MOORE INDUSTRIES

SGT/XSGT

Strain Gage Transmitter

USER'S MANUAL

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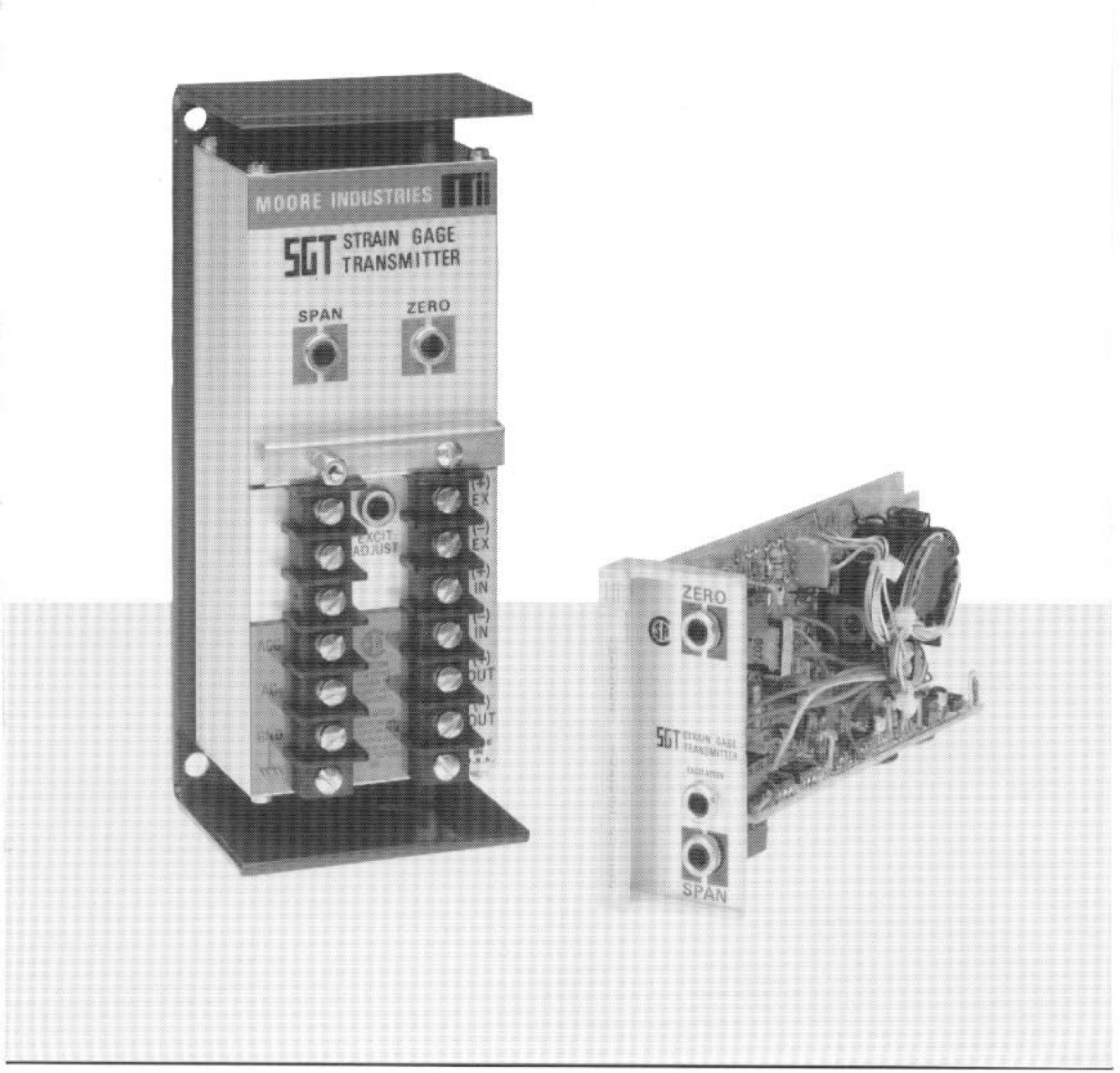


Table of Contents

Introduction	**1**
Description	**1**
Calibration	**3**
Installation	**8**
Maintenance	**13**

SGT/XSGT

Introduction

Moore Industries' Strain Gage Transmitters (SGT and XSGT) accept a low-level voltage input (between 5 and 15 mV full-scale) from a strain gage and coverts it to a standard process current or voltage (refer to table 1).

This manual contains descriptive, calibration, and installation information for the SGT and XSGT. Notes and Warnings are presented in this manual to help you avoid minor inconveniences and personal injury while calibrating or installing this instrument.

Description

The SGT/XSGT accepts a voltage input of between 0-5 and 0-15 mV from a strain gage with a 350-ohm bridge. Changes in the resistance of the bridge produce a proportional change in the output of the SGT. The SGT is factory-configured for a specific current or voltage output (table 1) and provides complete isolation of the input and output, which prevents troublesome system ground-loops.

The SGT is available in two primary housing styles; the Standard (STD) and Plug-in Card (PC). The STD Housing is equipped with a U-back bracket that provides extra protection for the SGT's aluminum housing and allows for mounting on flat, sturdy surfaces. The STD Housing is actually available in several mounting options; each having a different housing code. The PC Housing is designed to mount in one of Moore Industries' card racks — the RMR or SMR.

The EX Housing is a STD unit that has been modified to fit in a high-dome, explosion-proof enclosure. On EX units, the electrical connections have been moved from the front of the unit to the bottom. A mating connector is supplied with EX units for making the electrical connections. The bottom of the SCT housing is fitted with pins that mate with the connector in the base of the explosion-proof enclosure.

The XSGT is packaged in a dual-wide (DU) housing, which is twice the size of the STD unit without the U-back bracket.

Each housing style is designed for a different mounting application, but functionally they are identical. The housing style you select should be based on the application and the environment in which it is to be used.

Not all features and options are available for all housing styles. For example; while the STD unit can operate from a dc or an ac power source, the PC unit operates on dc power only.

The basic SGT has no visual indicators, but it does feature three adjustments (ZERO, SPAN, and EXCITATION), which are located on the front panel of each unit (including the EX Housing). The ZERO adjustment is used to set the zero-percent output of the unit. The SPAN adjustment is used to set the 100-percent output. The EXCITATION (EX.) adjustment is used to set the excitation voltage of the SGT or XSGT.

Table 1 contains the operational and performance specifications for the SGT/XSGT.

Options

The SGT/XSGT is available with several optional features. The following are brief descriptions of some of our most popular options available for the SGT/XSGT:

EZ Option. Elevated zero; required on all units with inputs that exceed standard zero adjustment capability.

FU Option. A 400 mA power fuse for protecting the PC Housing from power surges.

RC Option. Provides a front panel push button used for calibrating the SGT/XSGT. The push button applies a fixed resistance to the input circuit which simulates the full-scale input from a transducer bridge.

RF Option. RFI/EMI protection; not available with all housing styles or with all other options.

For information on availability of other SGT/XSGT options please contact your local Moore Industries' Sales Representative or the factory.

SGT/XSGT

Table 1. *SGT/XSGT Operational and Performance Specifications*

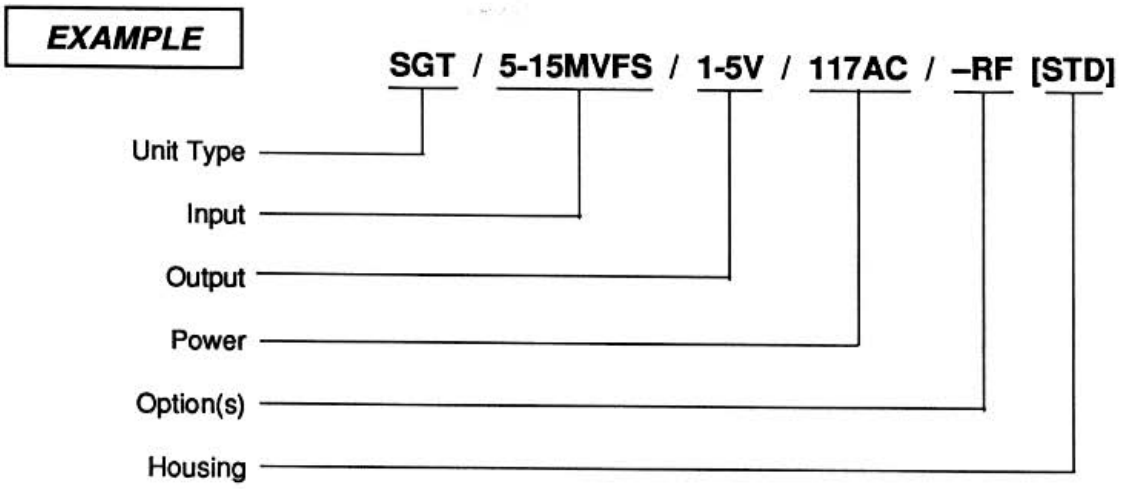
Characteristic	Specification
Input	**5-15 mV full-scale** (0-5 to 0-15 mV)
Output[1]	Factory-configured **1-5 mA** – into 0-4800Ω load **4-20 mA** – into 0-1200Ω load **10-50 mA** – into 0-480Ω load **SC** – Selectable Current output **0-5 Vdc** – into 20 kΩ, minimum **1-5 Vdc** – into 20 kΩ, minimum **0-10 Vdc** – into 40 kΩ, minimum
Power	Factory-configured **24 or 45 Vdc**, ±10% **117, 220, or 240 Vac**; 50/60 Hz; ±10% (STD units only)
Controls	**Zero**: With zero-percent input, ±1.5 mV, adjusts output for zero-percent **Span**: With full-scale input, adjusts output for 100-percent **Excitation:** For SGT, adjusts 5 Vdc excitation output to ±10%; for XSGT, adjusts output between 5 and 10 Vdc @ 100 mA
Performance	**Accuracy:** ±0.1% of span (includes linearity and repeatability) **Isolation:** Input, output, and power terminals are transformer isolated; no dc connections **Common Mode Rejection:** >120 dB @ 60 Hz with a limit of 500 Vrms **Ripple:** ≤10 mV P/P @ maximum load and span **Load Effect:** ±0.01% of span from 0 to maximum load resistance **Line Voltage Effect:** ±0.005%/1% line change (ac or dc) **Temperature Effect on Amplifier:** ±0.005%/°F over ambient operating range **SGT Gage Excitation:** 5 Vdc, ≤25 mA **XSGT Gage Excitation:** 5-10 Vdc, ≤100 mA
Environmental Ratings	**Ambient Operating Temperature:** –29 to 82 °C (–20 to 180 °F)
NOTES: 1. Other output ranges are available; consult the factory. 2. Refer to the Installation Section of this manual for unit dimensions.	

Serial Number. A historical record is kept at the factory on every product Moore Industries sells and services. This information is keyed to each unit's serial number. If you wish to obtain historical information about a particular product, you must provide the factory with the serial number of the unit.

The serial number for STD units and units of similar packaging, and the XSGT, is etched into a stainless steel tag that is secured to the front of the unit across the top of the terminal strips. The serial number for PC units is printed on a label that is affixed to the outer-left side of the front panel. The serial number for EX units is located on a label affixed to the top of the unit and on a metal tag on the top of the explosion-proof enclosure.

Model Number. Moore Industries model numbers identify the unit type, functional characteristics, input and output types, any options, and the unit's housing type. You should always verify the model number of a unit before placing it into service to ensure it is properly configured for the intended application.

The model number is found in the same location as the serial number for each housing style. The example below identifies the significance of each field of the SGT/XSGT model number.



Calibration

All SGT's are calibrated and checked at the factory before shipment. After receiving your unit, you should set it up for a bench check and verify that it responds to known inputs in a predictable manner. To do this properly, you must use test equipment to control the input and monitor the output. The bench check will indicate if the SGT is ready to be placed into service, or if it needs to be re-calibrated for your particular application. We recommend you perform a bench check on each unit before placing it into service.

SGT/XSGT Controls

The SGT/XSGT has three adjustments; ZERO, SPAN, and EXCITATION. These multiturn potentiometers are accessible at the front panel of all housing styles. The ZERO potentiometer adjusts the output for the zero-percent rating of the unit (e.g., 1 mA, 4 mA, 1 Vdc). The SPAN potentiometer adjusts the output for the 100-percent rating of the unit (e.g., 20 mA, 50 mA, 5 Vdc). The EXCITATION potentiometer adjusts the excitation voltage to 5 Vdc, ±10% in SGT's. For the XSGT, the EXCITATION potentiometer is used to set the excitation voltage between 5 and 10 Vdc.

All potentiometers on the SGT are equipped with a slip-clutch that prevents the potentiometer from being damaged should you turn the adjustment beyond the wiper stop. The use of each of these controls is explained in the calibration procedure later in this section.

The SC Output. The Selectable Current (SC) output feature is controlled by a resistor that is connected across specific terminals to produce a predetermined output range. Units equipped with this feature are shipped with three resistors, each having a different resistance value. The difference in resistance yields

are 1-5 mA (200Ω, 5%) 4-20 mA (50Ω, 5%), and 10-50 mA (20Ω, 5%). Before calibrating a unit with an SC output, verify the value and location of the SC resistor (see figure 1, 2, or 3).

The RC Option. This option involves the use of the push button and a calibration resistor, which is usually supplied by the transducer manufacturer. The resistor is momentarily inserted into the SGT input circuit with the actuation of the push button. The value of the resistance is such that the transducer bridge is unbalanced sufficiently to produce an exact percentage of the transducer's full-scale output. This percentage must first be determined from the manufacturer before calibration can be performed.

Calibration Setup

The SGT/XSGT has no visual indicators. To check or change its operational settings, you must use *calibration equipment*. The equipment required to bench check or calibrate the SGT is listed in table 2.

Units equipped with the RC Option require a 350-ohm resistor, which matches the resistance of the bridge. This resistor is user-supplied and required only for this option, where it is temporarily connected across the terminals indicated in figure 1, 2, or 3. When calibration is complete, remove the resistor.

Ensure that you use accurately calibrated test equipment to calibrate the SGT. If uncalibrated test equipment is used, the input you apply and output readings you observe will be unreliable and the performance of the SGT unpredictable.

Setting up a STD unit or dual-wide XSGT on a shop or laboratory bench for bench check/calibration is relatively easy. The wiring terminals for the STD unit and the XSGT are easy to access since they are all on the front of the unit (see figure 1). But, making connections to the PC and EX units is slightly more involved.

The PC unit can be bench checked in its intended rack location by connecting the calibration equipment at the rear terminal strip of the rack. Performing a bench check in the rack can be somewhat cumbersome, but it allows you to verify wiring connections of individual card slots of the rack.

The PC unit can also be bench checked and calibrated on a bench top using the appropriate mating connector. You can build your own test fixture or

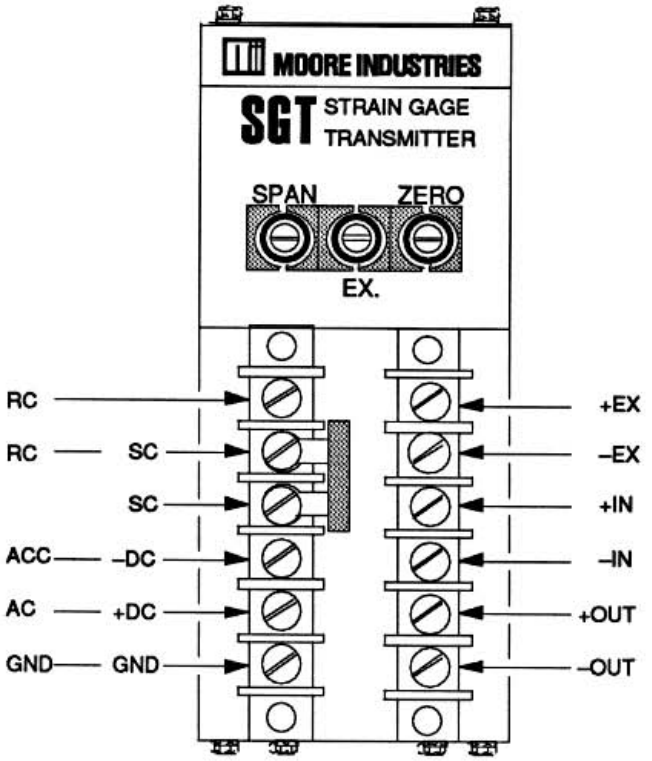
Table 2. *SCT/XSGT Calibration Equipment*

Equipment	Characteristic
Adjustable Millivolt Source	Capable of producing the voltage range required for the specific product application
Bridge Simulator (optional)	350-ohm bridge, ±0.05%
DC Power Source (for dc units only)	24 or 45 Vdc, ±10% (as required per unit configuration)
Voltmeter & Load Resistor (optional)	Accuracy of 0.05% or better; resistor of 250Ω (One voltmeter to measure excitation voltage and another with resistor to monitor the output; one voltmeter may be used for both purposes)
Milliammeter (optional)	Accuracy of 0.05% or better
Screwdriver	Head width no greater than 2.54 mm (0.1 inch)

special connector for this purpose. However, we recommend you use Moore Industries' Process Power Supply (PPS) with the CT Option. The PPS (with CT Option) is designed to accept the PC unit and provides terminals for connecting calibration equipment. The terminals on the PPS are numbered in the same manner as the terminals on the rear of a card rack. Connections are made to these terminals as they are to the card rack terminals. The PPS supplies 24 Vdc to the SGT internally. Figure 2 identifies the terminal locations for the PC-style unit.

The EX unit includes the explosion-proof enclosure with a terminal block secured to the base of the enclosure. To wire this unit for bench-top calibration, remove the top of the enclosure and pull the SGT straight out of the base to separate it from the terminal block. Individual terminal screws are used to make electrical connections at each of the terminals (numbered 1 through 12). Figure 3 identifies the terminal locations for the EX terminal block.

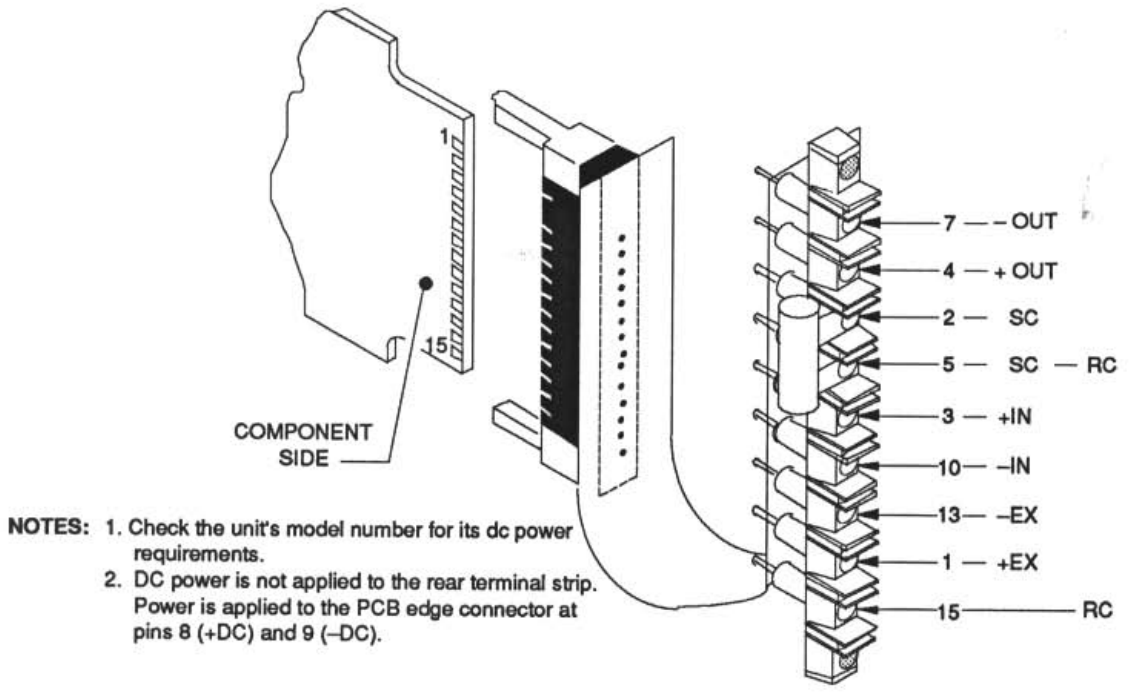
Figure 4 is a calibration hookup diagram for the basic SGT (STD and PC). The connections shown in figure 4 also apply to the XSGT. When connecting the calibration equipment to the SGT, be sure to observe the electrical polarities indicated in this illustration.



NOTE: Each unit is factory-configured for ac or dc power as indicated in the model number.

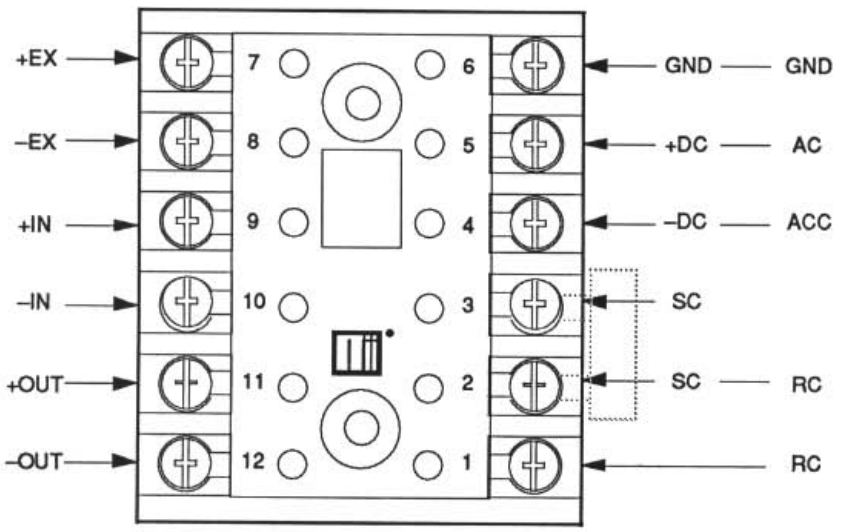
Figure 1. *SGT STD Housing Terminal Locations (also XSGT)*

SGT/XSGT



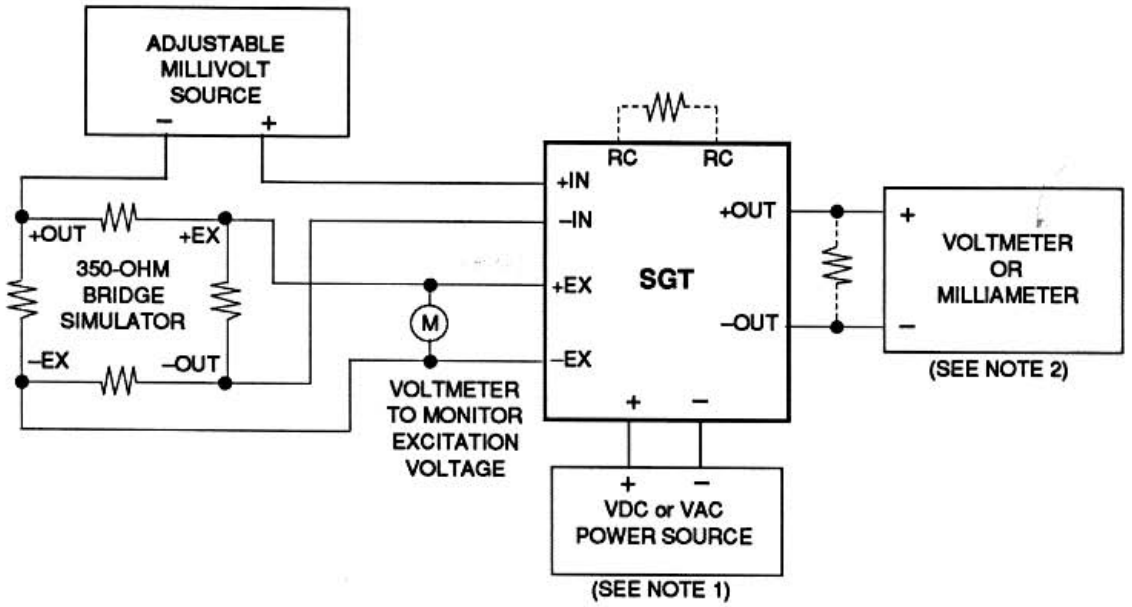
NOTES: 1. Check the unit's model number for its dc power requirements.
2. DC power is not applied to the rear terminal strip. Power is applied to the PCB edge connector at pins 8 (+DC) and 9 (–DC).

Figure 2. *SGT PC Housing Terminal Locations*



NOTE: Check the unit's model number for its power source requirements.

Figure 3. *SGT EX Housing Terminal Locations*



NOTES: 1. Check the unit's model number for its power source requirements.
2. If a voltmeter is used to monitor the output, a precision 250Ω load resistor is also required. You must convert current output ratings to an appropriate voltage drop range for the output rating of your unit. Voltage drop (E) = Current (I) x 250Ω (R).

Figure 4. *SCT/XSGT Calibration Hookup Diagram*

Calibration Procedure

Before beginning this procedure, check the model number of the unit to be calibrated to verify what power requirement the unit has and what the output is configured for. The following procedure is suitable for all SGT's.

When possible, calibrate the SGT/XSGT with the actual transducer rather than a bridge simulator.

1. Connect SGT/XSGT and calibration equipment as shown in figure 4 (refer to table 3).

WARNING

Power terminals are exposed on the STD Housing while the plastic safety cover is removed. To reduce the risk of electrical shock, replace the safety cover after completing wiring connections and before applying power.

2. Apply power and allow SGT/XSGT to warm-up for 5 minutes.
3. Set adjustable millivolt source to minimum input setting.
4. Monitor excitation voltage with a voltmeter and adjust EXCITATION potentiometer for a reading of 5.00 Vdc, ±0.01 V. (The XSGT may be set for any voltage between 5 and 10 Vdc.)
5. Monitor output to verify zero-percent output is as stated in model number.
6. Adjust ZERO potentiometer, as required, to bring zero-percent output to required setting.
7. Set adjustable millivolt source for required 100-percent input setting.

8. Monitor output to verify 100-percent output is as stated in model number (±0.1% of span).

9. Adjust SPAN potentiometer, as required, to bring 100-percent output to required setting.

10. Since zero and span are interactive, repeat steps 3 through 8 until zero- and 100-percent outputs are at the required levels when the input is changed from minimum to maximum without needing further adjustments.

11. Remove power and disconnect calibration equipment. Procedure is complete.

Calibration Procedure for Units With the RC Option

1. Connect SGT/XSGT and calibration equipment as shown in figure 4, including RC resistor.

WARNING

Power terminals are exposed on the STD Housing while the plastic safety cover is removed. To reduce the risk of electrical shock, replace the safety cover after completing wiring connections and before applying power.

2. Apply power and allow SGT/XSGT to warm-up for 5 minutes.

3. Set adjustable millivolt source to minimum input setting.

4. Use transducer manufacturer's data to determine millivolt-per-excitation voltage that represents full-scale output (in millivolts) of the transducer.

5. Monitor excitation voltage with a voltmeter and adjust EXCITATION potentiometer for a reading of 5.00 Vdc, ±0.01 V. (The XSGT may be set for any voltage between 5 and 10 Vdc.)

6. Monitor output to verify zero-percent output is as stated in model number.

7. Adjust ZERO potentiometer, as required, to bring zero-percent output to required setting.

8. Press and hold RC push button on front of unit and verify output rises to 100-percent output level.

9. Adjust SPAN potentiometer, as required, to bring 100-percent output to required setting.

10. Since zero and span are interactive, repeat steps 3 through 8 until zero- and 100-percent outputs are at the required levels when the input is changed from minimum to maximum without needing further adjustments.

11. Remove power and disconnect calibration equipment. Procedure is complete.

Installation

Installing the SGT/XSGT consists of physically mounting the unit and completing the necessary electrical connections. Before installion, you should bench check each unit to ensure that each is properly configured for its intended application.

Mounting the SGT

The SGT is available in several mounting configurations. The two primary housing styles are the STD and the PC Housing. The XSGT is housed in a dual-wide STD housing. The long-term performance of these transmitters will be greatly enhanced if they are mounted in an area free of excessive dust, moisture, or corrosive elements.

The STD Housing outline dimensions are shown in figure 5. This illustration includes the dimensions for the U-back bracket. For housing styles similar to the STD Housing, the dimensions shown for the aluminum enclosure alone are the primary dimensions to consider. Different variations of the STD Housing allows for mounting on racks, rails, flat surfaces, and instrument panels. The EX Housing is designed for mounting inside a high-dome, explosion-proof enclosure.

The XSGT is twice the width of the STD aluminum enclosure. Figure 6 shows the outline dimensions for the XSGT.

Figure 7 is an outline dimension drawing of the PC Housing. This housing style is designed for mounting in one of Moore Industries' standard card racks (RMR or SMR).

Making the Electrical Connections

Electrical connections to STD and EX units are made to individual terminals. Table 3 lists the terminal assignments for STD and EX units (includes XSGT) .

See figures 1 and 3 in the Calibration Section for specific terminal locations.

STD-type units are powered by either an ac or a dc power source. The power requirements for each unit is contained in its model number.

PC units slide between card guides to mate with an edge connector inside the RMR or SMR. Each unit has individual contacts on its rear edge that mate with an edge connector at the back of the rack. Internally, each connector is connected to individual terminal strips that are accessed at the rear panel. The numbering adjacent to each terminal strip corresponds to the edge connector contacts for each unit. Power is supplied to each unit via the power connec-

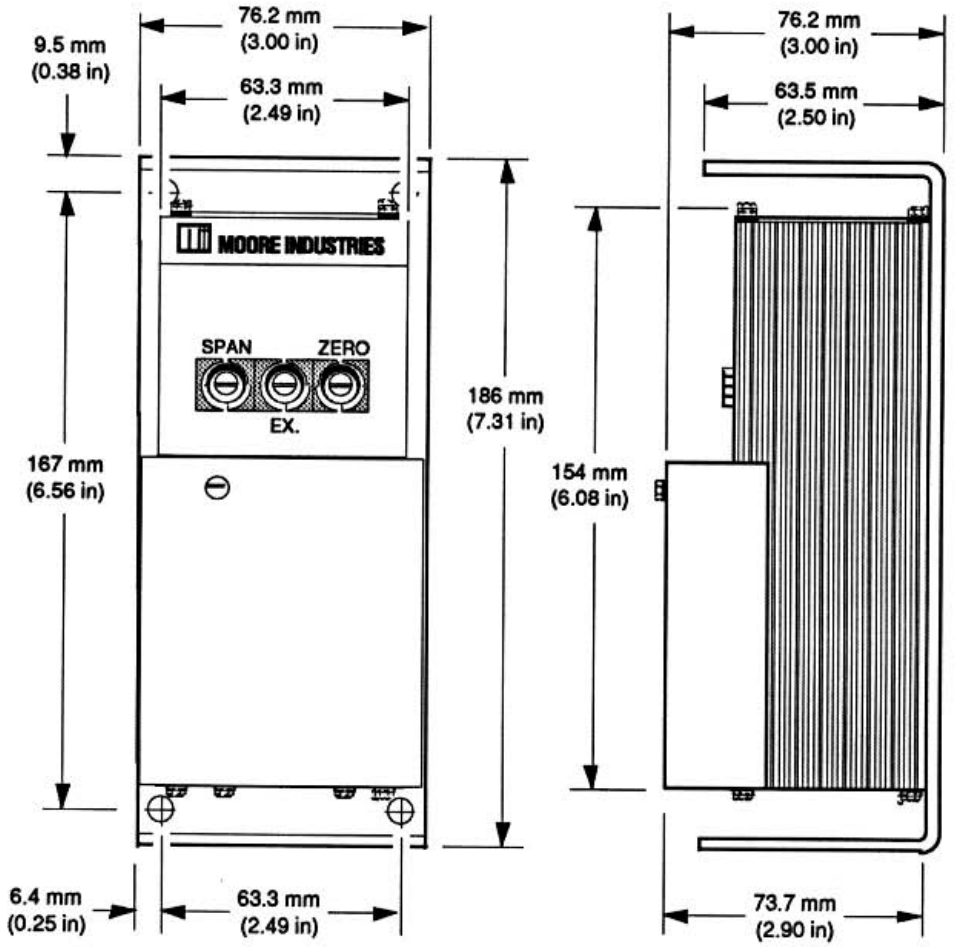


Figure 5. *STD Housing Outline Dimensions*

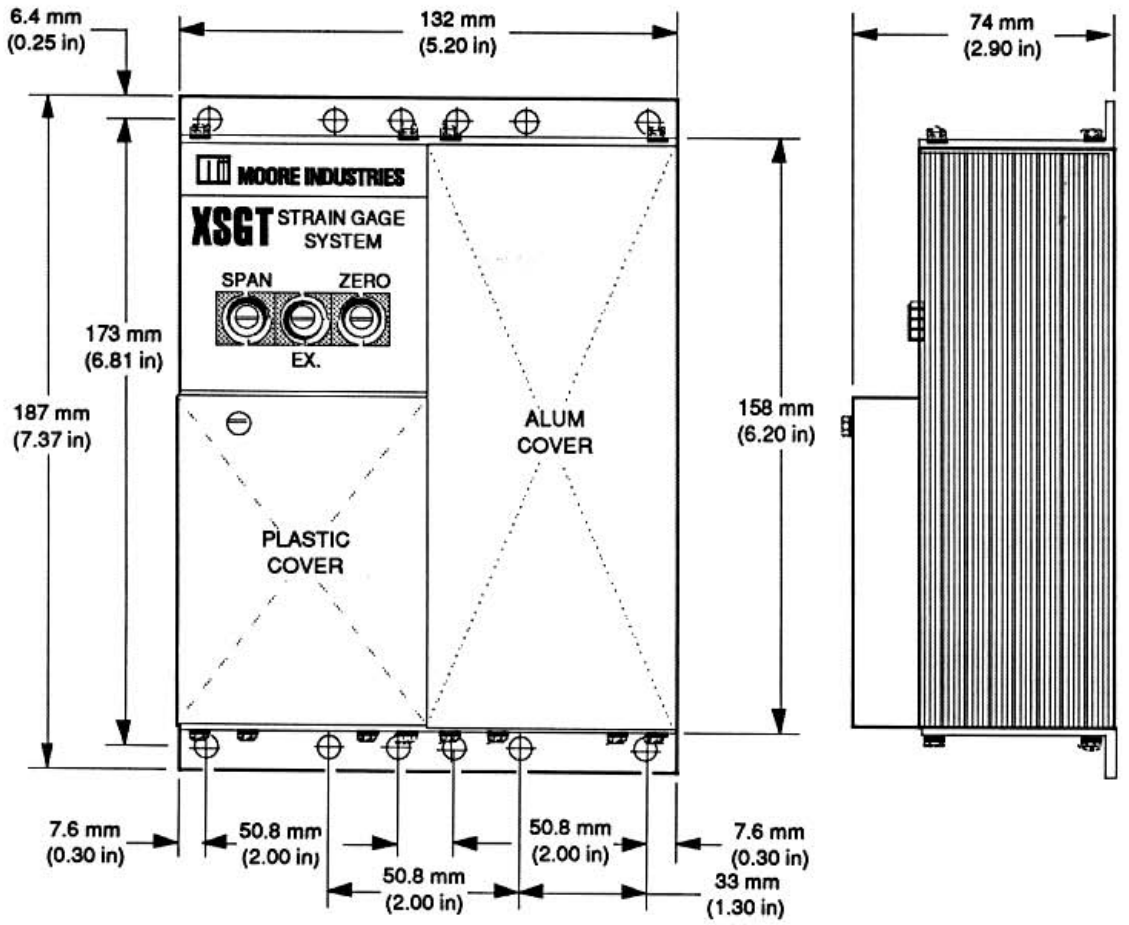


Figure 6. *XSGT Outline Dimensions*

tions to the rack and internal bussing. PC units operate on dc power ONLY, which is specified in each unit's model number. DC power is not present at the rear panel terminal strips. Table 4 lists the terminal assignments for the SGT in the PC Housing. See figure 2 in the Calibration Section for specific terminal locations.

Figure 8 is an installation hookup diagram for the SGT and XSGT.

For units equipped with an SC output, ensure that the value of the resistor used is appropriate for your application, and that it is connected to the proper terminals. Refer to "SGT/XSGT Controls" in the Calibration Section for SC resistor values.

NOTE

For low-level signals, we recommend the use of shielded, twisted-pair wire.

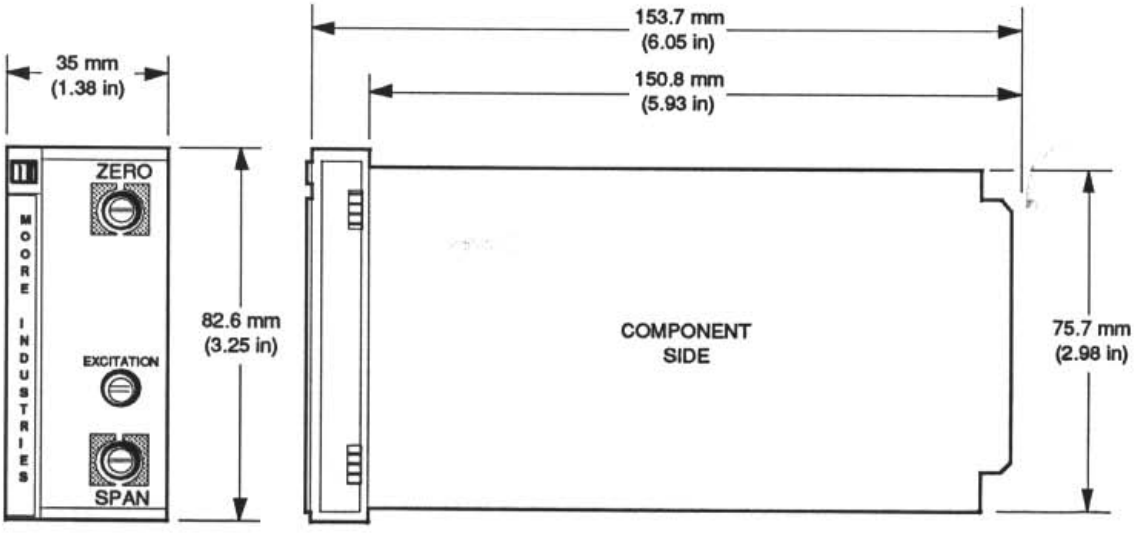


Figure 7. *PC Housing Outline Dimensions*

Table 3. *STD and EX Housing Terminal Designations*

Configuration	Terminals											
	1	2	3	4	5	6	7	8	9	10	11	12
DC Powered STD/EX Units				–DC	+DC	GND	+EX	–EX	+IN	–IN	+OUT	–OUT
AC Powered STD/EX Units				ACC	AC	GND	+EX	–EX	+IN	–IN	+OUT	–OUT
Unit with SC Output		*SC*	*SC*	(NOTE)	(NOTE)	GND	+EX	–EX	+IN	–IN	+OUT	–OUT
Unit with RC Option	*RC*	*RC*		(NOTE)	(NOTE)	GND	+EX	–EX	+IN	–IN	+OUT	–OUT
NOTE: AC or dc power as stated in unit's model number.												

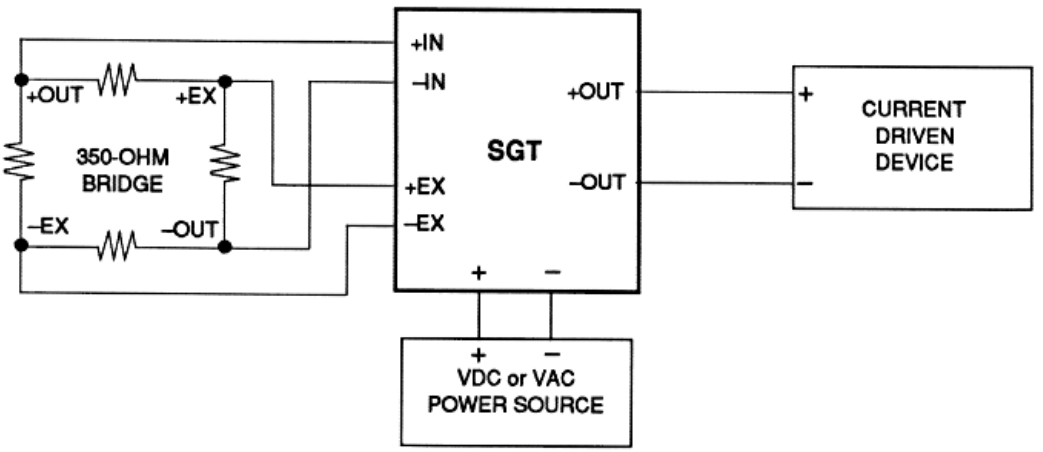
LEGEND:
AC, AC power input
ACC, AC power return
GND, Chassis ground
RC, Calibration resistor
SC, Selectable current resistor
+DC, DC power input
–DC, DC power return
+EX, Positive excitation output
–EX, Negative excitation output
+IN, Positive signal input
–IN, Negative signal input
+OUT, Positive current or voltage output
–OUT, Negative current or voltage output

SGT/XSGT

Table 4. *PC Housing Terminal Designations*

Configuration	Terminals (at rear of card rack)								
	7	4	2	5	3	10	13	1	15
No Options	–OUT	+OUT			+IN	–IN	–EX	+EX	
Unit with SC Output	–OUT	+OUT	*SC*	*SC*	+IN	–IN	–EX	+EX	
Unit with RC Option	–OUT	+OUT		*RC*	+IN	–IN	–EX	+EX	*RC*
NOTE: DC power is bussed to pins 8 (–) and 9 (+) of each internal card connector of the RMR or SMR, but is not present at the rear panel terminals.									

LEGEND: **RC,** Calibration resistor
SC, Selectable current resistor
+EX, Positive excitation output
–EX, Negative excitation output
+IN, Positive signal input
–IN, Negative signal input
+OUT, Positive current or voltage output
–OUT, Negative current or voltage output



NOTE: Check the unit's model number for it's power source requirements.

Figure 8. *SGT/XSGT Installation Hookup Diagram*

Maintenance

Once the SGT/XSGT is properly calibrated and installed, it will operate reliably for extended periods of time. Routine maintenance of the SGT is limited to keeping the unit clean and ensuring terminal connections are secure and free of oxidation. We recommend that you visually inspect the unit at least once every six months to verify that its physical condition is acceptable.

Periodically, you may wish to check the performance of the SGT to ensure that it is operating within the desired parameters. To check its operational performance, take the unit off-line and set it up for a bench check by using the calibration equipment and hookup information contained in the Calibration Section of this manual. Apply a known input to the SGT/XSGT and monitor its output for a predictable result. If the output is out of tolerance or at an unacceptable level, perform the calibration procedures contained therein.

The schedule for in-service bench checks depends on your facility's maintenance practices and on indication of need. We recommend that you bench check the SGT about once a year. But, if there is no indication of variation in performance, you may elect to let the SGT remain on-line for longer periods.

If an operational problem arises with the SGT or XSGT, contact Moore Industries' Customer Service Department at 1-800-999-2900 or your local Sales Representative. To return a unit, follow the instructions on the back cover of this manual.

RETURN PROCEDURES

To return equipment to Moore Industries for repair, follow these four steps:

1. Call Moore Industries and request a Returned Material Authorization (RMA) number.

   Warranty Repair –
   If you are unsure if your unit is still under warranty, we can use the unit's serial number to verify the warranty status for you over the phone. Be sure to include the RMA number on all documentation.

   Non-Warranty Repair –
   If your unit is out of warranty, be prepared to give us a Purchase Order number when you call. In most cases, we will be able to quote you the repair costs at that time. The repair price you are quoted will be a "Not To Exceed" price, which means that the actual repair costs may be less than the quote. Be sure to include the RMA number on all documentation.

2. Provide us with the following documentation:
   a) A note listing the symptoms that indicate the unit needs repair
   b) Complete shipping information for return of the equipment after repair
   c) The name and phone number of the person to contact if questions arise at the factory

3. Use sufficient packing material and carefully pack the equipment in a sturdy shipping container.

4. Ship the equipment to the Moore Industries location nearest you.

The returned equipment will be inspected and tested at the factory. A Moore Industries representative will contact the person designated on your documentation if more information is needed. The repaired equipment, or its replacement, will be returned to you in accordance with the shipping instructions furnished in your documentation.

MOORE INDUSTRIES

WORLDWIDE • www.miinet.com

United States • info@miinet.com
Tel: (818) 894-7111 • FAX: (818) 891-2816

Belgium • info@mooreind.be
Tel: 03/448.10.18 • FAX: 03/440.17.97

China • sales@mooreind.sh.cn
Tel: 86-21-62491499 • FAX: 86-21-62490635

Australia • sales@mooreind.com.au
Tel: (02) 8536-7200 • FAX: (02) 9525-7296

The Netherlands • sales@mooreind.nl
Tel: (0)344-617971 • FAX: (0)344-615920

United Kingdom • sales@mooreind.com
Tel: 01293 514488 • FAX: 01293 536852