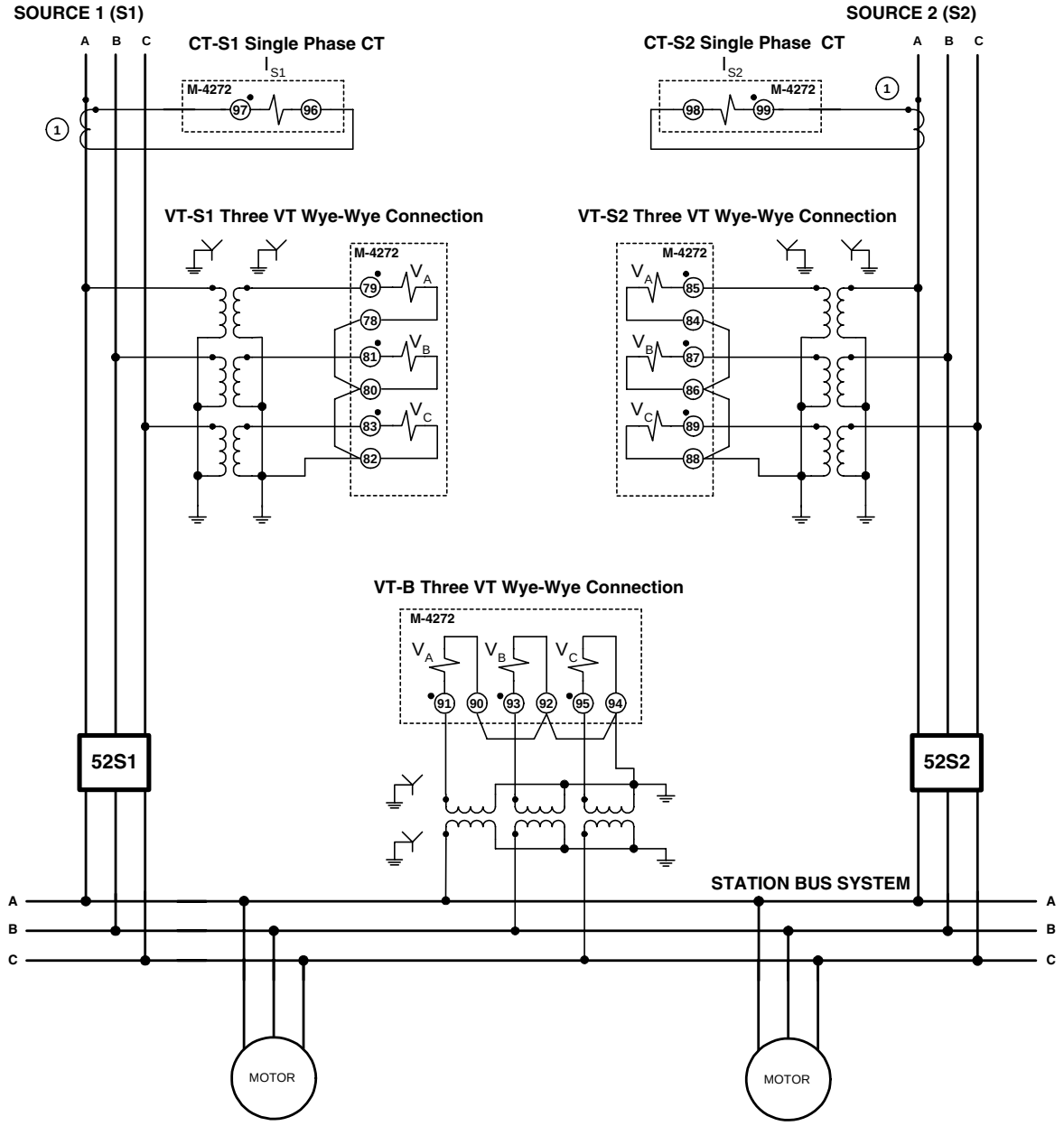


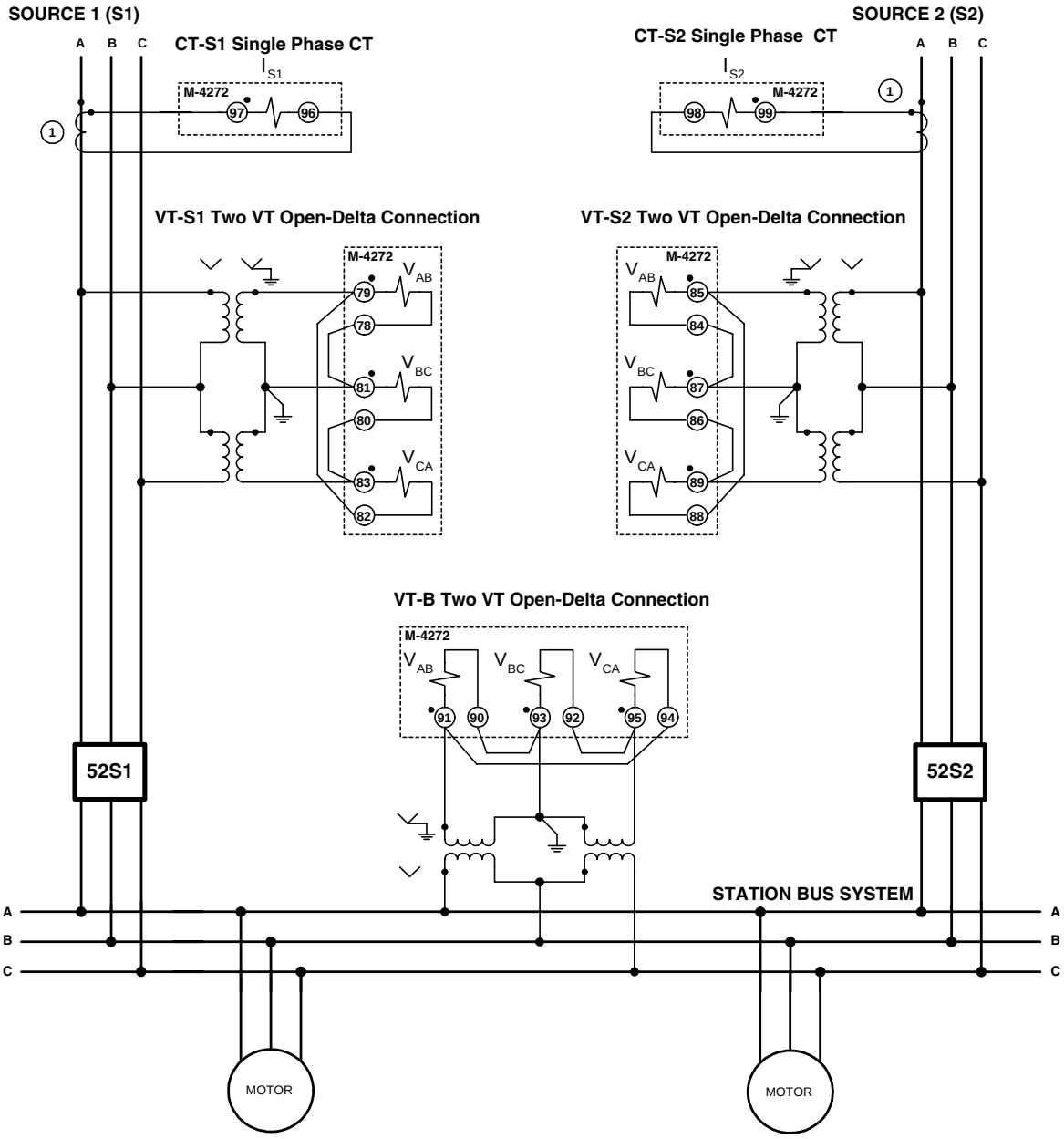
Figure 4-26 Input Active States Selection Screen

4.3 System Diagrams



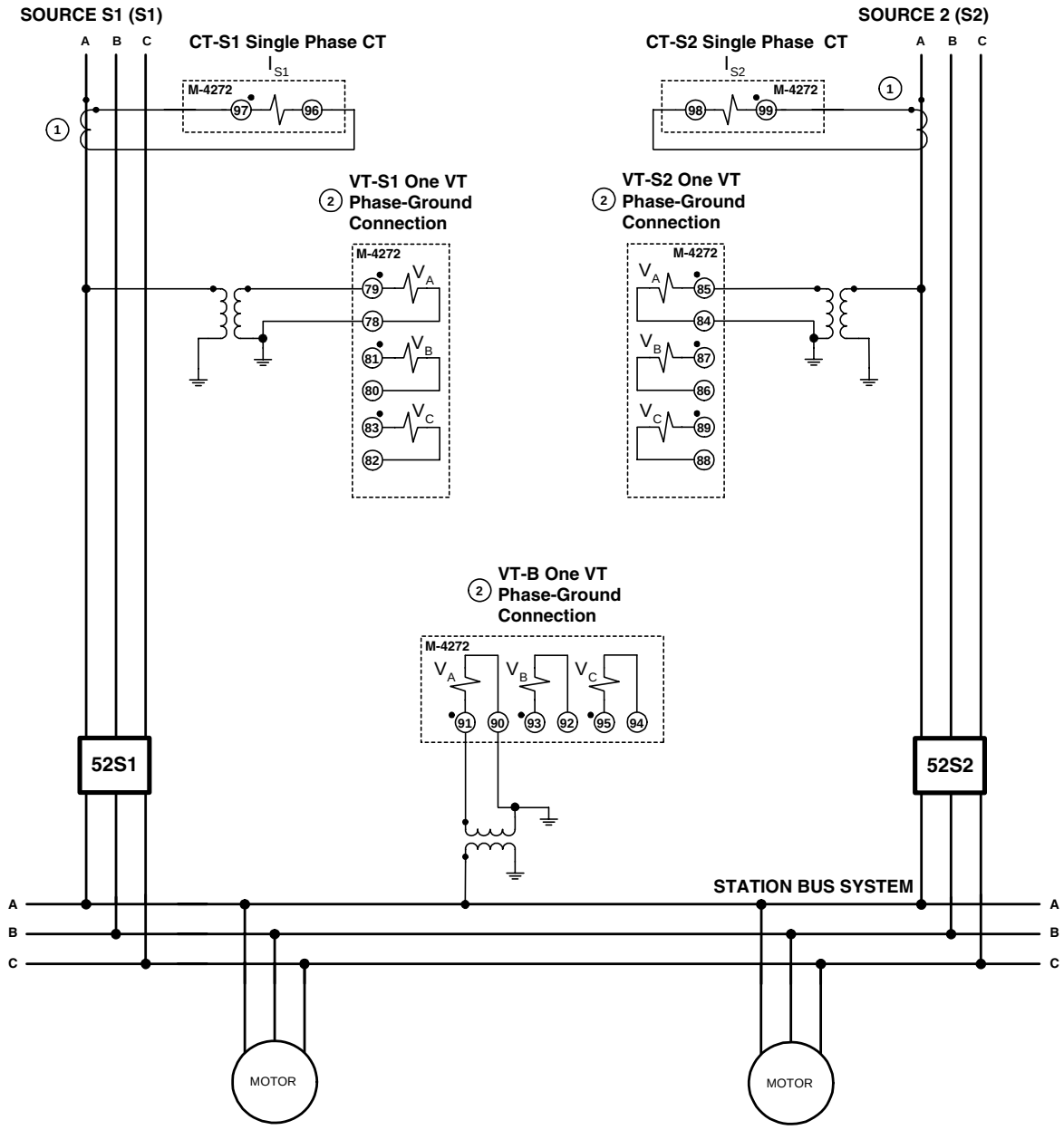
(1) CT-S1 and CT-S2 are single phase CTs. They both must be connected to the same phase, either Phase A, Phase B or Phase C.

Figure 4-27 Three-Phase Wye-Wye VT Three-Line Connection Diagram



(1) CT-S1 and CT-S2 are single phase CTs. They both must be connected to the same phase, either Phase A, Phase B or Phase C respectively.

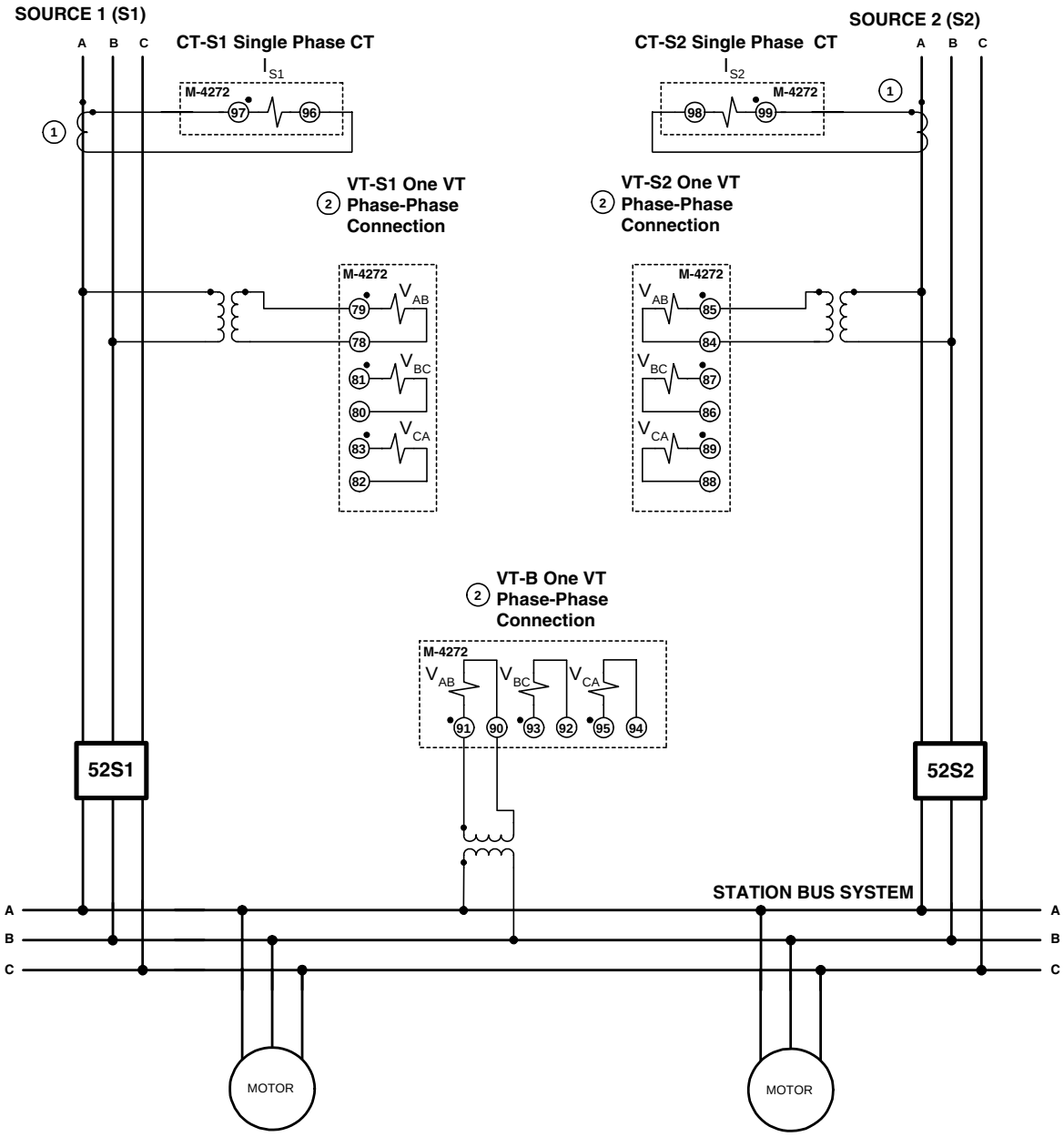
Figure 4-28 Three-Phase Open Delta VT Three-Line Connection Diagram



(1) CT-S1 and CT-S2 are single phase CTs. They both must be connected to the same phase, either Phase A, Phase B or Phase C.

(2) VT-S1, VT-S2 and VT-B are single phase VTs. They all must be connected to the same phase, either Phase A-To-Ground, Phase B-To-Ground or Phase C-To - Ground.

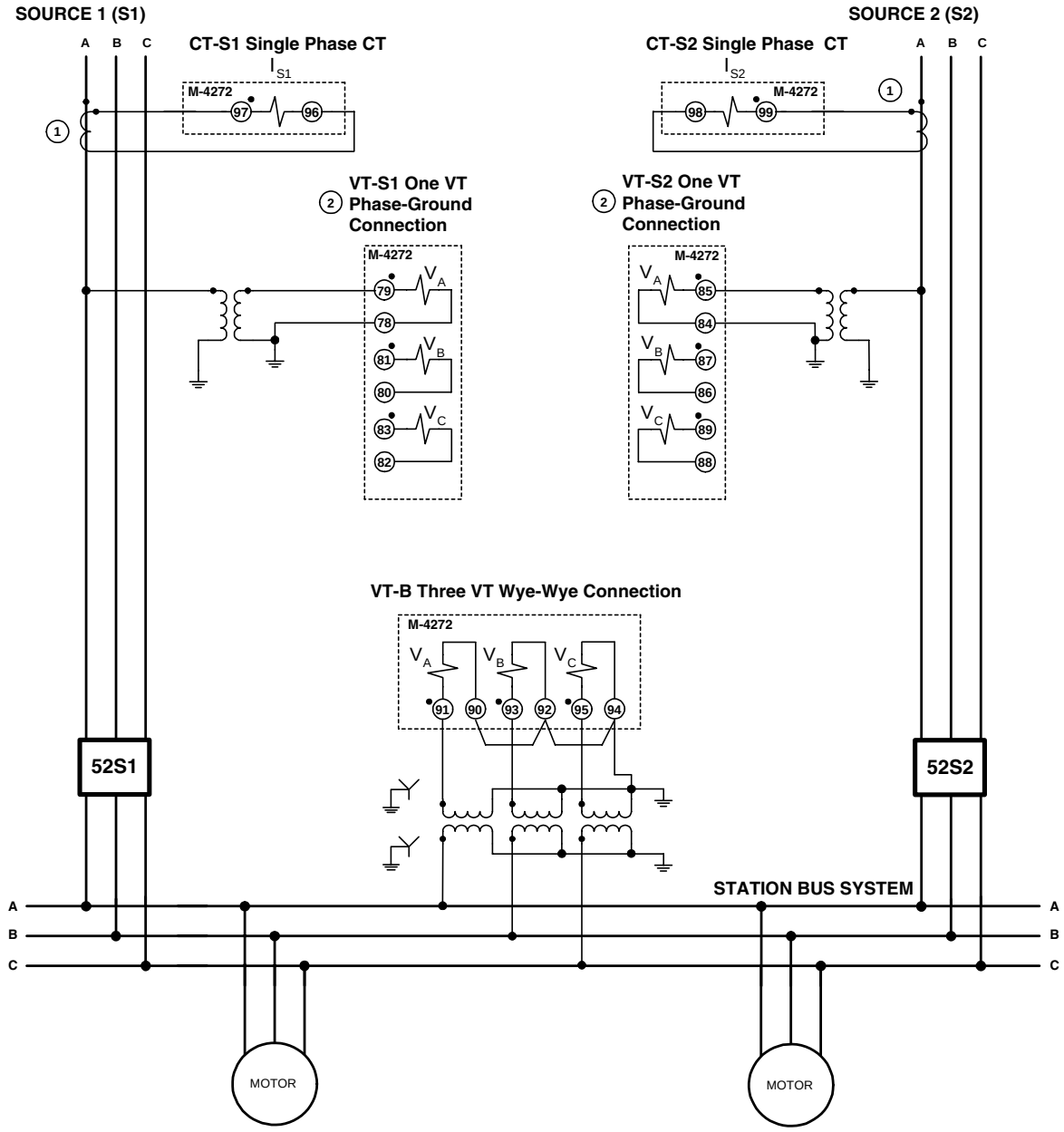
Figure 4-29 Single Phase, Phase-Ground VT Three-Line Connection Diagram



1 CT-S1 and CT-S2 are single phase CTs. They both must be connected to the same phase, either Phase A, Phase B or Phase C.

2 VT-S1, VT-S2 and VT-B are single phase VTs. They all must be connected to the same phase, either Phase A-To-Phase B, Phase B-To-Phase C or Phase A-To - Phase C.

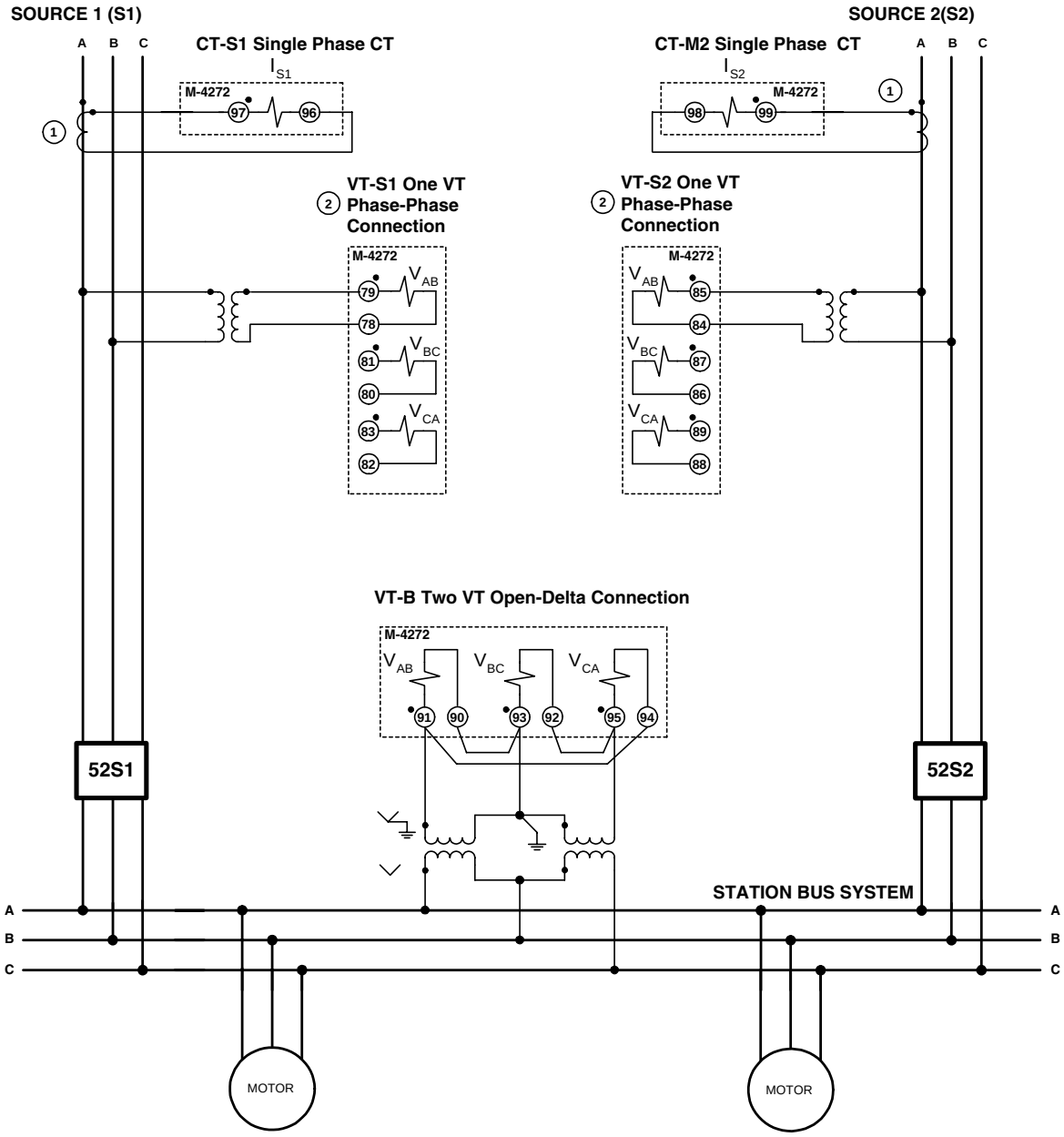
Figure 4-30 Single-Phase, Phase-Phase VT Three-Line Connection Diagram



(1) CT-S1 and CT-S2 are single phase CTs. They both must be connected to the same phase, either Phase A, Phase B or Phase C.

(2) VT-S1 and VT-S2 are single phase VTs. They both must be connected to the same phase, either Phase A-To-Ground, Phase B-To-Ground or Phase C-To - Ground.

Figure 4-31 Single-Phase Source Side, Phase-Ground, Three-Phase Bus Side, Wye-Wye Three-Line Connection Diagram



1 CT-S1 and CT-S2 are single phase CTs. They both must be connected to the same phase, either Phase A, Phase B or Phase C.

2 VT-S1 and VT-S2 are single phase VTs. They both must be connected to the same phase, either Phase A-To-Phase B, Phase B-To-Phase C or Phase A-To -Phase C.

Figure 4-32 Single-Phase Source Side, Phase-Phase, Three-Phase Bus Side Open Delta Three-Line Connection Diagram

4.4 System Setpoints

System Setpoints

The System Setpoints consist of defining all pertinent information regarding the system setpoints and transfer logic settings. The **M-4272 System Setpoints** dialog screen (Figure 4-33) is accessed through the **System** menu (**System/Setup/ Setpoints)**.

■ **NOTE**: Configuration Record Forms are contained in **Appendix A**. The Configuration Record Form tables list the System Setpoint parameters and the settings choices for each function.

The MBTS System Setpoints consists of entering the following:

- Selecting Transfer Logic and conditions including Automatic, Manual Transfer settings
- Enabling the functions and entering the desired settings
- Designating the output contacts each function will operate, and which control/ status inputs will enable or block the transfer.

The choices include 11 programmable output contacts (OUT5–OUT16) and six breaker status inputs (IN1–IN6) for Source 1 and Source 2, plus 12 other programmable inputs. A block or fixed time transfer choice for bus fuse loss logic operation.

The transfer settings for Automatic Transfers, Manual Transfers, Common Settings, control/status inputs and output contact assignments must be chosen before entering the settings for the individual functions.

Each of the individual submenus are described in the following pages. Settings for disabled functions do not apply. Some menu and setting screens do not appear for functions that are disabled. The System Setpoints can only be entered using the M-3872 software. See Section 1.2, **M-4272 Motor Bus Transfer System** for a listing of those Settings, Functions and Status values that are available from the front panel display and HMI.

The System Setpoints dialog screen contains two setting groups, the Transfer Settings and the Function Settings. The Transfer Settings group contains the settings that are necessary for transferring the motor bus load quickly and safely from one power source to another power source.

The Function Settings group contains settings that can initiate the transfer or are used as logic inputs to the transfer logic.

At the bottom of the System Setpoints dialog screen there are two additional selections:

- **Display All** — Selecting the Display All button displays the **All Setpoints Table** dialog screen (Figure 3-13). This dialog screen contains the settings for each MBTS function within a single window to allow scrolling through all MBTS setpoint and configuration values.
- **Configure** — Selecting the Configure button displays the Configure dialog screen (Figure 3-14), which contains a chart of programmed input and output contacts, in order to allow scrolling through all MBTS output and blocking input configurations.

Both dialog screens (All Setpoints Table and Configure), feature Jump Command Buttons which allow the user to jump from a scrolling dialog screen to an individual MBTS function dialog screen and return to the scrolling dialog screen. All available parameters can be reviewed or changed when jumping to a MBTS configuration dialog screen from either scrolling dialog screen.

The Transfer Settings group includes four menus. The Common Settings submenu contains settings that are used by the Automatic Transfer, Manual Transfer and Automatic Trip Logic. For example, some of the common settings are the Breaker Closing Time, Trip and Close Pulse Lengths and New Source Voltage Limits. These and other settings are used whether an Automatic or Manual Transfer is performed. Therefore, the settings in the Common Settings submenu must be entered for a transfer to operate correctly.

TRANSFER SETTINGS

COMMON SETTINGS (CS)

Path: System/Setup/Setpoints/Common Settings

The Common Settings selection from the Transfer Settings group (Figure 4-33) opens the Common Function Settings Dialog screen (Figure 4-34), which includes the Common Function Settings, Inputs and Outputs tabs.

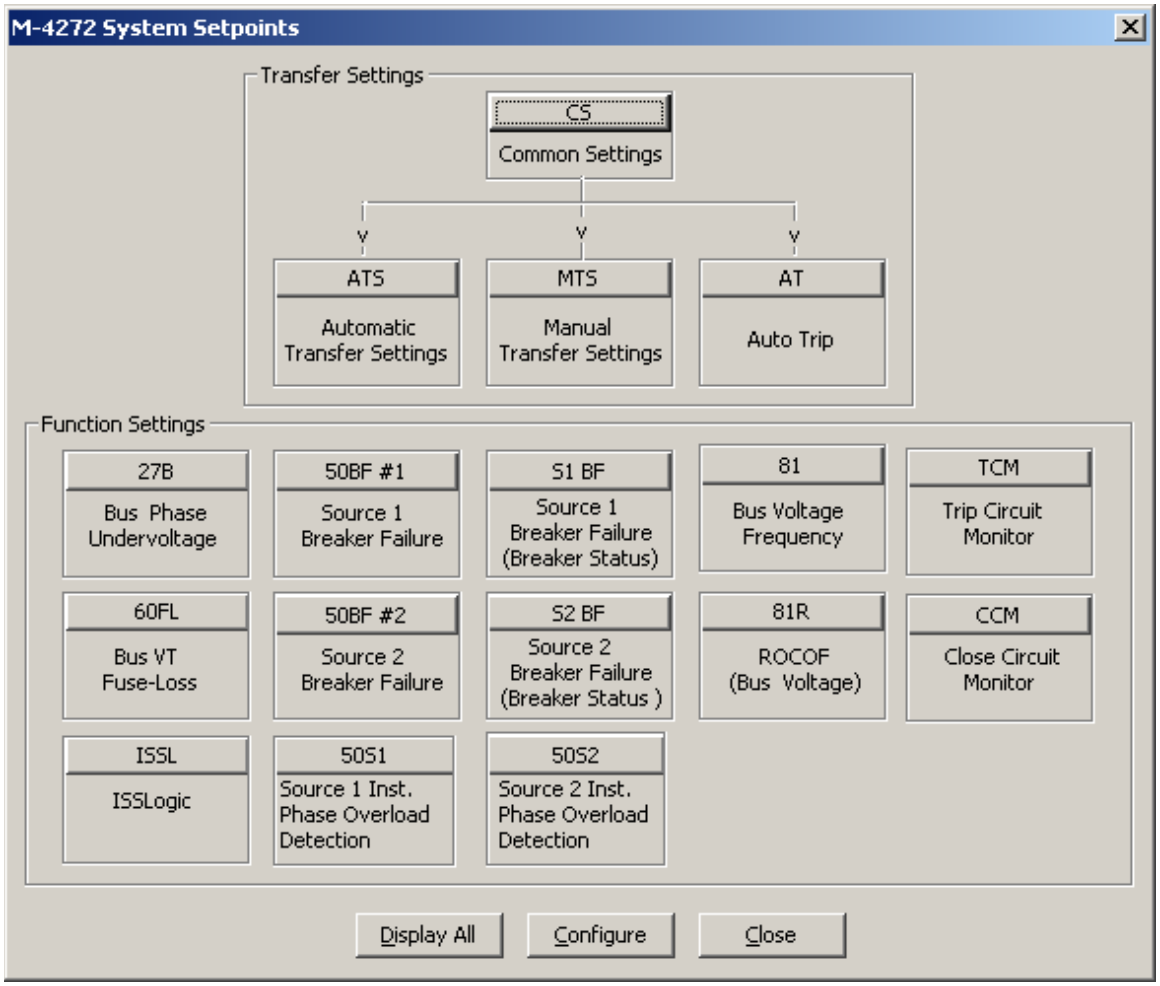


Figure 4-33 System Setpoints Dialog Screen

COMMON SETTINGS/COMMON FUNCTION SETTINGS TAB

Path: System/Setup/Setpoints/Common Settings

Figure 4-34, illustrates the MBTS Common Function Settings found under the Common Function Settings Tab on the Common Function Settings dialog screen.

Common Settings/Transfer Mode

Transfer Mode can be selected as either Simultaneous or Sequential:

- **Simultaneous** — With a transfer initiated, within 10 ms of transfer initiate, all three methods of transfer, Fast, Delayed In-Phase and Residual Voltage Transfer are immediately enabled to supervise closure of the new source breaker without waiting for the breaker status contact confirmation that the old source breaker has opened. At the same instant, the commands for the old source breaker and the new source breaker to trip and close are sent simultaneously if and only if the phase angle between the motor bus and the new source is within the delta phase angle limit for the Fast Transfer Method immediately upon transfer initiation. However only the Fixed Time Transfer is enabled 30 cycles after the old source breaker has opened. Refer to **Appendix F**, Transfer Logic Time Sequence for Timing Sequence of Transfer Logic in Simultaneous Transfer Mode.

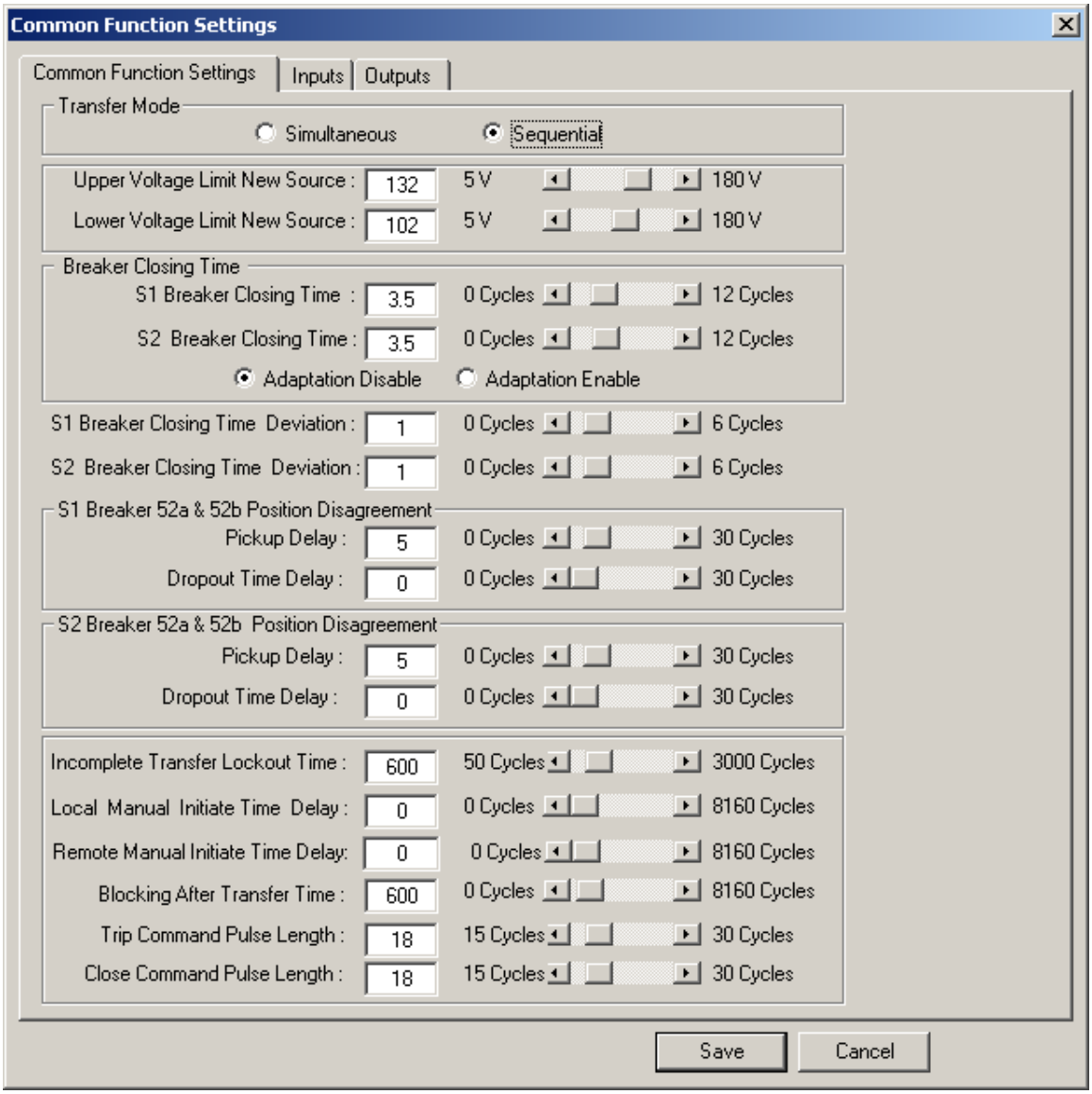


Figure 4-34 Common Function Settings Dialog Screen

- **Sequential** — With a transfer initiated, the command to trip the old source breaker is sent within 10 ms. Upon confirmation from the old source breaker status contact that the old source breaker is open. Within 4ms of receipt of this confirmation, all three transfer methods, Fast, Delayed In-Phase Transfer and Residual Voltage Transfer are enabled to supervise closure of the new source breaker and the Fixed Time Transfer is enabled 30 cycles later. Refer to **Appendix F**, Transfer Logic Time Sequence for Timing Sequence of Transfer Logic in Sequential Transfer Mode.

Common Settings/Upper-Lower Voltage Limit New Source

This setting defines the upper and lower voltage limits of the new source. If the new source voltage is not within these limits, then a transfer is blocked.

If a transfer is blocked and an initiate transfer signal is received, the transfer is not started (no trip or close command is sent to the supply breakers). This prevents a transfer to a new source that does not meet the voltage requirements established by the Upper and Lower Voltage Limits. The result is that the motor bus will lose power when the protective MBTS trips the supply breaker and initiates a transfer to the new source at the same time. Since the existing power is being tripped (due to some abnormality) and the new source is outside of the setting range, a transfer will not occur and the motor bus will lose power.

Common Settings/Breaker Closing Time

The Breaker Closing Time setting defines the breaker closing time (the time period from when the close command is issued to when the new source breaker status contact closes) of the Source 1 and Source 2 breakers that the MBTS is controlling. The breaker closing time is used during an In-phase transfer. The in-phase transfer sends the close command in advance of the phase coinsidence based on this breaker time and the rate of change of the frequency of the decaying motor bus.

The purpose of using the breaker closing time is to have the breaker actually close just at the time of the phase coinsidence setting is in cycles, so time changes based on frequency. The Adaptation feature, when selected calculates the S1 and S2 breaker closing times based on the average time of the Last 8 breaker operations. When initially selected, the selected breaker closing time will be used until eight breaker operations have been averaged. Breaker Closing Time setpoints cannot be changed while this feature is enabled.

Common Settings/S1(S2) Breaker Closing Time Deviation

The S1(S2) Breaker Closing Time Deviation setting establishes when the breaker has exceeded the normal expected variations, plus or minus from the programmed closing time.

When the Breaker Closing Time Deviation setting is exceeded a “S1/S2 Breaker Closing Time Out of Range” indicator on the System Status section of the Secondary Metering and Status screen will be activated. Activation of this indicator would indicate that the breaker may require maintenance.

Common Settings/S1(S2) Breaker 52a & 52b Position Disagreement

The S1 Breaker 52a & 52b Position Disagreement settings define the time the 52a and 52b breaker status contacts of the same breaker are allowed to be in the same state before the MBTS responds to that condition. If the 52a and 52b contacts on the same breaker are both closed or both open, then transfers are blocked. The Pickup Time is the time that both breaker status contacts are either closed or both open before the unit responds to that condition. The Pickup Time allows for possible overlap of the contacts as the breaker changes position. The Dropout Time Delay is the time period for the MBTS to consider the breaker status contact inputs in the same state after they are no longer in the same state. This setting is only applicable when both the 52a and 52b breaker status contacts are connected to the MBTS.

Common Settings/Incomplete Transfer Lockout Time

The Incomplete Transfer Lockout Time setting establishes the time period in which an Automatic Transfer must be completed. The time period is defined as the time at which the transfer is initiated until the transfer is complete.

If a transfer is not completed within the Incomplete Transfer Lockout Time period the following MBTS actions will occur:

1. The status of the target breaker will be set by this timer.
2. The MBTS will stop attempting to finish the present transfer.
3. The MBTS will enter into a lockout condition.
4. The Lockout Blocking contact (output 8) will change state and any subsequent transfer initiate commands will be ignored.

This feature keeps the unit from operating until the cause of the incomplete transfer is determined. It also prevents the unit from un-expectedly closing at a later time when the conditions would allow a close.

Common Settings/Local Manual Initiate Time Delay

The Local Manual Initiate Time Setting establishes the time delay before a locally initiated Manual Transfer actuates.

The manual local transfer can be initiated in either the Remote or Local mode of operation. The purpose of this time delay is to allow personnel initiating the transfer to move away from the front of the switchgear that would be operating during the transfer. This assumes that the M-4272 is physically located on the switchgear. Typically, manual transfers occur when the motor bus load is being transfered from one source to another and the conditions are stable and a time delay would have no effect on if the transfer is successful. This feature should **not** be used if there is any difference in frequency or fluctuating voltage amplitudes.

Common Settings/Remote Manual Initiate Time Delay

▲ **CAUTION:** This feature should NOT be used if there is any difference in frequency or fluctuating voltage amplitudes.

The Remote Manual Initiate Time Setting establishes the time delay before a remotely initiated Manual Transfer actuates.

The Remote Manual Transfer can be initiated in Remote mode of operation. The purpose of this time delay is to allow personnel initiating the transfer to move away from the front of the switchgear that would be operating during the transfer. This assumes that the remote manual initiate pushbutton is physically located on the switchgear. Typically, manual transfers occur when the motor bus load is being transferred from one source to another and the conditions are stable and the time delay would have no effect if the transfer is successful.

Common Settings/Blocking After Transfer Time

The Blocking After Transfer Time setting establishes the time delay after a transfer has been completed before another transfer is possible. During this time period, all initiate commands are ignored. The initiate commands are not stored or remembered, the initiate command will only be recognized after this block time. The purpose of this feature is to prevent an immediate automatic transfer back to an unviable source. In addition, the new source voltage may dip due to the motor bus load being connected. This dip in voltage could cause the 27B Bus Phase Undervoltage (internal or external) to trigger a transfer.

Common Settings/Trip Command and Close Command Pulse Length

Path: System/Setup/Setpoints/Common Settings

The Trip Command and Close Command Pulse Length settings establish the length of the trip and close outputs.

Common Settings Save/Cancel — The Save selection (Figure 4-34) saves the Common Function Settings Tab Settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

COMMON FUNCTION SETTINGS INPUTS TAB

Path: System/Setup/Setpoints/Common Settings/Input

Figure 4-35, illustrates the MBTS Common Function Settings found under the Inputs Tab on the Common Function Settings dialog screen.

Common Settings/Breaker Status Inputs

The Breaker Status Inputs section provides the user with the ability to select the type of 52 breaker status contact being used for Source 1 and Source 2. One of the three choices presented must be selected, the 52a, or 52b or both 52a and 52b. Only one choice for each breaker can be selected. The selection must match the physical connections to the unit for proper operation.

The 52a and 52b breaker status input contacts need to be breaker auxiliary contacts that change state whenever the breaker closes/opens and when the breaker is in test or fully racked-in (connected) positions. During commissioning, when a bus transfer test is simulated, the M-4272 needs to see the 52a and 52b contacts change state even when the breaker is in test position.

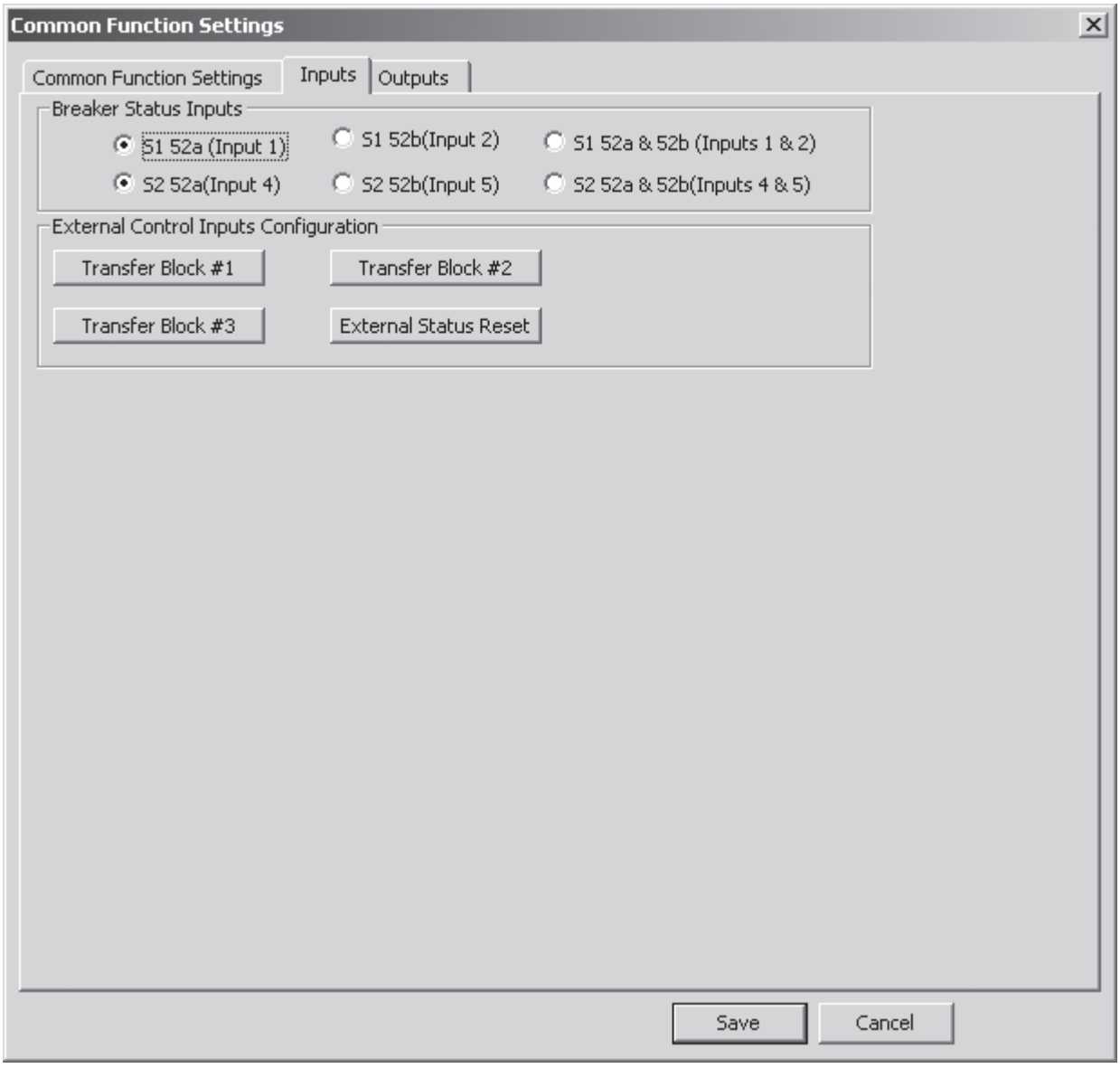


Figure 4-35 Common Function Settings Inputs Dialog Screen

Common Settings/External Control Inputs Configuration

The External Control Inputs Configuration section includes four selections:

- Transfer Block #1
- Transfer Block #2
- Transfer Block #3
- External Status Reset

Common Settings/Transfer Block #1 (#2, #3)

The Transfer Block #1, #2 and #3 provide three possible inputs to be used to block transfers. When the Transfer Block #1 button is selected the Transfer Block #1 Inputs dialog screen is displayed (Figure 4-36).

The desired input or inputs for blocking can be selected. The same is true for Transfer Block #2 and Transfer Block #3 dialog screens. Once an input has been selected it will be grayed out on the other dialog screens since it has already been assigned.

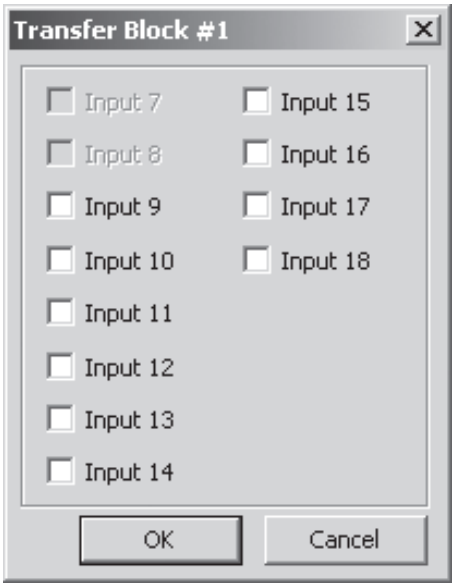


Figure 4-36 Transfer Block #1 Input Dialog Screen

Common Settings/External Status Reset

This feature allows the user to select the external input to be used to reset the system status and any selected latched outputs. When the External Status Reset button is selected the External Status Reset Input Selection dialog screen is displayed (Figure 4-37).

Only one input can be selected. When an input is selected it will be grayed out in other dialog boxes which allow selection of inputs for different functions.

Common Function Inputs Save/Cancel — The Save selection (Figure 4-35) saves the Common Function Settings Input Tab settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

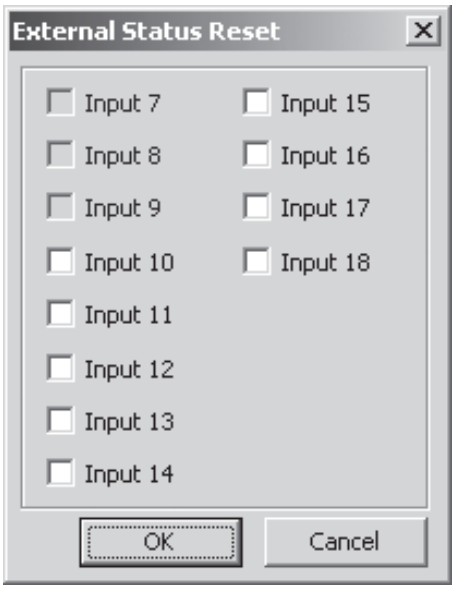


Figure 4-37 External Status Input Selection Dialog Screen

COMMON SETTINGS OUTPUTS TAB

Path: System/Setup/Setpoints/Common Settings/ Outputs

Figure 4-38, illustrates the MBTS Common Function Settings found under the Outputs Tab on the Common Function Settings dialog screen.

Common Settings/Auto Fast Transfer Ready Outputs

The Auto Fast Transfer Ready Outputs feature (Figure 4-38) allows the user to select one or more outputs (Figure 4-39) to indicate when the Automatic Fast transfer is ready.

The conditions that are necessary for a Fast Transfer to be ready to execute are:

- No lockout/blocking conditions exist.
- The phase angle between the Motor Bus and the New Source is within limit setting.
- The Delta Voltage between the Motor Bus and the New Source is within limit setting.
- The Delta Frequency between the Motor Bus and the New Source is within limit setting.

If a transfer is initiated and there are no Lock/ Blocking conditions or the conditions for an Auto Fast Transfer are not true, then a Fast transfer would not occur. The trip command would be sent, but the close command would not occur until conditions would allow an in-phase, residual or fixed time transfer.

When an output is selected it will be grayed out in other output selection dialog boxes.

Common Function Settings/Manual Fast Transfer/Hot Parallel Ready Outputs

The Manual Fast Transfer/ Hot Parallel Ready Outputs feature (Figure 4-38) allows the user to select one or more outputs (Figure 4-40) to indicate when the Manual Fast Transfer/Hot Parallel Ready Outputs are ready.

The conditions that are necessary for a Manual Fast Transfer/Hot Parallel to be ready to execute are as follows:

- No Lockout/Blocking conditions exist.
- The Phase Angle between the Motor Bus and the New Source is within limit setting.
- The Delta Voltage between the Motor Bus and the New Source is within limit setting.
- The Delta Frequency between the Motor Bus and the New Source is within limit setting.

If a transfer is initiated and there are no Lock/ Blocking conditions or any of the conditions for a Manual Fast Transfer are not true, then a Fast Transfer would not occur. The Manual Transfer trip command would be sent, but the close command would not occur until the conditions would allow an In-Phase, Residual or Fixed Time Transfer. For the Hot Parallel Transfer, when a Manual Hot Parallel Transfer is attempted and one of the parameters is outside of the setting, the close command is not sent if transfer conditions are not met. If conditions are not met before the incomplete transfer block timer expires, then an Incomplete Transfer Blocked Indication will be displayed.

When an output is selected it will be grayed out in other output selection dialog boxes.

Common Settings/Transfer Ready Outputs

The Transfer Ready Outputs feature (Figure 4-38) allows the user to select one or more outputs (Figure 4-41) to indicate when the Transfer Ready Outputs are ready.

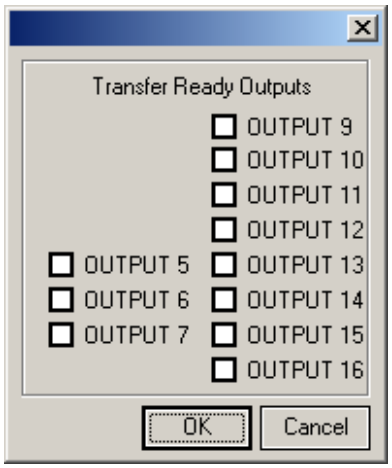


Figure 4-41 Transfer Ready Output Selection Dialog Screen

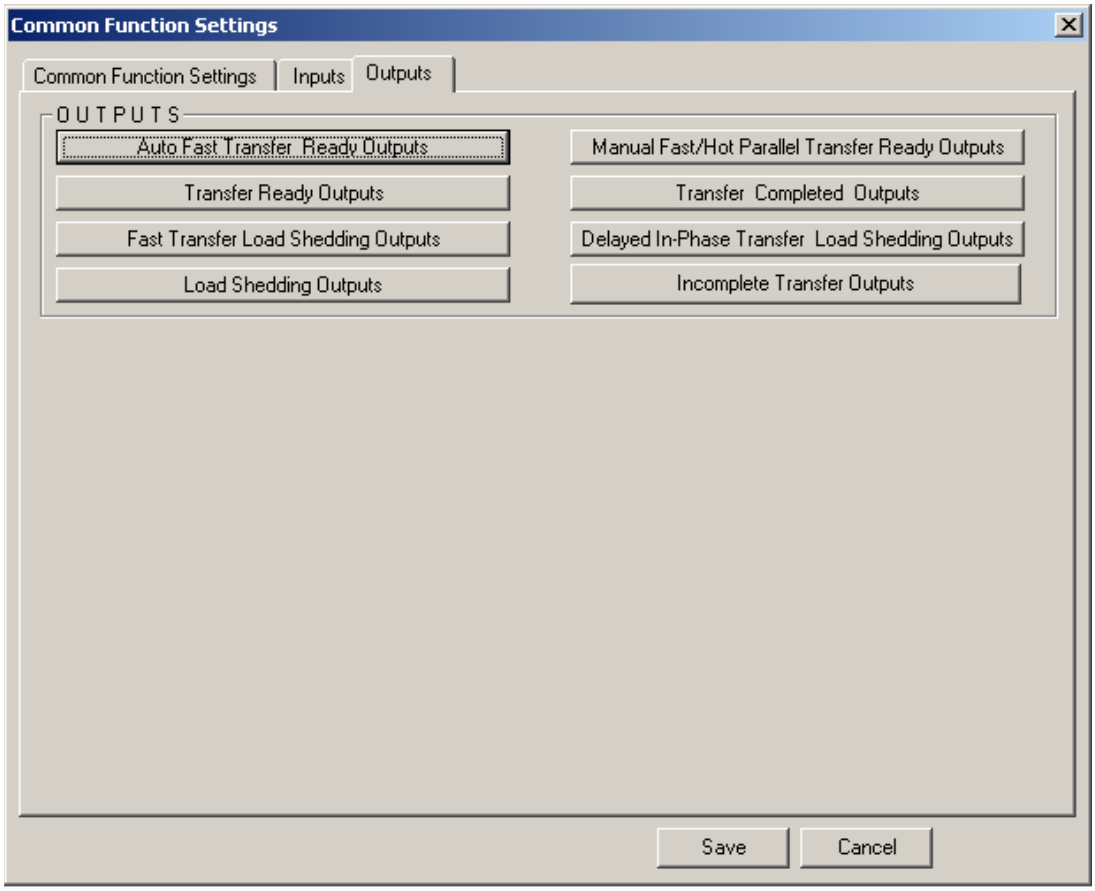


Figure 4-38 Common Function Settings Outputs Dialog Screen

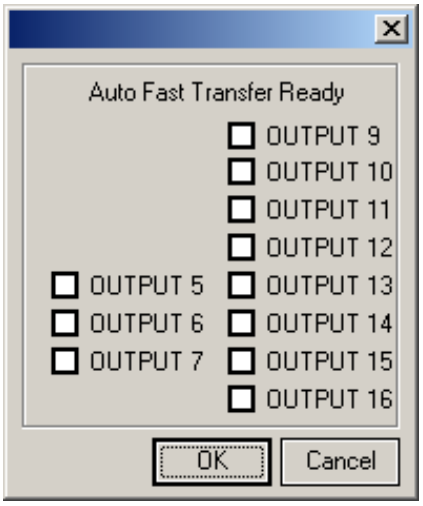


Figure 4-39 Auto Fast Transfer Ready Output Selection Dialog Screen

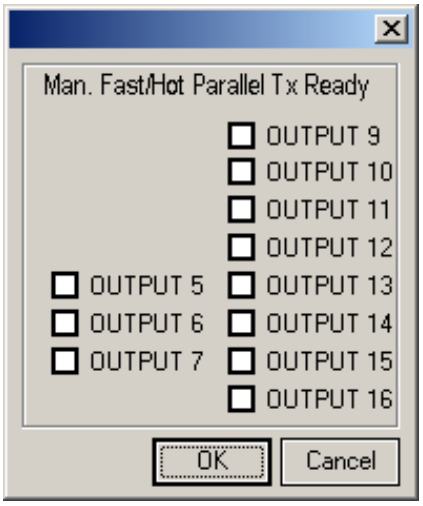


Figure 4-40 Manual Fast Transfer/Hot Parallel Ready Output Selection Dialog Screen

The Transfer ready indication only indicates that there are no blocking conditions, it does not indicate the Delta Phase Angle, Delta Frequency, or Delta Voltage parameters are within the settings of the Automatic or Manual Transfer settings. If a transfer is initiated when there were any Lockout/Blocking conditions present, then the transfer will be blocked. The trip command would *not* be sent.

One or more outputs can be selected to indicate when an Automatic or Manual Transfer is ready. A Transfer Ready indication is given when there are no Lockout/Blocking conditions. Lockout/Blocking conditions that will prevent a transfer are:

- Voltage Blocking — If prior to a transfer, the new source voltage exceeds the Upper or Lower Voltage Limits, all transfers are blocked as long as the voltage remains outside these limits.
- External Blocking — When any external blocking control input contact is closed, all transfers are blocked.
- Incomplete Transfer Lockout — Blocks any transfer initiated by a protective MBTS initiate, or an automatic initiated transfer or a manual transfer if the last transfer was not completed within the time delay. A time delay can be set from 50 to 3000 Cycles. The MBTS remains in the lockout condition until manually reset.
- Bus VT Fuse Loss Blocking — Transfer is blocked if the user has selected Bus VT Fuse Loss to block transfers and the MBTS detects a Bus VT Fuse Loss (60FL).
- Both Breakers Same State Blocking — If both breaker status contacts are in the open state, due to an external operation that opens the second breaker while leaving the first one open, and if the Auto Close feature is not selected, no transfer sequence is initiated.

  Furthermore, any subsequent initiation of a transfer sequence while the breakers are in this state is inhibited. If both breaker status contacts are closed due to an external operation that closes the second breaker while leaving the first one closed, and if the auto trip feature is disabled, no transfer sequence is initiated.
- Transfer in Process Blocking — When a transfer is in process, any other transfer initiate inputs will be ignored until the original transfer is complete.
- Blocking After Transfer — After a transfer has been completed, any additional transfers are blocked for 0 to 8160 cycles, as selected by the user.
- Trip/Close Circuit Open Blocking — Transfer is blocked if the Trip or Close Circuit Open is detected.
- 52a and 52b Position Disagreement Blocking — Transfer is blocked when the 52a and 52b status input positions disagree (applicable when both 52a and 52b status inputs are used).

When an output is selected it will be grayed out in other output selection dialog boxes.

Common Settings/Transfer Completed Outputs

The Transfer Completed Outputs feature (Figure 4-38) allows the user to select one or more outputs (Figure 4-42) to indicate which output is to be used to indicate when a transfer has been completed.

Typically this output would be configured as a latched output so it would remain closed like a target to indicate that a transfer had been completed.

When an output is selected it will be grayed out in other output selection dialog boxes.

Common Settings/Fast Transfer Load Shedding Outputs

The Fast Transfer Load Shedding Outputs feature (Figure 4-38) allows the user to select one or more outputs (Figure 4-43) to indicate which output is to be used for Fast Transfer Load Shedding.

The Fast Transfer Load Shedding command is sent at the same time as the Trip command for either Simultaneous or Sequential modes of transfer.

When an output is selected it will be grayed out in other output selection dialog boxes.

Common Settings/Delayed In-Phase Transfer Load Shedding Outputs

The Delayed In-Phase Transfer Load Shedding Outputs feature (Figure 4-38) allows the user to select one or more outputs (Figure 4-44) to indicate which output is to be used for Delayed In-Phase Transfer Load Shedding.

The Delayed In-Phase Transfer Load Shedding command is sent at the end of the Fast Transfer time window if a fast transfer has *not* been completed. The purpose of this load shedding output is to disconnect some loads so there will be a better possibility of completing an In-Phase Transfer. There may be a load that would cause the motor bus to decay very quickly if a Fast Transfer was not successful and it would be better to disconnect that load so the rest of the motor bus would have a better chance to complete an In-Phase transfer. Another purpose could be to disconnect a very sensitive load if a Fast Transfer is not possible.

When an output is selected it will be grayed out in other output selection dialog boxes.

Common Settings/Load Shedding Outputs

The Load Shedding Outputs feature (Figure 4-38) allows the user to select one or more outputs (Figure 4-46) to indicate which output is to be used for this Load Shedding.

The Load Shedding Function Selection also provides the ability to select one of 5 choices to be used to perform this load shedding feature. Typically Load Shedding occurs after the Fast and In-Phase Transfers have not been successful.

For the F27B#3, F81#1 or F81R#1 functions, when the settings are satisfied the selected load shedding output is closed. For Residual Voltage Transfer the Load Shedding Output is closed when the motor bus voltage drops below the Residual Voltage Limit. The close command for Residual Voltage Transfer is sent after the programmed load shedding time delay. For the Fixed Time Transfer the Load Shedding Output is closed when the Fixed Time Delay has timed out. The close command for the Fixed Time Delay Transfer is sent after the programmed load shedding time delay.

When an output is selected it will be grayed out in other output selection dialog boxes.

Common Settings/Incomplete Transfer Outputs — The Incomplete Transfer Outputs feature (Figure 4-38) allows user to select one or more outputs (Figure 4-45) to indicate which output is to be used to indicate when a transfer has been incomplete. Typically this output would be configured as a latched output so it would remain closed like a target to indicate that a transfer has been incomplete. When an output is selected it will be grayed out in the other output selection dialog.

Common Function Outputs Save/Cancel — The Save selection (Figure 4-38) saves the Common Function Settings Outputs Tab settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

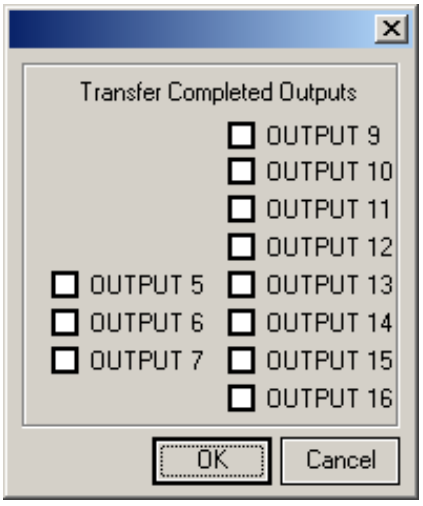


Figure 4-42 Transfer Completed Output Selection Dialog Screen

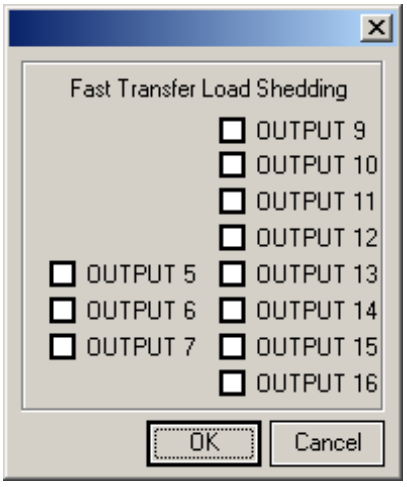


Figure 4-43 Fast Transfer Load Shedding Output Selection Dialog Screen

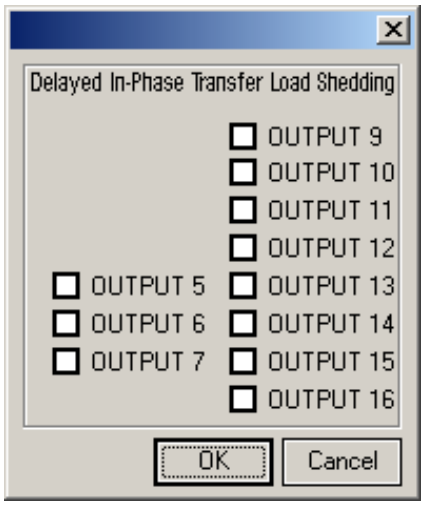


Figure 4-44 Delayed In-Phase Transfer Load Shedding Output Selection Dialog Screen

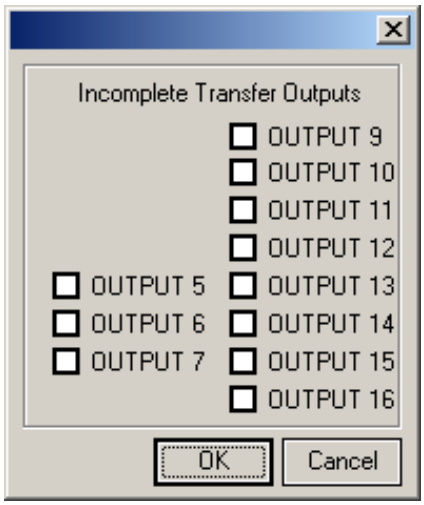


Figure 4-45 Incomplete Transfer Outputs Selection Dialog Screen

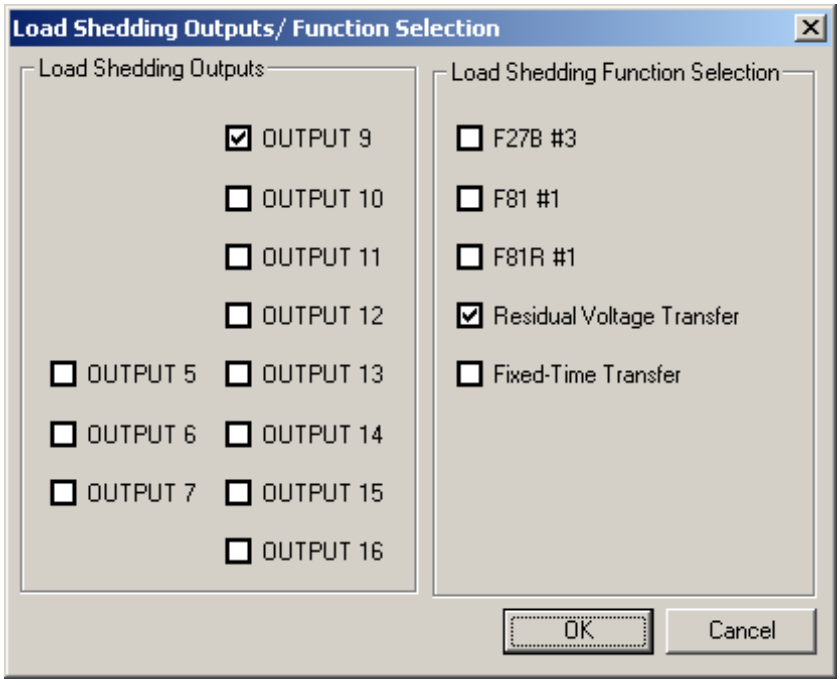


Figure 4-46 Load Shedding Output Selection Dialog Screen

AUTOMATIC TRANSFER SETTINGS (ATS)

Path: System/Setup/Setpoints/Automatic Transfer Settings

The Automatic Transfer Settings selection from the Transfer Settings group (Figure 4-33) opens the Automatic Transfer Settings dialog screen (Figure 4-47), which includes the following tabs:

- Setup
- Fast Transfer
- Delayed In-Phase Transfer
- Residual Voltage Transfer
- Fixed Time Transfer

AUTOMATIC TRANSFER SETTINGS SETUP TAB

Path: System/Setup/Setpoints/Automatic Transfer Settings/Setup

Figure 4-47, illustrates the MBTS Automatic Transfer Settings found under the Setup Tab on the Automatic Transfer Settings dialog screen.

Automatic Transfer Settings Setup Tab/Auto Transfer Mode

The Auto Transfer Mode (Figure 4-47) can be Disabled or Enabled. If Disable is selected and then Save is selected, then the remaining settings in the Automatic Transfer Settings dialog screen are grayed out.

HMI Auto Transfer Mode Enable/Disable

To enable or disable Auto Transfer from the Front Panel perform the following:

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.
   b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT    rmte_lcal
```

   c. Go to Step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT    rmte_lcal
```

4. Press the Right arrow pushbutton until the following is displayed:

```
AUTO TRANSFER
AUTO_XFER   man_xfer
```

5. Press **ENTER,** the following will be displayed:

```
AUTO TRANSFER
disable enable
```

6. Press the Left or Right arrow pushbutton as necessary to enable or disable Auto Tranfer (upper case).
7. Press **ENTER**. The following will be displayed:

```
AUTO TRANFER
AUTO X_FER  man x_fer
```

8. The MBTS is now in the selected Auto Tranfer Mode. Press **EXIT** as necessary to return to the Main Menu.

Automatic Transfer Settings Setup Tab/Both S1 & S2 Breakers Open

Both the S1 and S2 Breakers Open portion of the dialog screen (Figure 4-47) provides a selection for how the MBTS should respond when both the Source 1 and Source 2 breakers are open.

In normal operation either the Source 1 or the Source 2 break is closed. If the breaker that is closed is opened by an external operation when the Block Transfer is selected, then no transfer is performed by the M-4272. While this condition continues to exist any transfer initiated externally or internally will be blocked and no transfers will occur.

If the Auto Close feature has been selected, then if the breaker that was closed is opened by an external operation the other breaker will be closed. The breaker that is being closed will use the Fast Transfer, Delayed In-Phase Transfer, Residual Voltage transfer or Fixed Time Transfer settings of

the Automatic Transfer feature. The transfer method used will depend on how the motor bus voltage decays when the power source is disconnected. For example, assume the Source 1 breaker is closed and the Source 2 breaker is open. An operator accidentally opens the Source 1 breaker. The MBTS will close the Source 2 breaker based on the Automatic Transfer settings.

The Auto Close selection operates to transfer in either direction. The purpose is to permit a transfer when the normally-closed breaker is accidentally/ inadvertently tripped resulting in two open breakers. This operation is very similar to the regular transfer process except that it does not send out the trip command, since the second breaker is already open.

AUTOMATIC TRANSFER SETTINGS SETUP TAB/EXTERNAL CONTROL INPUTS CONFIGURATION

Path: System/Setup/Setpoints/Automatic Transfer Settings/Setup

The External Control Inputs Configuration portion of the Automatic Transfer Settings dialog screen (Figure 4-47) includes the following External Control Input configuration selections:

- Auto Transfer Block
- 86P-S1 Initiate (S1 to S2)
- 86P-S2 Initiate (S2 to S1)
- 27-S1 Initiate (S1 to S2)
- 27-S2 Initiate (S2 to S1)

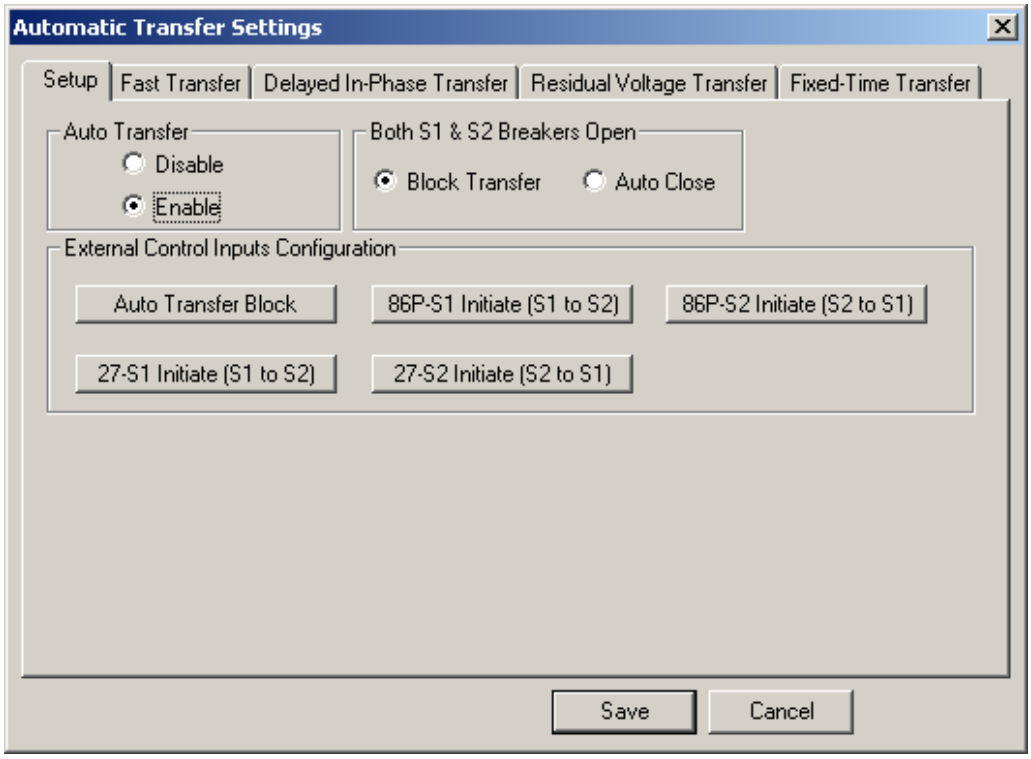


Figure 4-47 Automatic Transfer Settings Dialog Screen

Automatic Transfer/Auto Transfer Block

The Auto Transfer Block selection opens the Auto Transfer Block dialog screen (Figure 4-48) that allows the user to select an input that is used to block Automatic Transfers. When an input has been selected it will be grayed out in other dialog screens that provide input selection since it has already been assigned.

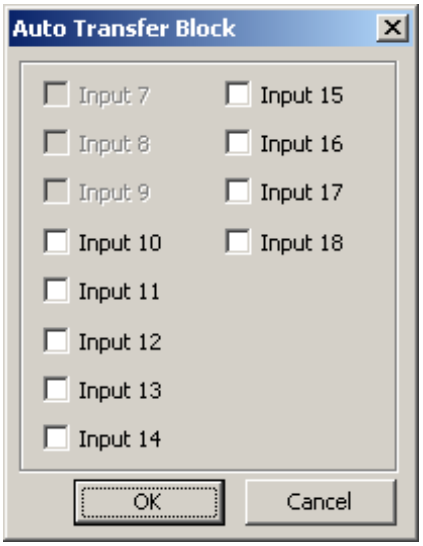


Figure 4-48 Automatic Transfer Block Input Settings Dialog Screen

Automatic Transfer/86P-S1 Initiate (S1 to S2)

The 86P-S1 Initiate (S1 to S2) opens a dialog screen similar to Figure 4-48 that allows the user to select an input that is used to initiate Automatic Transfers from an 86P Lockout MBTS.

The selected input will initiate an Automatic Transfer from Source 1 to Source 2. If the Source 2 breaker is closed and the Source 1 breaker is open the transfer is blocked since the breakers are in the wrong positions for this transfer, the transfer is ignored. Since Automatic Transfers can occur in either direction, a separate Transfer Initiate Input is needed.

When an input has been selected it will be grayed out in other dialog screens that provide input selection since it has already been assigned.

Automatic Transfer/86P-S2 Initiate (S2 to S1)

The 86P-S2 Initiate (S2 to S1) opens a dialog screen similar to Figure 4-48 that allows the user to select an input or inputs that are used to initiate Automatic Transfers from an 86P Lockout MBTS.

The selected input will initiate an Automatic Transfer from Source 2 to Source 1. If the Source 1 breaker is closed and the Source 2 breaker is open the transfer is blocked since the breakers are in the wrong positions for this transfer and the transfer is ignored. Since Automatic Transfers can occur in either direction, a separate Transfer Initiate Input is needed.

When an input has been selected it will be grayed out in other dialog screens that provide input selection since it has already been assigned.

Automatic Transfer/27-S1 Initiate (S1 to S2)

The 27-S1 Initiate (S1 to S2) opens a dialog screen similar to Figure 4-48 that allows the user to select an input or inputs that are used to initiate Automatic Transfers from an external 27 device.

The selected input will initiate an Automatic Transfer from Source 1 to Source 2. If the Source 2 breaker is closed and the Source 1 breaker is open the transfer is blocked since the breakers are in the wrong positions for this transfer and the transfer is ignored. Since Automatic Transfers can occur in either direction a separate Transfer Initiate Input is needed.

When an input has been selected it will be grayed out in other dialog screens that provide input selection since it has already been assigned.

Automatic Transfer/27-S2 Initiate (S2 to S1)

The 27-S2 Initiate (S2 to S1) opens a dialog screen similar to Figure 4-48 that allows the user to select an input or inputs that are used to initiate Automatic Transfers from an external 27 device.

The selected input will initiate an Automatic Transfer from Source 2 to Source 1. If the Source 1 breaker is closed and the Source 2 breaker is open the transfer is blocked since the breakers are in the wrong positions for this transfer and the transfer is ignored. Since Automatic Transfers can occur in either direction a separate Transfer Initiate Input is needed.

When an input has been selected it will be grayed out in other dialog screens that provide input selection since it has already been assigned.

Automatic Transfer Settings Setup Tab/Save/Cancel — The Save selection (Figure 4-47) saves the Automatic Transfer settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

AUTOMATIC TRANSFER SETTINGS FAST TRANSFER TAB

Path: System/Setup/Setpoints/Automatic Transfer Settings/Fast Transfer

The Fast Transfer tab (Figure 4-49) displays the settings for the Automatic Fast Transfer. The top right corner of the display includes a command button that will disable or enable the automatic fast transfer. This selection allows the Automatic Fast Transfer to be disabled (or enabled) independent from the Automatic In-Phase, Residual and Fixed Time transfers.

Since the Fast Transfer is the most desirable type of transfer, this feature is typically used to disable the other types of transfers if needed. **Appendix F**, Time Sequence of Transfer Logic includes the timing diagrams of the Simultaneous and Sequential Transfers. All transfers are enabled at the same time with the decay of the motor bus voltage determining which type of transfer is possible. This feature allows the user to disable the individual types of transfers if desired.

Automatic Fast Transfer/Delta Phase Angle Limit

The Delta Phase Angle Limit (Figure 4-49) can be set from 0.0 to 90.0 degrees. The Delta Phase Angle is the angle between the voltages of the motor bus and the new source. This setting cannot be disabled, the phase angle is always one of the parameters used to determine if a fast transfer can be executed.

Automatic Fast Transfer/Delta Voltage Limit

The Delta Voltage Limit (Figure 4-49) can be set from 0 to 60 volts. The Delta Voltage is the voltage difference between the motor bus and the new source. This setting can be disabled. If it is disabled then this parameter is not used as a condition to execute a Fast Transfer.

Automatic Fast Transfer/Delta Frequency Limit

The Delta Frequency Limit (Figure 4-49) can be set from 0.2 to 2.0 Hz. The Delta Frequency is the frequency difference between the motor bus and the new source. This setting can be disabled. If it is disabled then this parameter is not used as a condition to execute a fast transfer.

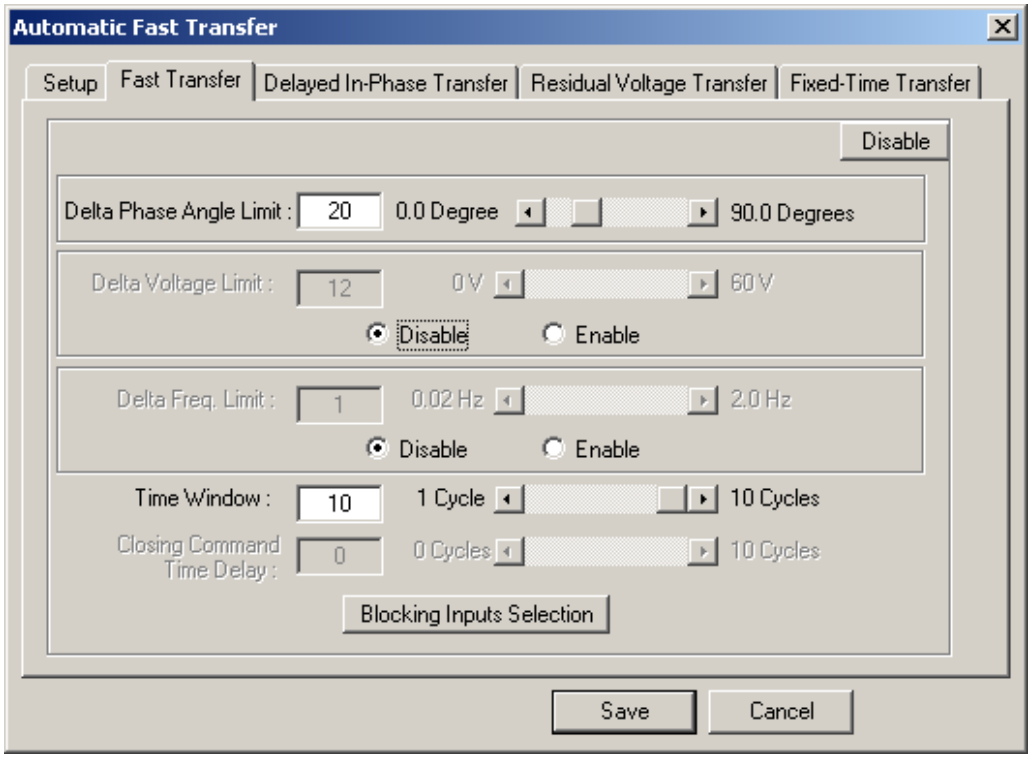


Figure 4-49 Automatic Transfer Settings Fast Transfer Tab Dialog Screen

Automatic Fast Transfer/Time Window

The Time Window (Figure 4-49) can be set from 1 to 10 cycles. The Time Window defines the window of opportunity for a Fast Transfer. The Time Window starts when the transfer is initiated and ends at the selected time limit. If a Fast Transfer has not been completed by the end of this Time Window, then the Fast Transfer is disabled and will no longer attempted. An In-Phase, Residual or Fixed Time Transfer is still possible.

Closing command Time Delay is grayed out when Common Function Settings/Transfer Mode is set to Sequential.

Automatic Fast Transfer/Closing Command Time Delay

The time delay can be set from 0 to 10 cycles. This time delay is only used for Fast Transfer method in Simultaneous transfer mode. Since the trip and close command are normally issued at the same time for Fast Transfer method in Simultaneous transfer mode, this time delay allows the flexibility to delay the closing command to accomplilsh the break-before-make mode of operation (open transition).

Automatic Fast Transfer/Blocking Inputs Selection

The Blocking Inputs Selection button (Figure 4-49) opens the Blocking Inputs Selection dialog screen (Figure 4-50). Any Input or the Fuse Loss (FL) function can be selected to block a Fast Transfer. When other functions such as External Status Reset are selected for these inputs it will be identified next to that input.

Automatic Fast Transfer Tab Save/Cancel

The Save selection (Figure 4-49) saves the Automatic Fast Transfer settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

The conditions that are necessary to execute a Fast Transfer are:

- No Lockout/Blocking conditions exist.
- The phase angle between the motor bus and the new source is within limit setting.
- The Delta Voltage between the motor bus and the new source is within limit setting.
- The Delta Frequency between the motor bus and the new source is within limit setting.
- A transfer must be completed within the Fast Transfer time window of 1 to 10 cycles.

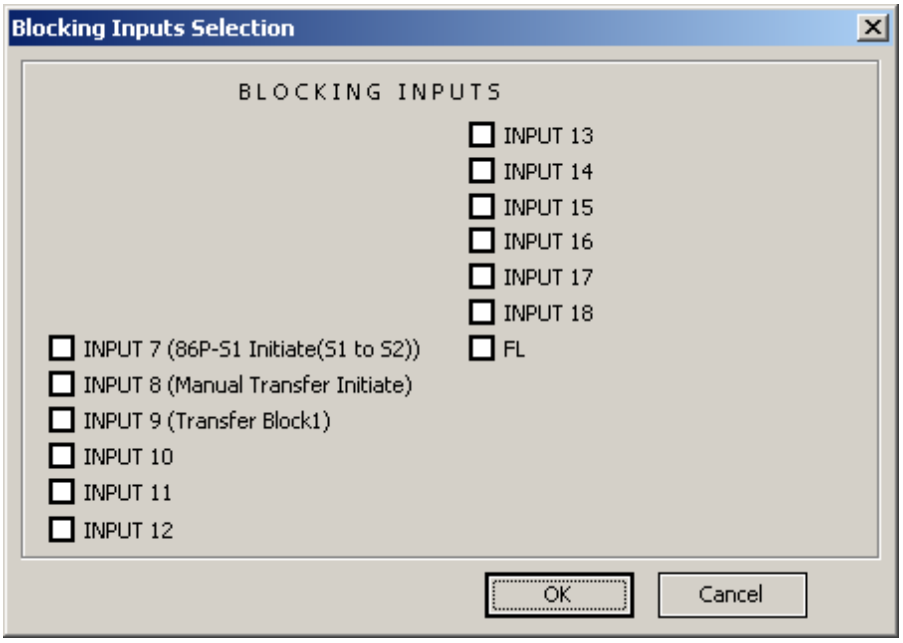


Figure 4-50 Fast Transfer Blocking Inputs Selection Dialog Screen

AUTOMATIC TRANSFER SETTINGS/DELAYED IN-PHASE TRANSFER TAB

Path: System/Setup/Setpoints/Automatic Transfer Settings/Delayed In-Phase Transfer

Figure 4-51, illustrates the MBTS Automatic Transfer Settings found under the Delayed In-Phase Transfer Tab on the Automatic Transfer Settings dialog screen. The top right corner of the display includes a command button that will disable or enable the automatic Delayed In-Phase Transfer. This selection allows the automatic Delayed In-Phase Transfer to be disabled (or enabled) independent from the Automatic Fast, Residual and Fixed Time Transfers.

Typically this feature is used to disable the other types of transfers if needed. **Appendix F**, Time Sequence of Transfer Logic includes the timing diagrams of the Simultaneous and Sequential Transfers. All transfers are enabled at the same time and the characteristics of the motor bus voltage decay determines which type of transfer is possible. This feature allows the user to disable the individual types of transfers if desired.

Automatic Delayed In-Phase Transfer/Delta Voltage Limit

The Delta Voltage Limit can be set from 0 to120 volts. The Delta Voltage is the voltage difference between the motor bus and the new source. This setting can be disabled. If it is disabled then this parameter is not used as a condition to execute a Delayed In-Phase Transfer.

Automatic Delayed In-Phase Transfer/Delta Frequency Limit

The Delta Frequency Limit can be set from 0.10 to 10.00 Hz. The Delta Frequency is the frequency difference between the motor bus and the new source. This setting cannot be disabled. The frequency is always one of the parameters used to determine if a Delayed In-Phase Transfer can be executed.

Automatic Delayed In-Phase Transfer/Time Window

The Time Window can be set from 10 to 600 cycles. The Time Window defines the window of opportunity for a Delayed In-Phase Transfer. The time window starts when the transfer is initiated and ends at the selected time limit. If a Delayed In-Phase Transfer has not been completed by the end of this time window then the Delayed In-Phase Transfer is disabled and will no longer be attempted. A Residual or Fixed Time Transfer is still possible.

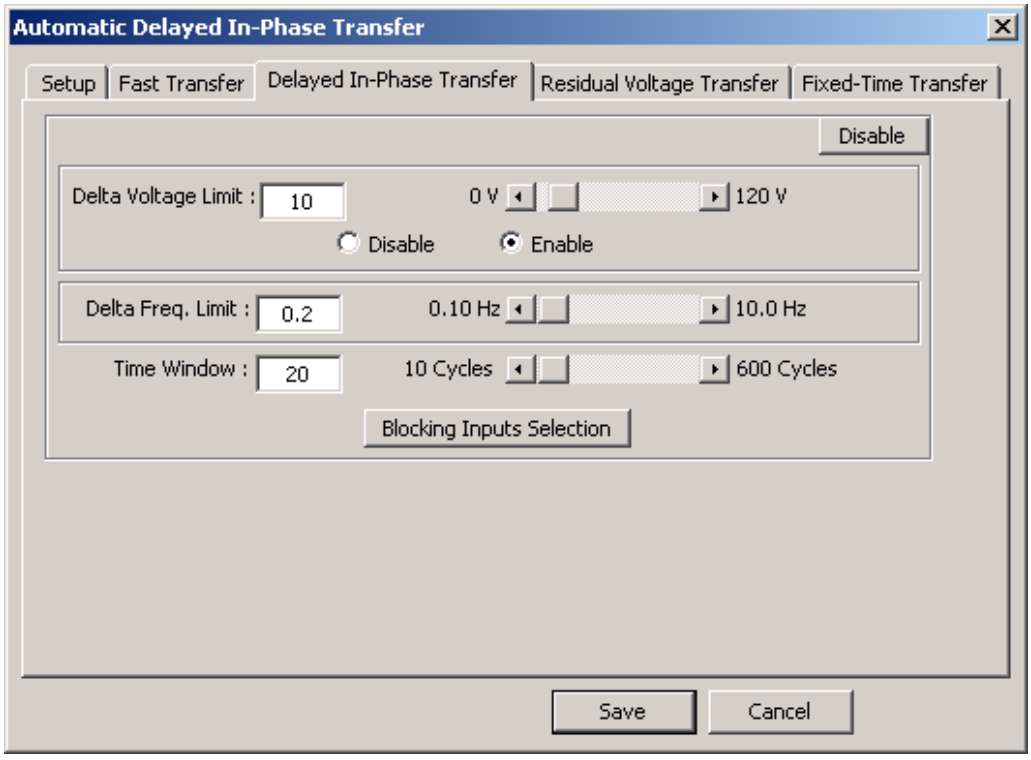


Figure 4-51 Automatic Transfer Settings Delayed In-Phase Transfer Tab Dialog Screen

Automatic Delayed In-Phase Transfer/Blocking Inputs Selection

The Blocking Inputs Selection button opens the Blocking Inputs Selection dialog screen (Figure 4-50). Any Input or the Fuse Loss (FL) function can be selected to block a Delayed In-Phase Transfer. When other functions such as External Status Reset are selected for these inputs it will be identified next to that input.

Automatic Delayed In-Phase Transfer Save/ Cancel

The Save selection saves the Automatic Delayed In-Phase Transfer Tab settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

The conditions that are necessary to execute a Delayed In-Phase Transfer are:

- No Lockout/Blocking conditions exist.
- The conditions for Fast Transfer have not been matched.
- The Delta Voltage between the motor bus and the new source is within limit setting.
- The Delta Frequency between the motor bus and the new source is within limit setting.
- The Phase Angle between the motor bus and the new source is changing and must enter the first phase coincidence (first zero degree crossing) within the Delayed In-Phase Transfer time window (adjustable from 10 to 600 cycles).

  The Delayed In-Phase Transfer feature includes two programmable advanced breaker closing times for Source 1 and Source 2 breakers (Figure 4-35) to coordinate the closing of the first phase coincidence. Programmable breaker closing time is from 0 to 12 cycles.

AUTOMATIC TRANSFER SETTINGS/RESIDUAL VOLTAGE TRANSFER TAB

Path: System/Setup/Setpoints/Automatic Transfer Settings/Residual Voltage Transfer

Figure 4-52, illustrates the MBTS Automatic Transfer Settings found under the Residual Voltage Transfer Tab on the Automatic Transfer Settings dialog screen.

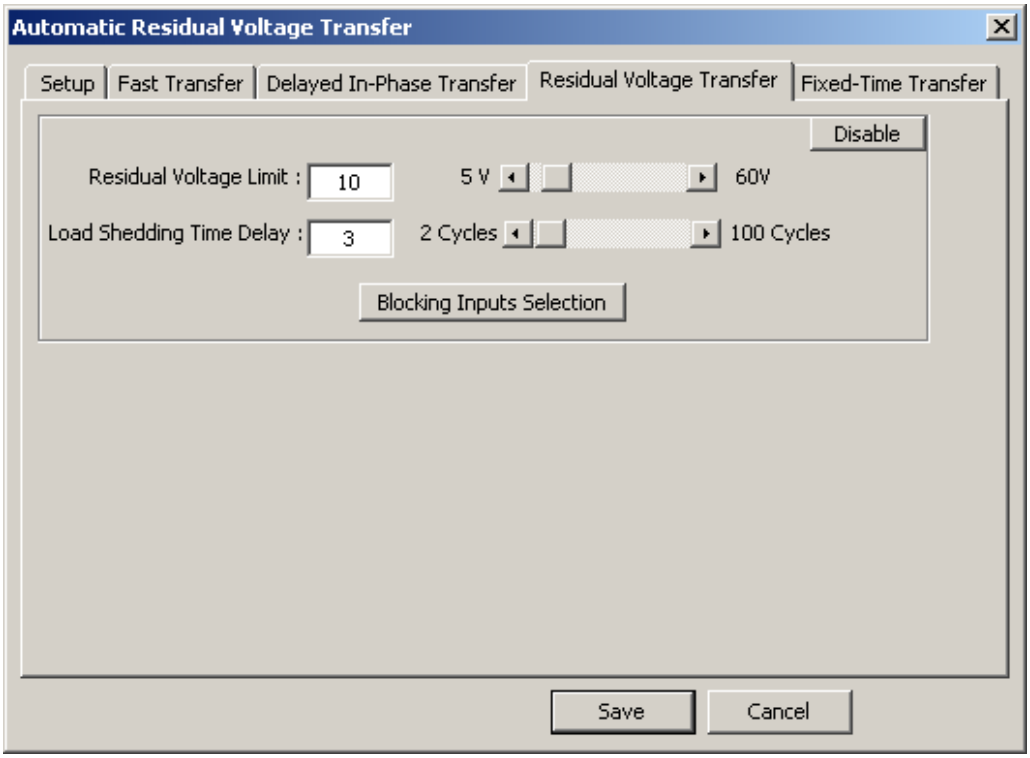


Figure 4-52 Automatic Transfer Settings Residual Voltage Transfer Tab Dialog Screen

The Residual Voltage Transfer tab (Figure 4-52) displays the settings for the Residual Voltage Transfer. The top right corner of the display includes a command button that will disable or enable the automatic Residual Voltage Transfer. This selection allows the automatic Residual Voltage Transfer to be disabled (or enabled) independent from Automatic Fast, In-Phase and Fixed Time Transfers.

Typically this feature is used to disable the other types of transfers if needed. **Appendix F**, Time Sequence of Transfer Logic includes the timing diagrams of the Simultaneous and Sequential Transfers. All transfers are enabled at the same time and the decay characteristic of the motor bus voltage determines which type of transfer is possible. This allows the user to disable the individual types of transfers if desired.

Automatic Residual Voltage Transfer/Residual Voltage Limit

The Residual Voltage Limit can be set from 5 to 60 volts. When the motor bus voltage drops below the Residual Voltage Limit the close command is sent to the new source breaker. If Load Shedding has been selected, then the Load Shedding Output is closed when the motor bus voltage decreases to less than the Residual Voltage Limit, then after the Load Shedding Time Delay times out, the close command is sent to the new source breaker.

This setting cannot be disabled, it is always the parameter used as the condition to execute a Residual Voltage Transfer. There is no Time Window for the Residual Voltage Transfer. However, it must be completed by the Incomplete Transfer Lockout Time Limit setting.

Automatic Residual Voltage Transfer/Load Shedding Time Delay

The Load Shedding Time Delay can be set from 2 to 100 cycles. The time delay defines the time period from when the motor bus voltage decreases to less than the Residual Voltage Limit until the close command is sent.

Automatic Residual Voltage Transfer/Blocking Inputs Selection

The Blocking Inputs Selection button opens the Blocking Inputs Selection dialog screen (Figure 4-50). Any Input or the Fuse Loss (FL) function can be selected to block a Delayed Residual Voltage Transfer. When and input is selected, it is not grayed out in the other types of transfers.

Automatic Residual Voltage Transfer Save/ Cancel

The Save selection saves the Automatic Residual Voltage Transfer Tab settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

The conditions that are necessary to execute a Delayed Residual Voltage Transfer are:

- No Lockout/Blocking conditions exist.
- The conditions for a Fast Transfer have not been matched.
- The conditions for an In-Phase Transfer have not been matched.
- The motor bus voltage drops below the Residual Voltage Transfer Limit setting (adjustable from 0 to 60 V) within the Incomplete Transfer Lockout Time Limit setting (50 to 3000 cycles).

AUTOMATIC TRANSFER SETTINGS/FIXED TIME TRANSFER TAB

Path: System/Setup/Setpoints/Automatic Transfer Settings/Fixed-Time Transfer

Figure 4-53, illustrates the MBTS Automatic Transfer Settings found under the Fixed Time Transfer Tab on the Automatic Transfer Settings dialog screen.

The Fixed Time Transfer tab (Figure 4-53) displays the settings for the Automatic Fixed Time Transfer. The top right corner of the display includes a command button that will disable or enable the Automatic Fixed Time Transfer. This selection allows the automatic Fixed Time Transfer to be disabled (or enabled) independent from Automatic Fast, In-Phase and Residual Voltage transfers.

Typically this feature is used to disable the other types of transfers if needed. **Appendix F**, Time Sequence of Transfer Logic includes the timing diagrams of the Simultaneous and Sequential Transfers. All transfers are enabled at the same time and the decay of the motor bus voltage determines which type of transfer is possible. This feature allows the user to disable the individual types of transfers if desired.

The Fixed Time Transfer is based only on Time Delay and does not use the Phase Angle, Frequency or Voltage to supervise the closing of the new source breaker.

Automatic Fixed Time Transfer/Time Delay

The Time Delay setting can be set from 30 to 1000 cycles. When the conditions are met for a Fixed Time Transfer the Time Delay starts timing. When the Time Delay times out, a close command is sent to the Load Shedding Time Delay. When the Load Shedding Time Delay times out the close command is sent to the new source breaker. No other parameters are monitored.

If Fixed Time Transfer has been selected as a Load Shedding Function Selection in the Common Settings (Figure 4-46), then the signal sent to the Load Shedding Output will be true when the Fixed Time Transfer, Time Delay times out.

These settings cannot be disabled, they are the only parameters used as the condition to execute a Fixed Time Transfer. There is no Time Window for the Fixed Time Transfer. However, it must be completed by the Incomplete Transfer Lockout Time Limit setting.

Automatic Fixed Time Transfer/Load Shedding Time Delay

The Load Shedding Time Delay can be set from 2 to 100 cycles. The Load Shedding Time Delay defines the time period from when the Fixed Time Transfer, Time Delay times out and when the close command is sent to the new source breaker.

Automatic Fixed Time Transfer/Blocking Inputs Selection

The Blocking Inputs Selection button opens the Blocking Inputs Selection dialog screen (Figure 4-50). Any Input or the Fuse Loss (FL) function can be selected to block a Fixed Time Transfer. When an input is selected, it is not grayed out in other types of transfers.

Automatic Fixed Time Transfer Save/Cancel

The Save selection saves the Automatic Fixed Time Transfer Tab settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

The conditions that are necessary to execute a delayed Fixed Time Transfer are:

- No Lockout/Blocking conditions exist.
- The conditions for a Fast Transfer have not been matched.
- The conditions for an In-Phase transfer have not been matched.
- The motor bus voltage drops below the Residual Voltage Transfer limit setting (adjustable from 0 to 60 V) within the incomplete transfer lockout time limit setting (50 to 3000 cycles).

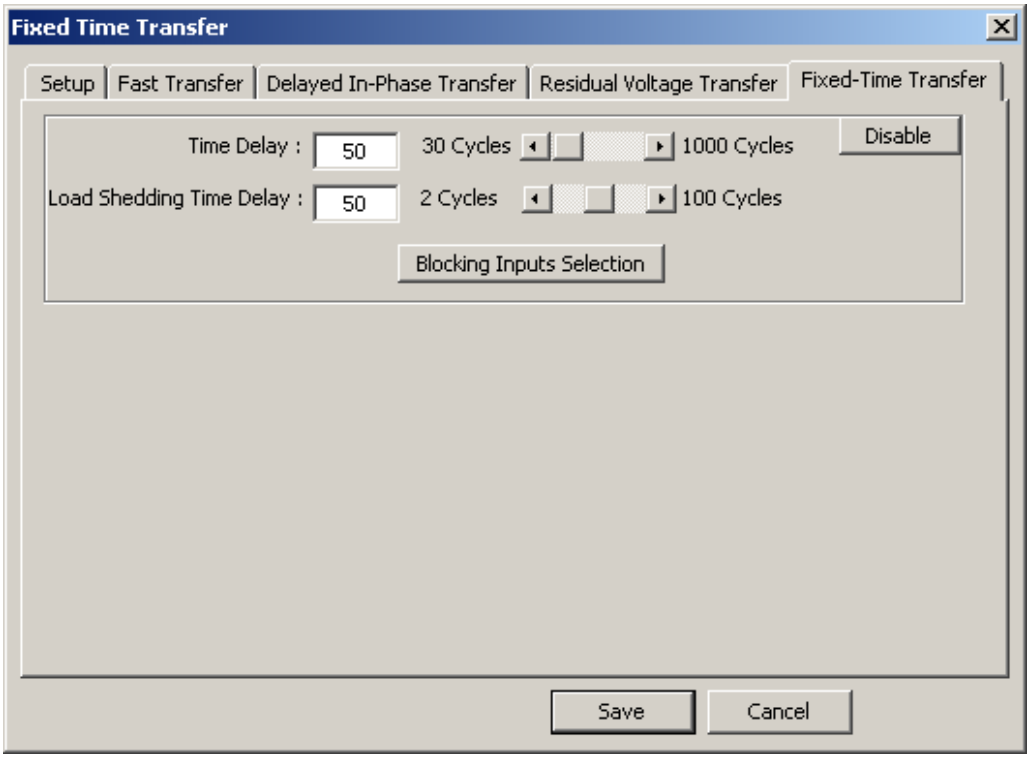


Figure 4-53 Automatic Transfer Settings Fixed Time Transfer Tab Dialog Screen

MANUAL TRANSFER SETTINGS (MTS)

Path: System/Setup/Setpoints/Manual Transfer Settings

The Manual Transfer Settings selection from the Transfer Settings group (Figure 4-33) opens the Manual Transfer Settings Dialog screen (Figure 4-54), which includes the following tabs:

- Setup
- Fast Transfer
- Delayed In-Phase Transfer
- Residual Voltage Transfer
- Hot Parallel Transfer

HMI Manual Transfer Enable/Disable (MBTS Front Panel)

To enable or disable Manual Transfer from the Front Panel perform the following:

1. Press the **ENTER** pushbutton.
2. If Level Access is active, the following is displayed:

```
ENTER ACCESS CODE
      0
```

   a. Input the required Access Code, then press **ENTER**.
   b. If the proper Access Code has been entered, the HMI will return:

```
LEVEL #(1,2 or 3)
Access Granted!
```

```
INIT TRANSFER
INIT    rmte_lcal
```

   c. Go to Step 4.

3. If Level Access is not active, then the following is displayed:

```
INIT TRANSFER
INIT    rmte_lcal
```

4. Press the Right arrow pushbutton until the following is displayed:

```
MANUAL TRANSFER
auto_xfer MAN_XFER
```

5. Press **ENTER,** the following will be displayed:

```
MANUAL TRANSFER
disable enable
```

6. Press the Left or Right arrow pushbutton as necessary to enable or disable Manual Transfer (upper case).
7. Press **ENTER**. The following will be displayed:

```
MANUAL TRANSFER
auto_xfer MAN_XFER
```

8. The MBTS is now in the selected Manual Transfer Mode. Press **EXIT** as necessary to return to the Main Menu.

MANUAL TRANSFER SETTINGS SETUP TAB

Path: System/Setup/Setpoints/Manual Transfer Settings/Setup

Figure 4-54, illustrates the MBTS Manual Transfer Settings found under the Setup Tab on the Manual Transfer Settings dialog screen.

Manual Transfer Settings/Manual Transfer Mode

Manual Transfer

The Manual Transfer Mode (Figure 4-54) can be Disabled or Enabled. If Disable is selected and then Save is selected, then the remaining settings in the Manual Transfer Settings dialog screen are grayed out. There are settings in the Common Settings that effect the operation of the Manual Transfer.

Manual Transfer Settings/External Control Inputs Configuration

The External Control Inputs Configuration portion of the Manual Transfer Settings dialog screen (Figure 4-54) includes the following External Control Input configuration selections:

- Manual Transfer Block
- Manual Transfer Initiate

Manual Transfer/Manual Transfer Block

The Manual Transfer Block selection opens the Manual Transfer Block dialog screen (Figure 4-55) that allows the user to select an input that is used to block Manual Transfers. When an input has been selected it will be grayed out in other dialog screens that provide input selection since it has already been assigned.

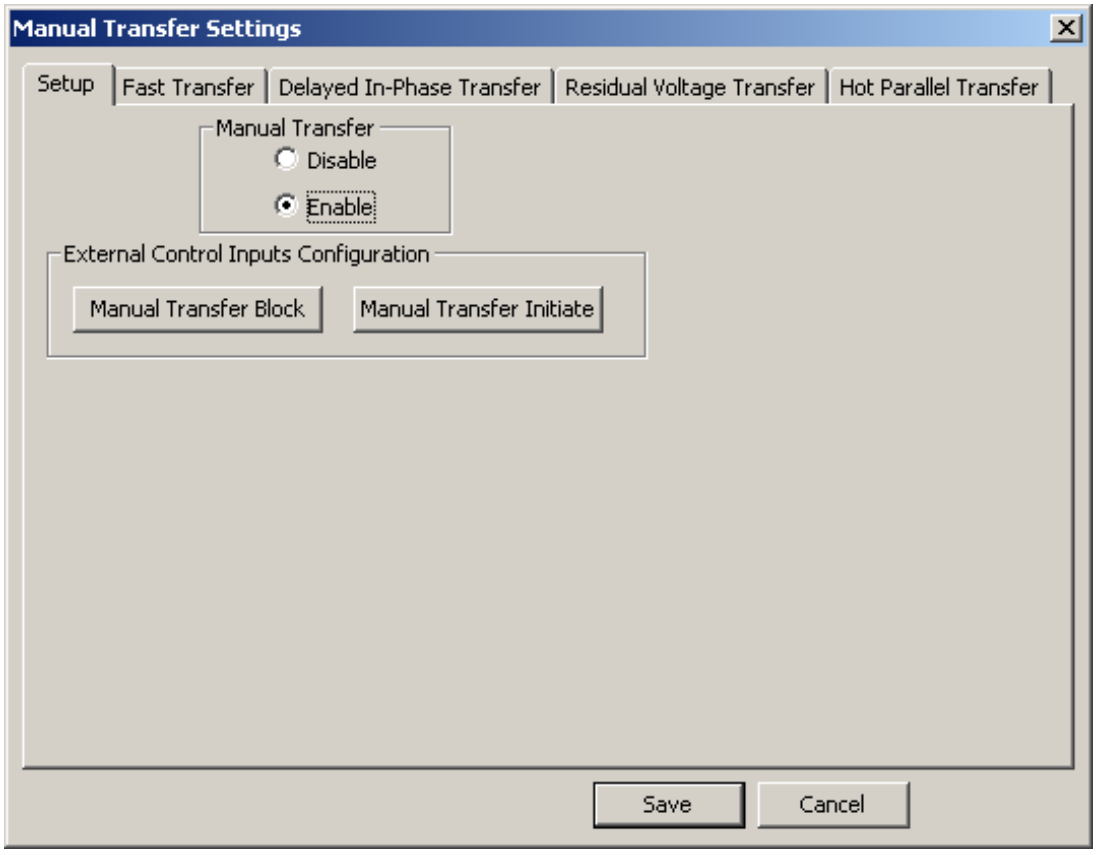


Figure 4-54 Manual Transfer Settings Dialog Screen

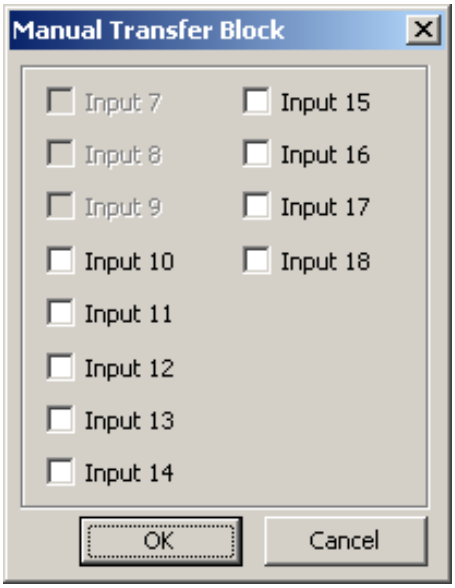


Figure 4-55 Manual Block Input Settings Dialog Screen

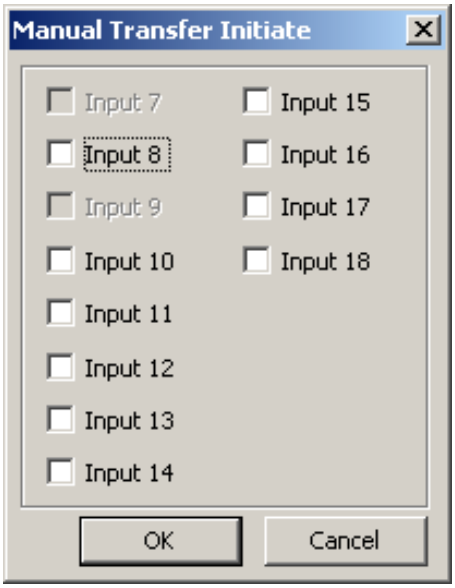


Figure 4-56 Manual Transfer Initiate Input Settings Dialog Screen

Manual Transfer/Manual Transfer Initiate

The Manual Transfer Initiate opens a dialog screen (Figure 4-56) that allows the user to select an input or inputs that are used to initiate Manual Transfers.

The selected input will initiate an Manual Transfer from Source 1 to Source 2 or from Source 2 to Source 1 depending on the breaker positions at that time. If the Source 1 breaker is closed and the Source 2 breaker is open then the transfer will be from Source 1 to Source 2. If the Source 2 breaker is closed and the Source 1 breaker is open then the transfer will be from Source 2 to Source 1. The Manual Transfer does not have separate initiate inputs for transferring in a specific direction; this is different from the automatic transfer initiate.

When an input has been selected it will be grayed out in other dialog screens that provide input selection since it has already been assigned.

Manual Transfer Save/Cancel

The Save selection saves the Manual Transfer Settings Tab either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

MANUAL TRANSFER SETTINGS/FAST TRANSFER TAB

Path: System/Setup/Setpoints/Manual Transfer Settings/Fast Transfer

The Fast Transfer tab (Figure 4-57) displays the settings for the Manual Fast Transfer. The top right corner of the display includes a command button that will disable or enable the Manual Fast Transfer. This selection allows the Manual Fast Transfer to be disabled (or enabled) independent from the Delayed In-Phase, Residual Voltage and Hot Parallel transfers.

Since the Fast Transfer is the most desirable type of transfer, this feature is typically used to disable the other types of transfers if needed. **Appendix F**, Time Sequence of Transfer Logic includes the timing diagrams of the Simultaneous and Sequential Transfers. All transfers are enabled at the same time with the decay of the motor bus voltage determining which type of transfer is possible. This feature allows the user to disable the individual types of transfers if desired.

Manual Fast Transfer/Delta Phase Angle Limit

The Delta Phase Angle Limit can be set from 0.0 to 90.0 degrees. The Delta Phase Angle is the angle between the voltages of the motor bus and the new source. This setting cannot be disabled, the phase angle is always one of the parameters used to determine if a fast transfer can be executed.

Manual Fast Transfer/Delta Voltage Limit

The Delta Voltage Limit can be set from 0 to 60 volts. The Delta Voltage is the voltage difference between the motor bus and the new source. This setting can be disabled. If it is disabled then this parameter is not used as a condition to execute a Fast Transfer.

Manual Fast Transfer/Delta Frequency Limit

The Delta Frequency Limit can be set from 0.02 to 2.0 Hz. The Delta Frequency is the frequency difference between the motor bus and the new source. This setting can be disabled. If disabled, then this parameter is not used as a condition to execute a fast transfer.

Manual Fast Transfer/Time Window

The Time Window can be set from 1 to 10 cycles. The Time Window defines the window of opportunity for a Fast Transfer. The Time Window starts when the transfer is initiated and ends at the selected time limit. If a Fast Transfer has not been completed by the end of this Time Window, then the Fast Transfer is disabled and will no longer be attempted. An In-Phase, Residual or Fixed Time Transfer is still possible.

Manual Fast Transfer/Closing Command Time Delay

The time delay can be set from 0 to 10 cycles. This time delay is only used for Fast Transfer method in Simultaneous transfer mode. Since the trip and close command are normally issued at the same time for Fast Transfer method in Simultaneous transfer mode, this time delay allows the flexibility to delay the closing command to accomplilsh the break-before-make mode of operation (open transition).

Manual Fast Transfer/Blocking Inputs Selection

The Blocking Inputs Selection button opens the Blocking Inputs Selection dialog screen (Figure 4-53). Any Input or the Fuse Loss (FL) function can be selected to block a Manual Fast Transfer. When an input is selected, it is not grayed out in other types of transfers.

Manual Fast Transfer Save/Cancel

The Save selection saves the Manual Fast Transfer settings to an open file or to the target MBTS. Cancel returns the user to the previous open screen.

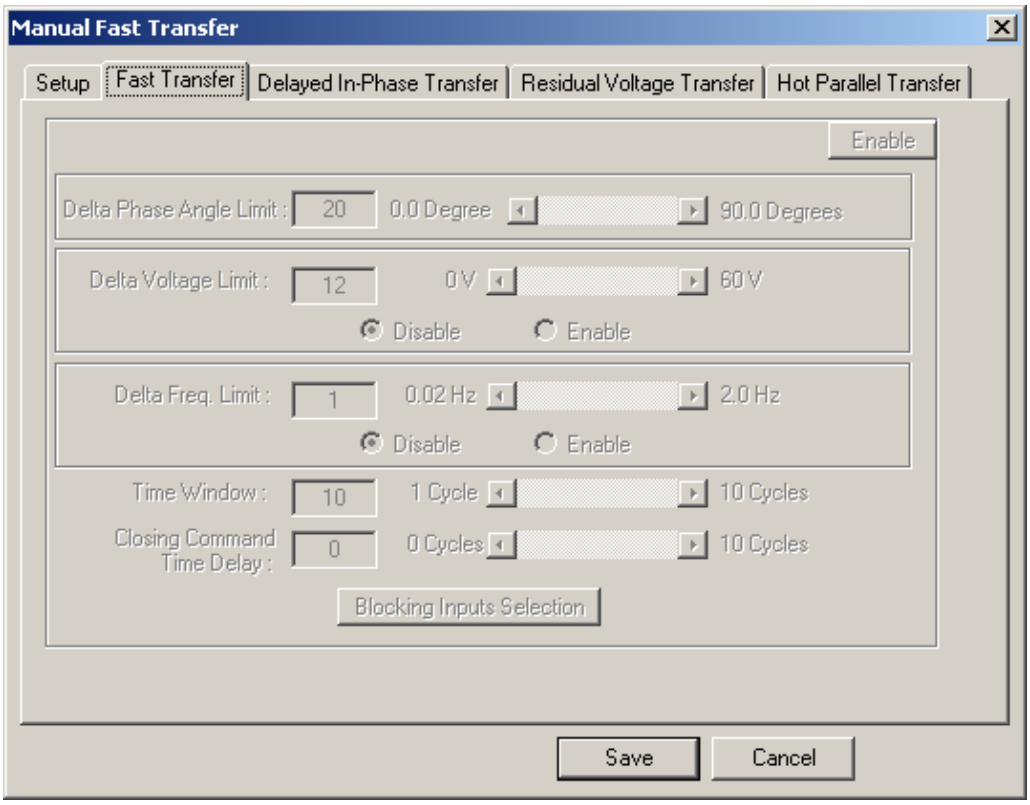


Figure 4-57 Manual Transfer Settings Fast Transfer Tab Dialog Screen

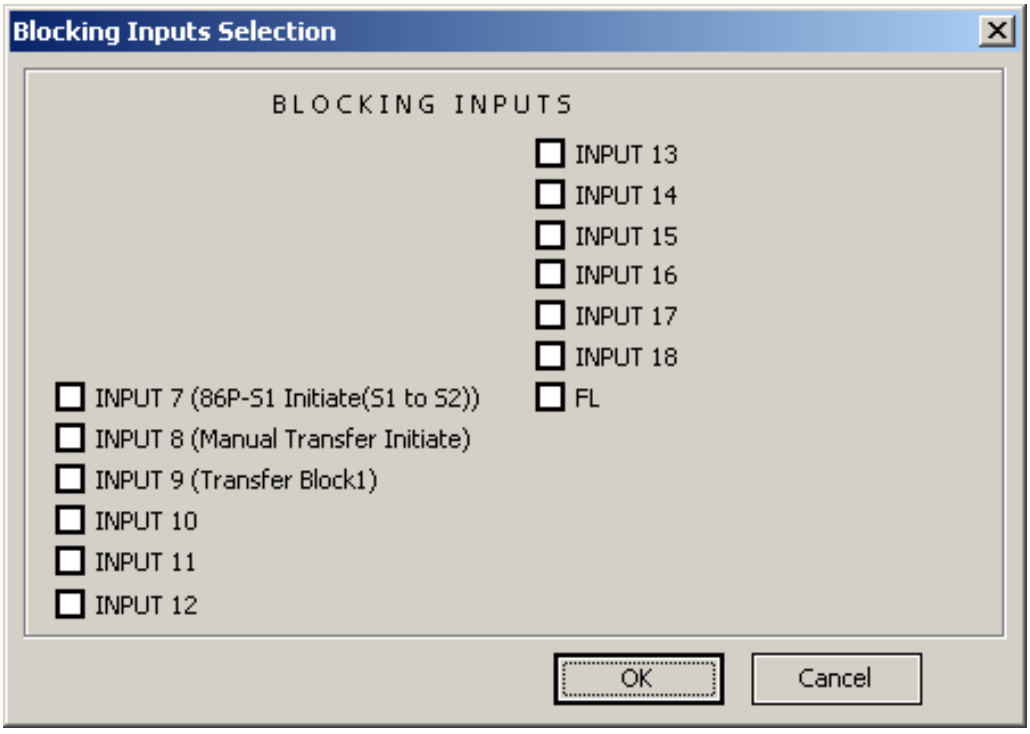


Figure 4-58 Manual Fast Transfer Blocking Inputs Selection Dialog Screen

The Conditions that are necessary to execute a Manual Fast Transfer are:

- No Lockout/Blocking conditions exist.
- The phase angle between the motor bus and the new source is within limit setting.
- The Delta Voltage between the motor bus and the new source is within limit setting.
- The Delta Frequency between the motor bus and the new source is within limit setting.
- A transfer must be completed within the Fast Transfer time window of 1 to 10 cycles.

MANUAL TRANSFER SETTINGS/DELAYED IN-PHASE TRANSFER TAB

Path: System/Setup/Setpoints/Manual Transfer Settings/Delayed In-Phase Transfer

The Delayed In-Phase Transfer tab (Figure 4-59) displays the settings for the Delayed In-Phase Transfer. The top right corner of the display includes a command button that will disable or enable the automatic Delayed In-Phase Transfer. This selection allows the manual Delayed In-Phase transfer to be disabled (or enabled) independent from the Manual Fast, Residual Voltage and Hot Parallel Transfers.

Typically this feature is used to disable the other types of transfers if needed. **Appendix F**, Time Sequence of Transfer Logic includes the timing diagrams of the Simultaneous and Sequential Transfers. All transfers are enabled at the same time and the decay of the motor bus voltage determines which type of transfer is possible. This feature allows the user to disable the individual types of transfers if desired.

Manual Delayed In-Phase Transfer/Delta Voltage Limit

The Delta Voltage Limit can be set from 0 to 120 volts. The Delta Voltage is the voltage difference between the motor bus and the new source. This setting can be disabled. If it is disabled then this parameter is not used as a condition to execute a Delayed In-Phase Transfer.

Manual Delayed In-Phase Transfer/Delta Frequency Limit

The Delta Frequency Limit can be set from 0.1 to 10.0 Hz. The Delta Frequency is the frequency difference between the motor bus and the new source. This setting cannot be disabled. The frequency is always one of the parameters used to determine if a Delayed In-Phase Transfer can be executed.

Manual Delayed In-Phase Transfer/Time Window

The Time Window can be set from 10 to 600 cycles. The Time Window defines the window of opportunity for a Delayed In-Phase Transfer. The time window starts when the transfer is initiated and ends at the selected time limit. If a Delayed In-Phase Transfer has not been completed by the end of this time window then the Delayed In-Phase Transfer is disabled and will no longer be attempted. A Residual or Fixed Time Transfer is still possible.

Manual Delayed In-Phase Transfer/Blocking Inputs Selection

The Blocking Inputs Selection button opens the Blocking Inputs Selection dialog screen (Figure 4-60). Any Input or the Fuse Loss (FL) function can be selected to block a Delayed In-Phase Transfer. When an input is selected, it is not grayed out in other types of tranfers.

Manual Delayed In-Phase Transfer/Save/Cancel

The Save selection saves the Manual Delayed In-Phase Transfer Tab settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

No Lockout/Blocking conditions exist.

- The conditions for Fast Transfer have not been matched.
- The Delta Voltage between the motor bus and the new source is within limit setting.
- The Delta Frequency between the motor bus and the new source is within limit setting.
- The Phase Angle between the motor bus and the new source is changing and must enter the first phase coincidence (first zero degree crossing) within the Delayed In-Phase Transfer time window (adjustable from 10 to 600 cycles).

  The Delayed In-Phase Transfer feature includes two programmable advanced breaker closing times for Source 1 and Source 2 breakers (Figure 4-33) to coordinate the closing of the first phase coincidence. Programmable breaker closing time is from 0 to 12 cycles.

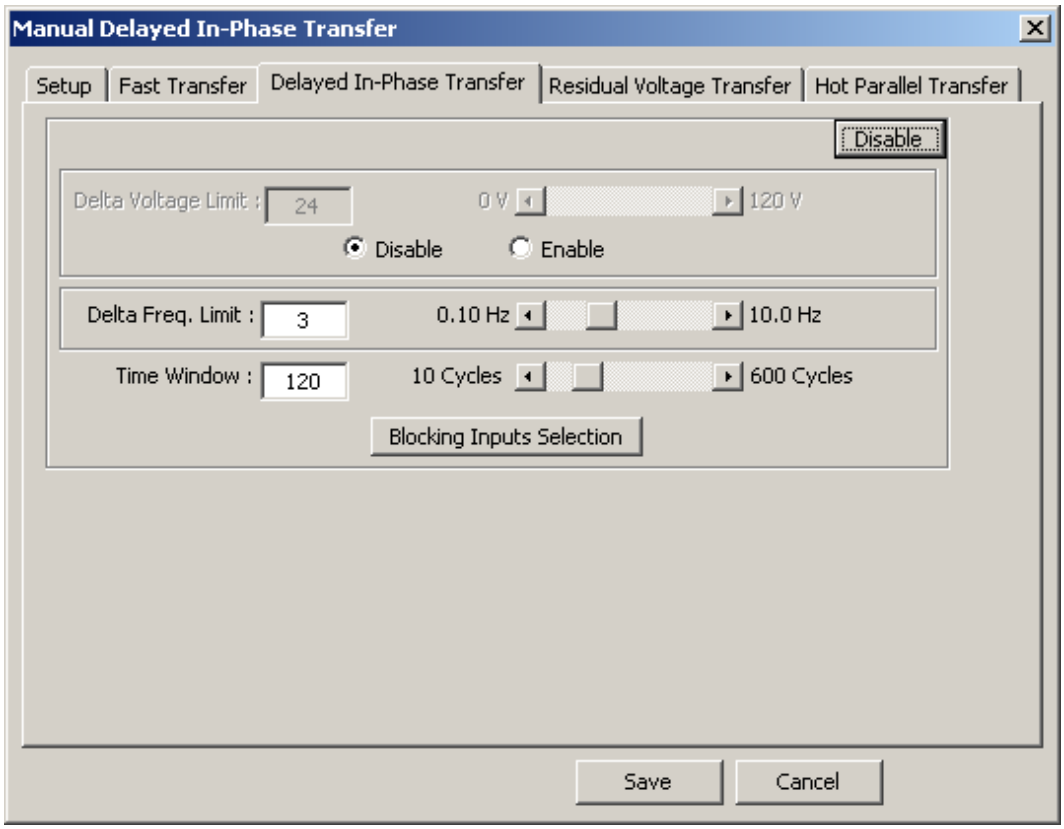


Figure 4-59 Manual Transfer Settings Delayed In-Phase Transfer Tab Dialog Screen

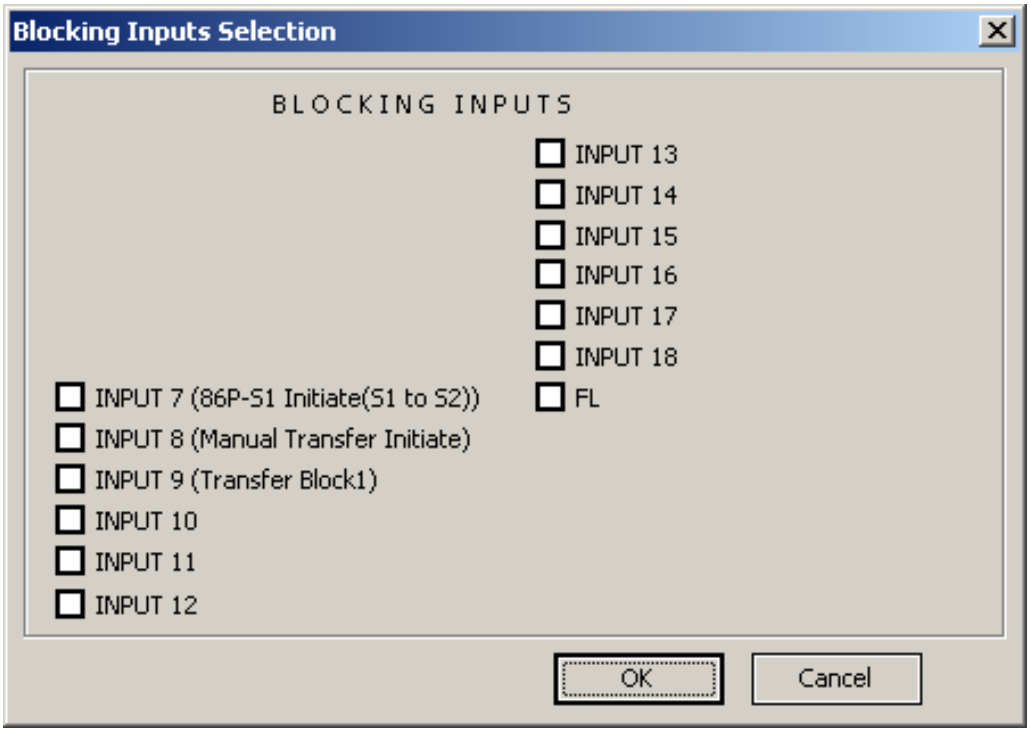


Figure 4-60 Delayed In-Phase Transfer Blocking Inputs Selection Dialog Screen

MANUAL TRANSFER SETTINGS/RESIDUAL VOLTAGE TRANSFER TAB

Path: System/Setup/Setpoints/Manual Transfer Settings/Residual Voltage Transfer

The Residual Voltage Transfer tab (Figure 4-61) displays the settings for the Residual Voltage Transfer. The top right corner of the display includes a command button that will disable or enable the Manual Residual Voltage Transfer. This selection allows the Manual Residual Voltage Transfer to be disabled (or enabled) independent from Manual Fast, Delayed In-Phase and Hot Parallel Transfers.

Typically this feature is used to disable the other types of transfers if needed. **Appendix F**, Time Sequence of Transfer Logic includes the timing diagrams of the Simultaneous and Sequential Transfers. All transfers are enabled at the same time and the decay of the motor bus voltage determines which type of transfer is possible. This feature allows the user to disable the individual types of transfers if desired.

Manual Residual Voltage Transfer/Residual Voltage Limit

The Residual Voltage Limit can be set from 5 to 60 volts. When the motor bus voltage drops below the Residual Voltage Limit the close command is sent to the new source breaker. If Load Shedding has been selected, then the Load Shedding Output is closed when the motor bus voltage decreases to less than the Residual Voltage Limit, then after the Load Shedding Time Delay times out the close command is sent to the new source breaker.

This setting cannot be disabled, it is always the parameter used as the condition to execute a Residual Voltage Transfer. There is no Time Window for the Residual Voltage Transfer. However, it must be completed by the Incomplete Transfer Lockout Time Limit setting.

Manual Residual Voltage Transfer/Load Shedding Time Delay

The Load Shedding Time Delay can be set from 2 to 100 cycles. The time delay defines the time period from when the motor bus voltage decreases to less than the Residual Voltage Limit until the close command is sent.

Manual Residual Voltage Transfer/Blocking Inputs Selection

The Blocking Inputs Selection button opens the Blocking Inputs Selection dialog screen (Figure 4-62). Any Input or the Fuse Loss (FL) function can be selected to block a Delayed Residual Voltage Transfer. When an input is selected, it is not grayed out in other types of transfers.

Manual Residual Voltage Transfer Save/Cancel

The Save selection saves the Manual Residual Voltage Transfer Tab settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

The conditions that are necessary to execute a Delayed Residual Voltage Transfer are:

- No Lockout/Blocking conditions exist.
- The conditions for a Fast Transfer have not been matched.
- The conditions for an In-Phase Transfer have not been matched.
- The motor bus voltage drops below the Residual Voltage Transfer Limit setting (adjustable from 0 to 60 V) within the Incomplete Transfer Lockout Time Limit setting (50 to 3000 cycles).

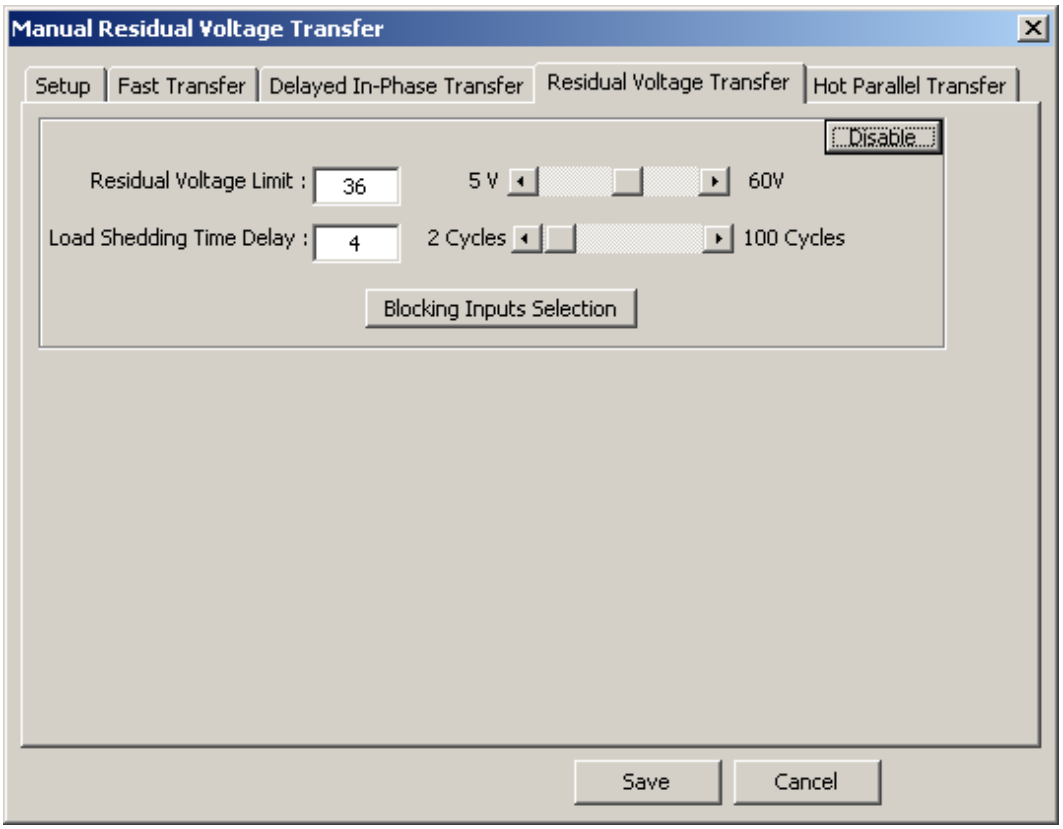


Figure 4-61 Manual Transfer Settings Residual Voltage Transfer Tab Dialog Screen

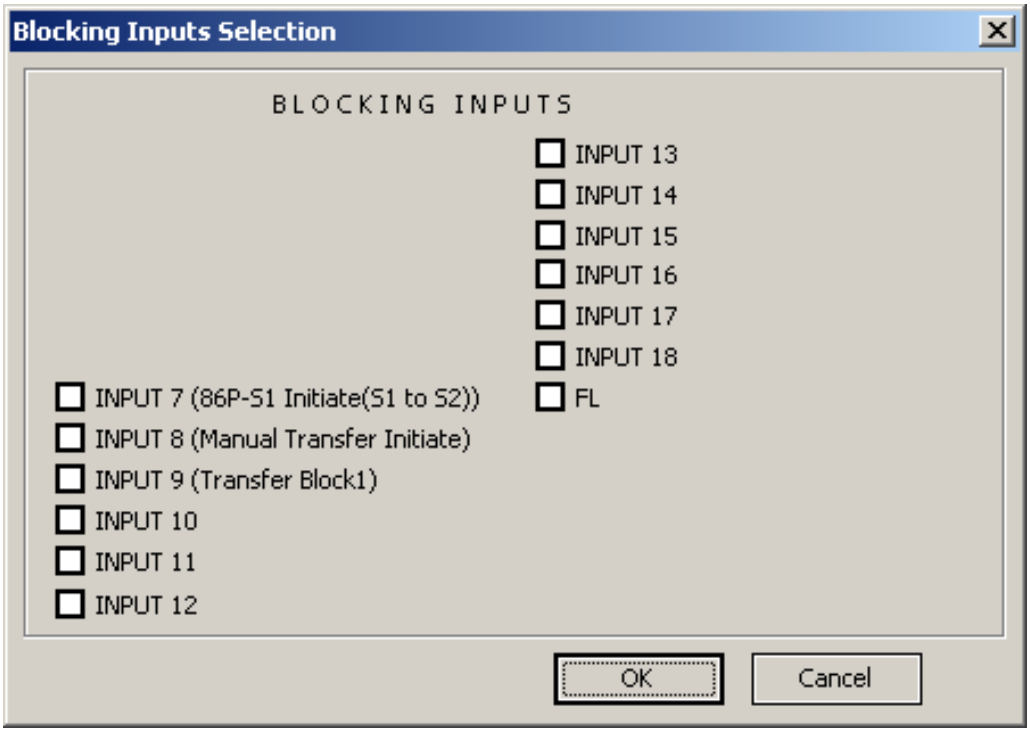


Figure 4-62 Residual Voltage Transfer Blocking Inputs Selection Dialog Screen

MANUAL TRANSFER SETTINGS/HOT PARALLEL TRANSFER TAB

Path: System/Setup/Setpoints/Manual Transfer Settings/Hot Parallel Transfer

The Hot Parallel Transfer tab (Figure 4-63) displays the settings for the Hot Parallel Transfer. The top right corner of the display includes a command button that will disable or enable the Manual Hot Parallel Transfer. Whenever the Hot Parallel Transfer is enabled the Manual Fast, Delayed In-phase and Residual Transfers are disabled. Only when the Hot Parallel Transfer is disabled can the Manual Fast, Delayed In-phase and Residual Transfers be enabled.

The Hot Parallel Transfer is typically used to transfer the motor load back to the original source after an Automatic Transfer has been completed and the conditions that caused it to occur have been resolved. This transfer operates differently than all the other transfers, in that it closes the breaker to the new source first and then opens the breaker to the old source. This allows for a bumpless transfer since the motor bus is never disconnected from a source. The Hot Parallel transfer is only performed when the bus and new source conditions are stable.

Manual Hot Parallel Transfer/Delta Phase Angle Limit

The Delta Phase Angle Limit can be set from 0.0 to 90.0 degrees. The delta angle is the angle between the voltages of the motor bus and the new source. This setting cannot be disabled. The phase angle is always one of the parameters used to determine if a Hot Parallel Transfer can be executed.

Manual Hot Parallel Transfer/Delta Voltage Limit

The Delta Voltage Limit can be set from 0 to 60 volts. The delta voltage is the voltage difference between the motor bus and the new source. This setting can be disabled and if it is disabled, then this parameter is not used as a condition to execute a Hot Parallel transfer.

Manual Hot Parallel Transfer/Delta Frequency Limit

The Delta Frequency Limit can be set from 0.02 to 0.5 hertz. The delta frequency is the frequency difference between the motor bus and the new source. This setting can be disabled and if it is disabled then this parameter is not used as a condition to execute a Hot Parallel Transfer.

Manual Hot Parallel Transfer/Time Window

The Time Window can be set from 1 to 50 cycles. The Time Window defines the window of opportunity for a Hot Parallel Transfer. The Time Window starts when the transfer is initiated and ends at the selected time limit. If a Hot Parallel Transfer has not been completed by the end of this Time Window, then the Hot Parallel Transfer is disabled and will no longer be attempted and an Incomplete Transfer alarm will be set.

Manual Hot Parallel Transfer/Tripping Command Time Delay

The Tripping Command Time Delay can be set from 0 to 30 cycles. The Tripping Command Time Delay is the time from when the new source breaker closes until the old source breaker is tripped. This time defines how long the two sources are paralleled. This time setting should be set as short as possible to limit the amount of time the motor bus would be exposed to double fault currents.

Manual Hot Parallel Transfer/Blocking Inputs Selection

The Blocking Inputs Selection button opens the Blocking Inputs Selection dialog screen (Figure 4-64). Any Input or the Fuse Loss (FL) function can be selected to block a Hot Parallel Transfer.

Manual Hot Parallel Transfer/Save/Cancel

The Save selection saves the Manual Hot Parallel Transfer settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

The conditions that are necessary to execute a Hot Parallel Transfer are:

- No lockout/blocking conditions exist.
- The phase angle between the motor bus and the new source is within limit setting.
- The delta voltage between the motor bus and the new source is within limit setting.
- The delta frequency between the motor bus and the new source is within limit setting.
- A transfer must be completed within the Hot Parallel Transfer time window of 1 to 50 cycles.

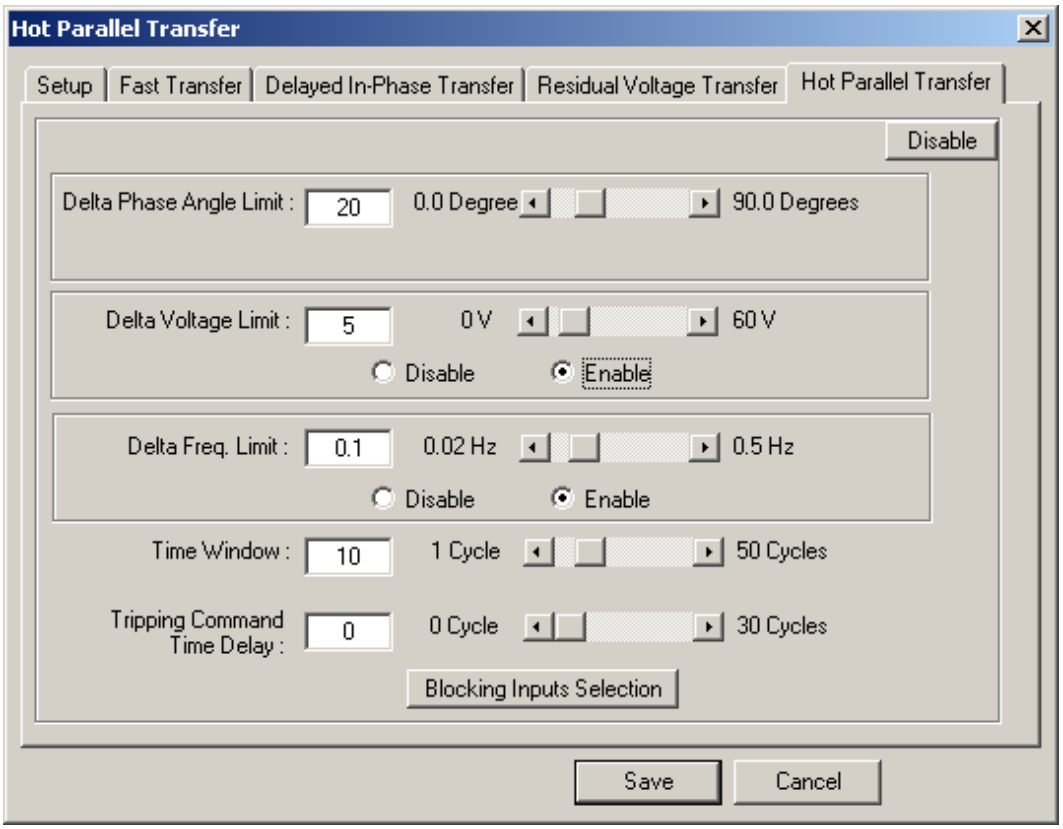


Figure 4-63 Manual Transfer Settings Hot Parallel Transfer Tab Dialog Screen

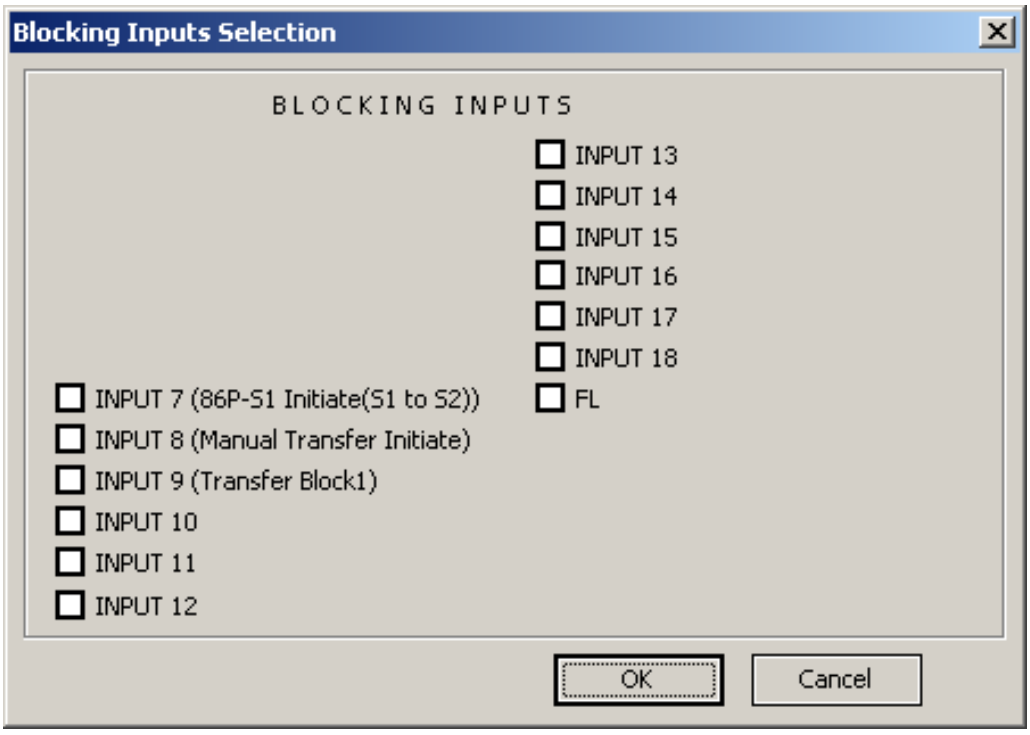


Figure 4-64 Hot Parallel Blocking Inputs Selection Dialog Screen

AUTO TRIP (AT)

Path: System/Setup/Setpoints/Auto Trip

The Auto Trip selection from the Transfer Settings group (Figure 4-33) opens the Auto Trip Dialog screen (Figure 4-65).

If an external operation closes the second breaker while leaving the first one closed, and if the Auto Trip feature is enabled, the MBTS will trip the breaker that was originally closed within an adjustable time delay (0 to 50 Cycles in increments of 0.5 Cycle) after the second breaker is closed.

The Auto Trip operates in either direction to allow external parallel transfer but prohibit inadvertent parallel operation. It must be noted that the external operation that closes the second breaker must be supervised by means that are external to the motor bus transfer system. Auto Trip is **not** a transfer, the only command sent is a trip command after the time delay and no other parameters are used to supervise this operation.

For example, in an application where there are two MBTS units connected in a main-tie-main configuration (see Figure 4-66) it is recommended to disable the Auto Trip feature. In this configuration both units can operate a common tie breaker. If one unit transfers by tripping its main breaker and closing the tie breaker, then the other unit would now see both of its breakers closed. Depending on the breaker selected in the Auto Trip feature this unit would trip either its main breaker and both motor buses would be disconnected or it would trip its tie breaker that was just closed, disconnecting the motor bus of the unit that originally transferred. Neither of these situations is desirable!

Auto Trip/Enable/Disable

In the top right corner of the screen is a command button that will Disable or Enable the Auto Trip feature.

Auto Trip/Breaker Trip Option

The Breaker Trip Option allows the selection of which breaker to trip when both breakers are closed. The selections include the “Just Closed Breaker” or “Originally Closed Breaker”. Typically the Originally Closed Breaker is tripped to allow an external Hot Parallel Transfer.

Auto Trip/Tripping Command Time Delay

The Tripping Command Time Delay allows the user to delay (0 to 50 cycles) sending the selected Breaker Trip Option.

Auto Trip/Blocking Inputs Selection

The Blocking Inputs Selection button opens the Blocking Inputs Selection dialog screen (Figure 4-60). Any Input or the Fuse Loss (FL) function can be selected to block an Auto Trip. When an input is selected, it is not grayed out in other types of transfers.

Auto Trip Save/Cancel

The Save selection saves the Auto Trip settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

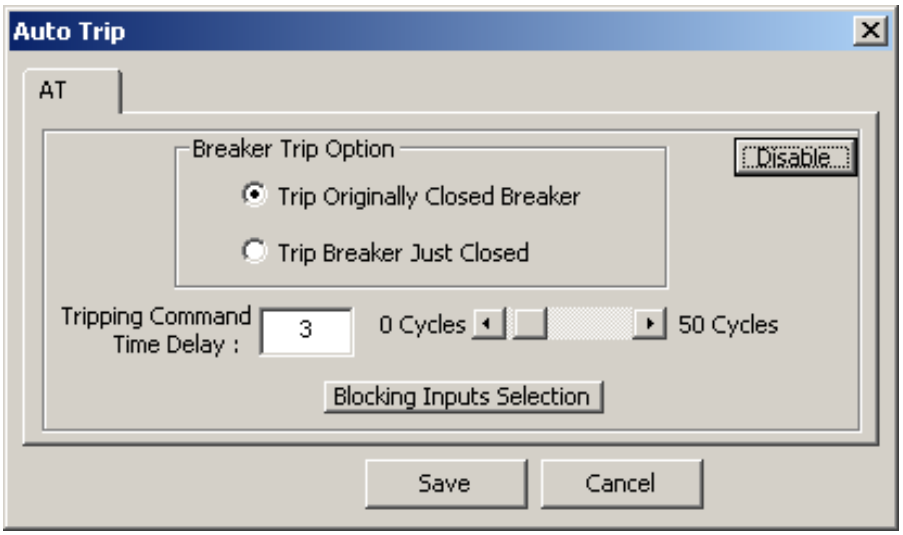


Figure 4-65 Automatic Trip Settings Dialog Screen

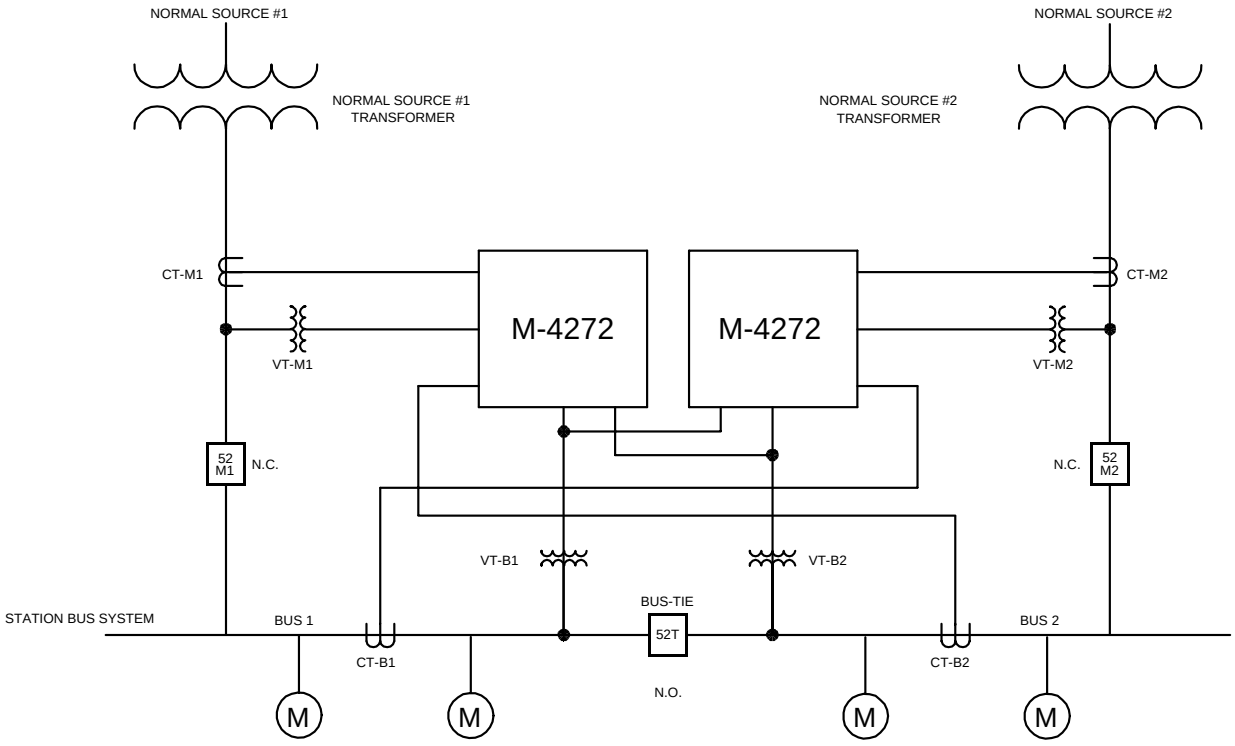


Figure 4-66 Main-Tie-Main Application Example

FUNCTION SETTINGS

Path: System/Setup/Setpoints

The Function Settings Group (Figure 4-33) includes following functions:

- 27B Bus Phase Undervoltage
- 50S1 Source 1 Instantaneous Phase Overload Detection
- 50S2 Source 2 Instantaneous Phase Overload Detection
- 50BF#1 Source 1 Breaker Failure
- S1BF Source 1 Breaker Failure (Breaker Status)
- 81 Bus Voltage Frequency
- TCM Trip Circuit Monitor
- 60FL Bus VT Fuse-Loss
- 50BF#2 Source 2 Breaker Failure (Breaker Status)
- S2BF Source 2 Breaker Failure (Breaker Status)
- 81R ROCOF (Bus Voltage)
- CCM Close Circuit Monitor
- ISSL ISSlogic

27B BUS PHASE UNDERVOLTAGE

Path: System/Setup/Setpoints/27B

The 27B Bus Phase Undervoltage selection from the Function Settings group (Figure 4-33) opens the Bus Phase Undervoltage Transfer Initiate (S1 to S2) dialog screen (Figure 4-67). The dialog screen includes the following tabs:

- 27#1 Bus Phase Undervoltage Transfer Initiate (S1 to S2)
- 27#2 Bus Phase Undervoltage Transfer Initiate (S2 to S1)
- 27#3 Bus Phase Undervoltage
- 27#4 Bus Phase Undervoltage

27#1 BUS PHASE UNDERVOLTAGE TRANSFER INITIATE (S1 TO S2)

Path: System/Setup/Setpoints/27B/27#1

Figure 4-67 displays the settings for the 27#1 Bus Phase Undervoltage Transfer Initiate (S1 to S2) function.

Enable/Disable — The top right corner of the display includes a command button that will disable or enable the function. This selection allows the 27#1 Bus Phase Undervoltage Transfer Initiate (S1 to S2) to be disabled (or enabled) independent from the 27#2 Bus Phase Undervoltage Transfer Initiate (S2 to S1), 27#3 Bus Phase Undervoltage or the 27#4 Bus Phase Undervoltage.

Pickup — The 27#1 Bus Phase Undervoltage Transfer Initiate (S1 to S2) function Pickup (5 to 120 Volts) initiates a transfer from Source 1 to Source 2 based on an undervoltage condition on the motor bus. However, it can be programmed to operate any available output.

Voltage Inhibit — When enabled, the Voltage Inhibit (5 to 120 Volts) is used to block the 27B Function when the motor bus voltage is below this setting. Voltage Inhibit is needed when the MBTS is initially energized or when the bus phase voltage is temporarily not applied to the unit. The Voltage Inhibit Function may be disabled or enabled.

The 27B#1 Function settings used to initiate an Automatic Transfer must be coordinated with any voltage dip that may occur when large motors are started. The 27B#1 Function should not initiate a transfer when a large motor is being started. The voltage dip caused by a large motor starting can be as much as 10 volts and last from several seconds up to 3 or 4 seconds.

Time Delay — A Time Delay (1 to 8160 cycles) can be applied to delay the Bus Phase Undervoltage Transfer Initiate (S1 to S2) start.

I/O Selection — The I/O Selection button opens the 27B#1 Bus Phase Undervoltage Transfer Initiate Inputs/Outputs Selection Dialog Screen (Figure 4-68) that allows any input or the Fuse Loss (FL) function to be selected to block the 27B#1 function. The 27B#1 function can also be used to activate a selected output when it times out.

Save/Cancel — The Save selection saves the 27 Bus Phase Undervoltage settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

27#2 BUS PHASE UNDERVOLTAGE TRANSFER INITIATE (S2 TO S1)

The 27B#2 Bus Phase Undervoltage Transfer Initiate (S2 to S1) is used to initiate a transfer from Source 2 to Source 1 based on an undervoltage condition on the motor bus. In all other respects it is the same as the 27B#1.

27#3 and 27#4 Bus Phase Undervoltage

The 27B#3 and 27B#4 are general purpose Bus Phase Undervoltage functions. They have the same settings and I/O selections as 27B#1 and 27B#2 except they are **not** predefined to initiate transfers. These functions could be used for load shedding, tripping or as an alarm.

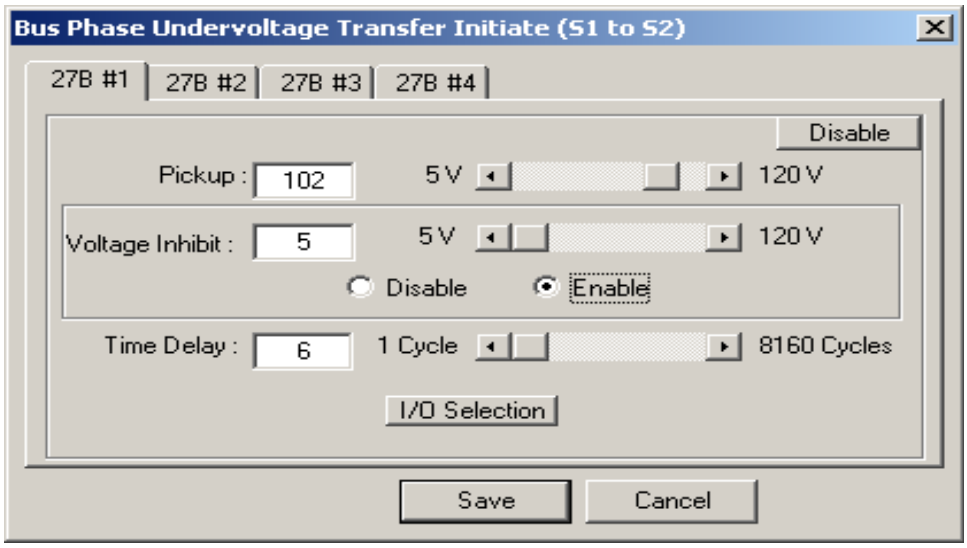


Figure 4-67 Function Settings Bus Phase Undervoltage Transfer Initiate (S1 to S2) Dialog Screen

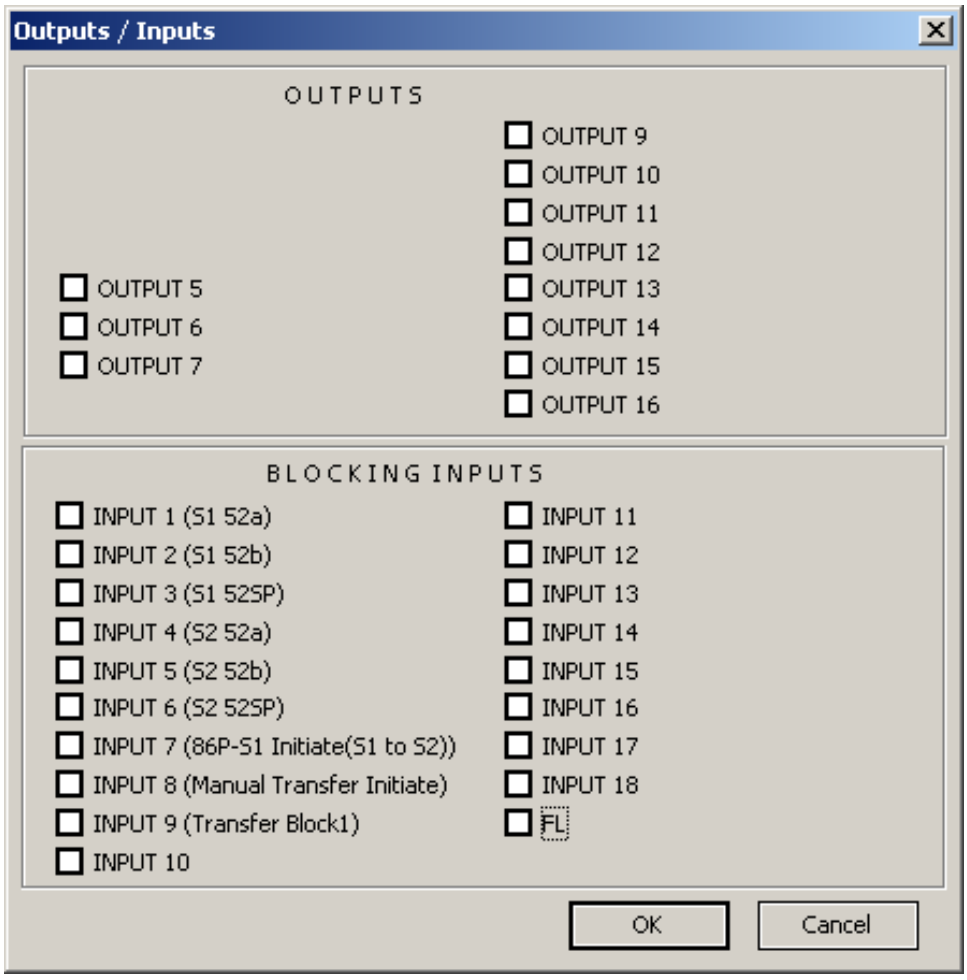


Figure 4-68 27B#1 Bus Phase Undervoltage Transfer Initiate Inputs/Outputs Selection Dialog Screen

50 SOURCE 1 INSTANTANEOUS PHASE OVERLOAD DETECTION

Path: System/Setup/Setpoints/50S1

The Instantaneous Phase Overload (50S1) Function provides fast tripping for high Source 1 currents. The settings must be set such that they will not pickup for normal load current conditions. Ranges and Increments are presented in Figure 4-70. Since this is only a single phase element, the 50S1 Function can only be used for overload detection and not used for overcurrent protection. The current (I_R) is equal to the primary current (I_p) divided by the appropriate CT ratio.

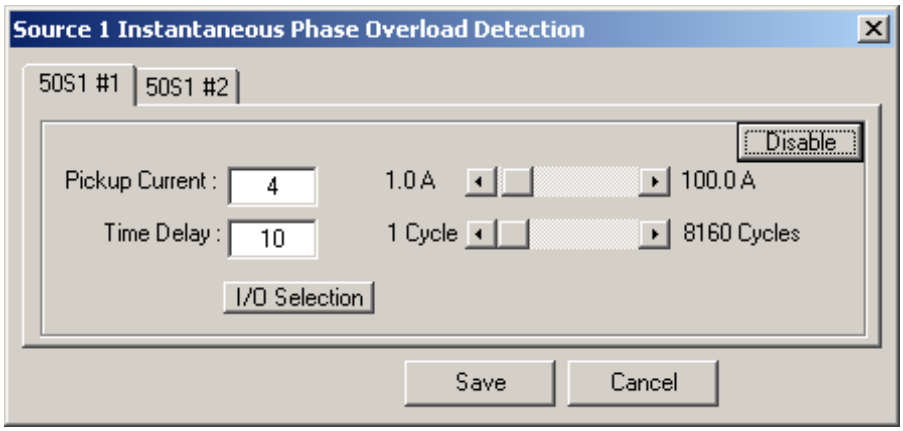


Figure 4-69 Source 1 Instantaneous Phase Overload Detection Dialog Screen

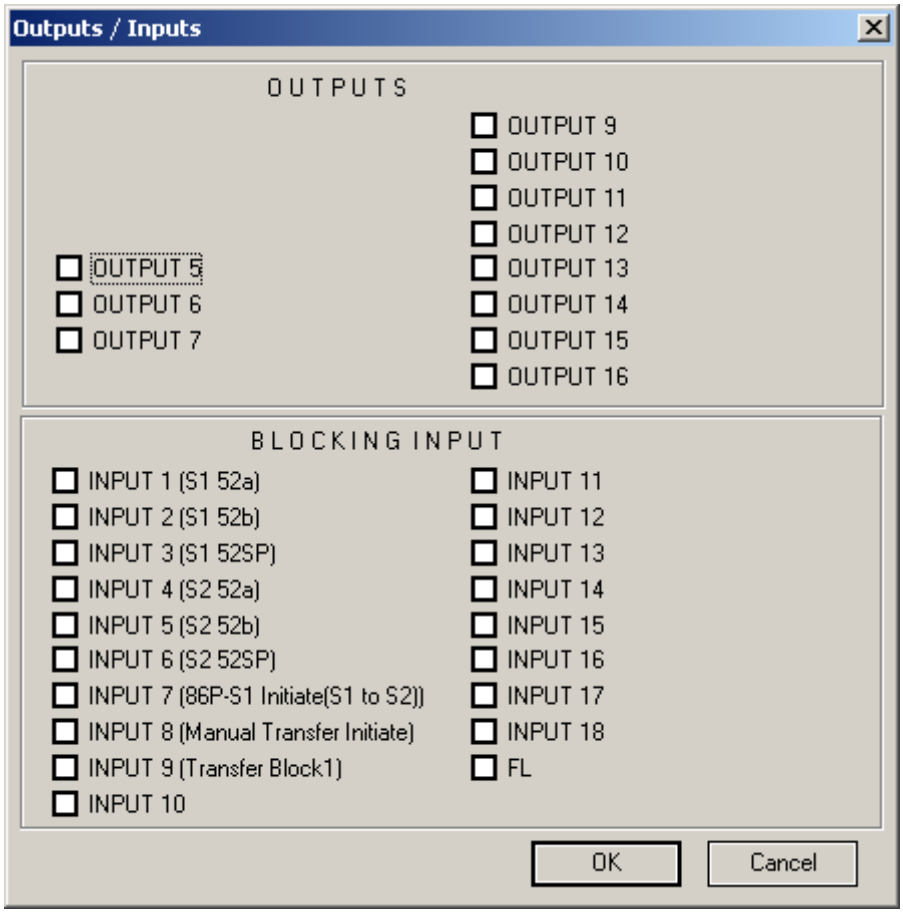


Figure 4-70 Source 1 Instantaneous Phase Overload Detection I/O Selection Dialog Screen

50 SOURCE 2 INSTANTANEOUS PHASE OVERLOAD DETECTION

Path: System/Setup/Setpoints/50S2

The Instantaneous Phase Overload (50S2) Function provides fast tripping for high Source 2 currents. The settings must be set such that they will not pickup for normal load current conditions. Ranges and Increments are presented in Figure 4-71. Since this is only a single phase element the 50S2 Function can only be used for overload detection and not used for overcurrent protection. The current (I_R) is equal to the primary current (I_p) divided by the appropriate CT ratio.

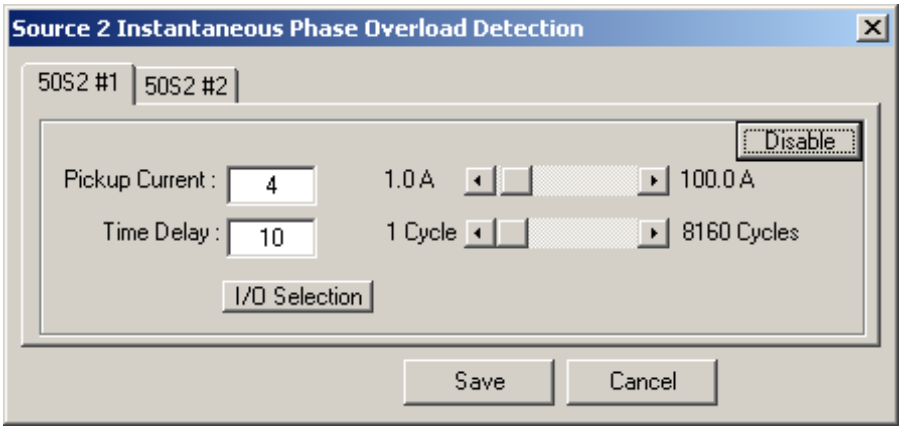


Figure 4-71 Source 2 Instantaneous Phase Overload Detection Dialog Screen

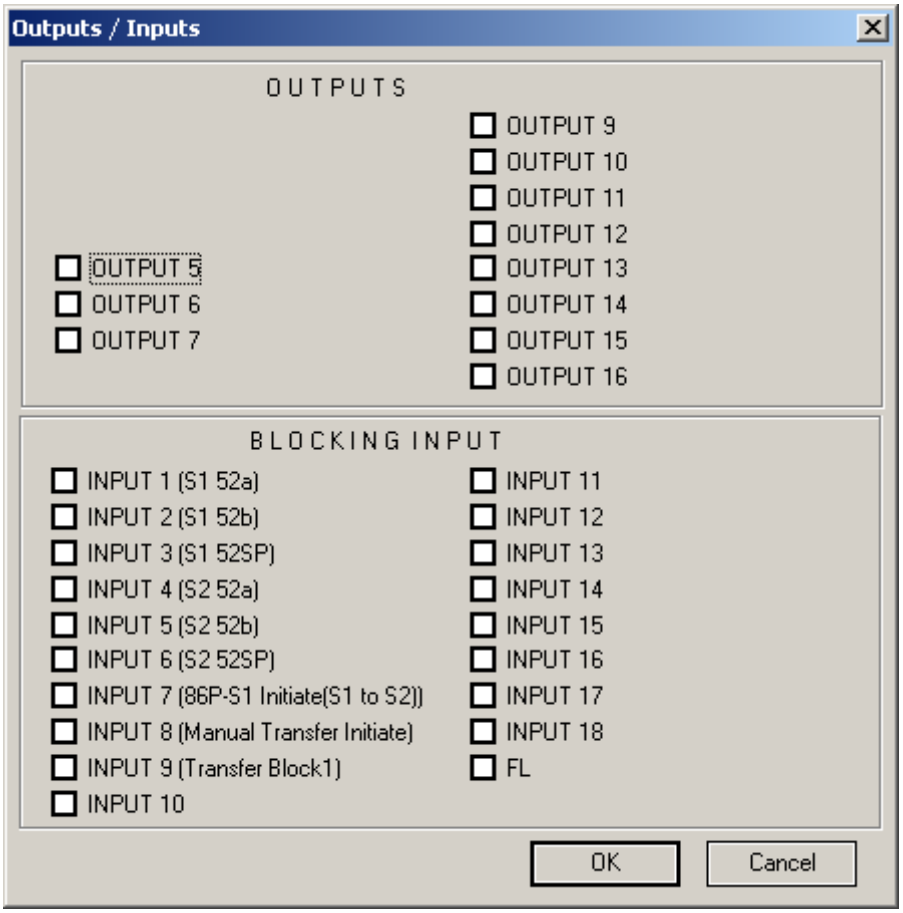


Figure 4-72 Source 2 Instantaneous Phase Overload Detection I/O Selection Dialog Screen

50BF #1 SOURCE 1 BREAKER FAILURE

Path: System/Setup/Setpoints/50BF#1

The 50BF #1 Source 1 Breaker Failure selection from the Function Settings group (Figure 4-33) opens the 50BF #1 Source 1 Breaker Failure dialog screen (Figure 4-73).

Enable/Disable — The top right corner of the display includes a command button that will disable or enable the function.

Pickup Current — A breaker failure condition is detected by the continued presence of current after a trip command has been sent to the Source 1 breaker. If the current is greater than the Pickup Current setting for the time period of the Time Delay setting after the trip command is sent, then the breaker failure alarm indicated.

If the Simultaneous Transfer mode is selected (Common Function Settings Figure 4-33), then the breaker that was just closed is tripped open to prevent the New Source from continuing to be connected through the failed breaker to the Old Source that could have a fault.

If the Sequential Transfer mode is selected (Common Function Settings Figure 4-33), then a close command will not be sent since the breaker status would indicate that the tripped breaker did not open. Since the transfer could not be completed the Incomplete Transfer Lockout timer would time out and generate a lockout condition.

Time Delay — The time period (1 to 30 cycles) after the Pickup Current setting is exceeded at which point the Breaker Failure Alarm is actuated.

I/O Selection — The I/O Selection button opens the 50BF #1 Source 1 Breaker Failure Outputs/Blocking Inputs Selection Dialog Screen (Figure 4-74). This screen allows any input or the Fuse Loss (FL) function to be selected to block the 50BF #1 Function. The 50BF #1 Function can also be used to activate a selected output when it times out.

I/O Initiate — The I/O Initiate button opens the 50BF #1 Source 1 Breaker Failure Initiate Inputs/ Initiate Outputs Selection Dialog Screen (Figure 4-75). This screen allows the selection of an input or inputs that can be used to initiate a breaker failure. Any of the outputs can also be selected to initiate a breaker failure.

Save/Cancel — The Save selection saves the 50BF #1 Source 1 Breaker Failure settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

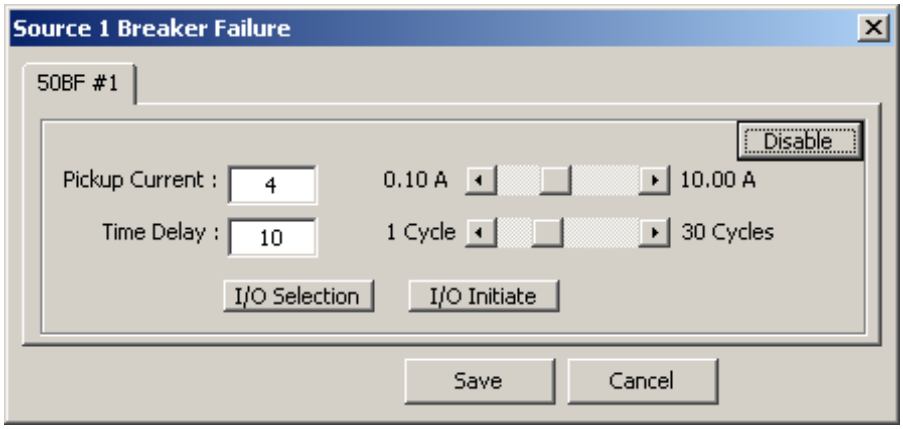


Figure 4-73 50BF #1 Source 1 Breaker Failure Dialog Screen

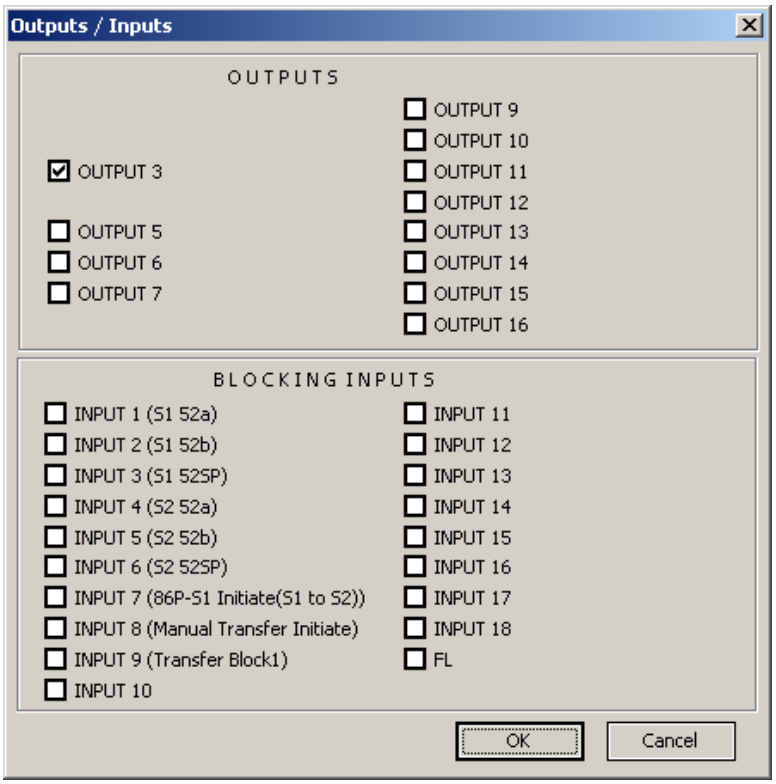


Figure 4-74 50BF #1 Source 1 Breaker Failure I/O Selection Dialog Screen

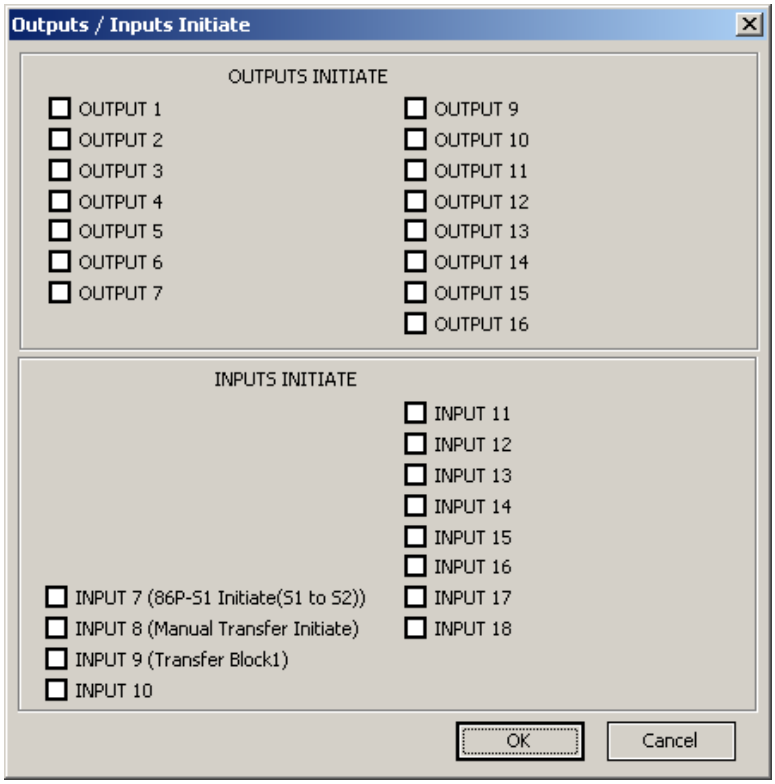


Figure 4-75 50BF #1 Source 1 Breaker Failure Initiate Inputs/Initiate Outputs Selection Dialog Screen

50BF #2 SOURCE 2 BREAKER FAILURE

Path: System/Setup/Setpoints/50BF#2

The 50BF #2 Source 2 Breaker Failure selection from the Function Settings group (Figure 4-33) opens the 50BF #2 Source 2 Breaker Failure dialog screen (Figure 4-76). The 50BF #2 Source 2 Breaker Failure Function includes the same features as 50BF #1 except that it monitors for a breaker failure of the Source 2 breaker and Output 1 for Trip S1 is the default output setting.

S1 BF SOURCE 1 BREAKER FAILURE (BREAKER STATUS)

Path: System/Setup/Setpoints/S1 BF

The S1 BF Source 1 Breaker Failure (Breaker Status) selection from the Function Settings group (Figure 4-33) opens the S1 BF Source 1 Breaker Failure (Breaker Status) dialog screen (Figure 4-77).

The Source 1 breaker status inputs are monitored for breaker failure. The Source 1 breaker is considered failed when the breaker status has not changed state within the programmable time after a trip command is issued.

When the Simultaneous Transfer mode is selected (Common Function Settings Figure 4-34), and a breaker failure occurs on Source 1 that should have tripped, the breaker that was just closed will be tripped. This prevents the New Source from continuing to be connected through the failed breaker to the old source that may be faulted.

If the Sequential Transfer mode is selected (Common Function Settings Figure 4-34), then a close command will not be sent since the breaker status would indicate that the tripped breaker did not open. Since the transfer could not be completed, the Incomplete Transfer Lockout timer would time out and generate a lockout condition.

Enable/Disable — The top right corner of the display includes a command button that will disable or enable the function.

Time Delay — (0 to 30 cycles) The Source 1 breaker is considered failed when the breaker status has not changed state within the programmable time after a trip command is issued.

I/O Selection — The I/O Selection button opens the S1 BF Source 1 Breaker Failure Outputs Blocking Inputs Selection Dialog Screen (Figure 4-78). This screen allows any input or the Fuse Loss (FL) function to be selected to block the S1 BF Function. The S1 BF Function can also be used to activate a selected output when it times out.

Save/Cancel — The Save selection saves the S1 BF Source 1 Breaker Failure (Breaker Status) settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

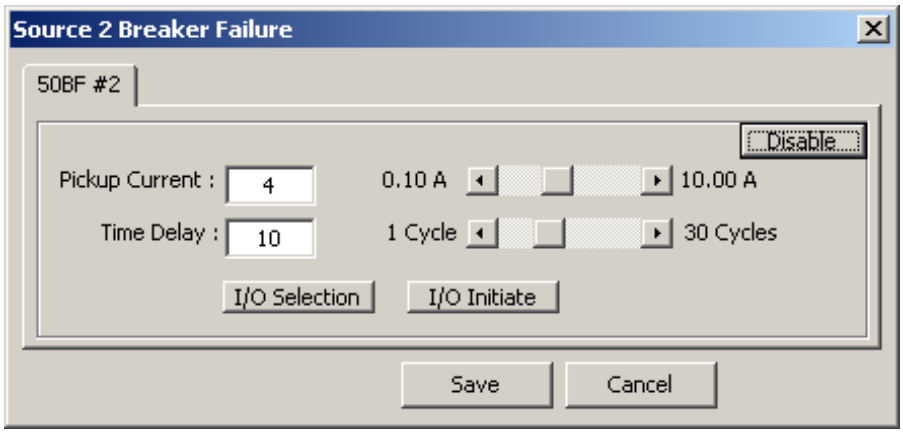


Figure 4-76 50BF #2 Source 2 Breaker Failure Dialog Screen

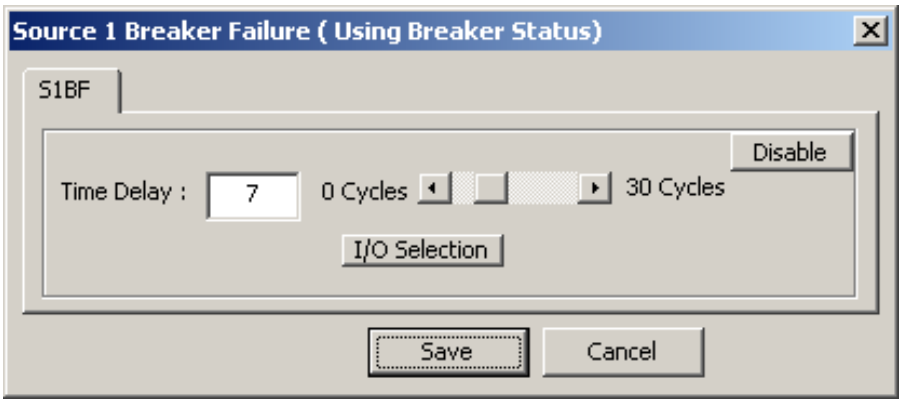


Figure 4-77 S1 BF Source 1 Breaker Failure (Breaker Status) Dialog Screen

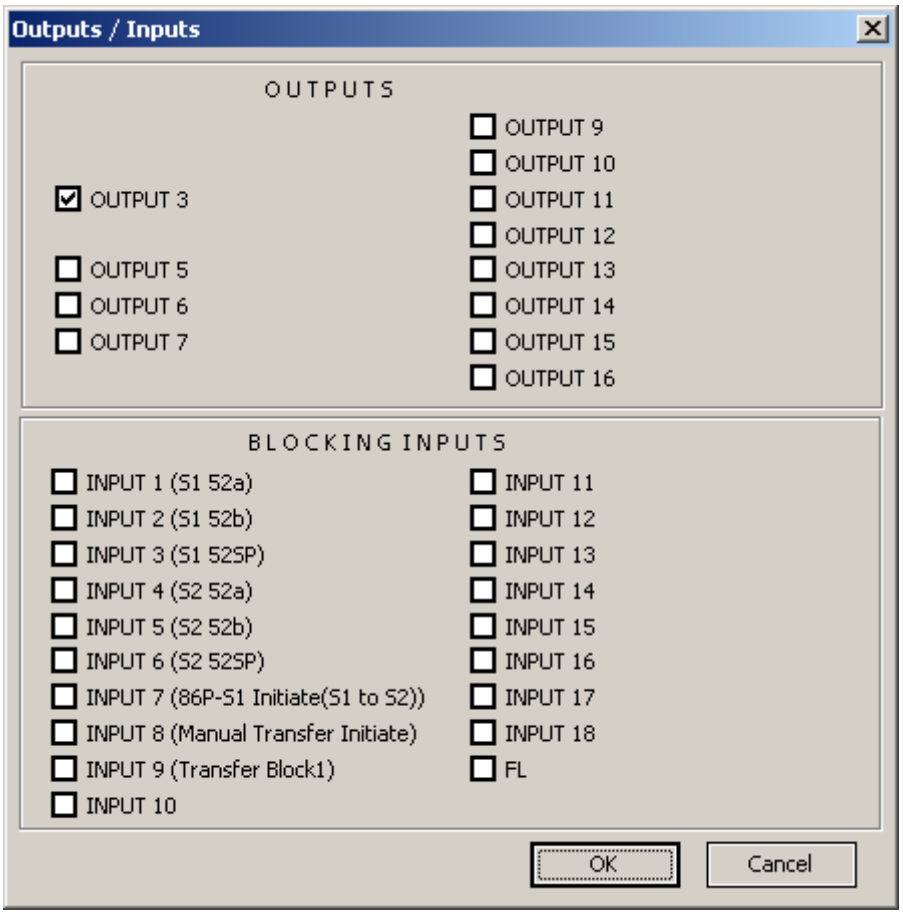


Figure 4-78 S1 BF Source 1 Breaker Failure (Breaker Status) I/O Selection Dialog Screen

S2 BF SOURCE 2 BREAKER FAILURE (BREAKER STATUS)

Path: System/Setup/Setpoints/S2 BF

The S2 BF Source 2 Breaker Failure (Breaker Status) selection from the Function Settings group (Figure 4-33) opens the S2 BF Source 2 Breaker Failure (Breaker Status) dialog screen (Figure 4-79). The S2 BF Source 2 Breaker Failure Function includes the same features as S1 BF except that it monitors for a breaker failure of the Source 2 breaker.

60FL BUS VT FUSE LOSS

Path: System/Setup/Setpoints/60FL

The 60FL Bus VT Fuse Loss selection from the Function Settings group (Figure 4-33) opens the 60FL Bus VT Fuse Loss dialog screen (Figure 4-80).

Enable/Disable — The top right corner of the display includes a command button that will disable or enable the function.

Delta Voltage Pickup — The 60FL Bus VT Fuse-Loss condition is detected by comparing either the Three-Phase voltage of the motor bus to the Three-Phase voltage of the connected source (VT's in Three-Phase connection) or the Single Phase voltage of the motor bus to the Single Phase voltages of the connected source (VT's in single phase connection):

- Phase A to Phase A
- Phase B to Phase B
- Phase C to Phase C

Time Delay — A Time Delay can be applied to delay the 60FL Bus VT Fuse-Loss function output.

Bus VT Fuse Loss Condition — When the difference in voltage between the bus and the connected source is present for the time delay the MBTS will respond based on the selection to either Block Transfer or perform a Fixed Time Transfer when a transfer is initiated. Since the bus voltage cannot be observed the only possible transfer that could be performed is the Fixed Time Transfer.

I/O Selection — The I/O Selection button opens the 60FL Bus VT Fuse-Loss I/O Selection Dialog Screen (Figure 4-81) that allows any input or the Fuse Loss (FL) function to be selected to block the 60FL Function. The 60FL Function can also be used to activate a selected output when it times out.

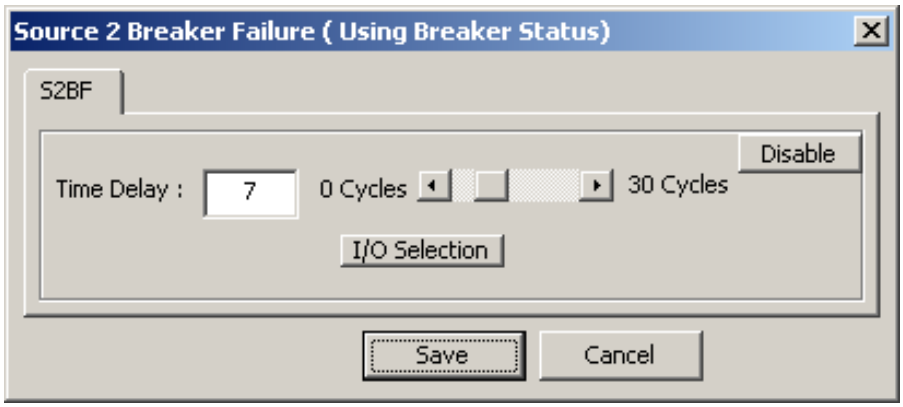


Figure 4-79 S2 BF Source 2 Breaker Failure (Breaker Status) Dialog Screen

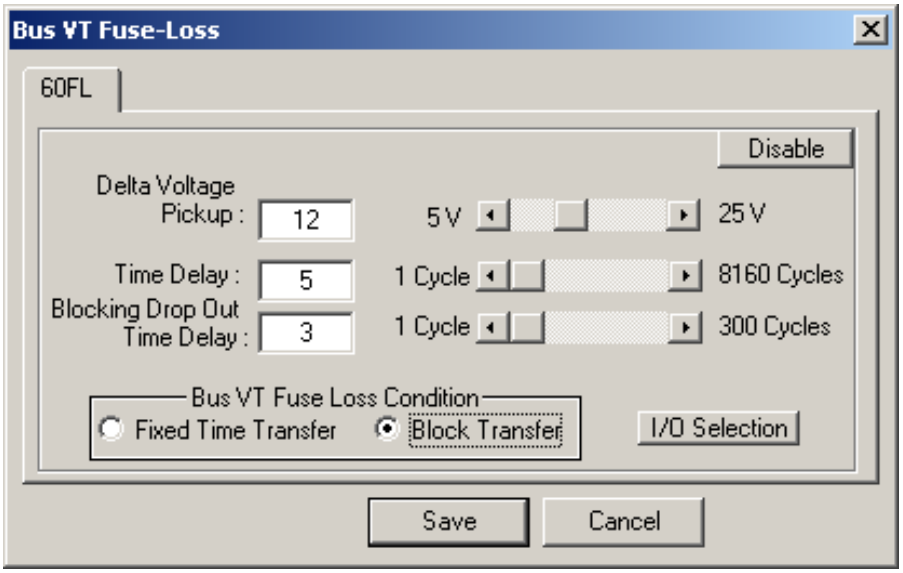


Figure 4-80 60FL Bus VT Fuse Loss Dialog Screen

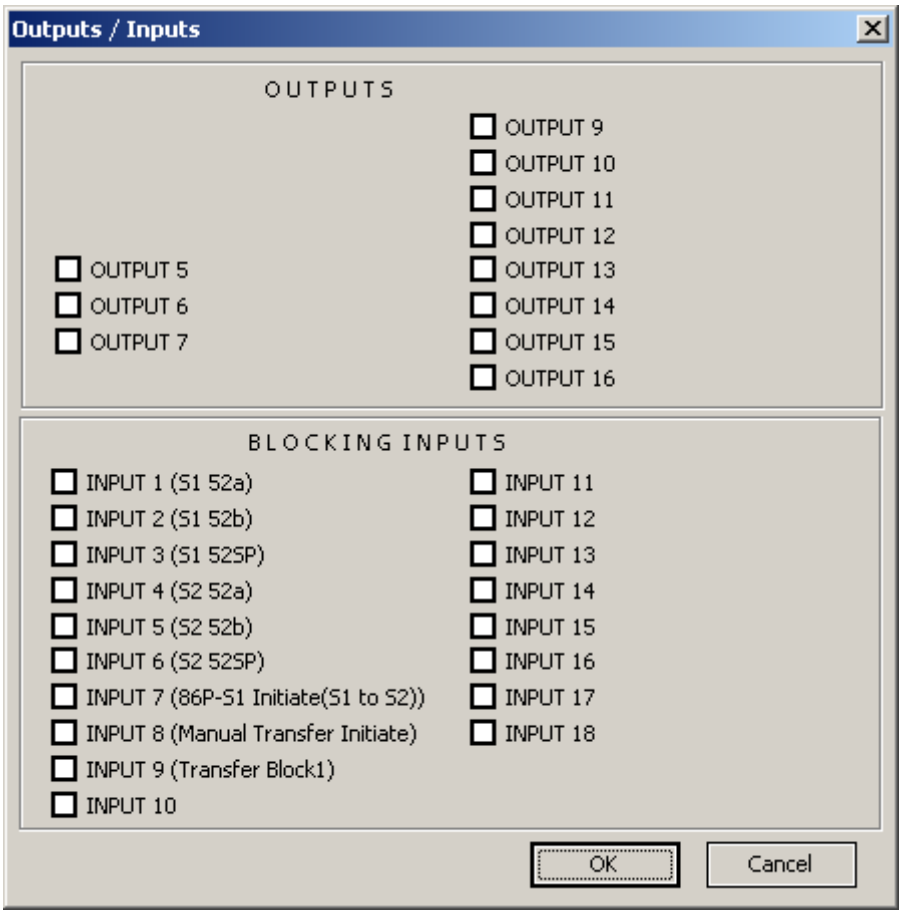


Figure 4-81 60FL Bus VT Fuse-Loss Function Inputs/Outputs Selection Dialog Screen

81 BUS VOLTAGE FREQUENCY

Path: System/Setup/Setpoints/81

Figure 4-82 displays the settings for the 81 #1 Bus Voltage Frequency function. The settings for the 81 #2 Bus Voltage Frequency are the same as the 81 #1.

Enable/Disable — The top right corner of the display includes a command button that will disable or enable the function. This selection allows the 81 #1 Bus Voltage Frequency to be disabled (or enabled) independent from the 81 #2 Bus Voltage Frequency.

Pickup — The 81 #1(2) Bus Voltage Frequency Function detects a drop in frequency of the motor bus. If the frequency is less than the Pickup setting (50.00 to 67.00 Hz) or (40.00 to 57.00 Hz for 50 Hz unit) for a time period that exceeds the Time Delay setting, then an 81 #1 or 81 #2 will be indicated and an output can be activated.

The 81 #1 function can be used for load shedding (Common Setting Outputs Load Shedding). The 81 Function is automatically disabled when the bus phase voltage input is less than 5 to 15 V (Positive Sequence) based on the frequency, or less than 5 V (Single Phase).

Time Delay — A Time Delay (5 to 65500 cycles) can be applied to delay the Bus Voltage Frequency output.

I/O Selection — The I/O Selection button opens the 81 #1 Bus Voltage Frequency I/O Selection Dialog Screen (Figure 4-83) that allows any input or the Fuse Loss (FL) function to be selected to block the 81 #1(2) Function. The 81 #1(2) Function can also be used to activate a selected output when it times out.

Save/Cancel — The Save selection saves the 81 #1(2) Bus Voltage Frequency Function Dialog Screen settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

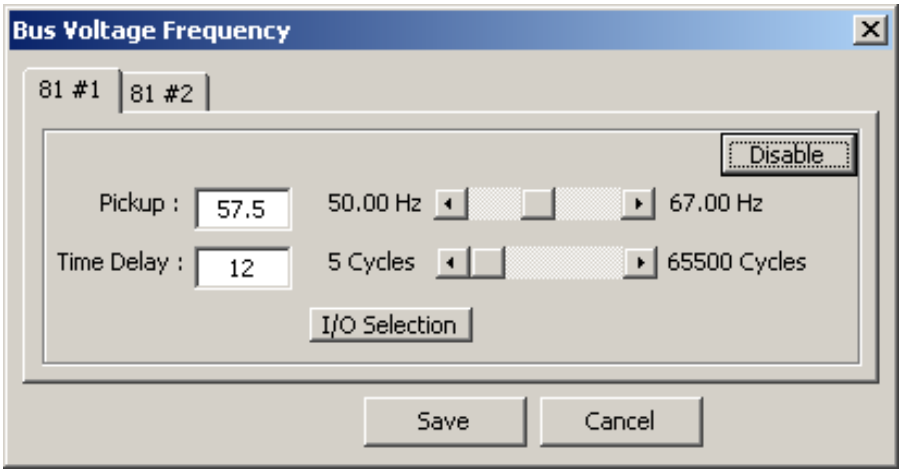


Figure 4-82 81 #1(2) Bus Voltage Frequency Function Dialog Screen

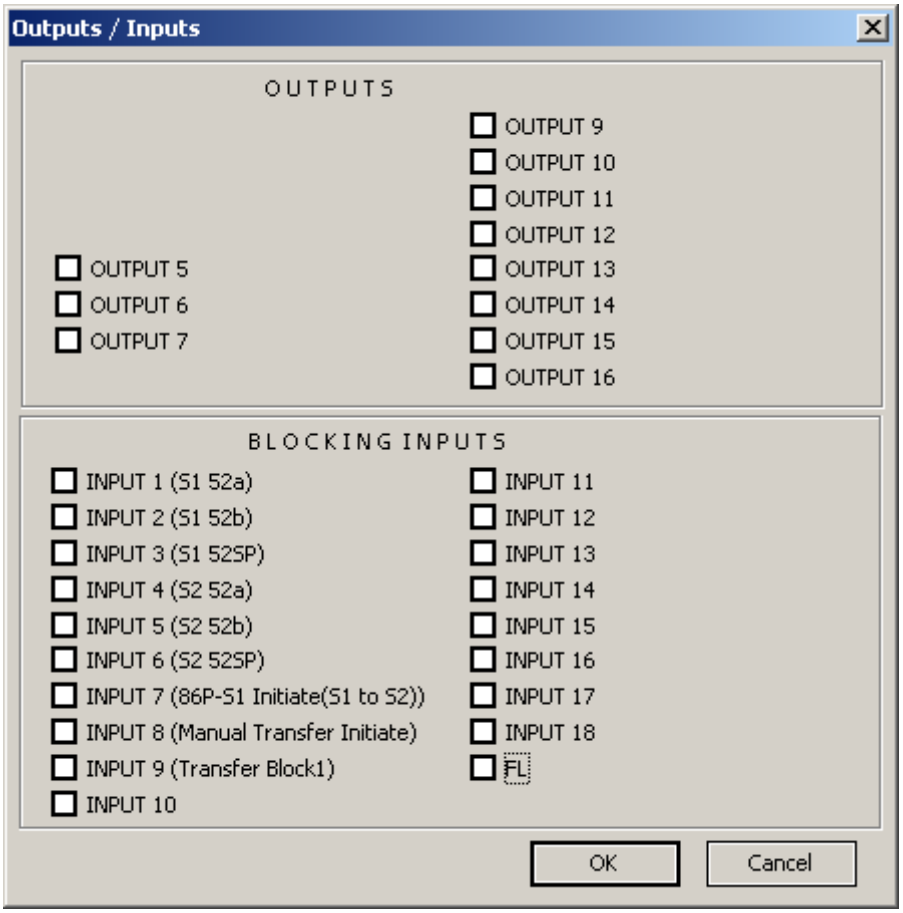


Figure 4-83 81 #1(2) Bus Voltage Frequency Function Inputs/Outputs Selection Dialog Screen

81R (Rate Of Change Of Frequency) (BUS VOLTAGE)

Path: System/Setup/Setpoints/81R

Figure 4-84 displays the settings for the 81R #1 ROCOF (Bus Voltage) function. The settings for the 81R #2 ROCOF (Bus Voltage) are the same as the 81R #1.

■ **NOTE**: Bus VT configuration must be set to Three-Phase to enable the 81R ROCOF Function.

Enable/Disable — The top right corner of the display includes a command button that will disable or enable the function. This selection allows the 81R #1 ROCOF (Bus Voltage) to be disabled (or enabled) independent from the 81R #2.

Pickup — The 81R Rate of Change of Frequency (ROCOF) Bus Voltage function is used to detect the rate of change of the frequency of the motor bus as it decays. When the bus is disconnected from the original source the frequency begins to decrease and the longer the bus is disconnected the faster the frequency changes. This function is used to recognize that the ROCOF has exceeded the Pickup setting.

This function is typically used for load shedding. If a load that is causing the frequency to change quickly can be disconnected, then a transfer may still be possible. The 81R Function is automatically disabled during unbalanced faults and other disturbances.

Time Delay — A Time Delay can be applied to delay the 81R ROCOF (Bus Voltage) function output. The time delay and magnitude settings of the 81R should be based on simulation studies.

Negative Sequence Voltage Inhibit — The function uses the negative sequence voltage to block the 81R.

Increasing ROCOF — The Increasing ROCOF (Bus Voltage) can be selected as either Enable or Disable. When the Increasing ROCOF is selected to Disable, the 81R function detects the rate of change of frequency of the motor bus voltage in the decreasing direction only, and the 81R function is blocked to detect the increasing direction. When the Increasing ROCOF is selected to Enable, the 81R function detects the rate of change of frequency of the motor bus voltage in both the increasing and decreasing directions.

I/O Selection — The I/O Selection button opens the 81R ROCOF (Bus Voltage) I/O Selection Dialog Screen (Figure 4-85) that allows any input or the Fuse Loss (FL) function to be selected to block the 81R #1(2) Function. The 81R #1(2) Function can also be used to activate a selected output when it times out.

Save/Cancel — The Save selection saves the 81R #1(2) ROCOF (Bus Voltage) Function Dialog Screen settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

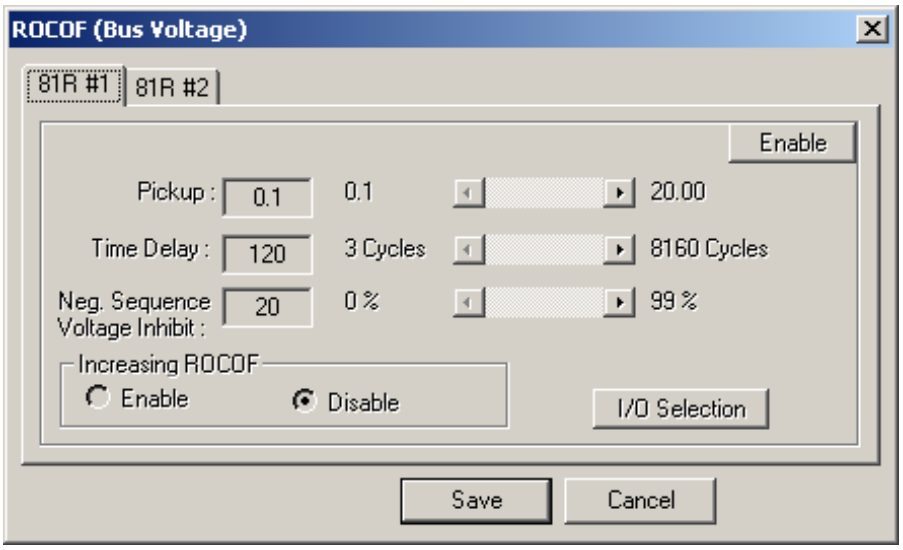


Figure 4-84 81R #1(2) ROCOF (Bus Voltage) Function Dialog Screen

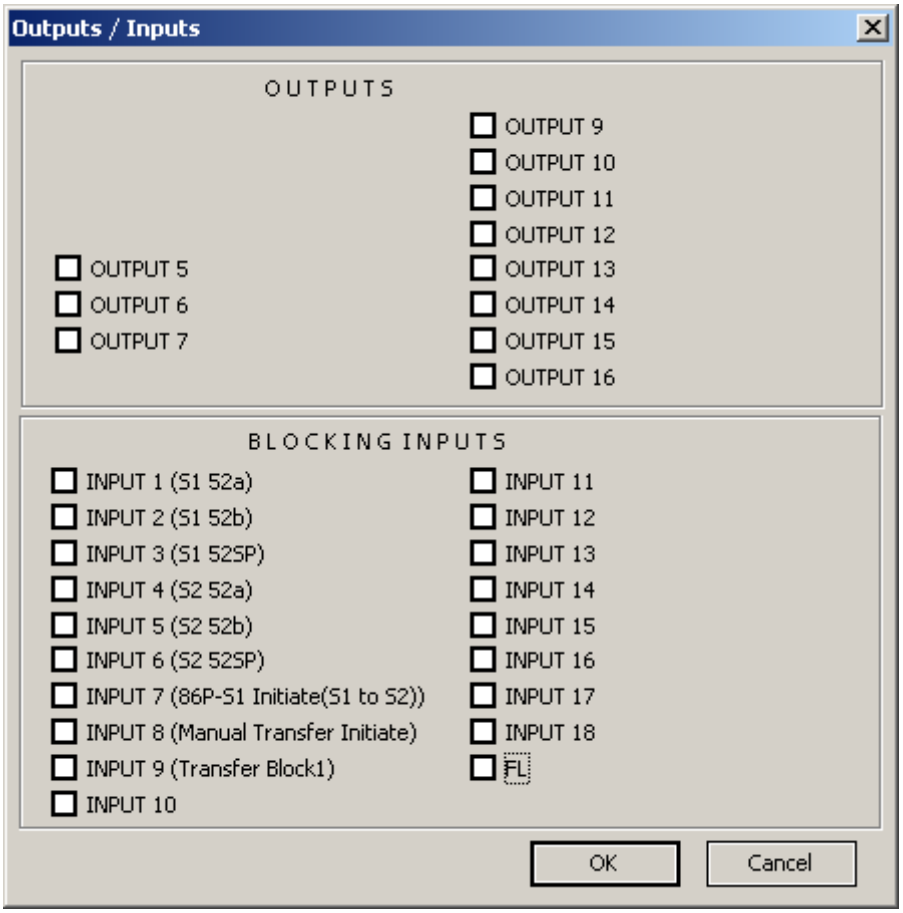


Figure 4-85 81R #1(2) ROCOF (Bus Voltage) Inputs/Outputs Selection Dialog Screen

CCM (CLOSE CIRCUIT MONITOR)

Path: System/Setup/Setpoints/CCM

Figure 4-86 displays the settings for the CCM (Close Circuit Monitor) function. The settings for the CCM #2 Close Circuit Monitor are the same as the CCM #1.

The CCM inputs are provided for monitoring the continuity of the close circuits. The inputs can be used for nominal close coil voltages of 24 V dc to 250 V dc. Close circuit monitoring is performed in the active breaker status only. Both the DC supply and continuity for the circuit is monitored. If a close coil is detected as being open for the time delay then transfers are blocked.

The M-4272 Close Coil Monitor will block all transfers and illuminate the appropriate alarm LED on the unit front panel when all of the following conditions exist:

- The M-4272 CCM is connected to the target close coil circuit.
- The CCM Function is enabled.
- An open condition has been detected in the close coil circuit for the duration of the Time Delay.

The M-4272 CCM Function is comprised of two elements; the close coil circuit open detection circuit element and the block all transfers element. The close coil circuit open detection circuit will illuminate the alarm LED even when the M-4272 is not physically connected to the close coil circuit. When the M-4272 is not connected to the close coil circuit, then the appropriate CCM alarm LED on the unit front panel should be labeled as necessary to identify the alarm as not valid. With the M-4272 connected to the close coil circuit the CCM Function must be enabled in order for the M-4272 to block all transfers. If the M-4272 is not connected to the close coil circuit, there is no affect on transfer operation.

The output of the Close Circuit Monitoring function can be programmed as an alarm to alert maintenance personnel.

CCM Connection Considerations — External connections for the Close Circuit Monitoring function are shown in Figures 4-86, 4-87 and Figure 5-4.

The default Close Circuit Monitor input voltage is 250 V dc. See Section 5.4, **Circuit Board Switches and Jumpers**, (Table 5-4 for CCM#1, Table 5-6 for CCM#2) for other available close circuit input voltage selections.

Beckwith Electric Co., Inc. recommends that the M-4272 CCM circuit be connected directly to the close coil, bypassing the anti-pump "Y" relay portion of the close circuit as illustrated in Figure 4-86.

The type of anti-pump "Y" relay that is often found within the close coil circuit is generally a high impedance type, such as an IDEC RR Series Power Relay. The relay coil resistance is high (approximately 8.5 to 10K Ohms), and it's rated pickup current is 11 to 13 mA, ± 15% at 20° C. However, the relay's dropout voltage is approximately 10 to 15% of rated 110 V dc voltage. Therefore, the anti-pump relay may be held up and would not drop out until the leakage current is reduced to approximately 2 mA.

▲ **CAUTION**: Connecting the M-4272 Close Coil Monitor (CCM) in parallel with other relay CCMs in the close coil circuit where the anti-pump "Y" relay is not bypassed may not provide reliable breaker closing operations.

If the close coil circuit configuration does not support connecting the CCM directly to the close coil (Figure 4-87), then Beckwith Electric Co., Inc. does not recommend connecting the M-4272 CCM in parallel with other relay CCMs. If two or more CCMs are connected to the close coil circuit, there is a high probability that the anti-pump "Y" coil will not drop out. Therefore, only one CCM, either a M-4272 or other relay should be used in the close coil circuit to provide reliable breaker closing operation.

Enable/Disable — The top right corner of the display includes a command button that will disable or enable the function. This selection allows the CCM #1 (Close Circuit Monitor) to be disabled (or enabled) independent from the CCM #2.

Time Delay — A Time Delay can be applied to delay the CCM (Close Circuit Monitor) function output.

Dropout Time Delay — A Time Delay can be applied to delay the reset of the CCM (Close Circuit Monitor) function output.

I/O Selection — The I/O Selection button opens the CCM (Close Circuit Monitor) I/O Selection Dialog Screen (Figure 4-88) that allows any input or the Fuse Loss (FL) function to be selected to block the CCM (Close Circuit Monitor). The CCM #1(2) Function can also be used to activate a selected output when it times out.

Save/Cancel — The Save selection saves the CCM (Close Circuit Monitor) Function Dialog Screen settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

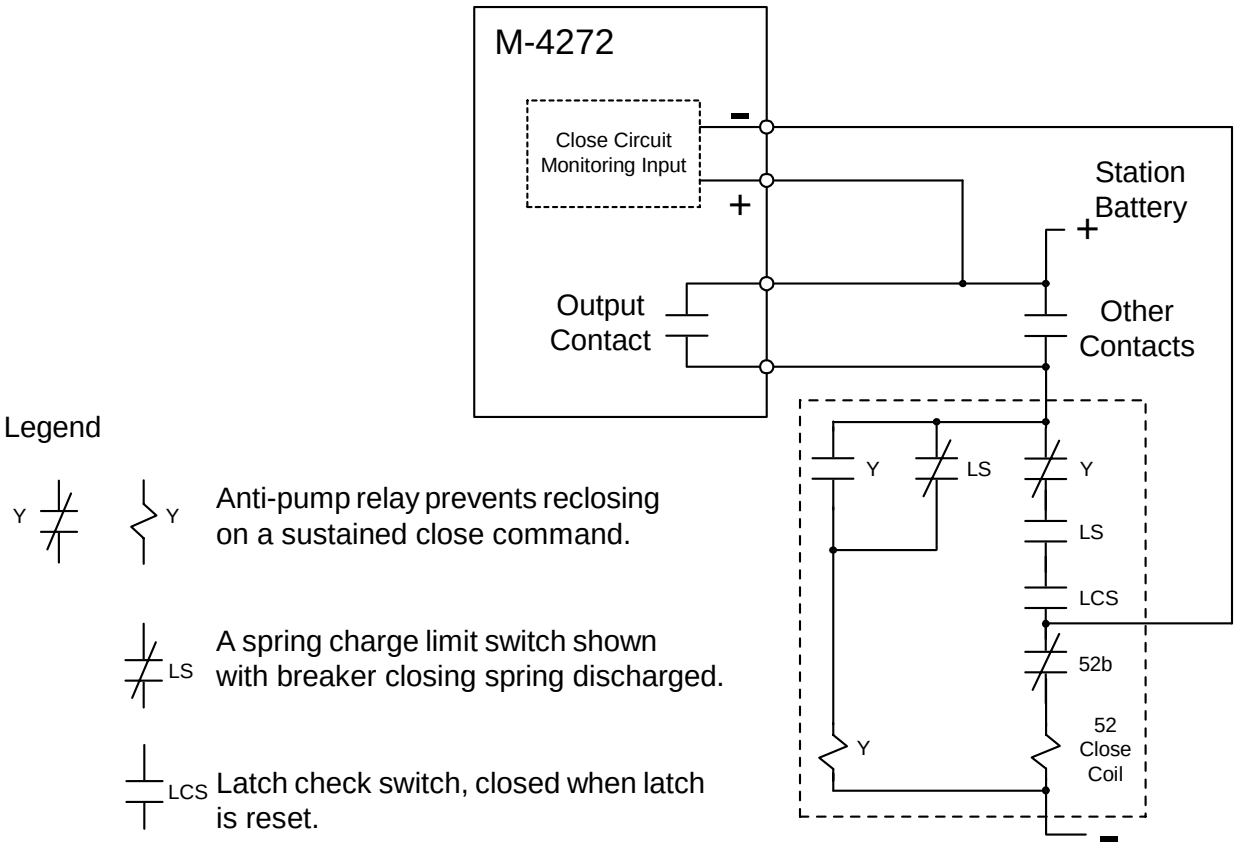


Figure 4-86 Recommended Close Circuit Monitoring Input Configuration

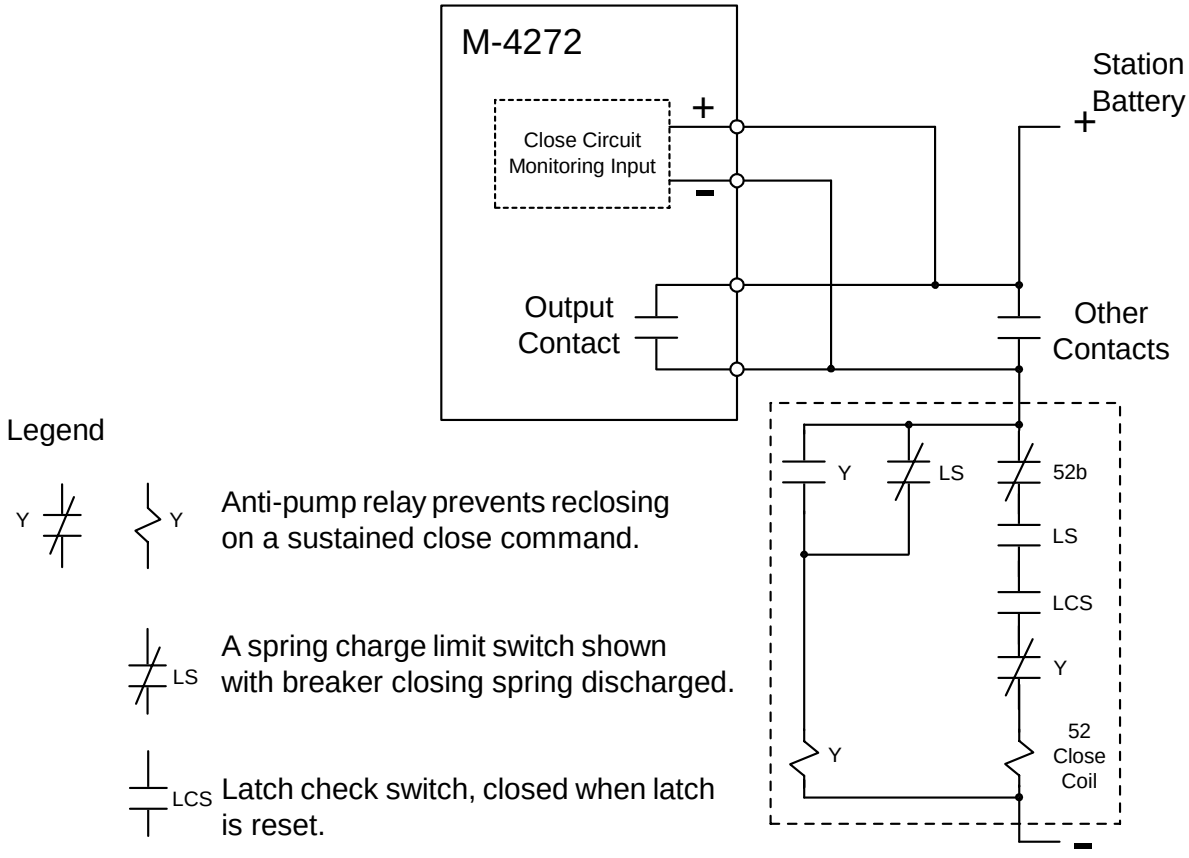


Figure 4-87 Close Circuit Monitoring Input Configuration With Anti-pump Relay Not Bypassed

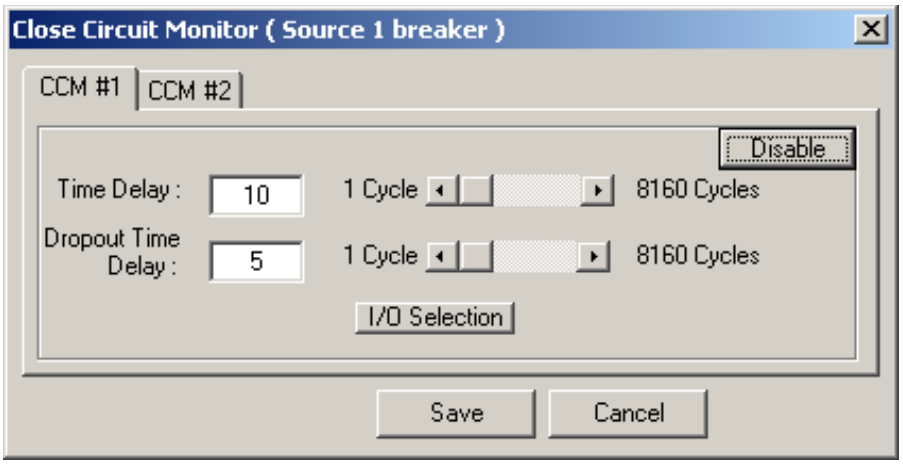


Figure 4-88 CCM (Close Circuit Monitor) Function Dialog Screen

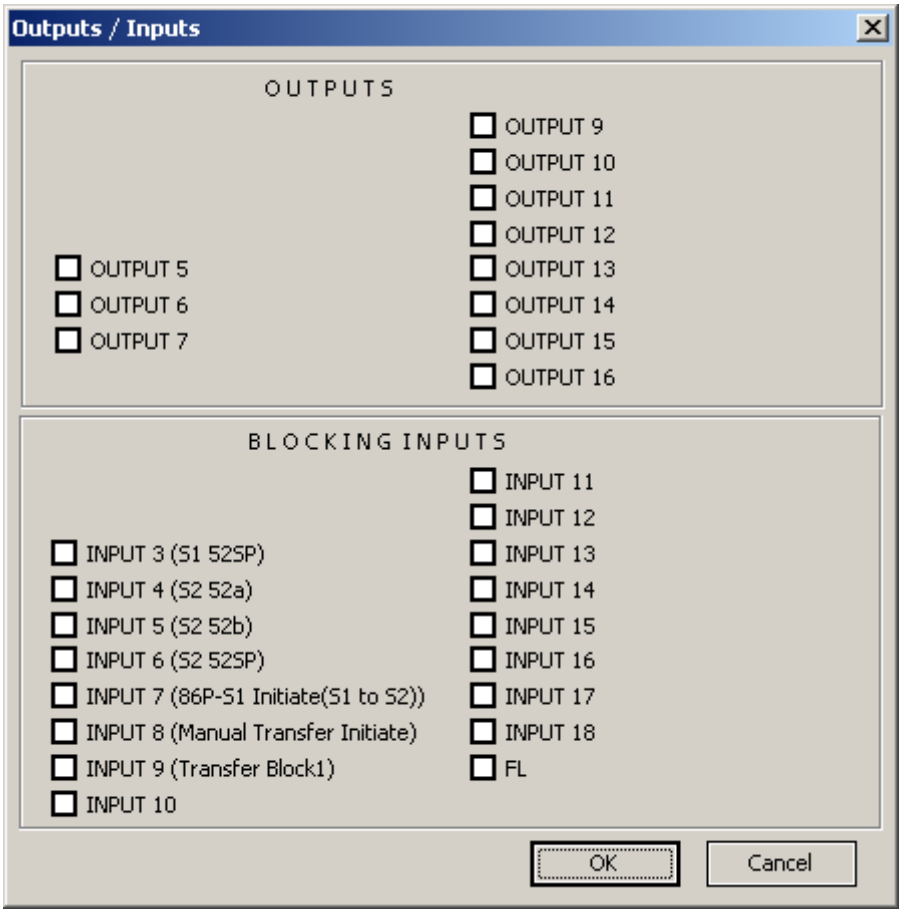


Figure 4-89 CCM (Close Circuit Monitor) Inputs/Outputs Selection Dialog Screen

TCM (TRIP CIRCUIT MONITOR)

Path: System/Setup/Setpoints/TCM

Figure 4-91 displays the settings for the TCM (Trip Circuit Monitor) function. The settings for the TCM #2 Trip Circuit Monitor are the same as the TCM #1.

Enable/Disable — The top right corner of the display includes a command button that will disable or enable the function. This selection allows the TCM #1 (Trip Circuit Monitor) to be disabled (or enabled) independent from the TCM #2.

The TCM inputs are provided for monitoring the continuity of the trip circuits. The inputs can be used for nominal trip coil voltages of 24 V dc to 250 V dc. Trip circuit monitoring is performed in the active breaker status only. Both the DC supply and continuity for the circuit is monitored. If a trip coil is detected as being open for the time delay then transfers are blocked.

External connections for the Trip Circuit Monitoring function are shown in Figure 4-90 and Figure 5-4. The default Trip Circuit Monitor input voltage is 250 V dc. See Section 5.4, **Circuit Board Switches and Jumpers**, (Table 5-3 for TCM#1, Table 5-5 for TCM#2) for other available trip circuit input voltage selections.

When the Output Contact is open, and continuity exists in the Trip Circuit, a small current flows that activates the Trip Circuit Monitoring Input. If the Trip Circuit is open, and the output contact is open, no current flows and the Trip Circuit Monitoring Input is deactivated. An Output Contact that is welded closed would also cause the Trip Circuit Monitoring Input to deactivate, indicating failure of the Output Contact.

When the Output Contact is closed, no current flows in the Trip Circuit Monitoring Input. If the M-4272 has issued a trip command to close the Output Contact and Trip Circuit Monitoring Input remains activated, this is an indication that the Output Contact failed to close.

The output of the Trip Circuit Monitoring function can be programmed as an alarm to alert maintenance personnel.

The M-4272 Trip Coil Monitor (TCM) will block all transfers and illuminate the appropriate alarm LED on the unit front panel when all of the following conditions exist:

- The M-4272 TCM is connected to the target trip coil circuit.
- The TCM Function is enabled.
- An open condition has been detected in the trip coil circuit for the duration of the Time Delay.

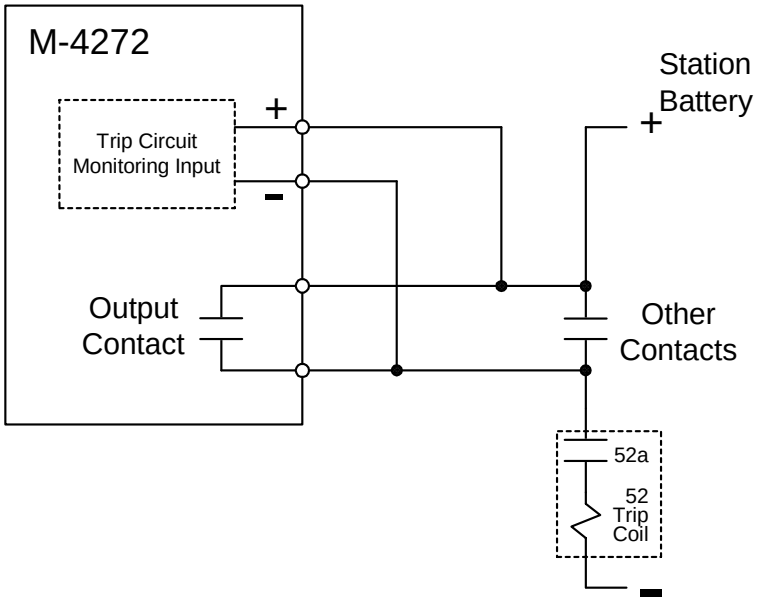


Figure 4-90 Trip Circuit Monitoring Input

The M-4272 TCM Function is comprised of two elements; the trip coil circuit open detection circuit element and the block all transfers element. The trip coil circuit open detection circuit will illuminate the alarm LED even when the M-4272 is not physically connected to the trip coil circuit. When the M-4272 is not connected to the trip coil circuit, then the appropriate TCM alarm LED on the unit front panel should be labeled as necessary to identify the alarm as not valid.

With the M-4272 connected to the trip coil circuit the TCM Function must be enabled in order for the M-4272 to block all transfers. If the M-4272 is not connected to the trip coil circuit, there is no affect on transfer operation.

Time Delay — A Time Delay can be applied to delay the TCM (Trip Circuit Monitor) function output.

Dropout Time Delay — A Time Delay can be applied to delay the reset of the TCM (Trip Circuit Monitor) function output.

I/O Selection — The I/O Selection button opens the TCM (Trip Circuit Monitor) I/O Selection Dialog Screen (Figure 4-91) that allows any input or the Fuse Loss (FL) function to be selected to block the TCM (Trip Circuit Monitor). The TCM #1(2) Function can also be used to activate a selected output when it times out.

Save/Cancel — The Save selection saves the TCM (trip Circuit Monitor) Function Dialog Screen settings either to an open file or to the target MBTS. Cancel, returns the user to the previous open screen.

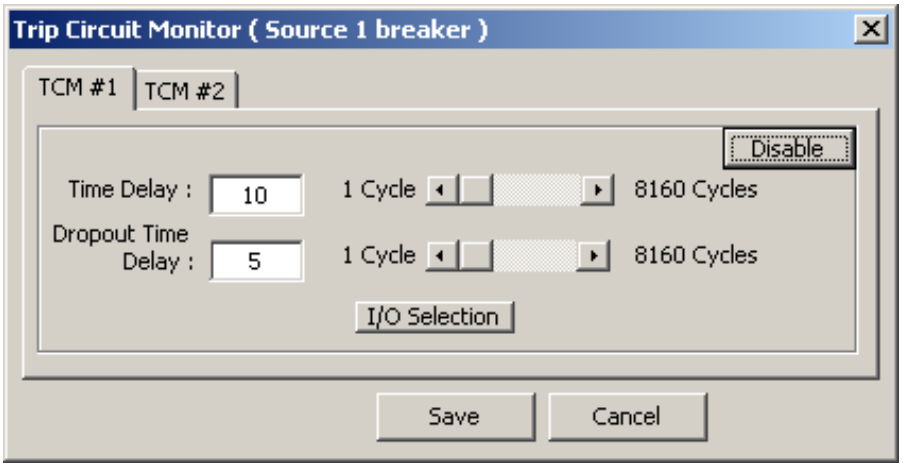


Figure 4-91 TCM (Trip Circuit Monitor) Function Dialog Screen

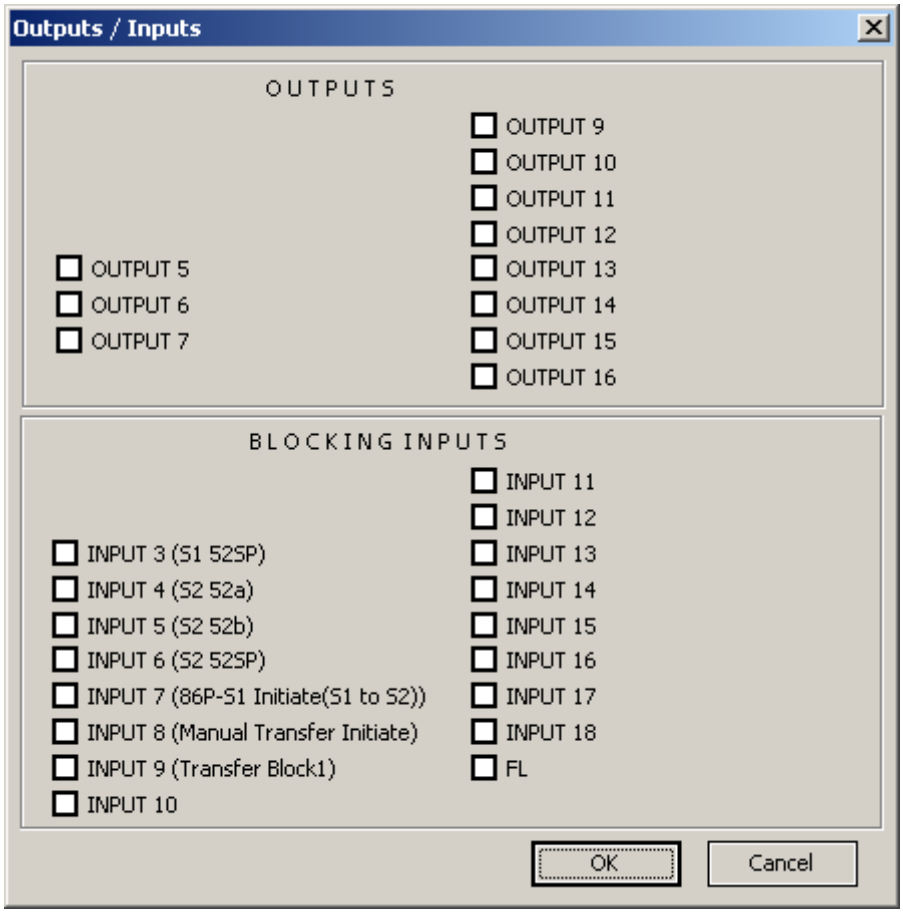


Figure 4-92 TCM (Trip Circuit Monitor) Inputs/Outputs Selection Dialog Screen

ISSL (ISSLOGIC®)

Path: System/Setup/Setpoints/ISSL

Figure 4-93 displays the settings for the ISSL (ISSLogic) function. The settings for the ISSL #2 through 6 are the same as the ISSL #1.

The MBTS provides six logic functions and associated ISSLogic. The logic functions can be used to allow external devices to trip through the MBTS, providing additional target information for the external device. More importantly, these functions can be used in conjunction with ISSLogic to expand the capability of the MBTS by allowing the user to define customized operating logic.

Enable/Disable — The top right corner of each ISSlogic tab includes a command button that will disable or enable the function. This selection allows the ISSL #1 (ISSlogic) to be disabled (or enabled) independent from the ISSL #2, #3, #4, #5 and #6.

ISSLogic Settings and Logic Functions

ISSlogic includes six Initiating Input sources:

- Initiating Outputs
- Initiating Function Time Out
- Initiating Function Pickup (including the ISSLogic Functions themselves)
- Initiating Inputs
- Initiating System Status
- Initiation using the Communication Point

The only limitation is that an ISSLogic Function may not be used to initiate itself.

There are three Blocking Input sources:

- Blocking Inputs
- Block System Status
- Blocking using the Communication Point

The activation state of the input function selected in the Initiating Function can be either Timeout (Trip) or Pickup. The desired Time Delay for security considerations can be obtained in the ISSLogic Function Time Delay setting.

The ISSLogic Function can be programmed to perform any or all of the following tasks:

- Change the Active Setting Profile
- Close an Output Contact
- Be activated for use as an input to another ISSLogic Function
- Initiate a transfer
- Block a transfer

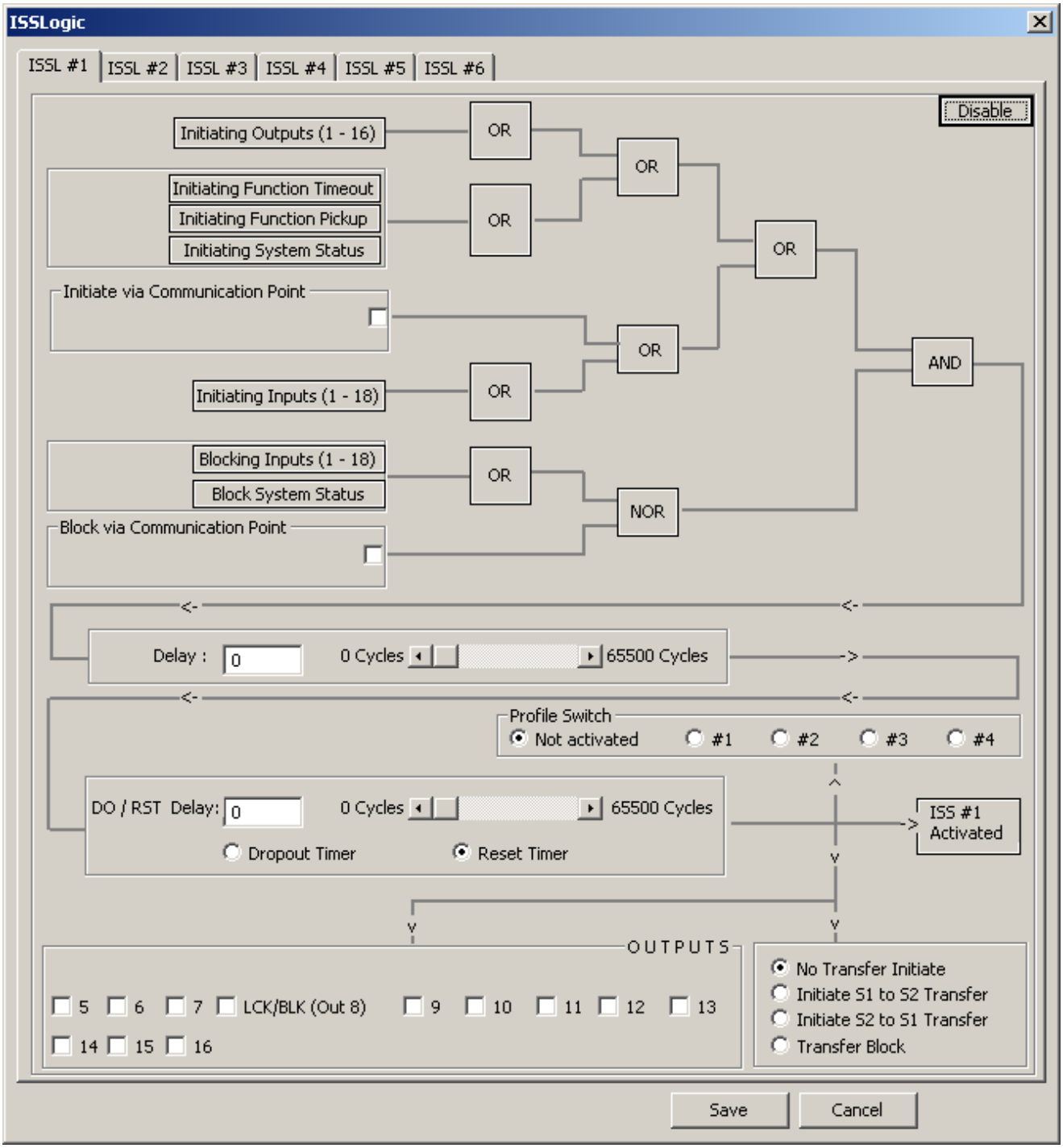


Figure 4-93 ISSLogic® Function Dialog Screen

ISSLogic® Function Setup

To setup an ISSLogic Function perform the following:

1. From the ISScom® Main Screen menu select **System/Setup/Setpoints/ISSL**. ISSLogic will display the ISSLogic Function dialog screen (Figure 4-93).
2. From the top right corner of the screen select the desired ISSL tab, then select **Enable**.
3. If desired select the Initiating Outputs button. ISSLogic will display the Initiating Outputs Selection screen (Figure 4-94).
   a. Select the desired Initiating Outputs, then select **OK**.
   b. Select the desired Initiating Output Logic Function (AND/OR).
6. If desired select the Initiating Function Timeout button. ISSLogic will display the Initiating Function Timeout Selection screen (Figure 4-95).
7. Select the desired Initiating Function Timeout, then select **OK**.
8. If desired select the Initiating Function Pickup button. ISSLogic will display the Initiating Function Pickup Selection screen (Figure 4-96).
9. Select the desired Initiating Function Pickup, then select **OK**.

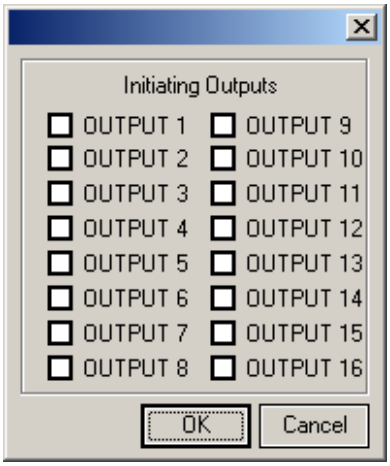


Figure 4-94 Selection Screen for Initiating Outputs

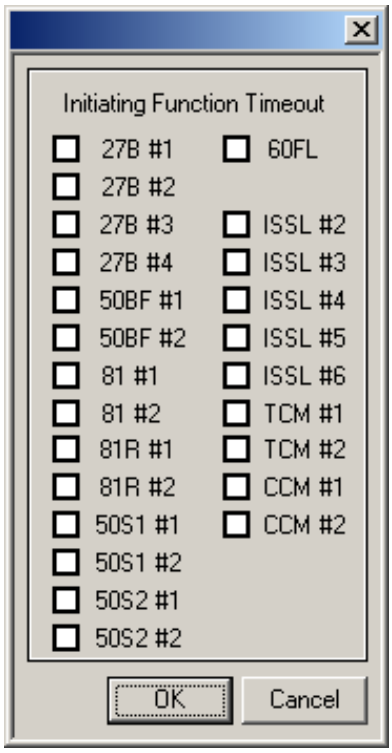


Figure 4-95 Selection Screen for Initiating Function Timeout

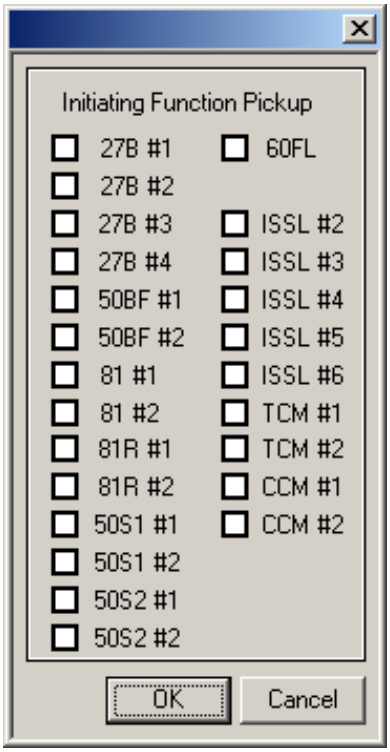


Figure 4-96 Selection Screen for Initiating Function Pickup

10. If desired select the Initiating System Status button. ISSLogic® will display the Initiating System Status Selection screen (Figure 4-97).

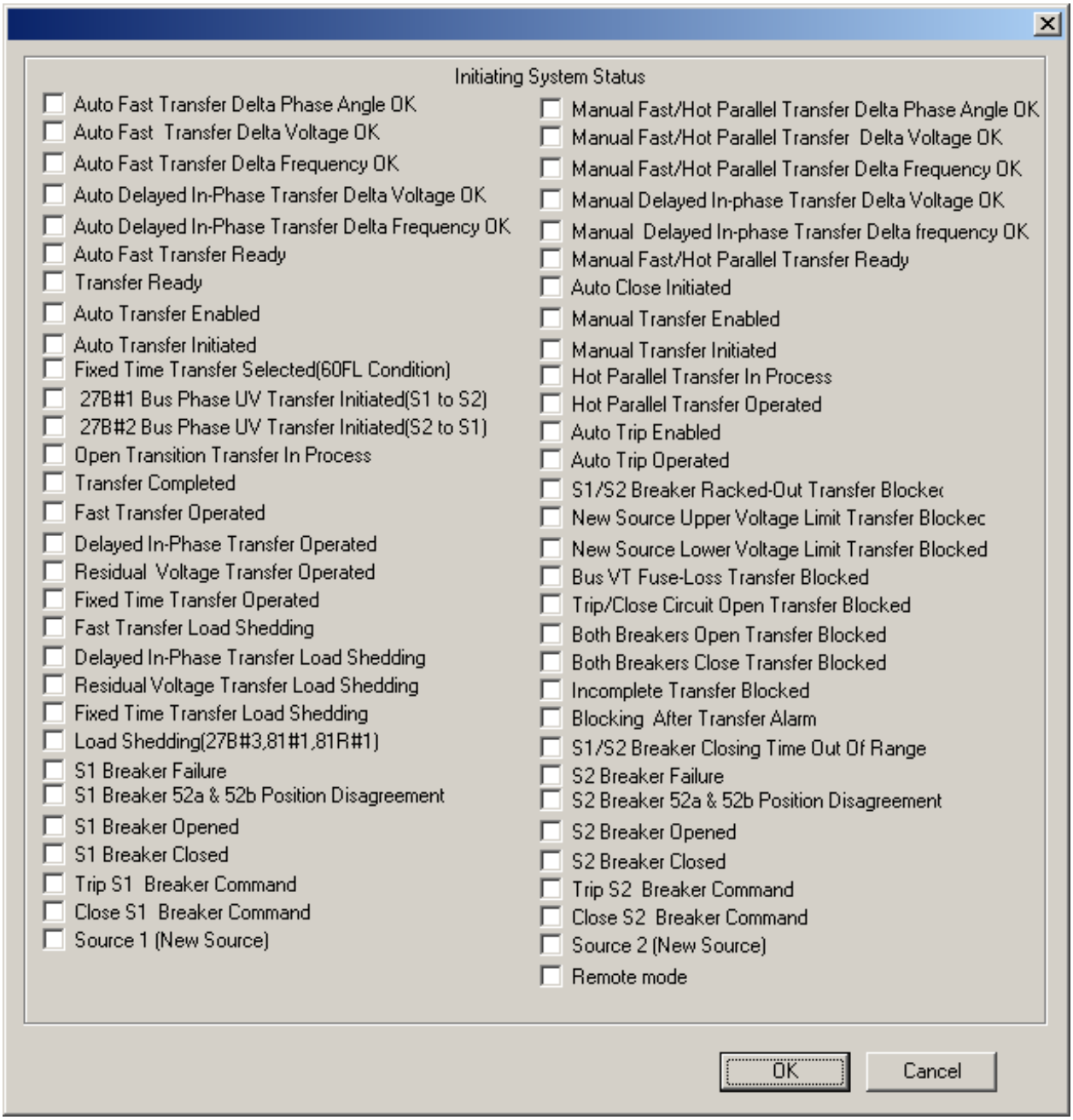


Figure 4-97 Selection Screen for Initiating System Status

11. Select the desired Initiating System Status selection(s), then select **OK**.
12. Select the desired Logic Function (AND/OR/NOR/NAND). The selected Logic Function (AND/OR/NOR/NAND) will apply only to the Initiating Function Timeout Selection(s), Initiating Function Pickup Selection(s) and Initiating System Status Selection(s). The selected Logic Function will ignore the functions and System Status that are not selected.
13. If desired select the "Initiate via Communication point". Select Check Box.
14. If desired select Initiating Input button. ISSLogic® will display the Initiating Input Selection screen (Figure 4-98).
15. Select the desired Initiating Input(s), then select **OK**.
16. Select the desired Initiating Inputs Logic Function (AND/OR).
17. If desired select Blocking Inputs button. ISSLogic will display the Blocking Inputs Selection screen (Figure 4-99).
18. Select the desired Blocking Input(s), then select **OK**.
19. If desired select Block System Status button. ISSLogic will display the Block System Status Selection screen (Figure 4-100).
20. Select the desired Block System Status(s), then select **OK**.
21. Select the desired Blocking Inputs/Block System Status Logic Function (AND/OR). The selected Blocking Inputs/Blocking System Status Logic Function (AND/OR) will apply only to the selected Blocking Input(s) and Blocking System Status Selection(s); the selected Logic Function will ignore the Inputs and System Status that are not selected.
22. If desired select the "Block via Communication point". Select Check Box.
23. Select the desired Time Delay.

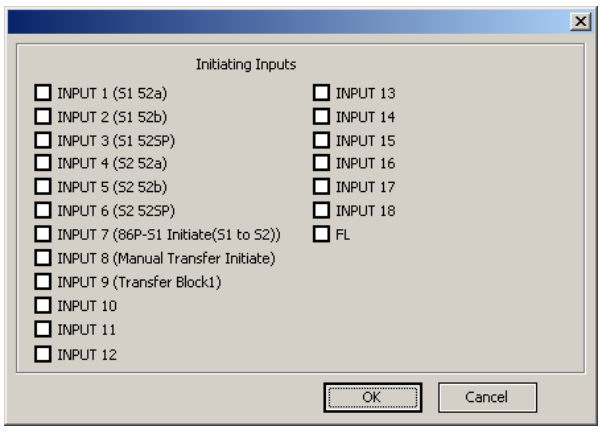


Figure 4-98 Selection Screen for Initiating Inputs

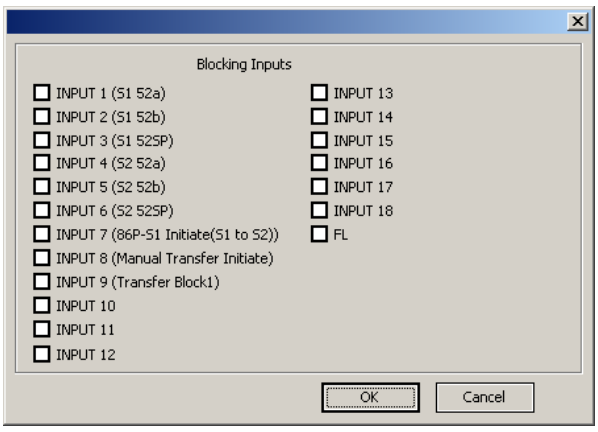


Figure 4-99 Selection Screen for Blocking Inputs

■ **NOTE**: The DO/RST Timer is described in detail in the “Dropout/Reset Timer Feature” later in this section.

24. Select the desired DO/RST Delay.
25. Select either Dropout Timer or Reset Timer.

■ **NOTE**: The ISSlogic® Profile Switch feature is described in detail in the “Change Active Profile (ISSLogic)” later in this section.

26. Determine if Profile Switching will be active and proceed as follows:
    a. If Profile Switching will not be activated, then select “Not Activated”.
    b. If Profile Switching will be activated then select the desire profile.
27. Select the desired Outputs.
28. Determine if a transfer or transfer block will be initiated and proceed as follows:
    a. If a transfer or transfer block will not be initiated, then select “No Transfer Initiate”.
    b. If a transfer or transfer block will be Initiated then select the desire function.
29. Select **Save**, ISSlogic will return to the System Setpoints Dialog Screen (Figure 4-35).

ISSL #1 is now setup, the remaining ISSL selections can be setup as desired.

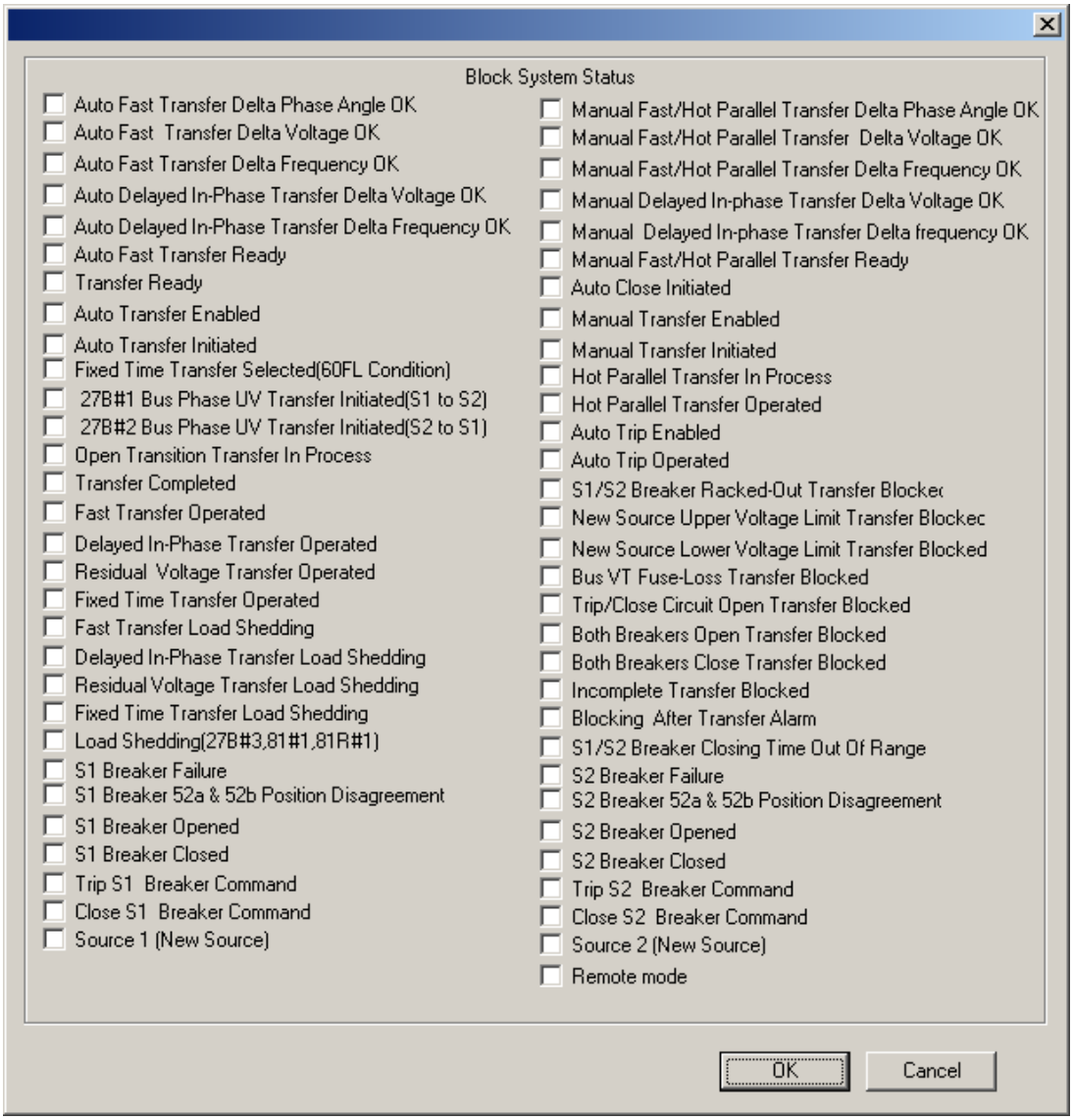


Figure 4-100 Selection Screen for Block System Status

Change Active Profile (ISSLogic®)

To change the active profile simply select the desired profile. The “Not activated” selection means the profile will not be changed. If the presently active profile is selected as the profile to which to change there is effectively no change since it would change to the same profile.

When an ISSLogic Function is enabled and the logic becomes “true” the ISS# is always activated so it could be used as an initiating input to any other ISSLogic.

Since there are six ISSLogic Functions per setting profile, depending on the number of different MBTS settings defined, the scheme may provide up to 24 different logic schemes.

DO/RST (Dropout/Reset) Timer Feature

The DO/RST timer can be set as either Dropout or Reset mode. The operation of the Dropout Delay Timer and the Reset Delay Timer are described below.

Dropout Delay Timer

The Dropout Delay Timer logic is presented in Figure 4-101. The Dropout Delay Timer feature allows the user to affect an output time delay that starts when the ISSLogic PU Status drops out (A) and can hold the Output (D) status true beyond the Output Seal In Delay value (C).

However, the Seal In Delay (E) may hold the Output (B) true if the time after ISSLogic PU Status dropout (A) and Dropout Delay Timer value (D) are less than the Seal In Delay time (E).

Reset Delay Timer

The Reset Delay Timer logic is presented in Figure 4-102. The Reset Delay Timer feature allows the user to delay the reset of the PU Time Delay Timer and hold the accumulated timer value (A) for the duration of the Reset Time Delay time period (B). The Reset Delay Timer starts when the ISSLogic PU Status drops out (C).

If the ISSLogic PU Status remains dropped out (D) after the reset delay has timed out, then the ISSLogic PU timer value will be reset to zero (E).

If the ISSLogic PU Status reasserts (F) while the Reset Delay Timer is still timing, then the PU Timer Delay begins timing from the accumulated value (G).

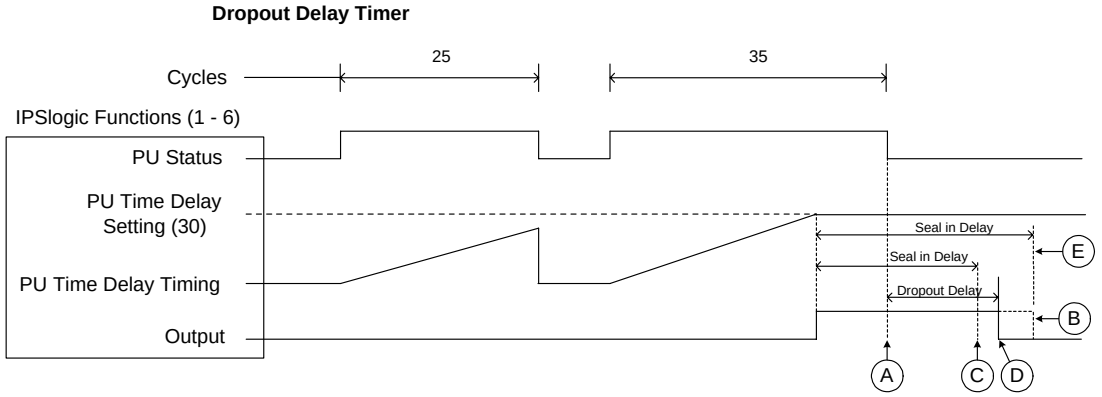


Figure 4-101 Dropout Delay Timer Logic Diagram

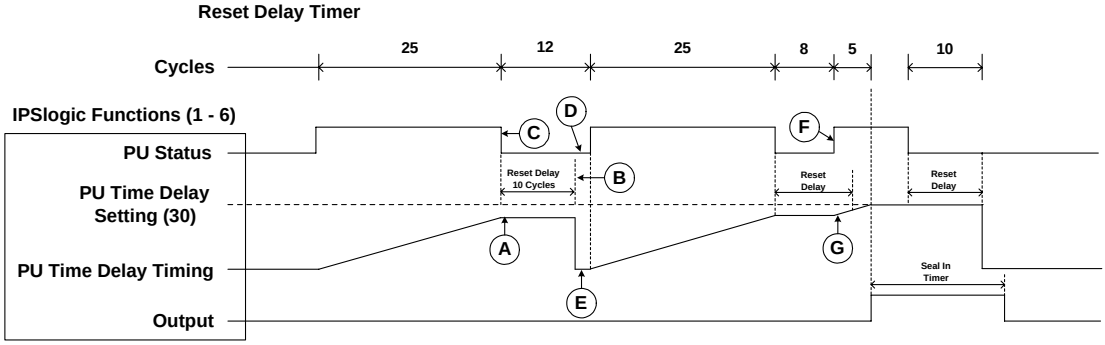


Figure 4-102 Reset Delay Timer Logic Diagram

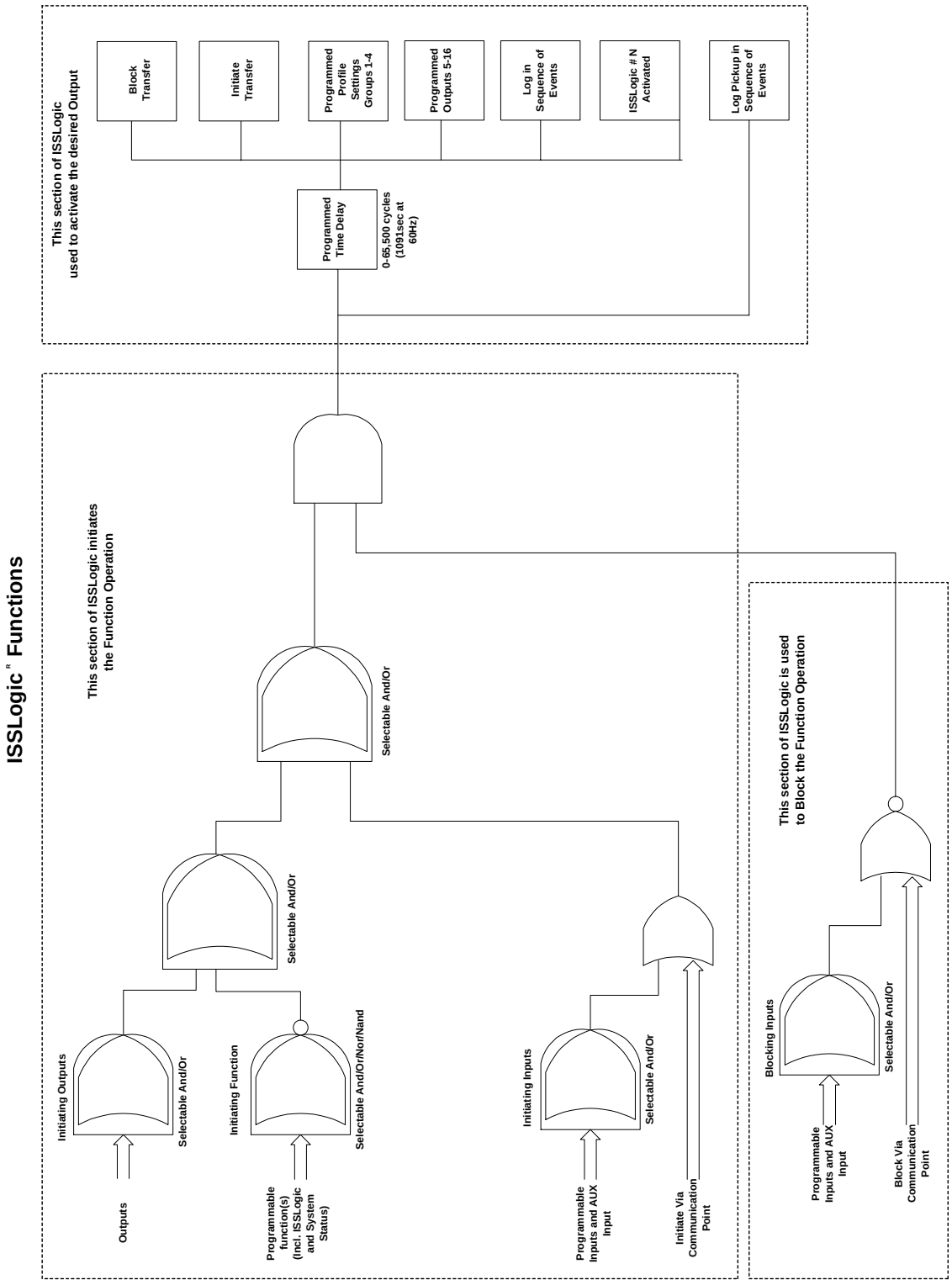


Figure 4-103 ISSLogic Function Diagram

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Appendix I–Declaration of Conformity

DECLARATION OF CONFORMITY
(in accordance to ISO/IEC 17050-1:2004)

No. M-4272

Manufacturer's Name: ***Beckwith Electric CO, INC.***
Manufacturer's Address: ***6190 118th Avenue North***
Largo, FL 33773-3724

The manufacturer hereby declares under our sole responsibility that the M-4272 product conforms to the following product standard as of July 25th, 2006 in accordance to Directive 2004/108/EC for equipment incorporated into stationary installations:

BS EN 60255-26:2005

Electromagnetic compatibility (EMC)
Requirements for measuring relays and protection equipment

Electromagnetic Emissions: EN 60255-25:2000

***Conducted* 150 kHz to 30MHz**
***Radiated* 30MHz to 1000MHz**
Class A Limits

Electromagnetic Immunity

1 MHz Disturbance
IEC 60255-22-1:2005

Electrostatic Discharge 8kV Contact; 15kV Air
EN 60255-22-2:1997

Radiated RF 80MHz to 1000MHz 10V/m, 80% AM (1kHz)
EN 60255-22-3:2001

Fast Transients 5ns/50ns Bursts @ 5kHz for 15ms 300ms for 1 min.
2kV power supply lines and earth 2kV signal data and control lines
EN 60255-22-4:2002

Surge 1Kv Line to Line coupling, 2Kv Line to Earth coupling power supply lines
IEC 60255-22-5:2002

Conducted RF 150KHz to 80MHz 10V emf
EN 60255-22-6:2001

Power frequency immunity test
Class A 300 Vrms common mode – 150 Vrms differential mode
Class B 300 Vrms common mode – 100 Vrms differential mode
IEC 60255-22-7:2003

DC voltage interruptions
IEC 60255-11:1979

***EN 61010-1: 2001* Safety requirements for electrical equipment for measurement, control, and laboratory use Part 1. General requirements European Safety Directive**

Manufacturers Contact*:*
Manager of Engineering
6190 118th Ave North
Largo, FL 33773-3724
Tel (727) 544-2326

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Legal Information

Patent

The units described in this manual are covered by U.S. Patents, with other patents pending.

Buyer shall hold harmless and indemnify the Seller, its directors, officers, agents, and employees from any and all costs and expense, damage or loss, resulting from any alleged infringementof United States Letters Patent or rights accruing thereform or trademarks, whether federal, state, or common law, arising from the Seller's compliance with Buyer's designs, specifications, or instructions.

Warranty

Seller hereby warrants that the goods which are the subject matter of this contract will be manufactured in a good workmanlike manner and all materials used herein will be new and reasonably suitable for the equipment. Seller warrants that if, during a period of five years from date of shipment of the equipment, the equipment rendered shall be found by the Buyer to be faulty or shall fail to peform in accordance with Seller's specifications of the product, Seller shall at his expense correct the same, provided, however, that Buyers shall ship the equipment prepaid to Seller's facility. The Seller's responsibility hereunder shall be limited to replacement value of the equipment furnished under this contract.

Seller makes no warranties expressed or implied other than those set out above. Seller specifically excludes the implied warranties of merchantibility and fitness for a particular purpose. There are no warranties which extend beyond the description contained herein. In no event shall Seller be liable for consequential, exemplary, or punitive damages of whatever nature.

Any equipment returned for repair must be sent with transportation charges prepaid. The equipment must remain the property of the Buyer. The aforementioned warranties are void if the value of the unit is invoiced to the Seller at the time of return.

Indemnification

The Seller shall not be liable for any property damages whatsoever or for any loss or damage arising out of, connected with, or resulting from this contract, or from the performance or breach thereof, or from all services covered by or furnished under this contract.

In no event shall the Seller be liable for special, incidental, exemplary, or consequential damages, including but not limited to, loss of profits or revenue, loss of use of the equipment or any associated equipment, cost of capital, cost of purchased power, cost of substitute equipment, facilities or services, downtime costs, or claims or damages of customers or employees of the Buyer for such damages, regardless of whether said claim or damages is based on contract, warranty, tort including negligence, or otherwise.

Under no circumstances shall the Seller be liable for any personal injury whatsoever.

It is agreed that when the equipment furnished hereunder are to be used or performed in connection with any nuclear installation, facility, or activity, Seller shall have no liability for any nuclear damage, personal injury, property damage, or nuclear contamination to any property located at or near the site of the nuclear facility. Buyer agrees to indemnify and hold harmless the Seller against any and all liability associated therewith whatsoever whether based on contract, tort, or otherwise. Nuclear installation or facility means any nuclear reactor and includes the site on which any of the foregoing is located, all operations conducted on such site, and all premises used for such operations.

Notice:

Any illustrations and descriptions by Beckwith Electric Co., Inc. are for the sole purpose of identification.

The drawings and/or specifications enclosed herein are the proprietary property of Beckwith Electric Co., Inc., and are issued in strict confidence; therefore, shall not be used as a basis of reproduction of the apparatus described therein without written permission of Beckwith Electric Co., Inc.

No illustration or description contained herein shall be construed as an express warranty of affirmation, promise, description, or sample, and any and all such express warranties are specifically excluded nor shall such illustration or description imply a warranty that the product is merchantable or fit for a particular purpose. There shall be no warranties which extend beyond those contained in the Beckwith Electric Co., Inc. terms of sale.

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