

# **SE74**

#### 16 signal head controller with 4 turnout controls and 8 input lines.

### Features:

- 4 SE1 Digitrax 10-pin ribbon cables that control 4 LED signal heads each.
- **4** Switch (SW) control outputs for solenoid or slow-motion turnouts.
- Plug-in connectors for simple and easy installation and service.
- User defined 4+32 consecutive SW addresses in 2000+ SW range.
- Optional 9 types of DCC Aspect control, including Lunar lamps.
- Easy setup with Option Switches (OPSW) or LocoNet CV programming.
- Power input from 2mm DC jack, or DCC track voltage, 10V min to 20V max.
- 8 easy to setup System Routes, with 8 SW Entries each.
- 8 input control lines; 4 for Output/SW change and 4 Sensor/DS inputs.
- Additional advanced LocoNet Configuration modes using DT602 throttles.

# Parts List

1 SE74 Stationary Decoder

1 10-pin pluggable input cable

1 Instruction Sheet

1 SE1 PCB test mast and 10pin cable

# 1.0 SE74 Quick Start - 4 Turnout control function

- 1. Figure 1 shows the recommended connections to operate the SE74 on a LocoNet layout and to control 4 SE1 signal cables with 16 total signal heads and 4 solenoid turnouts.
- 2. Connect a PS14 or similar DC 12V power supply to the SE74 via the DC power jack. When powered the green ID LED should light and will briefly wink OFF every 2 secs as a product 'heartbeat' showing the SE74 is operational. Alternatively, power from DCC feeder wires to the TKA/B terminals.
- 3. Plug in an active LocoNet to a SE74 RJ12 connector. The red OPS LED will light up showing connection. Any good LocoNet message seen will cause the SE74 OPS LED to blink OFF briefly. With no LocoNet the unit will default to switch commands from the DCC track connections TKA/TKB.
- 4. Factory default Base SW# is 253 to control turnout #1. *To set to a custom Base number*, press and hold down the ID button for about 3 seconds until the RTS and OPS LEDs blink alternately, then release the ID button. From your system send a SW command to set the new <u>Base address</u> at this SW#. The OPS and RTS LEDs will stop blinking showing the SE74 has set the unit's Base SW# to the SW# you just sent, which controls SE74 turnout 1.
- 5. Wire and plug in 3-wire solenoid turnouts as shown in figure 1. To use 4 stall type switch motors modify Option Switch (OPSW) 1 to Closed/C, (see section 4.0), and use 2 wires per motor, with no P+ connections.
- 6. Operate turnouts with a SW# and direction Thrown (T) or Closed(C) settings at the; Base SW#, or the next *consecutive* 3 SW#'s now used by this SE74.

### That's all that's required to initial check an SE74 on LocoNet!



# 1.1 SE74 Quick Start - Add SE1 signal heads:

To add 4 signal heads on a single SE1 cable using default 2 SW's per head:

- 1. The SE74's in factory default SE8C compatible mode have 4 turnout addresses es starting at the Base address SW253, *followed* by 32 more SW numbers from SW257 on that control heads 1-16 consecutively with 2SW per head. Each SE74 uses 36 total consecutive SW addresses.
- 2. The SW257-264 settings control heads; 1= A1-Main, 2=A2-Dwarf, 3=Main-B

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and 4= C-siding as shown in figures 2 and 3, on the cable S1 for the e.g. "left siding" example.

- 3. Plug in the first SE1 test cable into the 10pin header marked "S1" with the cable brown/pin1 to the left, looking at the unit. Plug the test mast in figure 4 into a test cable empty 10-pin socket with the led side towards the SE74
- 4. Default first SW address for Head A1 on cable S1 is the SE74 Base address 253+4 = SW257.
- Head A1 is controlled by SW257/258 using T/C directions to select 4 aspects to display. Power ON the SE74 and issue a SW257 = C switch command. The upper 3 led head on the test mast is A1 and should now light GREEN. SW257 = T will set this head to RED. For yellow, make SW258 = T, and Flashing Yellow make SW258=C. Head A2 is the DWARF/D lower test mast head at SW259/260.
- 6. Re-plug the Test mast with its leds pointing **away** from the SE74. Now SW261/262 control the lower head B-main and SW263/264 control the upper head C-siding.
- 7. For a **new** BASE address, Head1 will be at the new Base SW address+4.
- 8. SW1021/1022 allow Broadcast head setting in any head control method.
- 9. SE74 turnouts can be Broadcast setup by: turnout1=SW2041, through turnout4=SW2044.
- 10. SW1024=C turns ON Aspect Exercise cycles, SW1024=T turns OFF. A double click of the ID button will toggle Exercise ON/OFF for just that SE74.
- 11. SW1023=C sets Night dim level, SW1023=T sets DAY brightness.

**2.0 Advanced DT602 based SE74 configuration:** *To perform these advanced features, a DT602 with SubVersion 0.9 or higher will be needed* 

- see www.digitrax.com for the latest software IPL.

#### 2.1 Setup SE74 DCC Aspect control mode: A DT602 with IPL ver-

**control mode:** A DT602 with IPL version 0.9 or later allows the DT602 to change from 'Switch' to 'Signal' DCC Aspect control for SE74's.

- 1. To change an SE74 to use the nine DCC Aspect type controls for all 16 heads, set OPSW5= C. ( see section 4.0)
- 2. On an updated DT602 press the Switch key, then the new "Signal" mode or C soft key. The Signal mode screen like that adjacent will be displayed.
- 3. The current Head number will be displayed, along with; RED, YEL, GRN and LUNAR head aspect choice soft keys to set as the primary head aspect.



- 4. The head number will be GRAY and change to BLACK when a new Aspect key is sent to the head#.
- 5. The 'Modify' soft key A will cycle the selected head between the current; as-

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pect "color", "flashing color" and then head DARK. DARK provides a choice for "approach lighting".

- 6. Press the number keys to choose another head# to change. In DCC Aspect control mode the SE74 base Head1# is set as the same number as the Board base address used by the turnouts. Factory default Head1 = 253, through to Head16 = 268.
- 7. Press the C soft key (Switch) to return the DT602 to system Switch control for turnouts instead of Signal DCC Aspect control mode.
- 8. The nine default DCC Aspect commands define RED/YEL/GREEN or LU-NAR and their Flashing versions, as well as overall head DARK. The 'white' LUNAR lamp is an *alternate* to the 3 lamp colors on the same head number.
- 9. If you want a Lunar lamp on the Head to display at the Head address *at the same time* as one of the 3 color lamps, then configure the SE74 with OPSW41 =C to set the Lunar lamp setting *Persistent*, independent of the color lamps.
- 10. Head 2048 sets an Aspect mode Broadcast to all heads of SE74's using DCC Aspect control.

## 3.0 Setup SE74 Ez-Routes:

The SE74 has 8 internal Routes with up to 8 SW# and T/C direction Entries each. These can be set up by a basic Ez-Routes method using the RTS button and switch commands sent from a LocoNet throttle, connected PC or DCC track.

- 1. Press and hold the RTS button for about 3 seconds and the ID and OPSW LEDs will blink alternately to show one Route can be set up. Release the RTS button.
- 2. Select a switch address on your throttle between 1 and 8 and issue the command direction for Closed. This will now be the <u>Route Number</u> you are going to setup. Any previous Entries in this Route will now be replaced in following steps.
- 3. Select the desired TOP Switch address between 1 and 2000 and issue a C or T direction command. This SW# and direction is that which will trigger this Route to be executed when seen by this SE74
- 4. Now enter up to 7 more SW# and direction T or C for the other route Entries required. The route entry ID/OPS LED will stop blinking indicating when route is full/completed.
- 5. If you issue a SW# and direction twice consecutively that will also end route entry for that Route Number.
- 6. If this SE74 does not have a LocoNet connection but operates from DCC Track power on the TKA/B terminals, then it will ignore executing Route Entries that do not fall within the SE74's Base address and next 4 outputs.
- 7. Best practice is to set TOP SW#'s in each route in a unique "phantom" switch range e.g. 500 and above that do not control a physical switch. This will identify the issued switch is specifically a TOP or Route-start SW#.
- 8. Ez-Routes do not have the ability to; read back , review or edit SE74 routes already set up. For more powerful color graphics for comprehensive SE74 Route review and editing using a DT602 see section 6.2
- 9. The green RTS LED will be steady ON if there are any routes programmed.

**4.0 SE74 Options: OPSW changes** The SE74 configuration and behavior can be configured using non-volatile OPSW's. The Factory default OPSW settings will configure most common requirements.

- 1. Press and hold the OPS button for about 3 seconds until the green ID and RTS LEDs blink alternately. Release the OPS button. The SE74 is now setup to configure OPSW 1 to 48 by sending the required SW# as C or T to setup an option.
- 2. Send a SW# in range 1-48 as C/T matching the valid settings from Table 1 OPSW settings shown below.
- 3. When finished press and hold OPS button for 3 seconds to exit OPSW setup mode. The SE74 will now restart with the new OPSW settings.
- 4. Factory default OPSW settings are shown in **BOLD**.
- 5. OPSW's not in this table are reserved and should be kept at Factory default T settings for predictable operation.
- 6. OPSW40 =C will reset to Factory defaults on OPSW mode exit

OPSW#	Default= <b>bold</b>	Action:	
1	Т	C = Slow motion turnouts, T = pulse/solenoids	
5	Т	C =DCC Aspect control mode, T = SW control	
6	Т	C =Disable internal Routes	
10	Т	C = Bushby bit active	
11	Т	C = 8 input lines trigger Routes	
14	Т	C = DCC SW commands only	
15	Т	C = Do not echo Route SW's to Loconet	
16	Т	C = Solenoid pulse hi CD voltage	
30	Т	C = Send B2 not B0 input SW messages	
33	Т	C = 2-wire searchlight signals (figures 8/9)	
34	Т	C = Searchlight, T = 3 color signals	
35	Т	C = Common cathode signals, T=common anode	
37,36	<b>T, T</b> C, T T, C C, C	Flashing Yellow, 4th SW aspect Flashing Red, 4th SW aspect Dark, 4th SW aspect Flashing Green, 4th SW aspect	
38	Т	C = Disable SW1021/1022 signal broadcast	
40	Т	C = Set Factory defaults	
41	Т	C = Make Lunar aspects Persistent	

### Table 1: SE74 OPSW setting table:

#### www.digitrax.com

# 5.0 External hardware Input lines:

The SE74 has eight external hardware control lines on the "SWITCH/SENSOR IN" 10-pin PCB header using a plug-in 10-pin ribbon cable. The 6" Factory ribbon cable pin 1 edge should be on the right side when plugged in. With Gray cable the red stripe is pin 1 edge, and for 10-color cable pin 1 is BROWN, with wire colors shown in Table 2.

If you use these external lines, connect the wires from the pins of Table 2 to your custom wiring by e.g. screw terminal blocks. If using a Gray non-color ribbon cable, make sure pin 1 and counted pin numbers match Table 2 usage.

Alternately, plug in a DSXC4 board with its ribbon cable, which will support up to 4 DSXCP1 fascia SW controls with switch state indicating LEDs.

A +5V Reference voltage is provided on pin 10/ribbon cable BLACK wire for setting an ON/active level, and a OV/OFF reference level on pin 9 or the WHITE wire. DO not draw more than 100mA from the BLACK wire. The SW/ SENS wires on pins 1/BROWN through 8/GRAY are rated for up to +16V maximum input voltage, but best practice is OV to 5V opera-

tion.

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Pin#	Wire Color	Function			
1	BROWN	WN SW1 Toggle, +momentary			
2	RED	SENS1 occupancy level			
3	ORANGE	SW2 Toggle, +momentary			
4	YELLOW	SENS2 occupancy level			
5	GREEN	SW3 Toggle, +momentary			
6	BLUE	SENS3 occupancy level			
7	VIOLET	SW4 Toggle, +momentary			
8	GRAY	SENS4 occupancy level			
9	WHITE	oV reference			
10	BLACK	+5V reference			

#### Table 2: SE74 Input lines

- The SW1,SW2,SW3,and SW4 pins will toggle the state of the same number output when briefly connected to the +5V ON voltage on the BLACK wire or pin10. If the SE74 is connected to LocoNet this will occur as a SW# message to make the change and notify the system it has occurred. Wire to momentary press-on buttons for SW control.
- 2. The pins SENS1,SENS2, SENS3 and SENS4 will send a LocoNet Block Occupancy or DS message at the SW# of the output. This will be BLOCK OCCUPIED when the line is above +4V and a BLOCK UNOCCUPIED when between oV/WHITE and +2V.
- 3. For example; if the SENS2/YELLOW line of the input ribbon cable is connected to the BLACK +5V Reference wire, the DS number reported will be SW# used for Output 2R/2G. If SW10 is the SE74 BASE address of Output1, then Output2 is SW11 and the DS message will be Block 11 OCCUPIED.
- 4. A disconnected SENS line will report as UNOCCUPIED.
- 5. The BD4N does not plug directly into a 10 pin header, and will not operate. Connect the 5 wires used by the BD4N by name via a terminal strip. More conveniently, you may connect the BD4N through a plugged in DSXC4 board with ribbon cables for true plug and play connectivity. This will also allow DSXCP1 SW control and state display.
- 6. These ribbon cable wires should not connect to any other voltage levels or loads other than those defined here.

7. For OPSW11 =C: SW1 line ON starts Route1 and SENS1 starts Route2, in order through SENS4 line that starts Route 8. An empty route is ignored.

**6.0 Detecting all SE74's and setting Base addresses:** As for section 2.0, on a DT602 *plugged into* LocoNet, press the; Menu>3>4 keys to enter the Route Editor menu. If *any* SE74 is plugged into LocoNet, the DT602 will beep after about one second and show "DS7x" routes at the D soft key position.

- Press the D soft key to get the "Selecting DS7X device:" screen as shown beside. This *example* DT602 screen shows three SE74 and three SE74 devices detected on LocoNet, with their; Base SW address, active SW address count# and unique device serial numbers (SN or SerNo).
- 2. The lowest SE74 Base address *detected and sorted* is SW0001, with 4 turnouts using 4 SW#'s and SN 9122. The Base Sw# text is displayed in RED to indicate an overlap/conflict with some following Series7 device.
- This 1st SE74 shows a RED A character before the #SN. This A flags this SE74 is configured by its OPSW5=C for head control by DCC Aspect, so only uses 4 SW addresses total (for turnouts only).

CsRt		Ident					
Solocti	Collecting DC7v device						
Selecting DS/X device							
Device:	Base+Out#	SerNo					
SE74	Sw0001+04	A #9122					
DS74	Sw0007+04	#3122					
DS74	Sw0011+04	#2399					
SE74	Sw0016+04	a #0945					
SE74	Sw0040+36	S #0745					
DS74	Sw0075+04	#2399					
DS7x device select: LH knob							
Chng adr							
oning dai							

- 4. The RED capitalized A indicates the detected overlap is NOT a SW# but a *DCC Aspect head# problem with a following SE74*. The 2nd SE74 SN0945 is at SW/Aspect Base address 16. To clear the 1st SE74 SW1+16(heads) or aspect 17 means the 2nd SE74 SW/aspect Base would need to be 17 or higher.
- 5. Use the LH encoder knob to scroll up and down through the detected SE74 devices, with an underline shown at the 2nd SE74.
- 6. At the 2nd SE74 underlined as shown, press the number keys 1 then 7 and then "Chng adr" keys. The 1st SE74 will now change its Base SW0001 text to GREEN, and the large RED A will become a small GREEN a. This means that we do not have an *aspect overlap* problem with the 2nd SE74 now at Base adr SW0017. The GREEN 'a' character flags that this 1st SE74 is in ASPECT control mode to control all its signal heads.
- 7. The 3rd SE73 SN#0745 is RED showing it has a problem with a following Series7 device. Here the RED large S shows it has a SW address overlap with the 3rd SE74 #2399 at its base address of Sw0075. The 3rd SE74 shows its SW Out# range as 36 (4+32) because it is NOT in aspect control mode, so the following device SW base address must be *at or above* Sw40+36 = Sw76.
- 8. Use the LH encoder knob to select this 3rd SE74, then press 7, 6 then "Chng adr" keys, and the 3rd SE74 data turns green with no problems found. The full display page overlaps are not completely sorted and re-evaluated until the "Chng adr" soft key A is pressed. Best practice is to scroll past a 10th device line to see if Series7 devices above the current display page of 10 have

problems.

- 9. Note that the example 1st SE74 SN#3122 and 2nd SE74 SN#2399 sit between the minimum SW 5 and maximum SW15 Base SW#'s to have no overlaps with the first and second SE74's. This Switch 'gap' is because the 1st SE74 only uses to Sw004, but its aspect number goes from head 1 to 16, so any following SE74 has to have a Base Sw at 17 or above. The DS74's don't use Aspect address ranges so can be arranged in this 'gap'.
- 10. Press "X" to exit any DT602 advanced mode.
- 11. This advanced DT602 capability allows you to setup all DS7x family device combinations, like the SE74, DS78V, PM74 and SE74 etc, at installed positions on a LocoNet layout, quickly and conveniently, even if all devices are initially at factory-default Base address SW1.
- 12. If you are using other types of non-DS7x family control devices, you will have to note their active Base SW addresses/ranges and manually ensure the SE74's are configured to not overlap these.

**6.1 Reading and Editing a SE74's routes:** As for section 2.0, if you have a suitable DT602 plugged into LocoNet, press the; Menu>3>4 keys to enter Route Editor menu. If *any* SE74 is on LocoNet, the DT602 will beep after about one second and show "DS7x" routes at the D soft key position.

- 1. Press the D soft key to now enter the "Selecting DS7x device:" screen,
- 2. Rotate the LH encoder knob to underline the SE74 to edit routes for.
- 3. Now press DOWN the LH encoder knob to read in and display the Routes of the selected SE74, as shown in adjacent "EDIT DS7X Rt#:" screen.
- 4. The LH encoder knob now selects a Route# and the RH encoder selects the black outlined Entry# to edit. Soft A key will toggle the entry from T to C direction choice. Numeric keys will change the SW# in the outlined Entry position. "Add" soft key allows inserting another entry at current position and "Delete" will remove the current entry. The "SW test" soft key will send just the outlined switch# and direction to LocoNet.

CS Rt   EDIT DS7 Entry# TOI	SW test XRt# 01	Delete of 8			
0100c 0224t					
7					
SE74 Sw0016+04 #0945					
Inrown	Add	Save			

- 5. <u>After edit of any Route is complete</u> **be sure** to press the "Save" soft key to update this SE74 Route to non-volatile memory. Press "X" to exit.
- 6. With LocoNet connected SE74 routes have System wide control capability.

**6.2 Program SE74 CVs on LocoNet:** As for section 2.0, with a DT602, press the; Menu>2>1 keys to enter Operations Mode programming.

- Press the "SWITCH" soft key F to enter the "**Ops Switch**" mode programming screen as shown adjacent. This example screen shows CV11 selected for an SE74 with *BASE address of SW1*.
- 2. Use the LH and RH encoder knobs to select the SW#/ADR of the SE74 to modify a CV on. An SE74's CV11 to CV16 access the 48 OPSW bit settings.
- 3. For example; press the "CVDATA" soft key at CV11 to change to CV data entry, press the number 1 then press "WRITE". This now configures the 8 OPSW bits of CV11 to 1, forcing this SE74 to change to slow motion turnout control.
- 4. Be careful changing the values in CV11,12,13,14,15 and CV16 since the 8 bit data number 0-255 in these CV's ac-



tually each control 8 individual OPSW bits. OPSW1 is ls bit of CV11, through OPSW8, as ms bit of CV11.

5. The DT602 does not indicate to the SE74 when programming is complete. After *finishing* CV changes, best practice is to POWER cycle the SE74 to save changes. Alternately, you can WRITE CV7 to 00 to restart that SE74.

**7.0 Signal head connections:** The following figures include schematics of the supplied PCB test mast and details for wiring up your signal heads.

Figure 2 shows two SE1 cable sets to signal a siding. Figure 3 shows how plug-in masts are oriented to access the A1/A2 or B/C heads on masts plugged into a SE1 cable socket. On a layout B/C signals are separate masts/sockets. At right is an image of a PCB test mast >





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- 2. These six wiring diagrams show how to connect the signal LED leads you have into a SE1 cable to display LED aspects. **SE74 defaults support the provided Digitrax test mast with no OPSW changes needed.**
- Figure 4 shows a PCB test mast with; two 3-color G type heads, 100 ohm current-setting resistors and 10-pin plug. This mast is used for test and debugging the operation of SE74 A1/A2 (Dwarf) heads. Rotated 180 degrees on the cable this test mast acts like Figure 5; as B/C signal heads on any SE1 cable. The test mast is wired for common anode operation as shown in Figure 4. *The lunar LEDS are shown for wiring detail, and are not installed on the PCB test mast.*





4. The 3-wire Searchlights of Figures 6 and 7 are common cathode version and allow Lunar lamps to be connected for all 4 heads on an SE1 cable.





5. The 2-wire searchlight examples in Figures 8 and 9 need OPSW33 =C and do



not allow for Lunar lamps. OPSW35 polarity sets RED/GREEN choice.

- 6. Be sure to set LED polarity/type: OPSW33/34/35 to your actual signals.
- 7. The SE74 is setup to drive LEDS only, using external customer current setting resistors with about 5 volt unloaded drive levels.
- 8. For more signaling accessories and more information, see the Signaling section of the www.digitrax.com web site. If you need larger images, color or text, reference the pdf of these instructions on the web site.

**8.0 Setup Notes:** The SE74 manages turnout voltages and current.

- 1. In pulse solenoid mode; for problem solenoids, try OPSW16=C for higher current Capacitive Discharge pulse action.
- 2. In all modes a 12-14V DC 0.3A supply should suffice, depending on the Signal head brightness setting.
- 3. If you operate a SE74 with just DCC track power on TKA/TKB terminals, it will not have all features available.
- 4. For 2-wire pulse solenoids, e.g. a Kato N-crossover, just wire to R/G terminals in the polarity that operates as you need. Do not run more than one solenoid device per SE74 pulsed R/G output pair.
- 5. The combined Static turnout/Lamp and Signal mast loads should set less than 0.30A draw on the DC input. For Slow motion turnouts the total current per output R/G pair ON should draw less than 0.05A referred to DC input plug.
- 6. Take care not to short any of the SE74; SE1 cables, R/G Outputs and P+ leads, or connect to other voltages like DC, Track power etc. This may cause damage not covered by Warranty.
- 7. If the SE74 flashes the "Ident" pattern of ID & RTS LEDs alternating with OPS LED for 3 seconds it has detected an overload and has shutdown P+ voltage. Identify the overload and fix this before resuming operation.
- 8. The Digitrax original SE1 cable design has the multiplex symmetrical so the A/D and B/C masts can be rotated and alternately tested in a single socket.

**9.0 FCC Information:** Radio or TV Interference(this information is MANDAT-ED by the FCC) This equipment has been tested by Digitrax and is Declared in Conformity with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Note that any modifications to the equipment not expressly approved by Digitrax voids the user's authority to operate under and be in compliance with CFR 47 rules, as administered by the Federal Communication Commission. Digitrax believes any conscientiously installed equipment following guidelines in this manual would be unlikely to experience RFI problems.

For Canadian Users:

"This digital apparatus does not exceed the Class B limits for Radio noise emission from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications."

Le present appariel numerique n emet pas de bruits radio-electriques depassant les limites applicables aux appareils numeriques de la classe B prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada. fonctionnement."

### 10.0 Warranty & Repair

Digitrax gives a one year Warranty against material and manufacturing defects on the SE74.

Visit <u>www.digitrax.com</u> for instructions for

returning items for repair. **Please return warranty items directly to Digitrax** - DO NOT return items to place of purchase.

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- 12 -