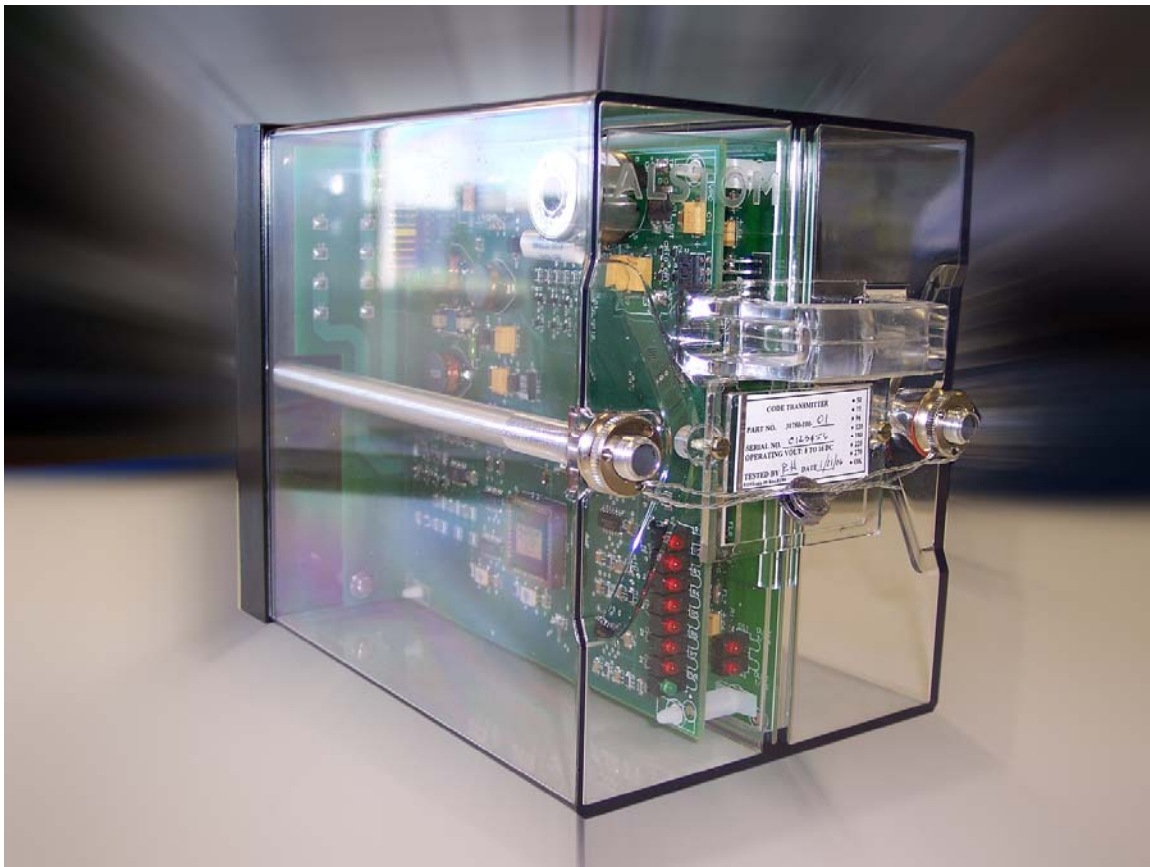


# ALSTOM

## Solid State Code Transmitter (SSCT)

Copyright © 2006, 2008 Alstom Signaling Inc.



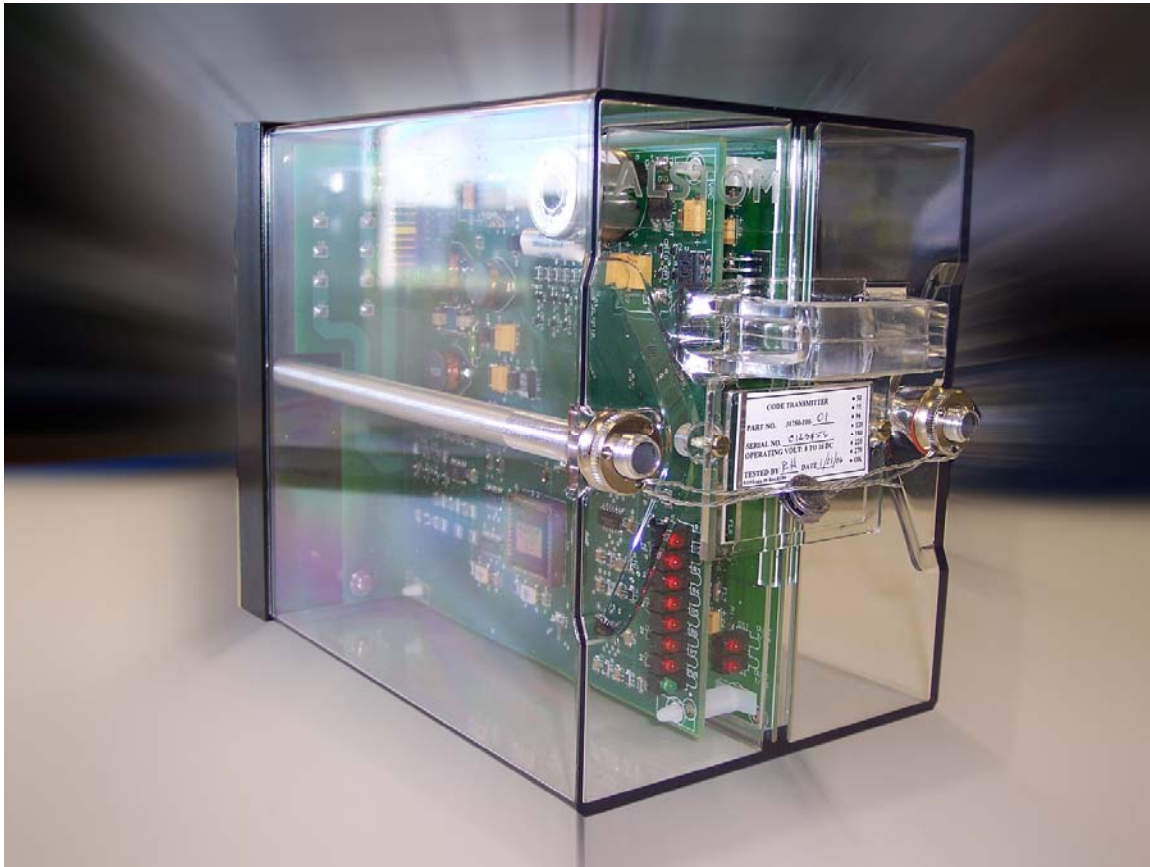
Installation, Operation and Maintenance Manual  
**P2514**



# ALSTOM

## Solid State Code Transmitter (SSCT)

Copyright © 2006, 2008 Alstom Signaling Inc.



Installation, Operation and Maintenance Manual  
**Alstom Signaling Inc.**

P2514, Rev. August 2008 Printed in U.S.A.



## LIST OF EFFECTIVE PAGES

### **P2514, Solid State Code Transmitter Installation, Operation and Maintenance Manual**

ORIGINAL ISSUE DATE: October 2006

CURRENT REVISION AND DATE: August 2008, updated Figure 1-1

PAGE	CHANGE OR REVISION LEVEL
Cover	Aug/08
Title page	Aug/08
Preface	Aug/08
i thru ii	Aug/08
1-1 thru 1-10	Aug/08
2-1 thru 2-6	Aug/08
3-1 thru 3-2	Aug/08
4-1 thru 4-4	Aug/08
5-1 thru 5-2	Aug/08

THIS PAGE INTENTIONALLY LEFT BLANK.

**PREFACE**

**NOTICE OF CONFIDENTIAL INFORMATION**

Information contained herein is confidential and is the property of Alstom Signaling Incorporated. Where furnished with a proposal, the recipient shall use it solely to evaluate the proposal. Where furnished to customer, it shall be used solely for the purposes of inspection, installation or maintenance. Where furnished to a supplier, it shall be used solely in the performance of the contract. The information shall not be used or disclosed by the recipient for any other purposes whatsoever.

**FOR QUESTIONS AND INQUIRIES, CONTACT CUSTOMER SERVICE AT  
1-800-717-4477  
OR  
WWW.ALSTOMSIGNALINGSOLUTIONS.COM**

**ALSTOM SIGNALING INC.  
1025 JOHN STREET  
WEST HENRIETTA, NY 14586**

**REVISION LOG**

<b>Revision</b>	<b>Date</b>	<b>Description</b>	<b>By</b>	<b>Checked</b>	<b>Approved</b>
0	October 2006	Original issue	MAS	RH	NI
1	August 2008	Updated Figure 1-1	MAS	RH	NI

THIS PAGE INTENTIONALLY LEFT BLANK.

## **ABOUT THE MANUAL**

This manual is intended to provide the necessary information to install, maintain and ensure proper operation of an Alstom Solid State Code Transmitter (SSCT).

The information in this manual is arranged into sections. The title and a brief description of each section follow:

**Section 1 – GENERAL DESCRIPTION:** This section gives general information on the components of the SSCT.

**Section 2 – INSTALLATION:** This section describes the installation of the SSCT.

**Section 3 – PREVENTIVE MAINTENANCE:** This section describes the preventive maintenance procedures performed on the SSCT.

**Section 4 – TROUBLESHOOTING:** This section describes troubleshooting the SSCT.

**Section 5 – CORRECTIVE MAINTENANCE:** This section describes the procedures associated with corrective maintenance of the SSCT.

THIS PAGE INTENTIONALLY LEFT BLANK.

## **MANUAL SPECIAL NOTATIONS**

In the Alstom manuals, there are three methods used to convey special informational notations to the reader. These notations are warnings, cautions, and notes. Both warnings and cautions are readily noticeable by boldface type two lines beneath the caption.

### **Warning**

A warning is the most important notation to heed. A warning is used to tell the reader that special attention needs to be paid to the message because if the instructions or advice is not followed when working on the equipment then the result could be either serious harm or death. The sudden, unexpected operation of a switch machine, for example, or the technician contacting the third rail could lead to personal injury or death. An example of a typical warning notice follows:

#### **WARNING**

DISCONNECT THE MOTOR ENERGY WHENEVER THE GEAR COVER IS REMOVED. OTHERWISE, THE SWITCH MACHINE MAY OPERATE UNEXPECTEDLY AND POSSIBLY CAUSE PERSONAL INJURY

### **Caution**

A caution statement is used when an operating or maintenance procedure, practice, condition, or statement, which if not strictly adhered to, could result in damage to or destruction of equipment. A caution statement is also used when personnel could be surprised if shocked by a circuit operating at a low current. A typical caution found in a manual is as follows:

#### **CAUTION**

Turn power off before attempting to remove or insert circuit boards into a module. Boards can be damaged if power is not turned off.

### **Note**

A note is normally used to provide minor additional information to the reader to explain the reason for a given step in a test procedure or to just provide a background detail. An example of the use of a note follows:

#### **NOTE**

A capacitor may be mounted on the circuit board with an RTV adhesive. Use the same color RTV.

THIS PAGE INTENTIONALLY LEFT BLANK.

## TABLE OF CONTENTS

Topic	Page
<b>1. SECTION 1 – GENERAL DESCRIPTION</b> .....	<b>1-1</b>
1.1. SCOPE OF MANUAL .....	1-1
1.2. GENERAL .....	1-1
1.3. SAFETY CONSIDERATIONS .....	1-2
1.3.1. Failure Modes .....	1-2
1.3.2. Software Safety .....	1-2
1.4. SPECIFICATIONS.....	1-3
1.4.1. Physical Specifications .....	1-3
1.4.2. Electrical Specifications .....	1-3
1.4.3. Environmental Specifications.....	1-4
1.4.4. Code Rates - Tolerance & Duty Cycle .....	1-4
1.5. CONFIGURATIONS .....	1-5
1.6. ARCHITECTURE .....	1-6
1.6.1. LED Indicators .....	1-7
1.7. EXTERNAL INTERFACE .....	1-8
1.7.1. DC Input.....	1-8
1.7.2. Front Contacts .....	1-8
1.7.3. Back Contacts.....	1-8
1.7.4. Rate Selection - Externally Selected Rates Only .....	1-9
1.8. INTERCHANGEABILITY .....	1-10
<b>2. SECTION 2 – INSTALLATION</b> .....	<b>2-1</b>
2.1. GENERAL .....	2-1
2.2. INSPECTION.....	2-2
2.3. SSCT WITH EXTERNALLY SELECTED CODE RATE .....	2-3
2.4. NEW SOLID STATE CODE TRANSMITTER INSTALLATION.....	2-4
2.5. MECHANICAL RELAY REPLACEMENT, SSCT INSTALLATION.....	2-5
<b>3. SECTION 3 – SCHEDULED MAINTENANCE</b> .....	<b>3-1</b>
3.1. GENERAL .....	3-1
3.2. MAINTENANCE .....	3-1
3.3. VISUAL INSPECTION.....	3-1
<b>4. SECTION 4 – TROUBLESHOOTING</b> .....	<b>4-1</b>
4.1. GENERAL PHILOSOPHY .....	4-1
4.2. TROUBLESHOOTING .....	4-1
4.3. DIAGNOSTICS.....	4-1
<b>5. SECTION 5 – CORRECTIVE MAINTENANCE</b> .....	<b>5-1</b>
5.1. GENERAL PURPOSE.....	5-1
5.2. CORRECTIVE MAINTENANCE .....	5-1

## LIST OF FIGURES

<b>Description</b>	<b>Page</b>
Figure 1–1. Solid State Code Transmitter (SSCT) .....	1–1
Figure 1–2. SSCT Block Diagram .....	1–6
Figure 1–3. Contact Configuration.....	1–9

---

## LIST OF TABLES

<b>Description</b>	<b>Page</b>
Table 1–1. Code Rates & Tolerances .....	1–4
Table 1–2. Configurations .....	1–5
Table 1–3. SSCT / Mechanical CT Cross Reference .....	1–10
Table 2–1. SSCT Pre-Installation Inspection Procedure .....	2–2
Table 2–2. Code Rate Selection.....	2–3
Table 2–3. SSCT New Installation Procedure .....	2–4
Table 2–4. Mechanical Relay Replacement, SSCT Installation Procedure .....	2–5
Table 3–1. SSCT Inspection Procedure .....	3–1
Table 4–1. Hardware Failure Error Codes.....	4–2

## 1. SECTION 1 – GENERAL DESCRIPTION

### 1.1. SCOPE OF MANUAL

This section provides a general description of the Alstom Solid State Code Transmitter, P/N 31750-100-XX and P/N 31750-101-XX (depending on contact configuration, see Figure 1–3).

### 1.2. GENERAL

The Solid State Code Transmitter (SSCT) is a vital code transmitter unit consisting of three printed circuit boards. The unit is totally Solid State, and does not contain any moving components, see Figure 1–1.

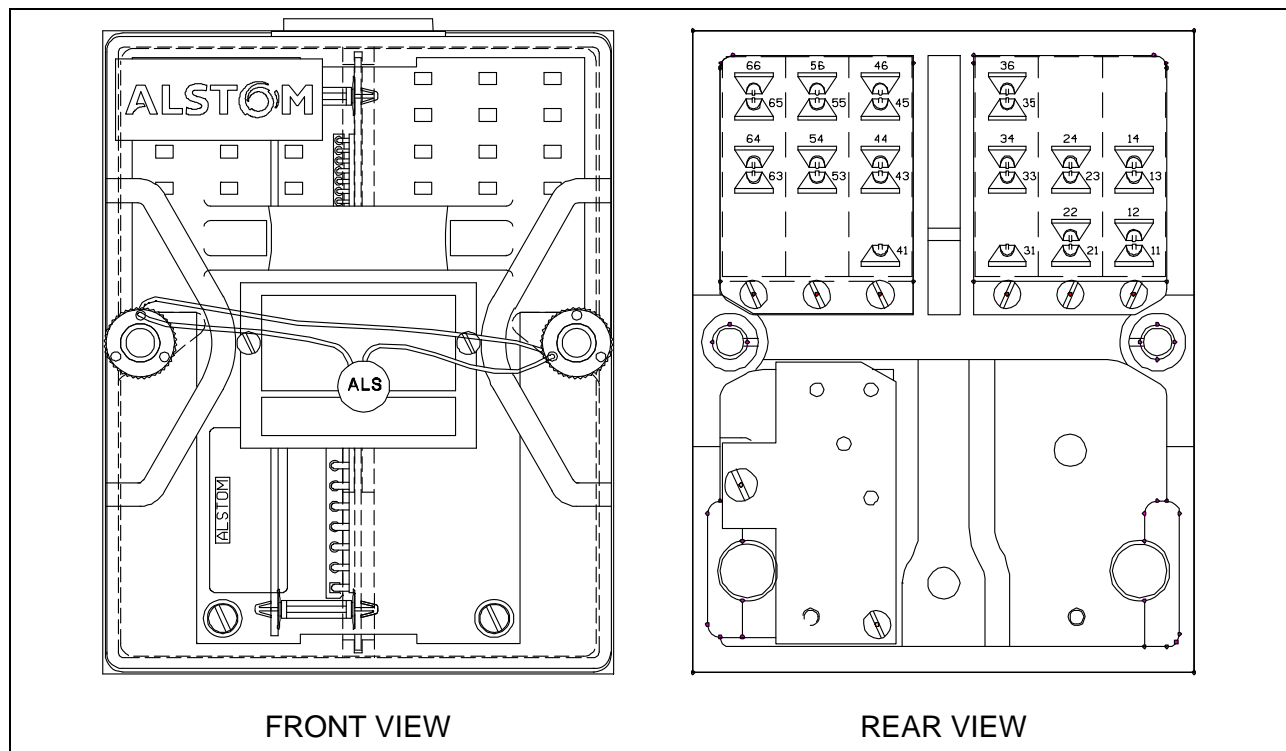


Figure 1–1. Solid State Code Transmitter (SSCT)

The SSCT is a microprocessor-based replacement for mechanical code transmitters such as Alstom P/N 57490-122-01 (see Table 1–3). The SSCT generates one of seven different code rates. Four Solid State circuits emulate the contacts of the mechanical code transmitter:

- Two sets of Solid State circuits emulate the two front contacts.
- Two sets of Solid State circuits emulate the two back contacts.

The timing of the contacts is such that a small delay occurs during the transition between the opening of one set and the closing of the opposite set (break-before-make). This delay simulates the operation of the front and back contacts of a mechanical code transmitter. Note that all contacts are open when power is removed from the unit, or when code generation is halted (due to a diagnostic error).

### 1.3. SAFETY CONSIDERATIONS

#### 1.3.1. Failure Modes

The SSCT is a vital product and only generates the selected code rate. All contacts may fail either in the ON or OFF state. If a failure should occur, a diagnostic code is displayed on the front of the unit.

- Failure of the hardware and/or software results in a 0 (zero) rate.
- If more than one rate is selected, the SSCT generates 0 (zero) rate.
- If no rate is selected, the SSCT generates 0 (zero) rate.

#### 1.3.2. Software Safety

The SCCT utilizes a microcontroller to accurately generate the various code rates. The microcontroller program utilizes a variety of software safety techniques to ensure the vitality of the unit.

As the program is running, it performs a continuous analysis on the program memory contents. Any failure that alters the program memory is detected and prevents the unit from operating.

## 1.4. SPECIFICATIONS

### 1.4.1. Physical Specifications

Length: 6.4"

Width: 5.0"

Height: 8.5"

Weight: 3.5 LBS

### 1.4.2. Electrical Specifications

#### 1.4.2.1. Input Voltage Range

Minimum: 8 VDC

Nominal: 12 VDC

Maximum: 16 VDC

#### **NOTE**

The SSCT is protected against damage by the application of reverse polarity.

#### 1.4.2.2. Current Draw

At 8 VDC Input: 420 mADC

At 12 VDC Input 320 mADC

At 16 VDC Input 230 mADC

#### 1.4.2.3. Low Voltage Output Circuit (Contact) Ratings

Maximum Voltage: 42 VDC or 30 VRMS

Maximum Current: 5.6 ADC or 4 ARMS

Maximum ON State Voltage Drop: 0.2 V

#### 1.4.2.4. High Voltage Output Circuit (Contact) Ratings

Maximum Voltage: 220 VDC or 220 VRMS

Maximum Current: 2.0 ADC or 2.0 ARMS

Maximum ON State Voltage Drop: 1.2 V

1.4.3. Environmental Specifications

The SSCT is designed to operate reliably in the environments encountered in wayside rooms and instrument cases.

- TEMPERATURE RANGE: Meets or exceeds environmental parameters as set forth in AREMA Manual Part 11.5.1 for Class C equipment (-40C to +70C).
- RELATIVE HUMIDITY: Meets or exceeds environmental parameters as set forth in AREMA Manual Part 11.5.1 for Class C equipment.
- MECHANICAL SHOCK: Meets or exceeds environmental parameters as set forth in AREMA Manual Part 11.5.1 for Class C equipment.
- VIBRATION: Meets or exceeds environmental parameters as set forth in AREMA Manual Part 11.5.1 for Class C equipment.

1.4.4. Code Rates - Tolerance & Duty Cycle

Table 1–1. Code Rates & Tolerances

<b>Rate</b>	<b>Actual Rate, Pulses Per Minute (+/- 1.0%)</b>	<b>Nominal On Time (msec)</b>	<b>Nominal Off Time (msec)</b>	<b>On Time Duty Cycle %</b>
50	51.0 (50.5-51.5)	510.0	666.0	43.4
75	75.0 (74.3-75.8)	378.0	422.0	47.3
96	96.2 (95.2 -97.2)	294.0	330.0	47.1
120	120.0 (118.8-121.2)	234.0	266.0	46.8
180	180.7 (178.9-182.5)	154.0	178.0	46.4
220	220.6 (218.4-222.8)	126.0	146.0	46.3
270	267.9 (265.2-270.6)	104.0	120.0	46.4

Code rate stability with temperature and power supply variations is better than +/-0.1%.

## 1.5. CONFIGURATIONS

The SSCT is available in 16 separate configurations. A unique part number designates each configuration. The group number defines the method of rate selection (fixed or externally selected), the rates available for that configuration, and whether the output circuits are designed for low voltage or high voltage operation.

Table 1–2. Configurations

<b>P/N</b>	<b>Rate</b>	<b>Low Voltage</b>	<b>High Voltage</b>
31750-100-01	EXT*	x	
31750-100-02	EXT*		x
31750-100-03	50 Fixed	x	
31750-100-04	50 Fixed		x
31750-100-05	75 Fixed	x	
31750-100-06	75 Fixed		x
31750-100-07	96 Fixed	x	
31750-100-08	96 Fixed		x
31750-100-09	120 Fixed	x	
31750-100-10	120 Fixed		x
31750-100-11	180 Fixed	x	
31750-100-12	180 Fixed		x
31750-100-13	220 Fixed	x	
31750-100-14	220 Fixed		x
31750-100-15	270 Fixed	x	
31750-100-16	270 Fixed		x
31750-101-01	EXT*	x	
31750-101-02	EXT*		x
31750-101-05	75 Fixed	x	
31750-101-06	75 Fixed		x

\*50, 75, 96, 120, 180, 220, 270 rate externally selected with a plugboard jumper

## 1.6. ARCHITECTURE

The SSCT is comprised of three printed circuit boards housed in a B2 relay enclosure. It utilizes the same B2 relay base as the mechanical code transmitter, including the B2 contact groups. This unit is form, fit and function interchangeable with the existing line of electromechanical code rate transmitters. Additional plugboard contact positions on the SSCT are used for external rate selection in the adjustable version of the relay.

The three printed circuit boards include:

- Output Board
- Central Processing Unit (CPU) Board
- Motherboard

Figure 1–2 is a block diagram showing how each of the functional units is connected.

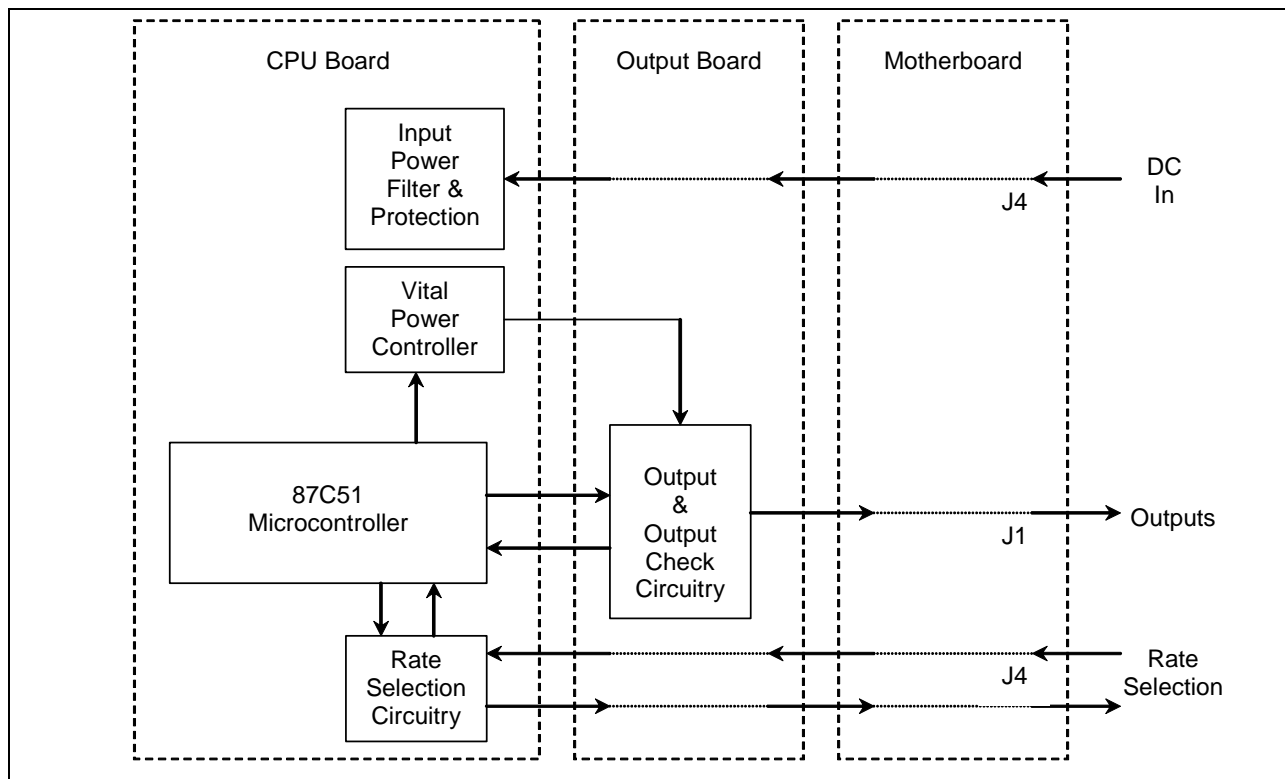


Figure 1–2. SSCT Block Diagram

### 1.6.1. LED Indicators

#### 1.6.1.1. Output Board

The Output board contains two Red LED's that indicate the status of the output circuits. The status of the two Front contact circuits is indicated by one LED, and the status of the two Back contact circuits is indicated by a second LED. The Outputs are ON when the LED is illuminated.

#### 1.6.1.2. CPU Board

The CPU board contains a Green LED to indicate when power is applied. This LED also flashes when the internal diagnostics detect a malfunction (see Troubleshooting, Section 4).

The CPU board also contains seven Red LED's that indicate which one of the seven rates is selected.

## 1.7. EXTERNAL INTERFACE

### 1.7.1. DC Input

- Terminal 41: +12 VDC
- Terminal 31: 12 V Common

### 1.7.2. Front Contacts

- 31750-100-XX
  - 63, 64 – 65, 66
  - 55, 56 – 53, 54
- 31750-101-XX
  - 62-63
  - 65-66

### 1.7.3. Back Contacts

- 31750-100-XX
  - 11, 12 – 13, 14
  - 23, 24 – 21, 22
- 31750-101-XX
  - 11-12
  - 14-15

1.7.4. Rate Selection - Externally Selected Rates Only

- Rate Select: 33
- 50 Rate: 43
- 75 Rate: 44
- 96 Rate: 45
- 120 Rate: 46
- 180 Rate: 36
- 220 Rate: 35
- 270 Rate: 34

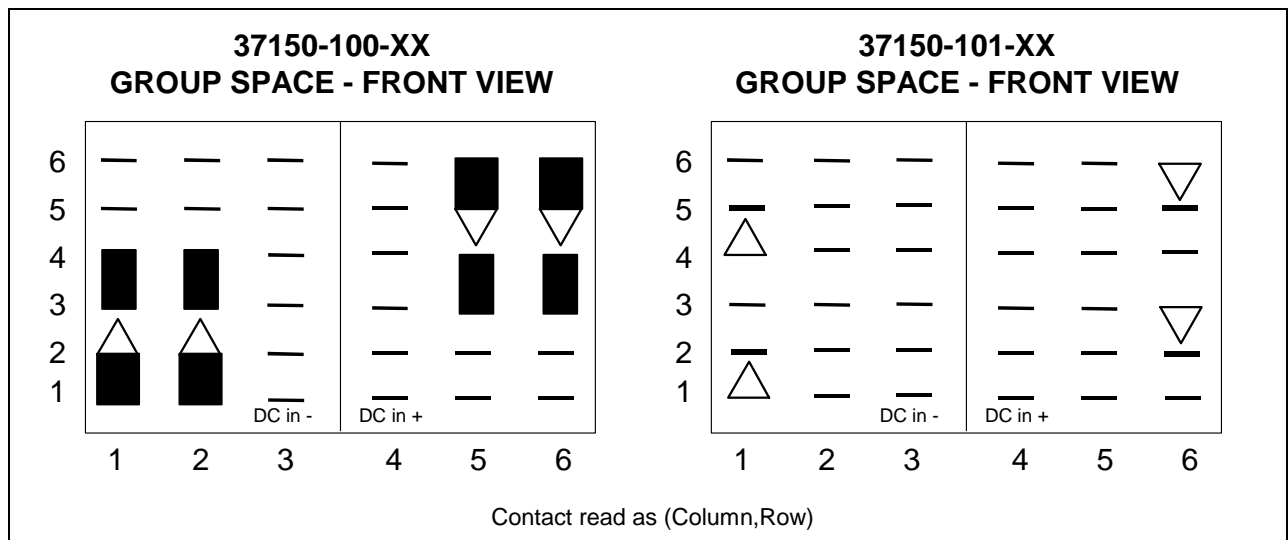


Figure 1-3. Contact Configuration

1.8. INTERCHANGEABILITY

The SSCT can replace numerous types of mechanical code transmitters. Table 1–3 lists the mechanical code transmitters’ equivalent SSCT.

**NOTE**

Registration code of replacement SSCT may be different.

Table 1–3. SSCT / Mechanical CT Cross Reference

SSCT P/N	Rate	Low Voltage	High Voltage	Registration Code	Equivalent Mechanical CT See Note
31750-100-01	EXT*	x		1-3-10-32	N/A
31750-100-02	EXT*		x	1-4-6-23	N/A
31750-100-03	50 Fixed	x		1-3-10-24	57490-121-01
31750-100-04	50 Fixed		x	1-3-10-25	57490-122-01
31750-100-05	75 Fixed	x		1-2-12-27	57490-065-02, -03, -04 57490-075-02, -03, -04, -06, -07, -08 57490-095-01, 02, -03, -04
31750-100-06	75 Fixed		x	1-2-17-19	57490-091-05,-06
31750-100-07	96 Fixed	x		1-3-8-27	57490-080-07, -09
31750-100-08	96 Fixed		x	1-3-10-29	57490-080-08
31750-100-09	120 Fixed	x		1-2-5-15	57490-096-01, -04
31750-100-10	120 Fixed		x	1-2-17-20	57490-082-XX (ALL) 57490-092-01, -02, -03
31750-100-11	180 Fixed	x		1-2-5-16	57490-097-01, -04
31750-100-12	180 Fixed		x	1-2-17-21	57490-083-XX (ALL) 57490-093-01, -02, -03
31750-100-13	220 Fixed	x		1-3-8-25	57490-116-01 57490-119-01, -02

Table 1–3. SSCT / Mechanical CT Cross Reference (Cont.)

<b>SSCT P/N</b>	<b>Rate</b>	<b>Low Voltage</b>	<b>High Voltage</b>	<b>Registration Code</b>	<b>Equivalent Mechanical CT See Note</b>
31750-100-14	220 Fixed		x	1-3-8-23	57490-111-01
31750-100-15	270 Fixed	x		1-3-7-8	57490-080-05, -06 57490-098-01 57490-118-01
31750-100-16	270 Fixed		x	1-3-9-22	57490-094-01 57490-113-01
31750-101-01	EXT*	x		1-4-6-24	N/A
31750-101-02	EXT*		x	1-4-6-25	N/A
31750-101-05	75 Fixed	x		1-2-12-27	57490-080-01,-10
31750-101-06	75 Fixed		x	1-2-14-24	57490-080-02

\*50, 75, 96, 120, 180, 220, 270 rate externally selected with a plugboard jumper

THIS PAGE INTENTIONALLY LEFT BLANK.

## **2. SECTION 2 – INSTALLATION**

### **2.1. GENERAL**

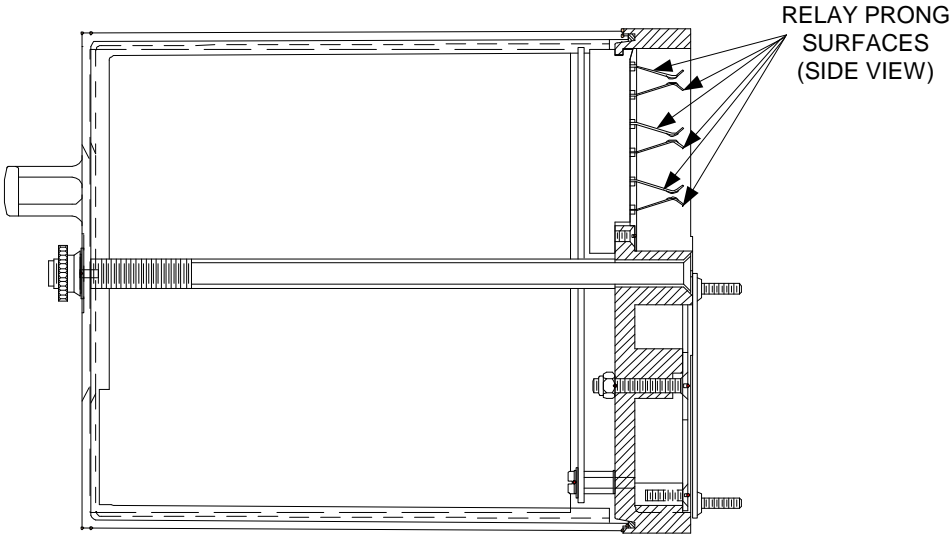
The SSCT is available in eight separate code rate configurations, as one of 7 fixed code rates or with an externally selected code rate. See Tables 1–2 and 1–3 for the various configurations and their associated part numbers.

## 2.2. INSPECTION

Upon receipt of an SSCT unit, inspect for cleanliness and overall condition. Also, always verify the operating characteristics of the unit before installing it in a particular circuit.

Prior to installing an SSCT, follow the inspection procedure provided in Table 2–1.

Table 2–1. SSCT Pre-Installation Inspection Procedure

Step	Procedure
1	Check that the cover and seal are not damaged.
2	<p data-bbox="298 659 1052 695">Verify that the prong surfaces are clean and not bent.</p> <div data-bbox="375 716 1321 1247">  <p data-bbox="1154 716 1321 800">RELAY PRONG SURFACES (SIDE VIEW)</p> </div> <p data-bbox="298 1262 1430 1371">While the prongs that engage with the terminals in the plugboards are clean and adjusted when they leave the factory, there is always the chance that they may become dirty or bent in handling.</p> <ul data-bbox="298 1381 1419 1520" style="list-style-type: none"> <li data-bbox="298 1381 894 1417">• If prongs are dirty, clean by burnishing.</li> <li data-bbox="298 1451 1419 1520">• If prongs are bent, bend them back into position so they make contact when the unit is installed.</li> </ul>
3	Review the operating characteristics of the unit and verify the appropriate configuration is being installed before proceeding. See Table 1–2 for the various configurations and their associated part numbers.

### 2.3. SSCT WITH EXTERNALLY SELECTED CODE RATE

If the externally selected code rate version of the SSCT is installed, it must be configured to provide one of 7 different code rates: 50, 75, 96, 120, 180, 220, and 270 pulses per minute. When not installed, the unit is in a “non-programmed” state. To select a code rate, a SHORT wire jumper is added to the wiring side of the B2 plugboard. When the unit is installed, it becomes “programmed” by the jumper to generate one of the seven rates. An LED indicates at which rate the unit is operating. Table 2–2 lists the jumper position required for each rate.

If the fixed rate version of the SSCT is installed, no external rate select jumper is required, and no connections should be made to any of the terminals shown in Table 2-2.

Plugboard position 33 is the Rate Select Common.

Table 2–2. Code Rate Selection

Rate	Jumper Position
50	33 to 43
75	33 to 44
96	33 to 45
120	33 to 46
180	33 to 36
220	33 to 35
270	33 to 34

**NOTE**

Keep the rate select jumper as short as possible. Do NOT bundle it with other relay wiring.

## 2.4. NEW SOLID STATE CODE TRANSMITTER INSTALLATION

The procedure in Table 2–3 describes how to install the SSCT at a new site. Perform the steps in the sequence given to ensure proper operation.

Table 2–3. SSCT New Installation Procedure

<b>Step</b>	<b>Procedure</b>
1	Perform the inspection procedure provided in Table 2–1, including verifying that the appropriate unit is being installed.
2	Install the plugboard to the Type B relay rack bars.
3	Connect the power to: <ul style="list-style-type: none"> <li>• Terminal 41 (+) 12 VDC</li> <li>• Terminal 31 (-) 12 V COM</li> </ul>
4	If the externally selected code rate version of the SSCT is installed, then continue with Step 5. Otherwise, a fixed code rate version is installed, skip to Step 6.
5	Connect a jumper between the Rate Select Common terminal 33 and the required rate terminal. See Figure 1–3 and Table 2–2.  <b style="text-align: center;"><u>NOTE</u></b>  Keep the rate select jumper as short as possible. Do NOT bundle it with other relay wiring.
6	Attach the mating registration plate to the plugboard and plug in the transmitter.
7	Energize the SSCT. Verify that the correct rate is being generated and that the LED indicates the selected rate.

## 2.5. MECHANICAL RELAY REPLACEMENT, SSCT INSTALLATION

Table 2–4 describes the replacement of an existing Type B2 mechanical code transmitter relay with an SSCT.

Table 2–4. Mechanical Relay Replacement, SSCT Installation Procedure

<b>Step</b>	<b>Procedure</b>
1	Perform the inspection procedure provided in Table 2–1, including verifying that the appropriate unit is being installed.
2	If the externally selected code rate version of the SSCT is to be installed, then continue with Step 3. Otherwise, a fixed code rate version is to be installed, skip to Step 4.
3	Connect a jumper between the Rate Select Common terminal 33 and the required rate terminal. See Figure 1–3 and Table 2–2.  <b><u>NOTE</u></b>  Keep the rate select jumper as short as possible. Do NOT bundle it with other relay wiring.
4	If necessary, replace the registration plate on the plugboard with the registration plate supplied with SSCT.
5	Energize the SSCT. Verify that the correct rate is being generated and that the LED indicates the selected rate.

THIS PAGE INTENTIONALLY LEFT BLANK.

### 3. SECTION 3 – SCHEDULED MAINTENANCE

#### 3.1. GENERAL

This section describes the preventive maintenance procedures associated with proper SSCT operation.

#### 3.2. MAINTENANCE

Under normal operating conditions, the SSCT requires no maintenance or inspections. Routine maintenance consists of periodic visual inspection and is at the discretion of the customer. During inspection look for damaged components, corrosion or other contamination, loose parts, broken seals, or a cracked or broken cover. Units not passing this inspection should be replaced and returned to Alstom Signaling Inc.

#### 3.3. VISUAL INSPECTION

The SSCT is enclosed in a clear polycarbonate cover. The components to be inspected can be seen with the cover installed and sealed. Follow the procedure provided in Table 3–1 to inspect the unit.

Table 3–1. SSCT Inspection Procedure

Step	Procedure
1	Check that the cover and seal are not cracked, broken or discolored. If any damage is detected, the unit must be removed from service and replaced.
2	Verify that internal components are not loose inside the cover.
3	If components inside the cover are loose, remove and replace the unit. Contact Alstom Signaling Inc. Customer Service at 1-800-717-4477 or <a href="http://www.Alstomsignaling.com">www.Alstomsignaling.com</a> .

THIS PAGE INTENTIONALLY LEFT BLANK.

## 4. SECTION 4 – TROUBLESHOOTING

### 4.1. GENERAL PHILOSOPHY

This section describes the troubleshooting of the SSCT.

### 4.2. TROUBLESHOOTING

Standard troubleshooting, such as verifying field wiring and energy, can be used to identify a failure. If the unit fails to operate at all (all LEDs off), check that the input power is present at the corresponding plugboard terminals.

If the selected rate LED fails to light but the GREEN LED is on, verify that the rate select jumper on the wiring side of the plugboard is in the correct positions (for externally selected rate units only). If the Green LED on the CPU board is flashing, see Diagnostics, below.

Any unit that is suspected of being defective must be removed from service.

#### **NOTE**

If an SSCT or any component (such as one of its three boards) is suspected to be defective, return the entire unit to Alstom Signaling for repair.

Contact Alstom Signaling Inc. Customer Service at 1-800-717-4477 or [www.Alstomsignalingsolutions.com](http://www.Alstomsignalingsolutions.com)

### 4.3. DIAGNOSTICS

The SSCT CPU board contains a Green LED to indicate when power is applied. This LED is also used to display diagnostic information in the event of an error. The unit incorporates diagnostics to assist in the identification and remedy of internal and some external failures. Upon detection of a fault condition, the Green LED flashes a diagnostic code. This code is repeated three times, and then the unit attempts to restart. See Table 4–1 for the definition of the error codes.

Table 4–1. Hardware Failure Error Codes

# of Flashes	Description	Remedy
1	An error has been detected in the state of the output circuit for output 1.	Remove and replace unit and contact Alstom Customer Service.
2	An error has been detected in the state of the output circuit for output 1.	Remove and replace unit and contact Alstom Customer Service.
3	An error has been detected in the state of the output circuit for output 2.	Remove and replace unit and contact Alstom Customer Service.
4	An error has been detected in the state of the output circuit for output 2.	Remove and replace unit and contact Alstom Customer Service.
5	An error has been detected in the state of the output circuit for output 3.	Remove and replace unit and contact Alstom Customer Service.
6	An error has been detected in the state of the output circuit for output 3.	Remove and replace unit and contact Alstom Customer Service.
7	An error has been detected in the state of the output circuit for output 4.	Remove and replace unit and contact Alstom Customer Service.
8	An error has been detected in the state of the output circuit for output 4.	Remove and replace unit and contact Alstom Customer Service.
9	An error has been detected in the reading of the rate selection. Either a hardware fault has occurred, or more than one rate has been selected.	For units configured with external rate selection, verify the rate selection jumper is in the correct position. Contact Alstom Customer Service if additional assistance is required.
10	An error has been detected in the reading of the rate selection. Either a hardware fault has occurred, or more than one rate has been selected.	For units configured with external rate selection, verify the rate selection jumper is in the correct position. Contact Alstom Customer Service if additional assistance is required.
11	The normal and inverted reading of the rate selection is not in correspondence.	For units configured with external rate selection, verify the rate selection jumper is in the correct position. Contact Alstom Customer Service if additional assistance is required.
12	An error has been detected in the comparison of the microprocessor clock to the secondary time base.	Remove and replace unit and contact Alstom Customer Service.

Table 4–1. Hardware Failure Error Codes (Cont.)

<b># of Flashes</b>	<b>Description</b>	<b>Remedy</b>
13	An error has been detected in the comparison of the number of microprocessor cycles to execute.	Remove and replace unit and contact Alstom Customer Service.
14	An error has been detected in the computation of the RAM check.	Remove and replace unit and contact Alstom Customer Service.
15	An error has been detected in the computation of the program signature analysis.	Remove and replace unit and contact Alstom Customer Service.

THIS PAGE INTENTIONALLY LEFT BLANK.

## **5. SECTION 5 – CORRECTIVE MAINTENANCE**

### **5.1. GENERAL PURPOSE**

This section describes the procedures associated with corrective maintenance of the SSCT.

### **5.2. CORRECTIVE MAINTENANCE**

If an SSCT or any component (such as one of its three boards) is suspected to be defective, return the entire unit to Alstom Signaling for repair. Contact Alstom Signaling Inc. Customer Service at 1-800-717-4477 or at [www.Alstomsignaling.com](http://www.Alstomsignaling.com)

THIS PAGE INTENTIONALLY LEFT BLANK.



**FOR QUESTIONS AND INQUIRIES, CONTACT CUSTOMER SERVICE AT  
1-800-717-4477  
OR  
[WWW.ALSTOMSIGNALINGSOLUTIONS.COM](http://WWW.ALSTOMSIGNALINGSOLUTIONS.COM)**

**ALSTOM SIGNALING INC.  
1025 JOHN STREET  
WEST HENRIETTA, NY 14586**