Track Circuit Systems
Products

Clearguard® Phase Shift Overlay
Track Circuit Modules
C1 - C4
PSO Series

Clearguard® Intelligent Processor
Island Track Circuit
C5 - C8
IPITC Track Circuits

Clearguard® Steady Energy Phase
Selective Track Circuit
C9 - C16
SE-3 Track Circuits

Clearguard® Series Overlay
Track Circuit
C17 - C20
SOTC Track Circuits
The PSO 4000 Series is a reliable and secure, microprocessor based, vital system for use in a variety of complex installations.

The ability of PSO 4000 Series to differentiate between its operation signal and all other signals present on the track is due to the non-symmetrical coded modulation and receiver decoding techniques which ensure that the system is immune to random or foreign AM, FM and beat signals.
**Transmitter Module**
- Weight is approx. 6.1 lbs. (2.77 kgs.) including connectors.
- Quiescent power consumption is approx. 0.85 A @ 9 V
- Operates in -40°F to +160°F (-40°C to +70°C) @ up to 90% Non-Condensing Relative Humidity
- Frequency stability is ±0.01% (Hz) of the selected frequency
- Frequency modulation with 8 bit serial address
- Track transmitter load 25 Ω
- Track receiver load 250 Ω
- Relay coil resistance 400 Ω - 1,000 Ω
- Input power supply can be 9VDC, 12VDC (nominal) or 16.5VDC
- Power supply ripple is 1.0VDC Peak to Peak maximum
- (2) Vital inputs

**Receiver Module**
- Weight is approx. 6.1 lbs. (2.77 kgs.) including connectors.
- Quiescent power consumption is approx. 1.02 A @ 9 V
- Operates in -40°F to +160°F (-40°C to +70°C) @ up to 90% Non-Condensing Relative Humidity
- Frequency stability is ±0.01% (Hz) of the selected frequency
- Frequency modulation with 8 bit serial address
- Track transmitter load 25 Ω
- Track receiver load 250 Ω
- Relay coil resistance 400 Ω - 1,000 Ω
- Input power supply can be 9VDC, 12VDC (nominal) or 16.5VDC
- Power supply ripple is 1.0VDC Peak to Peak maximum
- (2) Vital inputs
- (3) Vital relay outputs

**Transceiver Module**
- Weight is approx. 6.1 lbs. (2.77 kgs.) including connectors.
- Quiescent power consumption is approx. 1.12 A @ 9 V
- Operates in -40°F to +160°F (-40°C to +70°C) @ up to 90% Non-Condensing Relative Humidity
- Frequency stability is ±0.01% (Hz) of the selected frequency
- Frequency modulation with 8 bit serial address
- Track transmitter load 25 Ω
- Track receiver load 250 Ω
- Relay coil resistance 400 Ω - 1,000 Ω
- Input power supply can be 9VDC, 12VDC (nominal) or 16.5VDC
- Power supply ripple is 1.0VDC Peak to Peak maximum
- (2) Vital inputs
- (3) Vital relay outputs

**Crossing Module**
- Weight is approx. 6.1 lbs. (2.77 kgs.) including connectors.
- Quiescent power consumption is approx. 0.87 A @ 9 V
- Operates in -40°F to +160°F (-40°C to +70°C) @ up to 90% Non-Condensing Relative Humidity
- Frequency stability is ±0.01% (Hz) of the selected frequency
- Frequency modulation with 8 bit serial address
- Track transmitter load 25 Ω
- Track receiver load 250 Ω
- Relay coil resistance 400 Ω - 1,000 Ω
- Input power supply can be 9VDC, 12VDC (nominal) or 16.5VDC
- Power supply ripple is 1.0VDC Peak to Peak maximum
- (2) Vital inputs
- (3) Vital relay outputs
Dimensions
(Applicable for all Clearguard® Phase Shift Overlay 4000 Series Modules)

- **2.5” (6.35 cm) Center to Center**
- **8.60” (21.84 cm) Center to Center**
- **9.54” (24.23 cm) Overall**
- **3.62” (9.20 cm) Overall**
- **2.65” (6.73 cm) Enclosure**
- **10.35” (26.29 cm) Enclosure**
- **11.00” (27.94 cm) Overall**
Typical Directional Stick Application Diagram

NOTE: This is one of many possible configurations with PSO 4000 modules
Clearguard® Intelligent Processor Island Track Circuit (IPITC)

**IPITC Track Circuits**

Clearguard® Intelligent Processor Island Track Circuit Module 7000-71150-0001

**Layout**

- **Transmitter Output Connections**
- **Receiver Input Connections**

**SIEMENS** Clearguard® Intelligent Processor Island Track Circuit (IPITC) module 7000-71150-0001 shown for reference purposes only! Actual unit selected may vary in mounting and features.

**SIEMENS** Clearguard® Intelligent Processor Island Track Circuit (IPITC) module provides a stand alone island circuit solution at grade crossings.

Unit is a single board, microprocessor based, multi-frequency, modulated, short range (120’ - 350’ [37 - 107m]) track occupancy detector.

Designed to detect poor shunting conditions and provides a simple automated process for track circuit calibration. Module is frequency programmable via an on board jumper and the operating program is contained in a flash memory device on board.

Direct replacement for legacy Short Modulated Track Circuit (SMTC) series.

- Microprocessor based
- Weight is approx. 5.0 lbs. (2.27 kgs.)
- Operates in -40º F to +160º F (-40ºC to +70ºC) @ up to 95% Non-Condensing Relative Humidity
- 9 - 16.5 VDC Input voltage
- 550mA VDC Input current (nominal)
- 0.1 Amp Transmitter output current (maximum)
- Field selectable frequencies: 2.14 kHz, 2.63 kHz, 3.24 kHz, 4.00 kHz, 4.90 kHz, 5.90 kHz, 7.10 kHz, 8.30 kHz, 10.0 kHz, 11.5 kHz, 13.2 kHz, 15.2 kHz, 17.5 kHz and 20.2 kHz
Clearguard® Intelligent Processor Island Track Circuit (IPITC)

Dimensions

- Overall: 5.8” (14.7 cm)
- Typical: 8.8” (22.4 cm)
- Overall: 9.5” (24.1 cm)

Optional Accessories

For 023834 AAR beveled washers, 023831 AAR binding shoulder nuts
or 023832 AAR clamp nuts (023832), See Tools and Accessories Section, Page K28
Clearguard® Steady Energy Phase Selective Track Circuit (SE-3) Receivers provides a solution where traction or other severe electromagnetic interference conditions could interfere with signaling circuits.

Designed to detect train presence and/or broken rail conditions in electric traction territory, or where high levels of induced AC interference occur.

SE-3 receivers can be used in conjunction with impedance bonds for traction current return or with either balanced or unbalanced (single rail) track circuits using insulated joints without impedance bonds. SE-3 receivers have no moving parts and requires no regular maintenance. It is entirely a passive component design, utilizing no active electronic circuits.
<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE-3 60Hz Receiver Module</td>
<td>Meets or exceeds applicable AREMA® specifications</td>
<td>Weight is approx. 14.0 lbs. (6.35 kgs.) including hardware.</td>
</tr>
<tr>
<td></td>
<td>Operates in -40° F to +160° F (-40°C to +70°C) @ up to 95% Non-Condensing Relative Humidity</td>
<td>91.7 Hz receiving frequency.</td>
</tr>
<tr>
<td></td>
<td>1 pair DC outputs (to track relay)</td>
<td>40° ± 20° Phase angle relationship.</td>
</tr>
<tr>
<td></td>
<td>1 pair local inputs (to inverter)</td>
<td>200 - 500 mΩ shunting sensitivity.</td>
</tr>
<tr>
<td>SE-3 60 Hz Receiver Module with Code Reset</td>
<td>Meets or exceeds applicable AREMA® specifications</td>
<td>Weight is approx. 14.0 lbs. (6.35 kgs.) including hardware.</td>
</tr>
<tr>
<td></td>
<td>Operates in -40° F to +160° F (-40°C to +70°C) @ up to 95% Non-Condensing Relative Humidity</td>
<td>91.7 Hz receiving frequency.</td>
</tr>
<tr>
<td></td>
<td>1 pair DC outputs (to track relay)</td>
<td>40° ± 20° Phase angle relationship.</td>
</tr>
<tr>
<td></td>
<td>1 pair local inputs (to inverter)</td>
<td>200 - 500 mΩ shunting sensitivity.</td>
</tr>
<tr>
<td>SE-3 83.3Hz Receiver Module</td>
<td>Meets or exceeds applicable AREMA® specifications</td>
<td>Weight is approx. 14.0 lbs. (6.35 kgs.) including hardware.</td>
</tr>
<tr>
<td></td>
<td>Operates in -40° F to +160° F (-40°C to +70°C) @ up to 95% Non-Condensing Relative Humidity</td>
<td>100 Hz receiving frequency.</td>
</tr>
<tr>
<td></td>
<td>1 pair DC outputs (to track relay)</td>
<td>40° ± 20° Phase angle relationship.</td>
</tr>
<tr>
<td></td>
<td>1 pair local inputs (to inverter)</td>
<td>200 - 500 mΩ shunting sensitivity.</td>
</tr>
<tr>
<td>SE-3 83.3Hz Receiver Module with Code Reset</td>
<td>Meets or exceeds applicable AREMA® specifications</td>
<td>Weight is approx. 14.0 lbs. (6.35 kgs.) including hardware.</td>
</tr>
<tr>
<td></td>
<td>Operates in -40° F to +160° F (-40°C to +70°C) @ up to 95% Non-Condensing Relative Humidity</td>
<td>100 Hz receiving frequency.</td>
</tr>
<tr>
<td></td>
<td>1 pair DC outputs (to track relay)</td>
<td>40° ± 20° Phase angle relationship.</td>
</tr>
<tr>
<td></td>
<td>1 pair local inputs (to inverter)</td>
<td>200 - 500 mΩ shunting sensitivity.</td>
</tr>
<tr>
<td>Model Number</td>
<td>Description</td>
<td>Specifications</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
<td>----------------</td>
</tr>
</tbody>
</table>
| 4000-44930-917X | SE-3 91.7Hz Receiver Module | - Meets or exceeds applicable AREMA® specifications  
- Weight is approx. 14.0 lbs. (6.35 kgs.) including hardware  
- Operates in -40°F to +160°F (-40°C to +70°C) @ up to 95% Non-Condensing Relative Humidity  
- 91.7 Hz receiving frequency  
- (1) pair DC outputs (to track relay)  
- (1) pair local inputs (to inverter)  
- (1) pair track inputs (to track transformer)  
- 40° ± 20° Phase angle relationship  
- 200 - 500 mΩ shunting sensitivity |
| 4000-44930-917RX | SE-3 91.7Hz Receiver Module with Code Reset | - Meets or exceeds applicable AREMA® specifications  
- Weight is approx. 14.0 lbs. (6.35 kgs.) including hardware  
- Operates in -40°F to +160°F (-40°C to +70°C) @ up to 95% Non-Condensing Relative Humidity  
- 91.7 Hz receiving frequency  
- (1) pair DC outputs (to track relay)  
- (1) pair local inputs (to inverter)  
- (1) pair track inputs (to track transformer)  
- (1) pair code reset outputs (to code recognition system)  
- 40° ± 20° Phase angle relationship  
- 200 - 500 mΩ shunting sensitivity |
| 4000-44901-100X | SE-3 100Hz Receiver Module | - Meets or exceeds applicable AREMA® specifications  
- Weight is approx. 14.0 lbs. (6.35 kgs.) including hardware  
- Operates in -40°F to +160°F (-40°C to +70°C) @ up to 95% Non-Condensing Relative Humidity  
- 100 Hz receiving frequency  
- (1) pair DC outputs (to track relay)  
- (1) pair local inputs (to inverter)  
- (1) pair track inputs (to track transformer)  
- 40° ± 20° Phase angle relationship  
- 200 - 500 mΩ shunting sensitivity |
| 4000-44901-100RX | SE-3 100Hz Receiver Module with Code Reset | - Meets or exceeds applicable AREMA® specifications  
- Weight is approx. 14.0 lbs. (6.35 kgs.) including hardware  
- Operates in -40°F to +160°F (-40°C to +70°C) @ up to 95% Non-Condensing Relative Humidity  
- 100 Hz receiving frequency  
- (1) pair DC outputs (to track relay)  
- (1) pair local inputs (to inverter)  
- (1) pair track inputs (to track transformer)  
- (1) pair code reset outputs (to code recognition system)  
- 40° ± 20° Phase angle relationship  
- 200 - 500 mΩ shunting sensitivity |
Dimensions
(Applicable for all SE-3 Series Receivers)

NOTES:
1. Generic depiction of SE-3 Series frame dimensions for representation purposes only!
2. Staggered mounting bracket hole pattern is 3" (7.6 cm) on center and matches relay bar mounting hole configuration for ST series relay center to center dimensions.

Optional Accessories

For 023834 AAR beveled washers, 023831 AAR binding shoulder nuts or 023832 AAR clamp nuts (023832), See Tools and Accessories Section, Page K28
**SIEMENS** ST-7 Track Feed Reactor model 4000-44903-000X shown for reference purposes only! Actual unit selected may vary in mounting and features.

SIEMENS ST Series Track Feed Reactors varies the amount of phase shift desired in the track circuit. Available in (3) models with varying inductance loads to accommodate wide variety of track design needs.
<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4000-44903-000X</td>
<td>ST-7 Track Feed Reactor</td>
</tr>
<tr>
<td>- Meets or exceeds applicable AREMA® specifications</td>
<td></td>
</tr>
<tr>
<td>- Weight is approx. 6.5 lbs. (2.95 kgs.) including hardware</td>
<td></td>
</tr>
<tr>
<td>- Operates in -40° F to +160° F (-40°C to +70°C) @ up to 95% Non-Condensing Relative Humidity</td>
<td></td>
</tr>
<tr>
<td>- 0.09 mH - 2.0 mH inductance</td>
<td></td>
</tr>
<tr>
<td>4000-44906-000X</td>
<td>ST-9 Track Feed Reactor</td>
</tr>
<tr>
<td>- Meets or exceeds applicable AREMA® specifications</td>
<td></td>
</tr>
<tr>
<td>- Weight is approx. 6.5 lbs. (2.95 kgs.) including hardware</td>
<td></td>
</tr>
<tr>
<td>- Operates in -40° F to +160° F (-40°C to +70°C) @ up to 95% Non-Condensing Relative Humidity</td>
<td></td>
</tr>
<tr>
<td>- 4.4 mH - 14.1 mH inductance</td>
<td></td>
</tr>
<tr>
<td>4000-44909-000X</td>
<td>ST-8 Track Feed Reactor</td>
</tr>
<tr>
<td>- Meets or exceeds applicable AREMA® specifications</td>
<td></td>
</tr>
<tr>
<td>- Weight is approx. 6.5 lbs. (2.95 kgs.) including hardware</td>
<td></td>
</tr>
<tr>
<td>- Operates in -40° F to +160° F (-40°C to +70°C) @ up to 95% Non-Condensing Relative Humidity</td>
<td></td>
</tr>
<tr>
<td>- 1.8 mH - 5.7 mH inductance</td>
<td></td>
</tr>
</tbody>
</table>
Typical Application Diagram

- Track Reactor
- Track Transformer
- Track Transformer
- Track Receiver
- Impedance Bonds
- 100 Hz Signal Power
- Track Relay

Clearguard® Steady Energy Phase Selective Track Circuit (SE-3)
Clearguard® Steady Series Overlay Track Circuit (SOTC) Modules

**SOTC Track Circuits**

Clearguard® Series Overlay Track Circuit Module

**Layout**

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**SIEMENS** Clearguard® Series Overlay Track Circuit (SOTC) Series model 7000-7A190-5900 shown for reference purposes only! Actual unit selected may vary in mounting and features.

**SIEMENS** Clearguard® Series Overlay Track Circuit (SOTC) Series modules are an adjustable length audio frequency track circuit intended primarily for obtaining release of electrically locked switches (through a normally deenergized external relay) by occupying the main track immediately ahead of the switch points.

Compact design is available in (3) frequencies and except for primary arresters, no external surge protection devices are required.
## Clearguard® Steady Series Overlay Track Circuit (SOTC) Modules

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Frequency (KHz)</th>
<th>Specifications</th>
</tr>
</thead>
</table>
| 7000-7A190-5900 | 5.9             | - Meets or exceeds applicable AREMA® specifications  
- Weight is approx. 4.0 lbs. (1.81 kgs.) including hardware  
- Operates in -40°F to +160°F (-40°C to +70°C) @ up to 95% Non-Condensing Relative Humidity  
- 5.9 KHz |
| 7000-7A190-10.0 | 10.0            | - Meets or exceeds applicable AREMA® specifications  
- Weight is approx. 4.0 lbs. (1.81 kgs.) including hardware  
- Operates in -40°F to +160°F (-40°C to +70°C) @ up to 95% Non-Condensing Relative Humidity  
- 10.0 KHz |
| 7000-7A190-26.0 | 26.0            | - Meets or exceeds applicable AREMA® specifications  
- Weight is approx. 4.0 lbs. (1.81 kgs.) including hardware  
- Operates in -40°F to +160°F (-40°C to +70°C) @ up to 95% Non-Condensing Relative Humidity  
- 26.0 KHz |
**Clearguard® Steady Series Overlay Track Circuit (SOTC) Modules**

### Dimensions

- Overall: 5.8” (14.7 cm)
- Typical: 8.3” (21.1 cm)
- Overall: 9.5” (24.1 cm)

### Optional Accessories

For 023834 AAR beveled washers, 023831 AAR binding shoulder nuts
or 023832 AAR clamp nuts (023832), See Tools and Accessories Section, Page K28