



Genesis

USER GUIDE

SOS-5 Signal Override System

Genesis Technologies Inc.
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Thank you for purchasing the Genesis SOS-5 Signal Override System.

It is our goal always to provide quality products and service at a fair price, and treat every customer in a fair and forthright manner. We believe this is the only way to endure in the railroad industry marketplace over the long-term.

We ask for your suggestions, whether they be criticism, product or service improvement ideas, or praise. Your feedback will be taken seriously and in good faith. We will work hard to earn and deserve your business.

The Genesis Team

User Guide

SOS-5 Signal Override System

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What's Included with the Genesis SOS-5 Signal Override System

QUAN	P/N	DESCRIPTION
1	16059-000	SOS-5 Signal Override System
1	16059-302	13-position Spring-Cage Mating Female Connector
2	16059-007	Keys for SOS-5 DISABLE Keyswitch
1	16059-901	User Guide for SOS-5 Signal Override System
1	16059MEC000	SOS-5 Customer Reference Dimensional Drawing, 11" x 17"
1	16059-902	SOS-5 Instruction Placard, 3.5" x 5", with Adhesive Backing

User Guide

SOS-5 Signal Override System

Orientation

Features Summary

- Five Modes of Operation:
 1. DISABLE ALL - Disable All Signal Operation
 2. ISLAND ONLY - Disable All Signal Operation Except Island
 3. NORMAL - Normal Signal Operation
 4. TEST WITH GATES UP - Signals Flashing with Gates Raised
 5. TEST ALL - Signals Flashing with Gates Lowered
- Compatible with All Types of Railroad Crossing Signal Equipment:
 - Predictors
 - Motion Sensors
 - DC & ACDC (Style C)
 - Solid-State Crossing Control
 - Relay Crossing Control
- Critical Positive and Negative Inputs use Multi-break Force-Guided Switch Contacts to XR± Output
- Powered from Signal System Flasher/Gate Battery Supply or Equipment Battery Supply
- Built-in Flasher to Drive External 'SIGNALS DISABLED' Warning Indicator
- Built-in Flasher Flash Pattern is User Selectable to One of Eight Flash Patterns
- Two In-sequence Separate Switch Position Settings Required to Disable Signals
- Key for Keyswitch Required to Disable Signals
- Audio Annunciator Sounds upon Disabling Signal Operation
- Event Recorder Outputs for NORMAL and TEST Modes
- Plug-in Connector for Input/Output Wiring
- Compact Aluminum Enclosure
- Rugged Design and Construction
- Internal Surge Protection on all Inputs and Outputs
- Three-year Limited Warranty

Why Use a Signal Override System?

IMPROVED CROSSING SAFETY FOR THE RAILROAD AND THE PUBLIC

Most rail/highway signal malfunctions are “False Activations” with lights flashing and gates lowered with no trains approaching or occupying the crossing. This usually results in disrupted highway traffic and calls from citizens and local law enforcement agencies notifying the railroad of the problem.

When the railroad’s signal maintainer is not readily available, a method is needed for railroad personnel untrained in signal maintenance to safely disable the crossing signals until the maintainer can arrive to make necessary repairs or corrections.

An additional benefit when using the Genesis SOS-5 Signal Override System is the ability to disable all signal operation except the island. If the cause of the signal false activation is due to a fault located in the track approach circuits, such as a broken or high-resistance bond (which it often is), it is possible to operate the signals when the island is occupied by a train. Although this does not eliminate the requirement of issuing and executing a crossing protect order, it nevertheless affords signal protection while the train occupies the highway/rail crossing.

The SOS-5 Signal Override System provides an easy and safe way to disable crossing signals with 3 simple steps:

1. **WARNING!! Before disabling the signals in any manner it is imperative that a STOP AND PROTECT CROSSING ORDER IS ISSUED TO ALL AFFECTED TRAIN OPERATING PERSONNEL.**
2. Rotate the Mode Selector to the ISLAND ONLY Mode position, then rotate the momentary DISABLE keyswitch clockwise and release. The Audible Annunciator* will then sound for 60 seconds, the SIGNALS DISABLED LED will be flashing and the exterior flasher warning indicator (if installed) will be activated.
NOTE: If the malfunctioning signals recover (turn OFF and gates raise) then leave the switch in the ISLAND ONLY Mode and skip the next step (3).
3. If step 2 (above) does not cause the signals to recover, then rotate the selector switch to the DISABLE ALL Mode position and rotate the momentary DISABLE keyswitch clockwise and release. This should result in all signal operation being disabled, the Audible Annunciator* sounding for 60 seconds, the SIGNALS DISABLED LED flashing and the exterior flasher warning indicator (if installed) will be activated.

*Audible Annunciator may be silenced after 5 seconds by rotating the DISABLE keyswitch a second time.

IMPROVED CONVENIENCE FOR THE RAILROAD SIGNAL MAINTAINER AND THE MOTORING PUBLIC

The Federal Railroad Administration requires that each rail/highway signal system be inspected every 30-days. Part of this inspection requires that every flashing lamp unit be visually inspected for proper operation and visibility. This inspection may take several minutes as it requires the maintainer to activate the signal system and move across the tracks to view flashing lamps facing the opposite direction. During this time, gates are lowered and highway traffic is stopped.

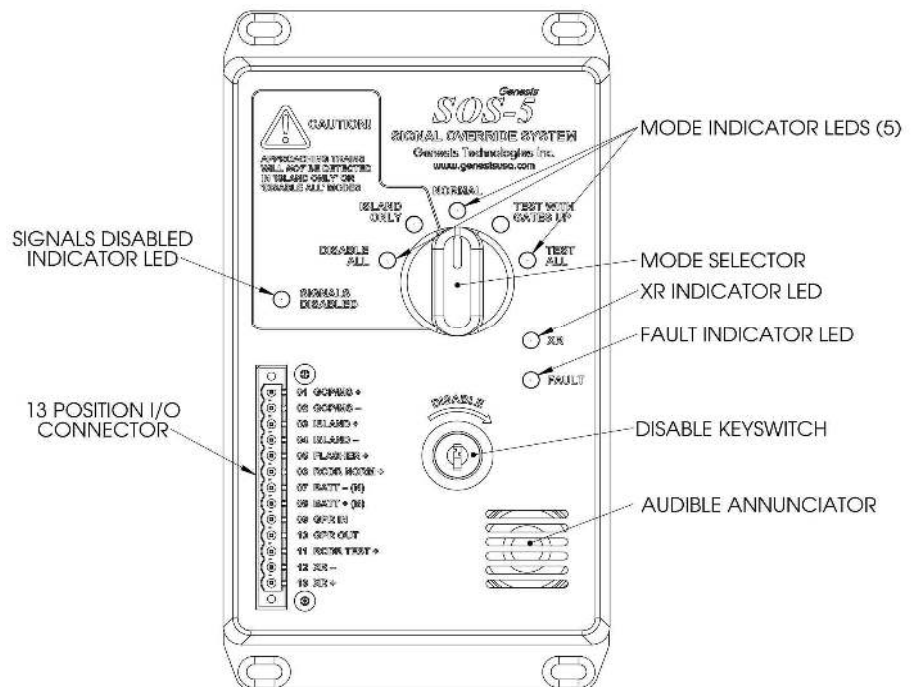
To avoid delaying highway traffic during testing, the Genesis SOS-5 Signal Override System allows the signal maintainer to first activate the flashers and lower the gates by placing the selector switch to the TEST ALL position. Once verification of proper gate operation has been made, the maintainer can then move the selector switch to the TEST WITH GATES UP position which will leave the flashers on but raise the gates. The maintainer can then proceed to visually inspect all flashing lamp units. For safety reasons the SOS-5 Signal Override System will lower the gates if an approaching train is detected.

Front Panel Description

User controls include a 5-position MODE SELECTOR switch and a momentary 2-position DISABLE keyswitch. Five LED indicators verify the selected position/mode of the MODE SELECTOR with the following switch positions and indications:

MODE SELECTOR Positions & LED Indications:

- DISABLE ALL - Disable all signal operation;
- ISLAND ONLY - Disable all signal operation except island;
- NORMAL - Normal signal operation;
- TEST WITH GATES UP - Signals flashing with gates raised; and
- TEST ALL - Signals flashing with gates lowered.



DISABLE Momentary Keyswitch:

- 12 O’Clock Position - No change;
- 2 O’Clock Position (momentary) - Disable signals (clockwise switch action has no effect unless MODE SELECTOR is in the DISABLE ALL or ISLAND ONLY Mode).

Additional LED indicators are:

- SIGNALS DISABLED - Flashing when in either the DISABLE ALL or ISLAND ONLY Mode;
- XR - Illuminated when power is available at the XR relay output; and
- FAULT - Illuminated when the SOS-5 Signal Override System has detected an internal operational fault. In the event of a fault, DISABLE ALL and ISLAND ONLY modes are non-functional and signals cannot be disabled.

The Audible Annunciator will sound for 60 seconds immediately upon actuating the momentary DISABLE keyswitch if in either the ISLAND ONLY or DISABLE ALL mode. It will also momentarily sound for 1½ seconds every 2 minutes as long as either of the disable signal modes are active. The Audible Annunciator may be silenced after 3 seconds by rotating the DISABLE keyswitch a second time.

The 13-position connector provides all necessary electrical input and output connections for the Genesis SOS-5 Signal Override System.

Functional Description

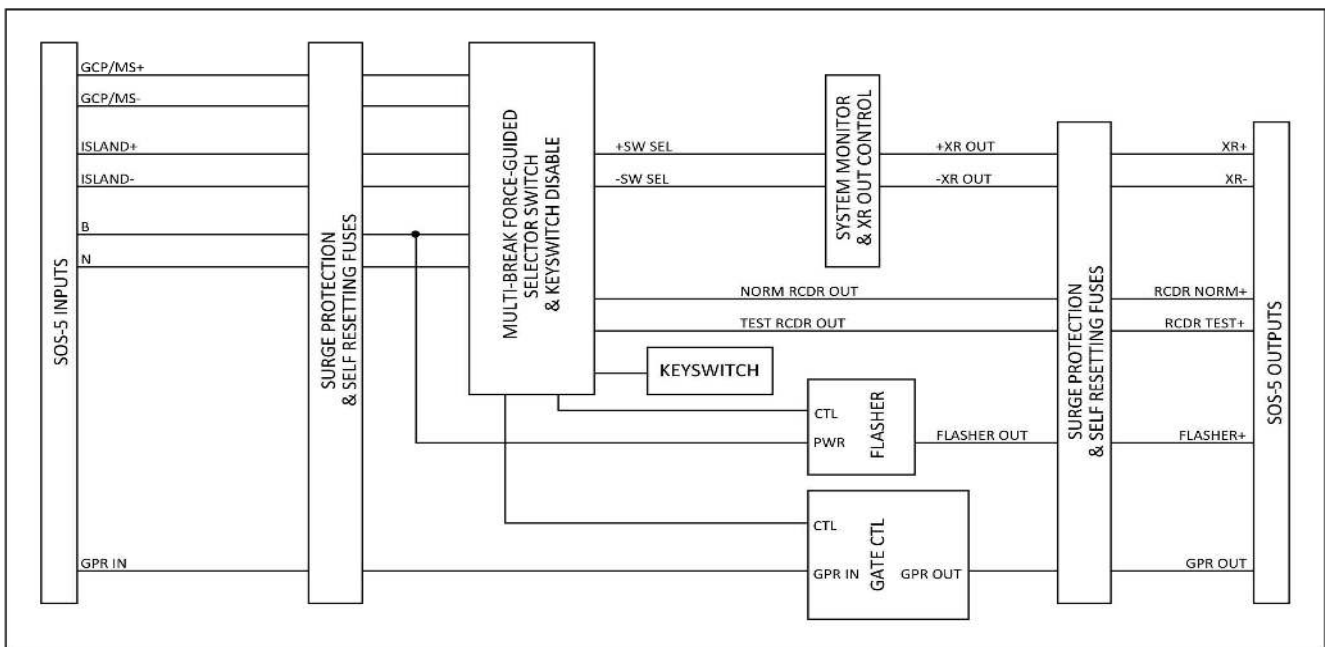
Please refer to the SOS-5 Signal Override System Block Diagram.

All inputs and outputs are protected using secondary level surge protection devices and self-resetting fuses. Positive and negative input pairs GCP/MS±, ISLAND± and B/N (battery±) are electrically isolated from each other.

Battery inputs (B/N) are, by necessity, electrically common with the FLASHER+, RCDR NORM+ and RCDR TEST+ outputs.

Critical inputs (GCP/MS±, ISLAND±, B/N) utilize force-guided and multi-break contacts to route electrical energy to the SYSTEM MONITOR & DISABLE XR OUT section.

The SYSTEM MONITOR & DISABLE XR OUT section monitors the MODE SELECTOR position versus the input



SOS-5 SIGNAL OVERRIDE SYSTEM - BLOCK DIAGRAM

selected and the XR± output. In the event of an internal mismatch or other fault the XR± output is disabled. This section also verifies its ability to interrupt the XR± output every few seconds by interrupting the output briefly, but not long enough to “drop” the XR relay or activate the highway/rail crossing signals.

The FLASHER+ output is capable of driving either LED lamps or one incandescent lamp. Any one of eight flash patterns is user selectable.

The GPR IN and GPR OUT pins connect to a normally closed contact. This contact is opened when the TEST WITH GATES UP Mode is selected.

Operation

NORMAL Mode

When the NORMAL Mode is selected the corresponding mode LED (blue) indicator is illuminated.

NORMAL is the Mode Selector position that provides normal signal operation and passes the GCP/MS± input through to the system monitor and on to the XR± output.

TEST WITH GATES UP Mode

When the TEST WITH GATES UP Mode is selected the corresponding mode LED (yellow) is illuminated.

When properly connected to the highway/rail crossing signal system, the TEST WITH GATES UP Mode will result in the signal flashers being activated with the gates in the raised position.

The TEST WITH GATES UP Mode opens the circuit between GPR IN and GPR OUT, but maintains the connection to GCP/MS± input. Leaving the GCP/MS± input connected ensures that if an approaching train is detected while the SOS-5 Signal Override System is in the TEST WITH GATES UP Mode, the gates will nevertheless be lowered.

This mode is useful to the signal maintainer when verifying proper flasher operation during a periodic signal inspection while leaving gates raised to permit vehicle traffic to proceed uninterrupted.

TEST ALL Mode

When the TEST ALL Mode is selected the corresponding mode LED (yellow) indicator is illuminated and a brief test of the SOS-5 front panel indicators (the SIGNALS DISABLED LED, FAULT LED and the Audible ANNUNCIATOR) occurs. The FLASHER+ output is also activated for approximately 30 seconds.

The TEST ALL Mode Selector position removes energy from the XR± output which causes full signal activation with flashers ON and gates lowered.

This mode is used by the signal maintainer when verifying proper signal operation during a periodic signal inspection and also provides tested verification of the SOS-5 indicators and the exterior flasher indicator (if installed).

ISLAND ONLY Mode

When the ISLAND ONLY Mode position is selected the corresponding mode LED (red) indicator is illuminated.

DANGER!! Before disabling the signals in any manner it is imperative that a STOP AND PROTECT CROSSING ORDER IS ISSUED TO ALL TRAIN OPERATING PERSONNEL.

To activate the ISLAND ONLY Mode and disable the signals, move the Mode Selector to ISLAND ONLY then rotate the DISABLE Keyswitch clockwise and release.

The ISLAND ONLY Mode disables the “train approach detection” capability of the highway/rail crossing signal system, but leaves “island occupied detection” enabled. If the island occupied detection capability is functioning properly, this allows the signals and gates to activate when a train enters and occupies the island.

The ISLAND ONLY Mode passes the ISLAND± input through to the system monitor then to the XR± output.

The following occurs immediately upon rotating and releasing the DISABLE Keyswitch:

- the SIGNALS DISABLED LED flashes continuously;
- the Audible Annunciator* sounds for 60 seconds and will sound for 1½ seconds every two minutes as long as the SOS-5 Signal Override System is in the *activated* ISLAND ONLY Mode; and
- the SOS-5 Signal Override System built-in FLASHER+ output is activated.

The ISLAND ONLY Mode is preferred to the DISABLE ALL Mode as it affords crossing protection when a train is occupying the island.

*Audible Annunciator may be silenced after 5 seconds by rotating the DISABLE keyswitch a second time.

DISABLE ALL Mode

When the DISABLE ALL Mode position is selected the corresponding LED (red) indicator is illuminated.

DANGER!! Before disabling the signals in any manner it is imperative that a STOP AND PROTECT CROSSING ORDER IS ISSUED TO ALL TRAIN OPERATING PERSONNEL.

To activate the DISABLE ALL Mode and disable the signals, move the Mode Selector to DISABLE ALL then rotate the DISABLE Keyswitch clockwise and release. While activated, the DISABLE ALL Mode completely disables all functions of the highway/rail crossing signal system.

The DISABLE ALL Mode passes the B/N (battery ±) input to the system monitor and then to the XR± output.

The following occurs immediately upon rotating and releasing the DISABLE Keyswitch:

- the SIGNALS DISABLED LED flashes continuously;
- the Audible Annunciator* sounds for 60 seconds and will sound for 1½ seconds every 90 seconds as long as the SOS-5 Signal Override System is in the *activated* DISABLE ALL Mode; and
- the SOS-5 Signal Override System built-in FLASHER+ output is activated.

The DISABLE ALL Mode is used when the ISLAND ONLY Mode does not successfully disable the highway/rail crossing signals. This may occur when island occupancy detection is not functioning properly.

*Audible Annunciator may be silenced after 5 seconds by rotating the DISABLE keyswitch a second time.

SIGNALS DISABLED LED Indicator

The SIGNALS DISABLED LED (red) indicator will flash continuously while SOS-5 Signal Override System is in the *activated* ISLAND ONLY or DISABLE ALL Mode.

XR LED Indicator

The XR LED (blue) indicator is illuminated whenever the XR± output is ON. Although it is barely perceptible, the XR LED indicator will very briefly extinguish about every 3 seconds. This is caused by the system monitor output self-check circuit verifying that it can successfully interrupt power to the XR± output.

FAULT LED Indicator

The FAULT LED (red) indicator is illuminated if the SOS-5 Signal Override System detects an internal operating fault.

If a FAULT is detected, the DISABLE ALL and the ISLAND ONLY modes are disabled by the SOS-5 Signal Override System and can no longer be used. However, the NORMAL, TEST WITH GATES UP and TEST ALL modes may or may not continue to function properly. If the FAULT LED stays ON, the unit should be taken out-of-service immediately and returned to Genesis for repair. See the troubleshooting section for how to remove the SOS-5 from service and how to wire the connector to provide normal signal operation.

Installation and Testing

Wiring and Connections

The Genesis SOS-5 Signal Override System is connected between the train detection equipment and the crossing relay (XR) or the XR input to a crossing control unit (CCU). The detection equipment may be a predictor, motion sensor, ACDC (aka Style-C or Ring-10) or DC type highway/rail crossing signal system and its outputs are connected to the SOS-5 Signal Override System inputs.

If gates are present, the gate repeater relay (GPR) circuit or the gate relay (GR) circuit can be passed through the SOS-5 Signal Override System where it can be interrupted to actuate the signal flashers without lowering the gates when the TEST WITH GATES UP mode is selected.

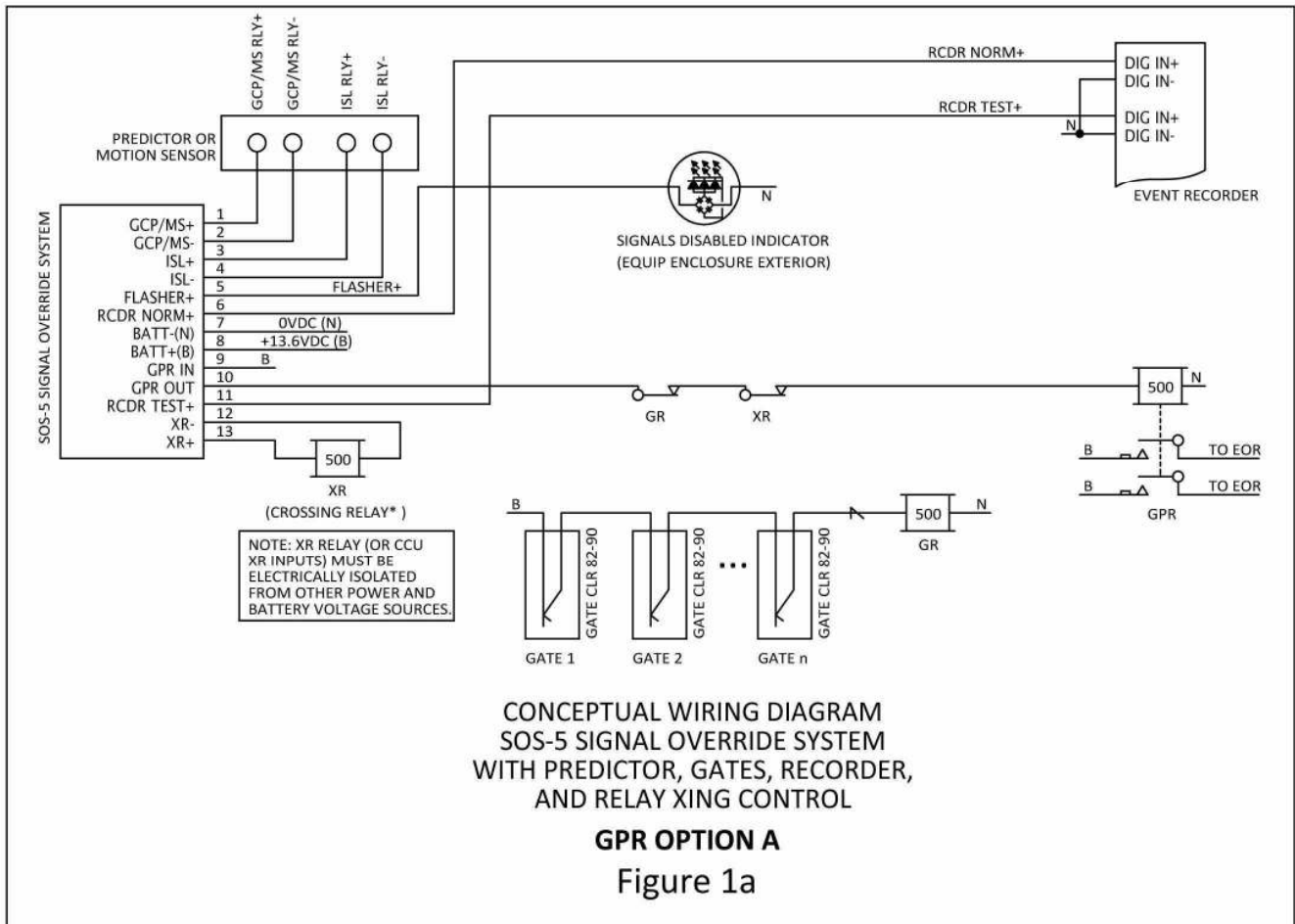
The FLASHER+ output is available to drive a LED or incandescent lamp when signals are disabled.

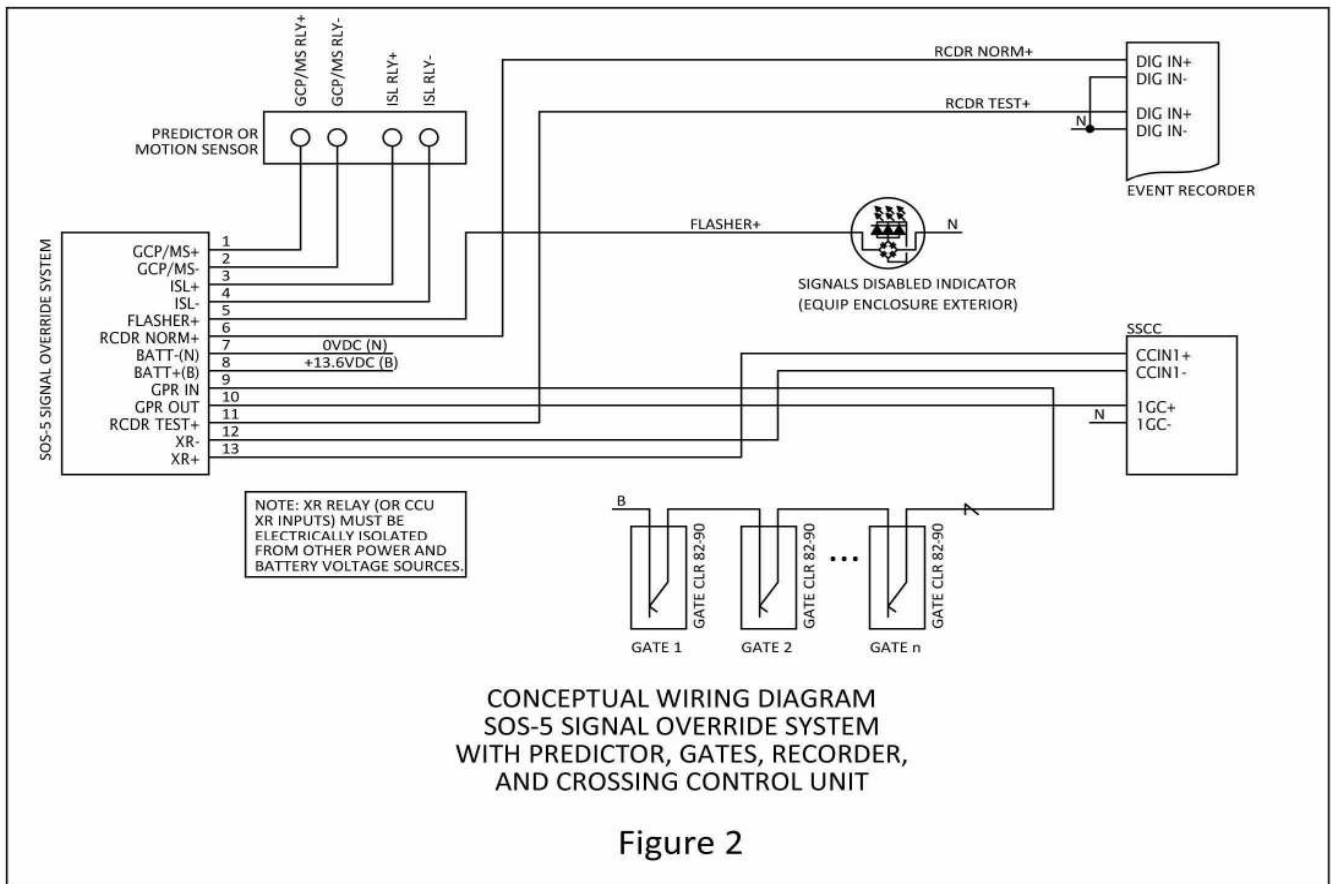
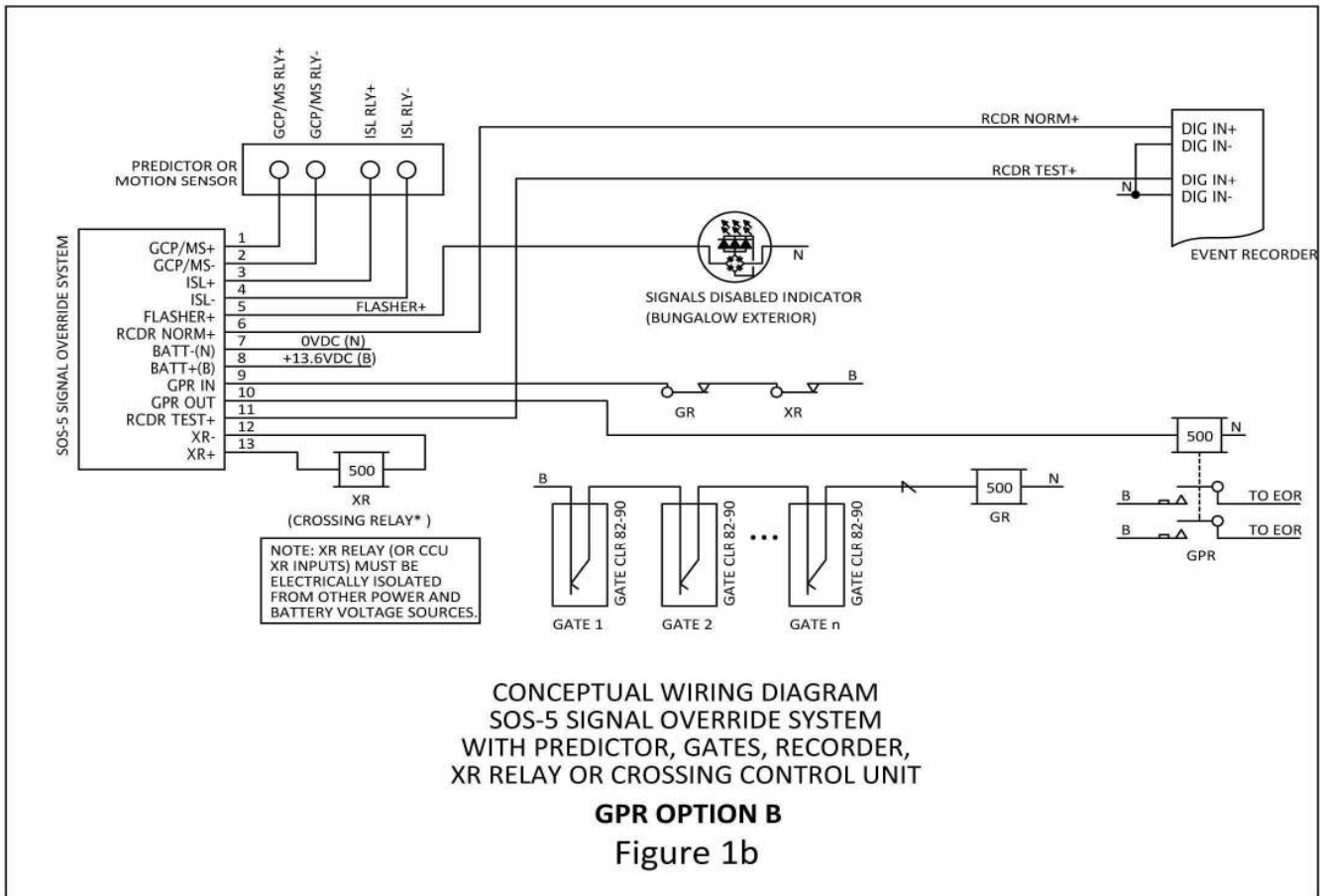
Also available are two event recorder outputs: NORMAL and TEST.

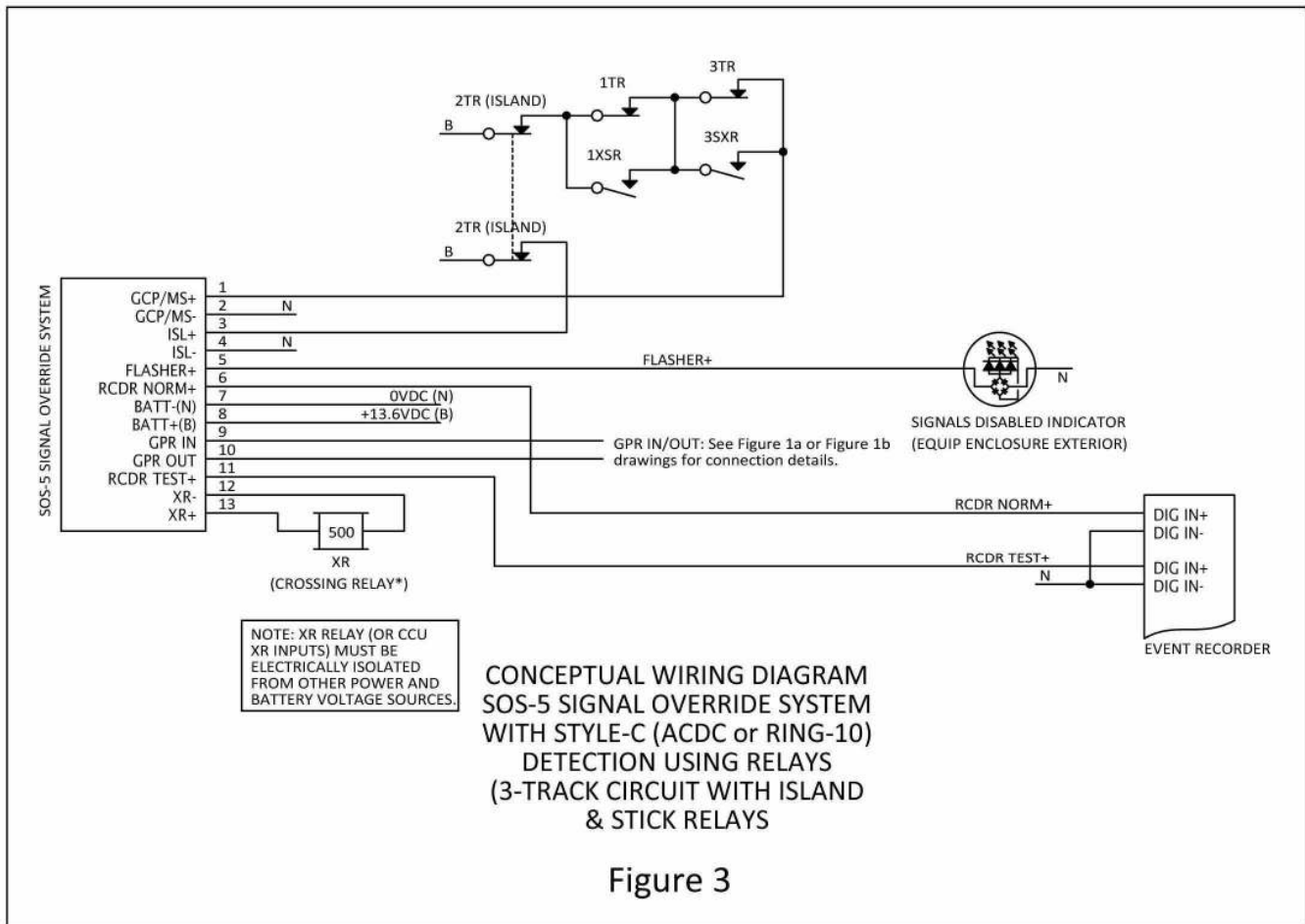
SOS-5 B/N Power Input Source

The choice of input power for the SOS-5 Signal Override System is left up to the signal engineer/designer, however certain factors may dictate or suggest a preference for which of the power/battery systems should be used to power the SOS-5.

The FLASHER+, RCDR NORM+ and RCDR TEST+ all acquire power from the SOS-5 BATT+ (B) input and therefore require their negative connection to be common to the corresponding BATT- (N) input.







Wire Size and Connector Wiring

Suggested wire is AWG #16 stranded. The mating female connector uses spring-cage type wire retainers and can accommodate **one wire per position**. **Do NOT attempt to place more than one wire per position** as only one wire can be reliably retained.

Do not wire the connector with power applied or when plugged-in to the SOS-5 Signal Override System. Strip each wire of insulation approximately 3/8" or 10 mm. Open the cage-clamp by depressing the connector orange plunger using a small flat-blade screwdriver. Then push the wire into the appropriate receiver hole adjacent to the plunger and release the plunger. Make sure all wire strands are inside the receiver hole. No bare wire strands should be visible and only wire insulation should be exposed. Pull on the wire to make sure the cage-clamp is firmly gripping the wire.

Double check your wiring for accuracy before plugging-in the connector and applying power. Damage caused by incorrect hookup is not covered by the warranty.

Predictor or Motion-Sensor Detection System

When using a predictor or motion sensor, connect the predictor or motion-sensor GCP/MS± and the ISLAND± outputs to their respective SOS-5 Signal Override System inputs as shown in Figures 1 or 2. These connections should be electrically isolated from other power sources of the signal system.

The SOS-5 Signal Override System XR± outputs must be electrically isolated from other parts of the signal system and connected only to the XR± relay inputs or the equivalent XR± inputs of a Crossing Control Unit (CCU).

NOTE: If it becomes necessary to jumper the XR relay by connecting it to another power source, the SOS-5 Signal

Override System must first be disconnected. If not disconnected, the SOS-5 will sense that power from a foreign source is present on its XR± output. This results in the:

1. Audible Annunciator sounds continuously;
2. Signals Disabled LED flashes continuously;
3. FLASHER+ output is activated;
4. GPR circuit is opened causing crossing signals to flash (gates are not lowered).

ACDC (Style-C) Detection System

When using an ACDC or Style-C type detection system, connect the relay contacts (or if a CCU, their equivalent) as shown in Figure 3. In this arrangement, battery N (negative) must be connected to GCP/MS-, ISLAND- and N.

The SOS-5 Signal Override System XR± outputs must be electrically isolated from other parts of the signal system and connected only to the XR± relay inputs or the equivalent XR± inputs of a CCU.

Please note that for ISLAND ONLY operation, a separate relay contact is preferred. See Figure 3. (TR2 is the island circuit relay.)

NOTE: If it is deemed necessary to jumper the XR relay by connecting it to another power source, the SOS-5 Signal Override System should first be disconnected. If not disconnected, the SOS-5 will sense that power from a foreign source is present on its XR± output. This results in the:

1. Audible Annunciator sounds continuously;
2. Signals Disabled LED flashes continuously;
3. FLASHER+ output is activated;
4. GPR circuit is opened causing crossing signals to flash (gates are not lowered).

Signal System Battery (B/N) Inputs

Battery B and N supply power to the SOS-5, which it uses to power the FLASHER+ and event recorder outputs. Depending on the position of the SOS-5 Mode Selector switch, either GCP/MS±, ISLAND±, B/N or no connection is routed to the system monitor and then powers (or doesn't power, if it has no input) the XR relay output. The SOS-5 internal systems power is isolated from B and N and other inputs via a separate internal DC/DC converter which is used to power LEDs and other internal circuitry.

FLASHER+ Output

The FLASHER+ Output is used to power an externally mounted LED or incandescent indicator to warn train crews and other railroad personnel that the signal system is disabled. Any one of eight output flash patterns is user selectable. FLASHER+ output is common with battery N.

Please note that the "strobed" flasher modes are not suitable for incandescent lamps as their turn-on time is too slow for the short time the strobed output is ON.

Event Recorder Outputs

Two event recorder outputs are available for NORMAL and TEST conditions. If the Mode Selector is placed in any position other than NORMAL, the NORMAL event recorder output is removed.

The event recorder TEST output is active when the Mode Selector is in either of the TEST positions.

An active event recorder output is positive, limited to 20 milliamps, and is common with battery N.

GPR IN and GPR OUT

GPR IN and GPR OUT are used for the TEST WITH GATES UP Mode to activate the signal flashers without lowering the gates. Examples of how the GPR/GR circuit can be wired are shown in Figure 1a, 1b and Figure 2.

GPR IN and GPR OUT is routed through a normally closed contact that is opened when the Mode Selector is placed in the TEST WITH GATES UP position. Opening the GPR circuit causes the crossing signal gate repeater relay to drop and activate the flashers.

There are several ways the GPR/GR circuit can be wired. The SOS-5 Signal Override System can be inserted anywhere in the GPR circuit or between a GR contact and the GPR coil. This permits maximum flexibility and is compatible with systems which do not provide both positive and negative isolated GPR/GR inputs (i.e., when the negative input is common with battery N).

Flasher Patterns and Flasher Pattern Programming

The Genesis SOS-5 Signal Override System built-in flasher is activated when either the ISLAND ONLY or the DISABLE ALL Mode is activated. The FLASHER+ output is a positive polarity dc voltage and is equal to the DC voltage on the BATT+ (B) input pin. Programming is accomplished using the Mode Selector switch and the Disable keyswitch.

Available Flasher Output Patterns

Eight user selectable flasher output patterns are available. These are shown in Figure 4.

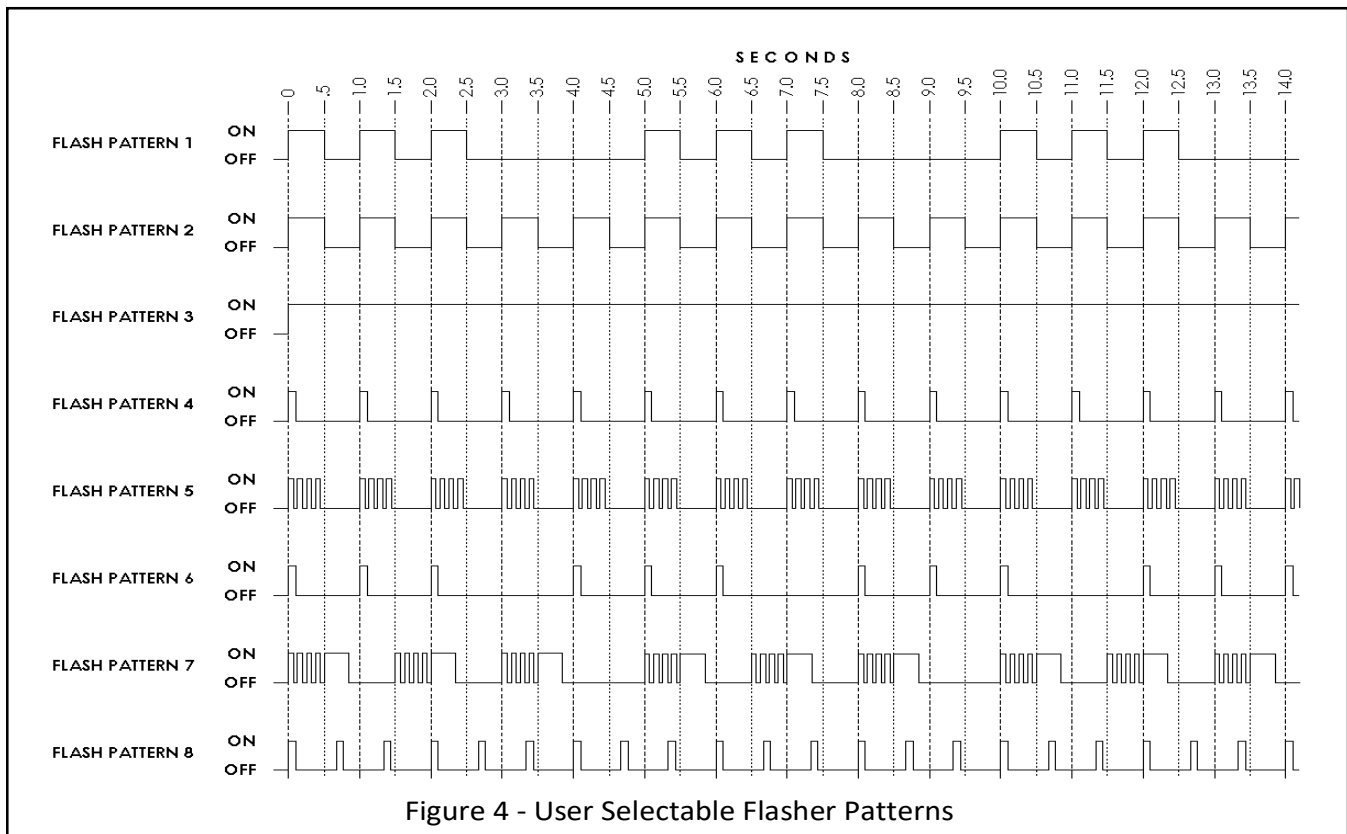


Figure 4 - User Selectable Flasher Patterns

1. Flash Pattern 1* – 3 flashes per group, 12 groups per minute;
2. Flash Pattern 2* – 60 flashes per minute, 50% duty cycle;
3. Flash Pattern 3* – ON continuous;
4. Flash Pattern 4 – 60 strobes per minute;
5. Flash Pattern 5 – 4 strobes per group, 60 groups per minute;
6. Flash Pattern 6 – 3 strobes per group, 15 groups per minute;
7. Flash Pattern 7 – 4 strobes plus extended length strobe per sub-group, 3 sub-groups per group, 12 groups per minute; and
8. Flash Pattern 8 – 90 strobes per minute.

*Suitable for use with 18 Watt incandescent flasher lamp (an adjustable 5Ω current limiting resistor may be required).

Flasher Output Programming

To select the flasher output pattern, use the following steps:

1. Remove power from the SOS-5 Signal Override System by unplugging the 13-position connector;

NOTE: Removing power from the SOS-5 Signal Override System will result in activation of the crossing signals. If necessary, take proper steps to do this safely. When in the Flasher Programming Mode, the SOS-5 continues to operate in the NORMAL Mode.
2. Place the Mode Selector switch to the NORMAL position;
3. Rotate the DISABLE keyswitch and hold ON while restoring power to the SOS-5 by plugging-in the 13-position connector;
4. Release the DISABLE keyswitch within 5 seconds after restoring power to the SOS-5. The currently selected flash pattern will then be output to the flasher and will also be displayed by the SOS-5 SIGNALS DISABLED and the FAULT LEDs;
5. Momentarily actuating the DISABLE keyswitch will advance to the next flash pattern, or if currently on the last flash pattern, back to the first flash pattern. (Note: The currently selected flash pattern will be output to the flasher and will also be displayed by the SOS-5 SIGNALS DISABLED and the FAULT LEDs);
6. Continue to actuate the DISABLE keyswitch until you reach the desired flash pattern.
7. To select and program the pattern into the SOS-5, move the Mode Selector switch to any other position, then rotate the Mode Selector to the desired operational mode. This exits the Flasher Programming Mode.

NOTE: If the SOS-5 DISABLE keyswitch is not rotated after a period of five minutes, the SOS-5 makes no flasher programming changes and reverts to the originally programmed flash pattern and exits the Flasher Programming Mode.

Cutover and Troubleshooting

Grounds and Cross-Circuit Continuity Checks

Most crossing signal installations have two or more power systems each consisting of standby batteries and a battery charger.

The SOS-5 Signal Override System's GCP/MS±, ISLAND±, B/N input pairs, and the GPR IN/GPR OUT terminals are electrically isolated from each other. The XR± output pair is connected to different input pairs, depending on the position of the Mode Selector and activation, and is as follows:

1. DISABLE ALL Mode: when activated, B/N inputs connected to XR± outputs, else no connection to XR±;
2. ISLAND ONLY Mode: when activated, ISLAND± inputs connected to XR± outputs, else no connection to XR±;
3. NORMAL Mode: GCP/MS± inputs connected to XR± outputs;
4. TEST WITH GATES UP Mode: GCP/MS± inputs connected to XR± outputs;
5. TEST ALL Mode: no connection to XR± outputs;

Electrical isolation between systems provides a barrier to foreign power sources and grounds that may inadvertently influence the normal operation of the highway/rail crossing signal system in an unsafe manner. It is for this reason that the signal maintainer must periodically check for grounds and cross-connections between the various electrical systems that make up the signal system.

Isolation of the power systems within the overall signal system differs with the type of system. For example, most modern rail/highway crossing systems have two or more power systems each consisting of a battery charger and a connected battery bank. Typically one power system is used to power the train detection equipment (GCP/MS, ACDC, etc.), and the other to power the flashers and gates.

Most train detection devices have isolated GCP/MS± outputs, however the island output on some older devices

may provide a positive output common with N (negative battery). This requires the ISLAND– (negative) connection to the SOS-5 Signal Override System to be connected to N (negative battery).

For a vital relay based DC or ACDC/Style-C type system it is necessary for both the GCP/MS- and ISLAND- inputs to be connected to the N battery power source.

Checking for Grounds and Cross-connections Prior to Cutover

The use of a 1000 Ohm input impedance volt-ohm meter (VOM) on the Ohms setting and connected in series with an 18V battery source is often used to check for grounds and crosses.

When the SOS-5 Signal Override System is wired into the overall signal system there should be no continuity between any of the inputs or outputs and earth ground.

How the signal system is connected will dictate which systems will need to be checked for improper cross-connections. The absence of ground and improper cross-connections is absolutely imperative.

If the SOS-5 Signal Override System is connected such that GCP/MS± is electrically isolated from the ISLAND± inputs, place the Mode Selector in the NORMAL or TEST WITH GATES UP position when checking for grounds and cross-connections.

If the ISLAND± input is common with B/N the you should expect to read continuity between it and B/N.

Cutover Tests

All SOS-5 Signal Override System modes should be checked for proper operation.

1. NORMAL Mode - Check for for full signal activation by shunting each approach and the island.
2. ISLAND ONLY Mode - Check for signal activation by shunting the island. Shunt each approach to verify that this does not result in signal activation.
3. DISABLE ALL Mode - Check for no signal activation when any approach or the island is shunted.
4. TEST WITH GATES UP Mode - Signal flashers should activate without lowering the gates. Verify that shunting any approach or the island will result in the gates being lowered.
5. TEST ALL Mode - Signal flashers should activate and all gates should lower.

All ground and cross-connection tests should be completed and any cross-connections eliminated before placing the system in service.

An example of required cutover tests for grounds and crosses for the Genesis SOS-5 Signal Override System used with a GCP/MS type system is shown in Figure 5. This example has two independent battery systems named B12-1 and B12-2. The B12-1 battery system voltage was measured at 14.8 VDC with commercial AC power ON and at 14.1 VDC with AC power OFF and on standby batteries. Both the positive and negative of all four of the

SYS-TEM NO.	SYSTEM NAME	SYSTEM VOLTS	SEC 234.249 - IMPROPER GROUNDS & CROSS CONNECTIONS							
			TERM	GND	SYSTEM (2)		SYSTEM (3)		SYSTEM (4)	
					+	-	+	-	+	-
SYS (1)	B12-1	AC ON 14.8	+	0	0	0	0	0	0	0
		STBY 14.1	-	0	0	0	0	0	0	0
SYS (2)	B12-2	AC ON 12.8	+	0	DO NOT TEST!		0	0	0	0
		STBY 12.2	-	0			0	0	0	0
SYS (3)	GCP/MS*	AC ON 13.4	+	0	0	0	DO NOT TEST!		0	0
		STBY 13.4	-	0	0	0			0	0
SYS (4)	ISLAND*	AC ON 13.3	+	0	0	0	0	DO NOT TEST!		
		STBY 13.3	-	0	0	0	0			

*SOS-5 in NORMAL or TEST WITH GATES UP Mode

Figure 5 - Example of Cutover Grounds and Cross Connections Tests for ACDC/Style-C Type Signal System

systems were checked for improper continuity with earth ground and both the positive and negative of each system against the positive and negative of each of the other three systems for improper cross-connections. The “0” in the column indicates the volt-Ohm meter reading was zero and there was no measured continuity.

SYSTEM NO.	SYSTEM NAME	SYSTEM VOLTS	SEC 234.249 - IMPROPER GROUNDS & CROSS CONNECTIONS					
			TERM	GND	SYSTEM (2)		SYSTEM (3)	
					+	-	+	-
SYS (1)	B12-1	AC ON 14.8	+	0	0	0	0	0
		STBY 14.1	-	0	0	0	0	0
SYS (2)	GCP/MS*	AC ON 12.8	+	0	DO NOT TEST!		0	0
		STBY 12.2	-	0			0	0
SYS (3)	ISLAND*	AC ON 13.5	+	0	0	0	DO NOT TEST!	
		STBY 13.5	-	0	0	0		

*SOS-5 in NORMAL or TEST WITH GATES UP Mode

Figure 6 - Example of Cutover Grounds and Cross Connections Tests for Single Battery/Charger Signal System

Figure 6. Shows an example of cutover tests required when the SOS-5 is used with a signal system with a single B12 battery system. In this example, the battery system is named B12-1. Battery voltage was measured with commercial AC power ON and again with it OFF and operating on standby battery power. All systems were checked for continuity with earth ground and against each other as in the previous example.

Blank forms similar to the forms in Figure 5 and 6 are included with the SOS-5 Signal Override System for use with testing after the unit is installed.

Note that all tests should be performed with the SOS-5 in either the NORMAL or TEST WITH GATES UP Mode.

Foreign Power Source Connected to XR±

The SOS-5 Signal Override System can detect when a foreign power source is interfering with the XR± output. If a foreign power source is detected on the XR± output, the SOS-5 Signal Override System Audible Annunciator will begin to sound continuously, the SIGNALS DISABLED LED will flash continuously, and the FLASHER+ output will be activated continuously. The GPR_IN/GPR_OUT circuit will also be opened causing the signal flashers to operate. This will occur regardless of the position of the Mode Selector.

This can be checked during cutover by applying B to the XR+ output and N to the XR- output. Make sure you observe the proper polarity when making this test. Be aware that if B and N are applied to the XR± inputs, the crossing signals are disabled and trains will not be detected.

Should it become necessary to disable the crossing signals by jumpering the XR relay or the inputs to a crossing control unit, the SOS-5 should first be disconnected from the signal system.

Disconnecting the SOS-5 Signal Override System from the Signal System Circuit

Should it become necessary to disconnect the SOS-5 Signal Override System from the signal system, you should be aware that the signals will be activated once power is removed from the SOS-5, and “jumpering” the signals will be necessary for either normal or disabled operation.

The variations in how different crossing signal circuits are designed and wired make it impractical to describe how a specific signal system should be jumpered. Nevertheless, certain conventions and precautions should *always* be followed. Some of these “rules” are:

1. Unplug the SOS-5 Signal Override System connector before connecting any jumpers. Unplugging the connector will activate the crossing signals and lower the gates.
2. When disabling signals, **ALWAYS** issue a Stop and Protect Crossing Order to train operating personnel using your railroads rules to do so. **NEVER omit this step.**
3. Only a qualified railroad signal maintainer who can read and understand the signal system wiring diagrams should attempt to jumper a crossing.
4. When disabling a signal system, NEVER connect B/N to the connections between the predictor/motion

sensor XR outputs and the XR relay coil or the Crossing Control Unit XR inputs, without first disconnecting from the predictor/motion sensor outputs. The preferred method is to disable the system by connecting the jumpers downstream from the XR inputs, if possible.

5. When disabling a signal system with gates, do not chain or tie gates in the up or any other position unless all power (including battery chargers and batteries) is disconnected from the gate(s).

To remove the SOS-5 from service and leave the signals in normal operation, 3 jumpers should be connected at the SOS-5 female connector pins/terminals:

1. GCP+/MS+ ↔ XR+ terminals;
2. GCP-/MS- ↔ XR- terminals;
3. GPR IN ↔ GPR OUT terminals.

Jumpers should be installed such that it is impossible for an unintended short-circuit or unintended connection to another pin/terminal to occur.

A full disarrangement test is required when any jumper is installed.

Three-Year Limited Warranty

Genesis warrants all new products for three-years against parts failure and workmanship unless the warranty terms are specifically stated otherwise on the invoice or packing slip for that product when shipped. Warranty is explicitly for parts and workmanship and not for design or function.

Any products we manufacture found to be faulty in any way may be returned for rework, shipping prepaid. If found to be in warranty, we will correct the fault or failure and return to you at no charge, shipping prepaid.

Warranty does not apply to damage caused by lightning, voltage surges, water, inappropriate storage, handling, misuse or if the product has been modified or repaired by others.

Troubleshooting

The following table lists some of the more common problems encountered when installing and maintaining a rail/highway crossing signal system using the Genesis SOS-5 Signal Override System.

Category

General		Possible Cause
	No LEDs are illuminated	No input to SOS-5 B/N. Provide B/N input. FLASHER+ Output is overloaded or shorted to N. Remove short or decrease load.
	Mode Select knob position disagrees with illuminated Mode LED	Loose Mode Selector knob set screw has allowed knob to turn on shaft. Realign knob and tighten set screw.
Audible Annunciator		Possible Cause
	Audible Annunciator sounds continuously	A foreign source of power is connected to XR± Output. Make sure the only connection to the XR relay or CCU XR inputs are from the SOS-5.
	Audible Annunciator does not sound when signals are disabled	The Audible Annunciator should sound for 60 seconds when the DISABLE Keyswitch is rotated to disable signals. It can be silenced by rotating a second time. It will sound for 1½ seconds every 90 seconds thereafter until signals are re-enabled. Confirm signals are disabled by checking if the SIGNALS DISABLED LED is flashing and the FLASHER+ Output is activated (if installed and programmed to be ON).
FAULT LED Indicator		Possible Cause
	FAULT LED indicator is illuminated continuously	The SOS-5 Signal Override System has detected an internal fault. This will cause the ISLAND ONLY and DISABLE ALL Modes to be non-functional, however the NORMAL, TEST WITH GATES UP and TEST ALL Modes may or may not be functional. Removing and restoring power to the SOS-5 may clear the fault and cause the FAULT LED to extinguish. If the FAULT LED continues to remain illuminated, the SOS-5 should immediately be removed from service and returned to Genesis for repair.
SIGNALS DISABLED LED Indicator		Possible Cause
	SIGNALS DISABLED LED flashes continuously	The SIGNALS DISABLED LED indicator will flash continuously when the SOS-5 has successfully disabled the crossing signals in either the ISLAND ONLY or DISABLE ALL modes. If the SIGNALS DISABLED LED is flashing when the Mode Selector is in the NORMAL, TEST WITH GATES UP or TEST ALL positions, see "Audible Annunciator sounds continuously" above.
XR LED Indicator		Possible Cause
	XR LED indicator 'blinks' periodically or occasionally	The XR± output is briefly interrupted about every 3 seconds to verify the SOS-5 can successfully interrupt the XR± output. This is normal when the XR LED is illuminated.
	XR LED indicator illuminated but XR relay not 'picked' and crossing signals are activated	Check the SOS-5 XR± output with a voltmeter for the about the same DC voltage as the selected input. If present, then check the input to the XR relay or the CCU for that same voltage. If it is present there, the problem may be with a 'downstream' component or relay, or with a gate mechanism contact.
	XR LED will not illuminate in SIGNALS DISABLED or ISLAND ONLY Modes	The DISABLE Keyswitch must be momentarily actuated after selecting either the ISLAND ONLY or DISABLE ALL Modes to disable signals and provide a XR output. If the XR LED is not illuminated when signals are disabled in the ISLAND ONLY Mode, the Island Output of the GCP/MS or ACDC Island may not be providing an output to the SOS-5 ISLAND± input.
	XR is not illuminated when in the TEST WITH GATES UP Mode	The SOS-5 GCP/MS± input is not receiving an output from the GCP/MS or ACDC system.
RCDR NORM+, RCDR TEST+ Outputs		Possible Cause
	RCDR TEST+ has no output when in TEST WITH GATES UP or TEST ALL Modes	Output overloaded. Make sure the RCDR TEST+ is not connected to a recorder input that requires more than 20 milliamps of current.
	RCDR NORM+ has no output when in NORMAL Mode	Output overloaded. Make sure the RCDR NORM+ is not connected to a recorder input that requires more than 20 milliamps of current.
FLASHER+ Output		Possible Cause
	FLASHER+ Output not causing LED or incandescent lamp to illuminate or no FLASHER+ Output	Verify FLASHER+ Output is not overloaded or shorted to N. If the FLASHER+ output is connected to an incandescent lamp, verify FLASHER+ flash pattern is not programmed to a "strobed" pattern. Check for wiring errors.
	Flasher+ Output ON continuously	Verify FLASHER+ Output Pattern is not programmed to the ON pattern. Check for wiring error or improper cross-connection.
GPR IN, GPR OUT		Possible Cause
	Gates lower when the TEST WITH GATES UP Mode is selected	No input to SOS-5 GCP/MS±.

Category

DISABLE ALL and ISLAND ONLY Modes		Possible Cause
	Crossing signals do not recover in DISABLE ALL Mode	See "XR LED indicator illuminated but XR relay not 'picked' and crossing signals are fully activated" above.
	Crossing signals do not recover in ISLAND ONLY Mode	No input to SOS-5 ISLAND±. Island occupancy detection system may be malfunctioning. Also, see "XR LED indicator illuminated but XR relay not 'picked' and crossing signals are fully activated" above.
NORMAL Mode		Possible Cause
	Signals are activated in the NORMAL Mode	See "XR LED indicator illuminated but XR relay not 'picked' and crossing signals are activated" above. Check for voltage at the SOS-5 GCP/MS± inputs.
	Signals never activate in the NORMAL Mode	Check for wiring error or improper cross-connection. Verify SOS-5 GCP/MS± inputs are connected correctly and not to B/N or island output.
TEST WITH GATES UP and TEST ALL Modes		Possible Cause
	TEST WITH GATES UP results in crossing flashers ON and gates being lowered	No input to SOS-5 GCP/MS±. GCP/MS must be functioning properly for gates to remain raised.
DISABLE Keyswitch		Possible Cause
	DISABLE keyswitch does not cause crossing signals to recover in DISABLE ALL Mode	See "XR LED indicator illuminated but XR relay not 'picked' and crossing signals are activated" above.
FLASHER OUTPUT Pattern Select Programming		Possible Cause
	SOS-5 Signal Override System will not go into 'Flasher Output Programming Mode'	Incorrect procedure. Refer to the User Manual section on programming.
	SOS-5 Signal Override System will not retain the selected Flasher Output Pattern	Incorrect procedure. Refer to the User Manual section on programming.
Ground and Cross-connection Tests		Possible Cause
	Continuity exists between XR± and GCP/MS± or ISLAND± or B/N	Improper cross-connection between offending systems. This may be caused by a wiring or design error. Refer to the User Manual section on 'Grounds and Cross-Circuit Continuity Checks' for more information.

SPECIFICATIONS

<u>INPUTS</u>	Min.	Max.	Units
B/N	10.5	20.0	VDC
GCP/MS±; ISLAND±	8.0	20.0	VDC
GPR IN	N/A	20.0	VDC
B/N.....	N/A	2.5	ADC

<u>OUTPUTS</u>	Typical	Max.	Units
XR±	12.0*	20.0	VDC
XR±	N/A*	0.4	ADC
FLASHER+	B (battery positive -0.3)		VDC
FLASHER+	2.0		ADC
RCDR NORM+; RCDR TEST+	0.02		ADC
GPR OUT	1.5		ADC

*equal to respective input depending on Mode selected/activated

<u>ENVIRONMENT</u>	Typical	Units
Operating Temperature Range	-40* (-40*) - 160 (71)	°F (°C)
Humidity (non-condensing).....	95%	Relative

*except Audible Annunciator is rated at -22 (-30) °F (°C)

DIMENSIONS (see reference drawings for details)

Height	8.55	(21.7)	in (cm)
Width	4.725	(12.0)	in (cm)
Depth (including connector)	4.20	(10.7)	in (cm)
Weight	2.50	(1.13)	lbs (kg)
Mounting Hole Centers - Width	3.72	(9.5)	in (cm)
Mounting Hole Centers - Height.....	8.09	(20.55)	in (cm)

CONNECTOR WIRING

Wire size range 12 - 24 AWG

CONNECTOR WIRING PINOUTS		
PIN	NAME	FUNCTION
1	GCP/MS+	GCP/MS POSITIVE INPUT
2	GCP/MS-	GCP/MS NEGATIVE INPUT
3	ISLAND+	ISLAND POSITIVE INPUT
4	ISLAND-	ISLAND NEGATIVE INPUT
5	FLASHER+	FLASHER POSITIVE OUTPUT
6	RCDR NORM+	NORMAL OUT TO EVENT RECORDER
7	BATT- (N)	BATTERY NEGATIVE INPUT
8	BATT+ (B)	BATTERY POSITIVE INPUT
9	GPR IN	GATE REPEATER RELAY IN
10	GPR OUT	GATE REPEATER RELAY OUT
11	RCDR TEST+	TEST OUT TO EVENT RECORDER
12	XR-	XR NEGATIVE OUTPUT
13	XR+	XR POSITIVE OUTPUT

HIGHWAY-RAIL GRADE CROSSING SIGNAL OUT OF SERVICE REPORT

OOS REPORT AND SIGNAL LOCATION INFORMATION

RECORDED DATE: _____

TIME: _____

STREET/HIGHWAY: _____

DOT NO.: _____

REPORTED MALFUNCTION: _____

SOURCE OF MALFUNCTION REPORT

REPORTED BY: _____

HOW RECEIVED: PHONE IN PERSON OTHER _____

REC'D REPORT DATE: _____ TIME: _____

COMMENT: _____

CORRECTIVE ACTION TAKEN FOR COMPLIANCE WITH CFR 234.105 THROUGH 234.107

CORRECTIVE ACTION DATE: _____ TIME: _____

CORRECTIVE ACTION TAKEN: NOTIFY MAINTAINER TIME: _____

HOW NOTIFIED: PHONE IN PERSON OTHER _____

COMMENT: _____

CORRECTIVE ACTION TAKEN: NOTIFY OPERATING PERSONNEL TIME: _____

HOW NOTIFIED: PHONE IN PERSON OTHER _____

NOTIFY OTHER _____ TIME: _____

HOW NOTIFIED: PHONE IN PERSON OTHER _____

COMMENT: _____

RESTORED TO NORMAL SERVICE

RESTORED TO SERVICE BY: _____

HOW RECEIVED: PHONE IN PERSON OTHER _____

RESTORED DATE: _____ TIME: _____

DISARRANGEMENT TEST? YES NO OTHER _____

COMMENT: _____

SYS- TEM NO.	SYSTEM NAME	SYSTEM VOLTS	SEC 234.249 - IMPROPER GROUNDS & CROSS CONNECTIONS							
			TERM	GND	SYSTEM (2)		SYSTEM (3)		SYSTEM (4)	
SYS (1)		AC ON STBY	+		+	-	+	-	+	-
SYS (2)		AC ON STBY	+		DO NOT TEST!					
SYS (3)	GCP/MS*	AC ON STBY	+						DO NOT TEST!	
SYS (4)	ISLAND*	AC ON STBY	+							DO NOT TEST!

*SOS-5 in NORMAL or TEST WITH GATES UP Mode

SYS- TEM NO.	SYSTEM NAME	SYSTEM VOLTS	SEC 234.249 - IMPROPER GROUNDS & CROSS CONNECTIONS							
			TERM	GND	SYSTEM (2)		SYSTEM (3)		SYSTEM (4)	
SYS (1)		AC ON STBY	+		+	-	+	-	+	-
SYS (2)	GCP/MS*	AC ON STBY	+		DO NOT TEST!					
SYS (3)	ISLAND*	AC ON STBY	+						DO NOT TEST!	

*SOS-5 in NORMAL or TEST WITH GATES UP Mode