

## PHASE SHIFT OVERLAY III



- **SOLID STATE, MODULATED, HIGH-SECURITY, AUDIO OVERLAY TRACK CIRCUIT**
- **SIXTEEN FREQUENCIES, 156 HZ TO 4.0 KHZ**
- **IMMUNE TO RANDOM OR FOREIGN AM, FM AND BEAT SIGNALS**
- **BACKWARD-COMPATIBLE WITH SAFETRAN PSO II UNITS OF SAME ADDRESS FORMAT**

The Phase Shift Overlay III (PSO III) track circuit is used to supply track occupancy information for crossing warning systems, as well as other train control systems. The PSO III is a reliable, secure, solid-state, vital system that can be used in a wide variety of complex installations.

The PSO III is available in two configurations: **Standard** and **Crossing Package**. The **Standard** configuration consists of separate transmitter and receiver assemblies. Each of these assemblies contains a single, plug-in printed circuit module for ease of maintenance.

The **Crossing Package** includes two receiver modules and a combination transmitters-receiver/island-circuit module (62609) in a single case. The Crossing Package receiver modules are identical to those used in the Standard configuration. The island module is Safetran's Intelligent Processor Island (IPI).

A total of 16 carrier frequencies, ranging from 156 Hz to 4,000 Hz, are available for use with the Standard PSO III and the Crossing Package in non-electrified territory. For electrified territory, 10 carrier frequencies, ranging from 645 Hz to 4000 Hz, are available for each configuration.

The island module (IPI) in the Crossing Package configuration is frequency selectable with 10 frequencies available in the range from 4.9 kHz to 20.2 kHz.

PSO III assemblies are available in two address formats: "A" or "C". The "A" address format is standard and is intended for most PSO III applications. The "C" address format is intended for use in applications involving a high-density mix of frequencies and multiple tracks. Modules and case assemblies are keyed electronically to prevent accidental mixing of address formats.

A variety of accessory equipment is available for use with the PSO III. Where it is desirable to have the transmitter and receiver at the same location, rail-to-line and line-to-rail couplers are available to enable signals to be transmitted or received over lines. Accessory equipment is also available for specialized applications such as preventing the loading effects of track batteries and bypassing PSO III signals around insulated joints at selected locations.

**WARNING**

**THE BYPASSING OF INSULATED JOINTS IN ELECTRIFIED TERRITORY IS NOT RECOMMENDED.**

The PSO III receiver and transmitter units are compatible with the signal format and track levels of Safetran’s PSO II receiver and transmitter units using the same address format. PSO III transmitter and receiver modules may also be used in the earlier PSO II cases with the same address format. However, the PSO III cases are electrically keyed to prevent the use of the PSO II modules in the newer PSO III cases. The table below indicates PSO III and PSO II interchangeability.

The PSO III is compatible with other Safetran equipment including motion sensors, grade crossing predictors, pulse-modulated track circuits, etc.

**PSO II and PSO III Transmitter and Receiver Module/Case Interchangeability**

System	Address Format	Module Type	Module Part No.	Assemblies (Cases)							
				PSO II				PSO III			
				"A" Address		"C" Address		"A" Address		"C" Address	
7A400	7A405	7A420	7A425	7A438	7A439	7A451	7A453				
PSO II	"A" Address	Receiver	7A416		X						
		Transmitter	7A411	X							
	"C" Address	Receiver	7A416-2				X				
		Transmitter	7A411-2			X					
PSO III	"A" Address	Receiver	7A436		X			X			
		Transmitter	7A437	X					X		
	"C" Address	Receiver	7A436-2				X				X
		Transmitter	7A437-2			X				X	

## ORDERING INFORMATION

To order, specify part number and frequency

Unit Description	Address Format	Assembly Part Number	Module Part Number(s)
PSO III Transmitter	"A" Address	7A439-f	7A437-f
PSO III Receiver	"A" Address	7A438-f	7A436-f
PSO III Crossing Package with island	"A" Address	7A448-f1-f2-IPI	7A436-f (2), 62609
PSO III Transmitter	"C" Address	7A451-f	7A437-2-f
PSO III Receiver	"C" Address	7A453-f	7A436-2-f
PSO III Crossing Package with island	"C" Address	7A455-f1-f2-IPI	7A436-2-f (2), 62609

f = Selected from list of available carrier frequencies below

f1 = Frequency of receiver number 1

f2 = Frequency of receiver number 2

IPI = IPI Island Module included

### Available PSO III carrier frequencies

156 Hz	430 Hz	970 Hz	2140 Hz
211Hz	525 Hz	1180 Hz	2630 Hz
285 Hz	645 Hz	1450 Hz	3240 Hz
348 Hz	790 Hz	1770 Hz	4000 Hz

To order, specify part number and frequency (if indicated)

Description	Part Number
Battery Choke	62648
Tuned Receiver Coupler <sup>(1)</sup>	7A355A-f
PSO Battery Choke	7A360
High Impedance Tuned Receiver Coupler <sup>(1)</sup>	7A366-f
PSO Receiver Line-to-Rail Coupler <sup>(1)</sup>	7A377-1-f
PSO Line Coupler	7A388
PSO Transmitter Line-to-Rail Coupler <sup>(1)</sup>	7A399-f
Line Overlay Coupler	7A403
PSO Cab Signal Filter <sup>(2)</sup>	7A417-X
Battery Line Filter	7A418
Tuned Insulated Joint Bypass Coupler <sup>(1)</sup>	7A422-f

<sup>(1)</sup> -f following part number incicated unit is frequency specific - use appropriate PSO III frequency

<sup>(2)</sup> -X following part number indicates dash number options are available (see table below)

7A417-X Dash Number Tab Chart				
Relay Base Configuration	Frequency			
	100 Hz	60 Hz	200 Hz	90 Hz
Transcontrol	-01	-11	-21	-31
U. S. & S.	-02	-12	-22	-32
Safetran	-03	-13	-23	-33

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<b>PSO III Carrier Frequencies (in Hz):</b>	156, 211, 285, 348, 430, 525, 645, 790, 970, 1180, 1450, 1770, 2140, 2630, 3240, 4000
<b>Transmitter Output Impedance:</b>	2 $\Omega$ (nominal)
<b>Receiver Input Impedance:</b> With 7A355 Coupler – With 7A366 Coupler –	Low impedance High impedance
<b>Surge Protection:</b>	Secondary protection built-in, Primary protection required on all external lines
<b>Relay Drive Output:</b>	400 to 1,000 $\Omega$ load
<b>Input Voltage:</b>	9.0 to 16.5 VDC (all units)
<b>Input Current:</b> Transmitter, 7A439/7A451 (low power) Transmitter, 7A439/7A451 (high power) Receiver, 7A438/7A453 Crossing Package (7A448/7A455)	350 mA (nominal) 600 mA (nominal) 400 mA (nominal) 1.3 A (nominal)
<b>Island Frequencies, in kHz (Crossing Package):</b>	4.9, 5.9, 7.1, 8.3, 10.0, 11.5, 13.2, 15.2, 17.5, 20.2
<b>Track Circuit Length (Crossing Package):</b>	Determined by track wire connections (50 – 500 ft.)
<b>Island Pickup Delay Time (Crossing Package):</b>	Field programmable for 2, 4, 6 seconds (IPI software version A01E and later only)
<b>Environmental Range (Temperature):</b>	-40 °F to +160 °F (-40 °C to +71 °C)
<b>Dimensions:</b> Transmitter (7A439/7A451) and Receiver (7A438/7A453)  Crossing Package (7A448/7A455)	8.75 inches high (22.23 centimeters) 8.25 inches wide (20.96 centimeters) 9.50 inches deep (24.13 centimeters)  11 inches high (27.94 centimeters) 14.38 inches wide (36.52 centimeters) 9.50 inches deep (24.13 centimeters)
<b>Shipping Weight:</b> Transmitter (7A439/7A451) and Receiver (7A438/7A453)  Crossing Package (7A448/7A455)	5 pounds (each) (2.27 kilograms)  16 pounds (7.26 kilograms)