



MODEL

3770

DC STRAIN GAGE CONDITIONER

INSTRUCTION MANUAL



3700
Instrument Series

WARNING

Death, serious injury, or fire hazard could result from improper connection of this instrument. Read and understand this manual before connecting this instrument. Follow all installation and operating instructions while using this instrument.

Connection of this instrument must be performed in compliance with the National Electrical Code (ANSI/NFPA 70-2014) of USA and any additional safety requirements applicable to your installation.

Installation, operation, and maintenance of this instrument must be performed by qualified personnel only. The National Electrical Code defines a qualified person as "one who has demonstrated the skills and knowledge related to the construction and operation of the electrical equipment and installations, and who has received safety training on the hazards involved."

Qualified personnel who work on or near exposed energized electrical conductors must follow applicable safety related work practices and procedures including appropriate personal protective equipment in compliance with the Standard for Electrical Safety Requirements for Employee Workplaces (ANSI/NFPA 70E-2012) of USA and any additional workplace safety requirements applicable to your installation.

ADVERTENCIA

Una conexión incorrecta de este instrumento puede producir la muerte, lesiones graves y riesgo de incendio. Lea y entienda este manual antes de conectar. Observe todas las instrucciones de instalación y operación durante el uso de este instrumento.

La conexión de este instrumento a un sistema eléctrico se debe realizar en conformidad con el Código Eléctrico Nacional (ANSI/NFPA 70-2014) de los E.E.U.U., además de cualquier otra norma de seguridad correspondiente a su establecimiento.

La instalación, operación y mantenimiento de este instrumento debe ser realizada por personal calificado solamente. El Código Eléctrico Nacional define a una persona calificada como "una que esté familiarizada con la construcción y operación del equipo y con los riesgos involucrados."

El personal cualificado que trabaja encendido o acerca a los conductores eléctricos energizados expuestos debe seguir prácticas y procedimientos relacionados seguridad aplicable del trabajo incluyendo el equipo protector personal apropiado en conformidad con el estándar para los requisitos de seguridad eléctricos para los lugares de trabajo del empleado (ANSI/NFPA 70E-2012) de los E.E.U.U. y cualquier requisito de seguridad adicional del lugar de trabajo aplicable a su instalación.

AVERTISSEMENT

Si l'instrument est mal connecté, la mort, des blessures graves, ou un danger d'incendie peuvent s'en suivre. Lisez attentivement ce manuel avant de connecter l'instrument. Lorsque vous utilisez l'instrument, suivez toutes les instructions d'installation et de service.

Cet instrument doit être connecté conformément au National Electrical Code (ANSI/NFPA 70-2014) des Etats-Unis et à toutes les exigences de sécurité applicables à votre installation.

Cet instrument doit être installé, utilisé et entretenu uniquement par un personnel qualifié. Selon le National Electrical Code, une personne est qualifiée si "elle connaît bien la construction et l'utilisation de l'équipement, ainsi que les dangers que cela implique".

Le personnel qualifié qui travaillent dessus ou s'approchent des conducteurs électriques activés exposés doit suivre des pratiques en matière et des procédures reliées par sûreté applicable de travail comprenant le matériel de protection personnel approprié conformément à la norme pour des conditions de sûreté électriques pour les lieux de travail des employés (ANSI/NFPA 70E-2012) des Etats-Unis et toutes les conditions de sûreté additionnelles de lieu de travail applicables à votre installation.

WARNUNG

Der falsche Anschluß dieses Gerätes kann Tod, schwere Verletzungen oder Feuer verursachen. Bevor Sie dieses Instrument anschließen, müssen Sie die Anleitung lesen und verstanden haben. Bei der Verwendung dieses Instruments müssen alle Installation- und Betriebsanweisungen beachtet werden.

Der Anschluß dieses Instruments muß in Übereinstimmung mit den nationalen Bestimmungen für Elektrizität (ANSI/NFPA 70- 2014) der Vereinigten Staaten, sowie allen weiteren, in Ihrem Fall anwendbaren Sicherheitsbestimmungen, vorgenommen werden.

Installation, Betrieb und Wartung dieses Instruments dürfen nur von Fachpersonal durchgeführt werden. In dem nationalen Bestimmungen für Elektrizität wird ein Fachmann als eine Person bezeichnet, welche "mit der Bauweise und dem Betrieb des Gerätes sowie den dazugehörigen Gefahren vertraut ist."

Qualifiziertes Personal, das an bearbeiten oder herausgestellte angezogene elektrische Leiter sich nähern, muß anwendbare Sicherheit bezogener Arbeit Praxis und Verfahren einschließlich passende persönliche schützende Ausrüstung gemäß dem Standard für elektrische Sicherheitsauflagen für Angestellt-Arbeitsplätze (ANSI/NFPA 70E-2012) der Vereinigten Staaten und alle zusätzlichen Arbeitsplatzsicherheitsauflagen folgen, die auf Ihre Installation anwendbar sind.

Safety Precautions

The following safety precautions must be followed whenever any type of voltage or current connection is being made to the instrument.

- Before connecting to electric circuits or pulse initiating equipment, open their related breakers or disconnects. It is recommended NOT TO install any connection of the instrument on live power lines. Only Qualified Service personnel that have demonstrated the abilities and received the proper safety training are capable of connecting to live circuits.
- Connections must be made to the instrument first, then connect to the circuit to be monitored.
- Wear proper personal protective equipment, including safety glasses and insulated gloves when making connections to power circuits.
- Hands, shoes and floor must be dry when making any connection to a power line.
- Before each use, inspect all cables for breaks or cracks in the insulation. Replace immediately if defective.
- If the equipment is used in a manner not specified in this user's guide, the protection provided by the equipment may be impaired.

Medidas de seguridad

Las medidas de seguridad siguientes deberán observarse cuando se realice cualquier tipo de conexión al instrumento.

- o Cuando se haga conexiones a circuitos eléctricos o a equipo de activación por pulso, deberá abrirse sus respectivas cajas de seguridad. NO deberá hacerse ninguna conexión del instrumento en líneas eléctricas bajo tensión.
- o Las conexiones deberán hacerse primero al instrumento y, luego, al circuito a ser monitorizado.
- o Al hacer conexiones a circuitos eléctricos, deberá utilizar anteojos y guantes protectores.
- o Sus manos, zapatos y el piso deberán estar secos en todo momento en que se haga una conexión a un cable eléctrico.
- o Verifique que la unidad esté DESACTIVADA antes de conectar sondas en el panel posterior.
- o Previo a cada uso, deberá verificarse que los cables no estén rotos y que el material aislante no tenga rajaduras. Reemplace de inmediato cualquier parte defectuosa.

Mesures de Sécurité

Les mesures de sécurité suivantes doivent être prises chaque fois qu'un type de connexion quelconque est effectué sur l'instrument.

- o Ouvrir les disjoncteurs correspondants lors d'une connexion à des circuits électriques ou à des équipement de génération d'impulsions. NE PAS effectuer de connexion d'instrument sur des lignes électriques sous tension.
- o Une fois toutes les connexions de l'instrument effectuées, connecter au circuit à contrôler.
- o Porter des lunettes de protection et des gants isolants pour effectuer des connexions aux circuits électriques.
- o S'assurer que les mains, les chaussures et le sol soient secs lors de connexions à une ligne électrique.
- o S'assurer que l'unité est ÉTEINTE avant de connecter les sondes au panneau arrière.
- o Inspecter tous les câbles, avant chaque utilisation, pour s'assurer que les isolants ne sont pas coupés ou fendus. Remplacer immédiatement tous les équipements défectueux.

Sicherheitsvorkehrungen

Die folgenden Sicherheitsvorkehrungen sind immer dann zu befolgen, wenn eine Verbindung zum Instrument hergestellt wird.

- o Öffnen Sie beim Anschluß an elektrische Stromkreise oder Impulsauslösungseinrichtungen die entsprechenden Unterbrecher. Es dürfen KEINE Anschlüsse an das Instrument unter stromführenden Spannungsleitungen montiert werden.
- o Die Verbindungen müssen zuerst am Instrument und danach an der zu überwachenden Schaltung hergestellt werden.
- o Tragen Sie Schutzbrillen und Isolierhandschuhe, wenn Sie Anschlüsse an den Stromkreisen vornehmen.
- o Hände, Schuhe und Fußboden müssen trocken sein, wenn Sie Anschlüsse an den Stromkreisen durchführen.
- o Stellen Sie sicher, daß das Gerät AUSgeschaltet ist, bevor Sie an der rückwärtigen Konsole Meßfühler anschließen.
- o Prüfen Sie vor jedem Gebrauch alle Kabel auf Bruchstellen und Risse in der Isolierung. Wechseln Sie schadhafte Kabel sofort aus.

Standard Accessories

Standard accessories

The following table lists the 3700 standard accessories.

Description	Part Number
3770 Manual	92363.00
3770 Quick Reference Guide	92368.00
5 Pin connector, analog signals	25657-LF
8 Pin connector, transducer	25658-LF
10 Pin connector, logic	25606.00
* US Power Cord	USSTDCORD (900744)
* European Power Cord	EUROSTDCORD (115369-G1)
* United Kingdom Power Cord	UKSTDCORD (115368-G2)
* Australian Power Cord	AUSTDCORD (901347)
Desk top feet (4ea.)	35058.00
*User specified, one standard only.	

3770

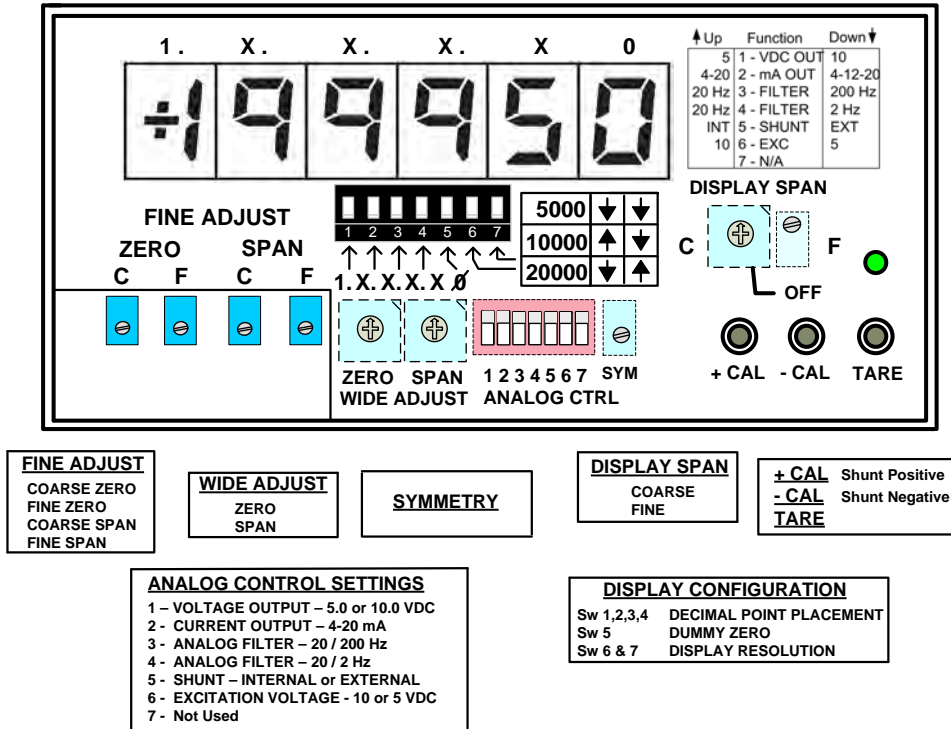
1.A.0.3770

1 GENERAL DESCRIPTION AND SPECIFICATIONS

The Model 3770 is a single-channel panel instrument for traditional wheat-stone bridge type sensors; intended for applications involving conventional full arm bridges from 120 to 10K Ohm transducers with mV/V ratings between 0.5 and 10.0 mV/V full scale. The 3770 will supply excitation, conditioning and provide a calibrated Engineering Unit's display and analog output signals for the measurement of force, load, torque, pressure and other parameters associated with DC based full bridge sensors. The 3770 is front panel configurable with user selectable wide gain, zero, symmetry, and selectable analog output of voltage and current signals. Display is user configured and can be independently adjustable for engineering unit scaling up to ± 199950 independent of the analog full scale signal.

The Model 3770 can be either calibrated by the “two-point (dead-weight)” process involving known input parameters or through the “Shunt” method using front panel push buttons or rear connections for simulated calibration using a known resistance provided internally by the 3770 or through a user installed resistor value.

FRONT PANEL VIEW OF 3770 CONTROLS (Front Display Cover Removed)



3770 SPECIFICATIONS

Measurement Range: Adjustable; 0.5 to 10 mV/V; nominal full-scale. Dependent on Excitation level selected

Transducer Types: Conventional 4-arm strain gage bridges, 120 to 10 k ohm

Excitation: Selectable: 5.0 or 10.0 Vdc, with remote sense lines. Up to 70 mA.

Power Supply: Voltage 90 - 250 VAC, 47 -63 Hz

Consumption 10 Watts

Physical Parameters: 5. 68" W x 2. 84" H x 7. 06" D; weight - 3. 25 Lbs.

Analog Output: selectable; ± 5 , ± 10 VDC, 4 -20 mA or 4 -12 -20 mA (20 % over -range on voltage outputs only)

Operating Temperature: 0 to +55 Degrees C, 5 to 95% relative humidity, non-condensing

Altitude: 2000m (6560 ft) maximum

Installation Category: Installation Category II, Pollution Degree 2

Amplifier

Normal - Mode Range: ± 0.2 V RMS operating; ± 28 V without instrument damage

Common - Mode Range: ± 3 V

Input Impedance: Differential >10 M Ω

Offset: vs. Temperature: ± 30 ppm μ V/ $^{\circ}$ C; vs. Time: ± 10 ppm/month

Gain Accuracy: Limited only by calibration accuracy

Gain Stability: vs. Temperature: ± 30 ppm/ $^{\circ}$ C; vs. Time: ± 10 ppm/month

Linearity: better than $\pm 0.03\%$ of full scale

Filter: 3-pole modified Butterworth; 3 dB down at 2 Hz, 20 Hz or 200 Hz; selectable.

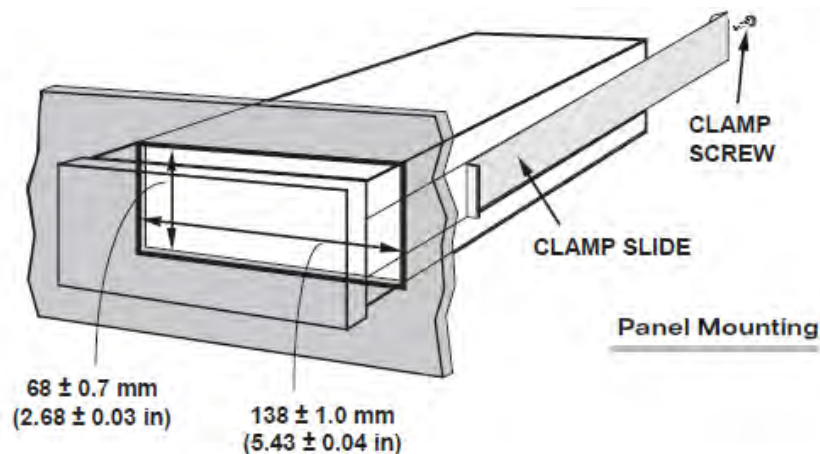
Fast output always enabled, 5 KHz response (J3 Pin 3).

Step-Response Settling Times for the 3770 (in milliseconds)

	3db Frequency	To within 1%	within .1%	within .02%
Fast Output	5000 Hz	0.14	0.10	0.08
Selectable Output	200 Hz	3.7	5.0	5.6
	20 Hz	37	50	56
	2 Hz	370	500	560

1. a PANEL MOUNTING

You can easily mount the instrument in your own precut panel. Cutout dimensions for a *panel-mounted* unit are standard **DIN**; panel thickness should not exceed 6 mm (0.24 in). Simply unscrew the two rear-panel CLAMP SCREWS and slide the CLAMP SLIDES rearwards out of their grooves (THE FRONT BEZEL NEED NOT BE REMOVED). Insert the unit through the panel cutout, *from the front of the panel* (if the unit has rubber feet, these will have to be removed). Then reinstall the CLAMP SLIDES, and tighten the CLAMP SCREWS until the instrument is securely mounted.



2 CONNECTIONS

The **Model 3770 I/O CONNECTIONS** are via removable screw terminals which will accept wire sizes from AWG 12 to 26. **NOTE:** The recommended transducer cabling would be eight wire, twisted pair, individually shielded - wired as indicated (Fig. 6) **Sense lines must be connected** at the transducer (as recommended) or at the 3770 screw terminals - as a minimum. Table 1 denotes screw terminal assignments

Rear Panel Connections

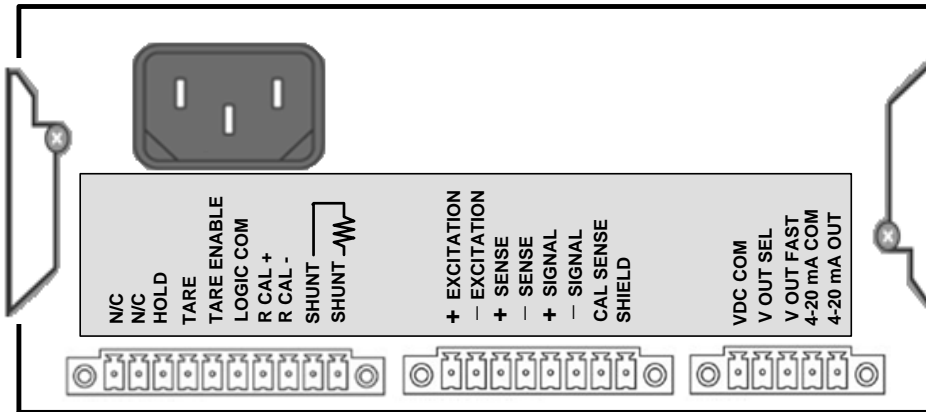


Table 1

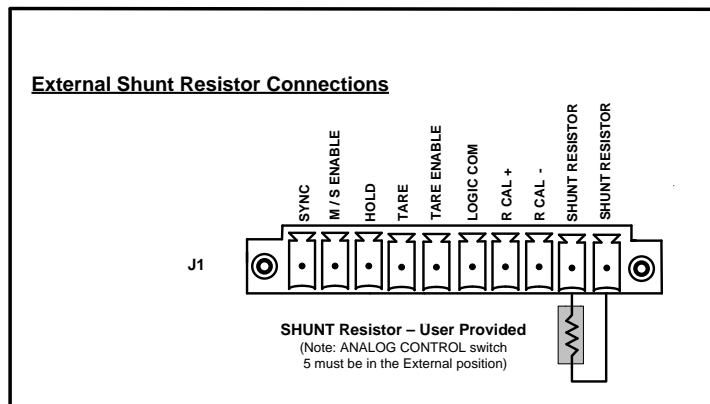
Connector Number	Screw Terminal	Terminal Label	Function
J1	1	N/C	No connection
J1	2	N/C	No connection
J1	3	HOLD	Input Analog Hold command
J1	4	TARE	Input Analog TARE command
J1	5	TARE ENABLE	External TARE enable input
J1	6	LOGIC COM	Logic Common
J1	7	R CAL +	Remote Positive SHUNT Command
J1	8	R CAL -	Remote Negative SHUNT Command
J1	9	SHUNT	External Shunt Resistor Connection
J1	10	SHUNT	External Shunt Resistor Connection
J2	1	+ EXCITATION	+ Excitation Power
J2	2	- EXCITATION	- Excitation Power
J2	3	+ SENSE	+ Sense excitation control
J2	4	- SENSE	- Sense excitation control
J2	5	+ SIGNAL	+ Signal Input from sensor
J2	6	- SIGNAL	- Signal Input from sensor
J2	7	CAL SENSE	Calibration Sense for Shunt
J2	8	SHIELD	Case Shield for cable termination
J3	1	VDC COM	- Signal Output Voltage Common
J3	2	V OUT SEL	+ Signal Output Voltage – Filter Select
J3	3	V OUT FAST	+ Signal Output Voltage – 5 kHz Filter
J3	4	4-20 mA COM	Current Output Common
J3	5	4-20 mA OUT	Current Output Signal

2 CONNECTIONS

J1 – Shunt Resistor Connections. Two terminal pins are provided via the J1 rear connector for installation of an external shunt resistor. Terminal connections are used to install a user defined resistor as determined by the sensor’s calibration data sheet or pre-determined by the user. When an externally installed resistor is used, the ANALOG CONTROL switch 5 is required to be in the **External** position (Switch 5 DOWN).

Note: The 3770 unit comes with an internally installed 59K Ohm resistor, as standard, and enabled when the front panel ANALOG CONTROL Switch# 5 is in the **Internal** position (Switch 5 UP).

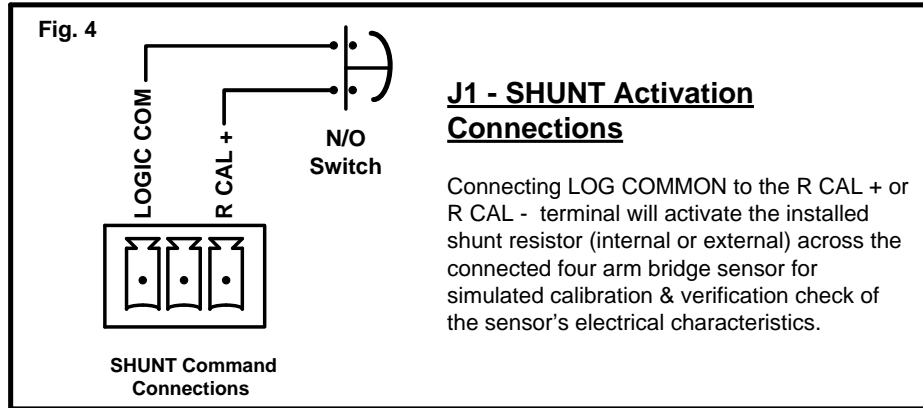
Note: When a sensor has an integrated shunt resistor, the ANALOG CONTROL switch setting needs to be in the External position and a shorting wire in place of the external shunt resistor position. This provides the electrical path for the Calibration Sense line to enable the sensor’s internal shunt resistor when the + or – Shunt Calibration rear terminals or push buttons are activated.



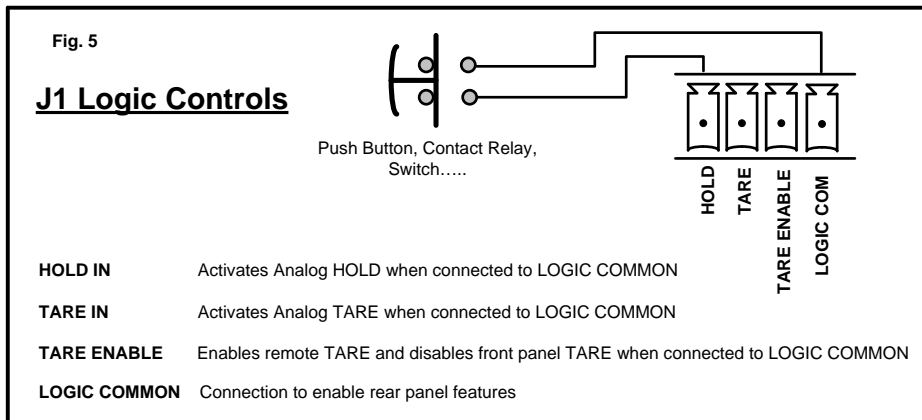
NOTE: Daytronic Shunt Calibration circuit, when activated, will place the Shunt resistor across the + Sense Line (for positive shunt) or the – Sense Line (for negative shunt) with the connection of the Sensor’s Calibration Sense line located on the J2 connector - which is recommend to be connected to the + Signal line. When not activated, the Calibration Sense line is buffered as to not affect the sensor’s operational characteristics.

2 CONNECTIONS

J1 – Shunt Command Connections. Connection is used to activate the positive or negative Shunt calibration command from the rear panel. When the + or – R CAL terminal is connected to LOGIC COM via a switch or relay, the installed Shunt resistor will be connected across + Signal and + Sense or – Sense depending on the Shunt polarity chosen and the CAL SENSE connection. CAL SENSE line is normally connected to + Signal for proper signal activation.



J2 - HOLD & TARE Connections. Connection is used when external control of the "HOLD" or "TARE" features of the unit are enabled and are controlled by an external switch, PLC or relay. The LOGIC COM signal is used to activate the analog HOLD or Analog TARE (offset) to the meter's display and analog output signals present on J3.

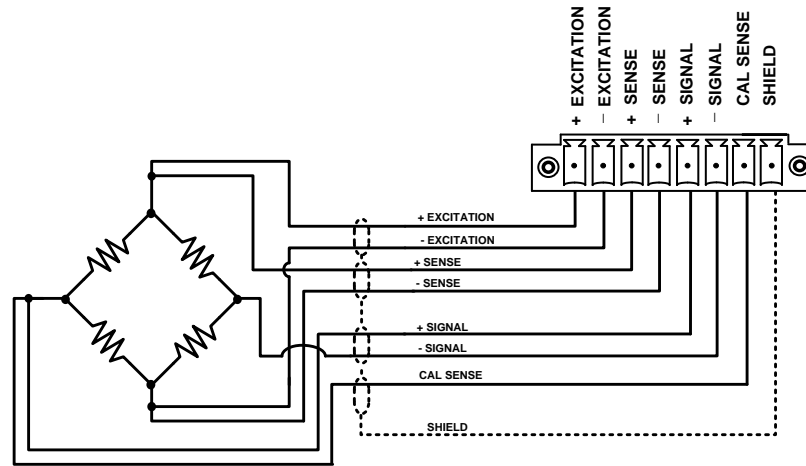


WARNING

Qualified personnel who work on or near exposed energized electrical conductors must follow applicable safety related work practices and procedures including appropriate personal protective equipment in compliance with the Standard for Electrical Safety Requirements for Employee Workplaces (ANSI/NFPA 70E-2012) of USA and any additional workplace safety requirements applicable to your installation.

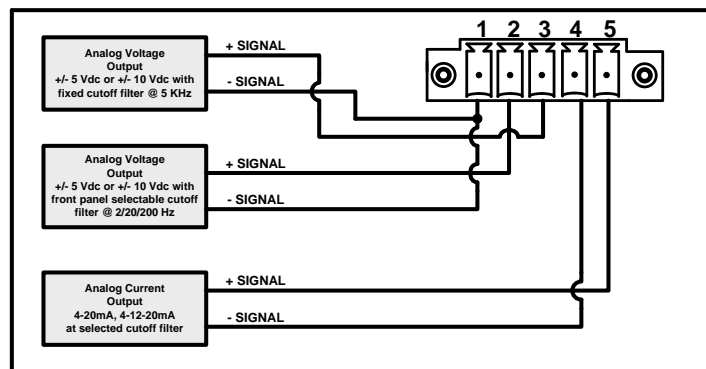
2 CONNECTIONS

Fig. 6 - Transducer Cabling – DC Strain Gage- J2



Note: Sense lines must be connected at the transducer or at the instrument for proper operation.

J3 - Analog Connections Provides analog outputs from the meter's signal conditioning area in the form of ± 5 Vdc or ± 10 Vdc (selectable via the front panel controls) and 4-20 mA (or selectable 4-12-20 mA). Full scale output is referenced to the display "range" selected (5000, 10000, or 20000). I.e. If range 10000 is selected, the analog output will be 5 Vdc or 10 Vdc, as determined by the front panel controls (or 20 mA FS) when in the default/home position and the display reads 10000 (irrespective of the decimal point).

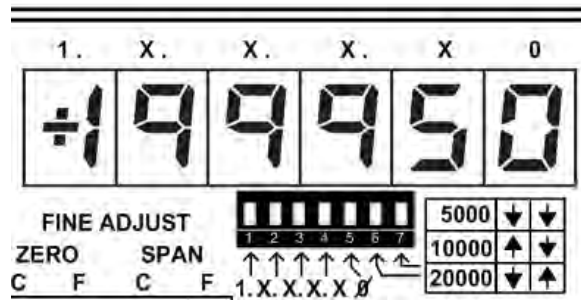


J3 - Analog Output Connections

- Pin 1** Voltage Common (- Signal out) reference for Pin 2 and Pin 3 + Signal Voltage Output.
- Pin 2** Voltage Output Selected (+Signal out) reference to Pin 1. The Full Scale Voltage is determined by the position of switch **1-VDC** on the Conditioner Controls. Output response is determined by the position of switch **3-FIL** and **4-FIL** on the Analog Controls.
- Pin 3** Voltage Output Fixed. (+ Signal out) reference to Pin 1. Full Scale Voltage is determined by the position of switch **1-VDC** of the Conditioner Controls. Filter response is fixed at the highest analog signal response of 5 KHz.
- Pin 4** 4-20 mA Current Output Common (- Signal) reference for Pin 5 Current Output.
- Pin 5** 4-20 mA Current Output (+Signal) reference to Pin 4 Current Output Common. The Current Output is selectable for 4 - 20 mA or 4-12-20 mA as determined by the position of switch **2 -mA** of the Conditioner Control switch(s) on the Front Panel.

3 CONTROLS

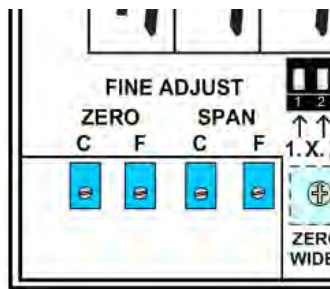
Display Range and Decimal Point Selection



- Switch 1** - selects decimal point for position **X.XXXXX**
- Switch 2** - selects decimal point for position **XX.XXXX**
- Switch 3** - selects decimal point for position **XXX.XXX**
- Switch 4** - selects decimal point for position **XXXX.XX**
- Switch 5** - enables dummy zero display digit **XXXXX0**
- Switch 6 & 7** - selects Display Full Scale Range.

Range will equate to an analog output value of ± 5 Vdc or ± 10 Vdc per Analog Control switch placement. Selection is set for 1 count in 5000, 2 counts in 10000 and 5 counts in 20000.

Analog Zero and Span Adjustments

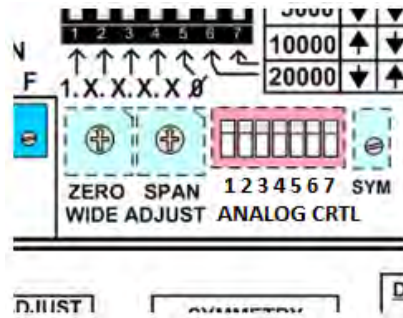


- Coarse Zero** - 22 Turn potentiometer adjustment for balance control of analog offset signal
- Fine Zero** - 25 Turn potentiometer for fine balance control of analog offset signal
- Coarse Span** - 22 Turn potentiometer adjustment for analog control of gain
- Fine Span** - 25 Turn potentiometer adjustment for analog control of fine gain

3 CONTROLS

Analog Wide Gain and Zero Controls

Two - 16 Position switches are used for wide control adjustment of the analog output signal from the 3770 meter; this in turn affects the digital readout for engineering unit's adjustments as determined by the display settings.

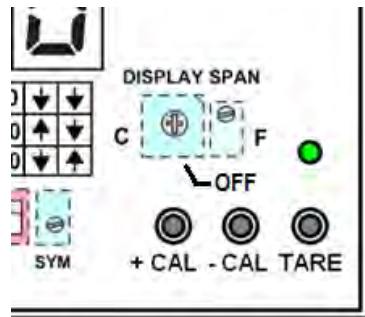


Wide Zero - 16 position switch to adjust wide zero-balance authority, approx. 13% /position

Wide Span - 16 position switch to adjust wide range gain for 0.5 to 10 mV/V sensors

Display Span Adjustments

Used to adjust the digital readout of the 3770 meter, the user calibrates the analog output for a specific span value and then adjusts the readout for proper engineering units display. "OFF" position indicator defines the default position. i.e. 5.000 Vdc for the analog outputs equals to 5000 counts on the display.



Display Coarse Span - 16 position switch to adjust wide span / gain authority for the display

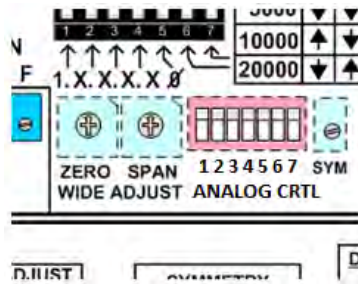
Display Fine Span - 25 Turn potentiometer for fine span / gain control of display reading

Display "OFF" – switch position "F" which disables the Adjustable Span feature of the display

3 Controls

Analog Control Settings

Front panel controls configure the Signal conditioner section for excitation level, mode of the analog output signal, low pass filter characteristics and shunt calibration being internal or external.



- 1 – **5 Vdc Output** - UP sets the analog output FS to 5 Vdc, DOWN is 10 Vdc
- 2 – **4 - 20 mA** - UP sets the analog current output for 4-20 mA , DOWN is 4-12-20ma
- 3 – **20/200 Hz** - UP selects 20 Hz filter. DOWN selects 200 Hz filter
- 4 – **20/2 Hz** - UP selects 20 Hz filter. DOWN selects 2 Hz filter
- 5 – **SHUNT Internal / External** - UP selects the Internal Shunt Resistor – 59K, DOWN is External
- 6 – **Excitation** - UP selects 10 Vdc excitation to the sensor, DOWN selects 5 Vdc
- 7 – **Not Used**

With all switches in the UP position, the unit will have the following settings:

- 10 Vdc Excitation voltage
- The full scale analog output will be 5.000 Vdc
- The current output will be set for 4 ma = zero and 20 ma will = positive full scale
- The analog low pass filter will be set for 20 Hz
- Shunt calibration resistor will be set for the internal 59K Ohm resistor value

Note: The Excitation (switch 6) placement is used to select the mV/V input range of the unit. 5 Vdc setting will accept sensors from 5.0 to 10 mV/V. 10 Vdc setting will accept .5 to 5.0 mV/V sensors.

Analog Control Settings for Conditioner Configuration

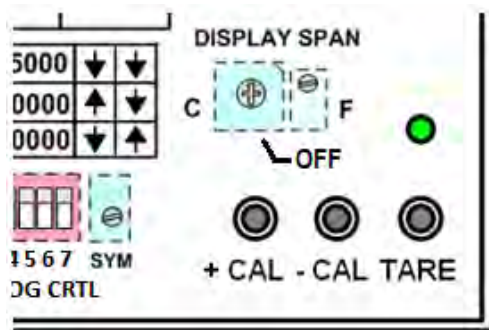
↑	Function	Down ↓
5	1 - VDC OUT	10
4-20	2 - mA OUT	4-12-20
20 Hz	3 - FILTER	200 Hz
20 Hz	4 - FILTER	2 Hz
INT	5 - SHUNT	EXT
10	6 - EXC	5
	7 - N/A	

Analog Control Settings (red switch array)

The selection of the 7 front panel analog control settings will configure the signal conditioning section of the meter. The position of the switches will depend on the type of sensor, its parameters and the expected analog output signal levels along with the output signal's 3db roll-off response characteristics.

3 Controls

Analog Symmetry, + CAL, - CAL, TARE



- SYM** **Symmetry** - Adjust the negative gain slope for symmetrical analog adjustment and display reading with reference to the positive span value. 20 Turn potentiometer, with approx. $\pm 2\%$ full scale authority
- +CAL** **Positive Calibration** – Activates the SHUNT Positive by switching in the external or internal shunt calibration resistor across the Cal Sense and + Sense leads of the bridge.
- CAL** **Negative Calibration** – Activates the SHUNT Negative by switching in the external or internal shunt calibration resistor across the Cal Sense and - Sense leads of the bridge.
- TARE** **TARE** - Push / Push switch. When enabled, offsets the present sensor signal input to "Zero". When activated, a green LED light will illuminate. During activation process, LED will light Yellow. If disabled, or out of range, LED will be RED. TARE maybe remotely activated via rear J1 connections. Front panel TARE can be disabled via J1 Pin 5 connected to Logic Common, Pin 6. Maximum TARE capability is approx. 60% of full scale reading.

4. CALIBRATION

This section contains the instructions for calibrating the 3770. Included is a functional description of the instrument front-panel (see Page 1). To perform calibration, proceed as follows.

- (a) Connect Sensor and Analog terminals as required. Connect and apply power to the unit. The front-panel digital display should light indicating the application of the AC input power. Allow 10 minutes of warm up for stabilization of transducer characteristics. Remove the front cover of the 3770 unit by removing the two small Phillips screws on the front panel. TARE should not be activated.
- (b) Center the Zero and Fine Span potentiometers by rotating the potentiometers CW until you feel the "end stop" or by the number of turns accomplished (Coarse is 22 turn, Fine is 25 turn). Rotate the potentiometer back to the middle of their range (Coarse 11 turns, Fine 12-13 turns). This will establish the adjustments middle authority.
- (c) Position the front panel switches to the desired settings for the application. Refer to Section 3 for details.
- (d) Relax the sensor input to "zero" load and adjust the Wide Zero and Fine Zero controls until the meter reading is achieved at the point which will be the "zero" value reference.
- (e) Once the Zero position has been established, apply a known load typically in the nominal working range of the sensor. With the load active and stabilized, adjust the Wide Span, Coarse Span and Fine Span controls until the display reading required is achieved.
- (f) Return the sensor to the "Zero" position and re-adjust the Coarse Zero and Fine Zero controls for the desired reading or analog output of the unit. Repeat the Span (step e) adjustment as necessary to achieve the proper reading or analog output. Note that changes in Span (Gain) will affect Zero. Span and Zero re-adjustments may need to be repeated to obtain the desired reading. (Note that the 3770 meter also has independent display adjustment capability to where the digital display can be adjusted independently to the analog output signal of the unit so as to achieve proper analog output levels from the meter.)
- (g) Once the Zero and the Gain (SPAN) adjustments have been accomplished, if needed - the user can adjust for Negative non-symmetrical value (as referenced by the positive SPAN value) by utilizing the front panel Symmetry control when the load is Negative. To accomplish this, apply a known negative load and adjust the symmetry control for the correct readout or analog output signal required. Note the Symmetry control has approx. $\pm 2\%$ full scale authority.
- (h) Once completed, replace the front display lens cover to the original position and ensure proper shielding and grounding have been done to the meter. Minor calibration adjustment may be accomplished using the front panel potentiometer for zero and span.

Display Calibration The 3770 instrument display has separate adjustment controls that are independent of the analog output controls - allowing the user to alter the display reading to a value that is suited for the display while maximizing the analog output amplitude. In the standard – default switch position (as marked near the Coarse Display Span control), the display has a fixed full scale reading set by the display range switches of 5000, 10000 or 20000 counts. At these settings the full scale analog output signal will be 5 Vdc or 10 Vdc, as selected via the analog controls. To accomplish the display adjustment change, the user would first set the desired display range and decimal location using the display dip switches, adjust the analog output to the desired level and then adjust the display Coarse then Fine span controls for the required digital readout.

4. CALIBRATION – Shunt Calibration

This section contains the instructions for calibrating the 3770 using the Shunt calibration method.

- (a) Connect Power, Sensor and Analog terminals as required. Apply power. The front-panel digital display should light indicating the application of the AC input power. Allow 10 minutes of warm up for stabilization of transducer characteristics. Remove the front panel cover of the 3770 unit which is held in place by the two small Phillip head screws.

Note: The 3770 unit has an internal 59K Shunt resistor installed within the unit. If a different resistor value is to be used to correspond to the transducer's calibration sheet; install the resistor on the rear J1 terminals provided and place the Analog Control Switch 5 to External. Shunt calibration will only activate if the CAL Sense line is connected to the + or – Signal lines on the transducer input connector J2.

For transducers with an internally installed shunt resistor: 1.) Cal Sense should be attached to the transducer's shunt activation connector pin; 2.) External Shunt selected on the Analog Controls; 3.) A shorting wire is to be installed in place of the External Shunt resistor terminals on the rear of the unit.

- (b) Center the Zero and Span potentiometers as needed by rotating the potentiometers fully CW (Coarse is 22 turns, Fine is 25 turns), then reverse direction - CCW (Coarse 11 turns and Fine 13 turns) to obtain mid-authority of the controls. Typically this is done on initial calibration. When recalibrating for minor adjustments this may not be required.
- (c) With mechanical Zero or Balance established at the transducer (transducer "relaxed"); Adjust Wide Zero then Coarse Zero and then Fine Zero for the Zero position reading on the display or the desired analog output signal. Display can be adjusted independently to the analog signal.
- (d) Depress and hold the + CAL button while adjusting the Wide Span, Coarse Span and Fine Span controls, as needed, for precise engineering units reading on the display as determined by the sensor's calibration sheet or other reference data (see Equivalent Input shunt calculation below).
- (e) Repeat Steps (d) and (e) to obtain proper measurement readings since the Gain – Span controls will affect the Zero amplification of the input signal.
- (f) Once completed, if the sensor is going to be utilized in the Negative or CCW mode, depress and hold the – CAL button and adjust the Symmetry control for a proper symmetrical reading of the shunt input as noted on the sensor's calibration data sheet. Note the Symmetry control affects the Negative Span for approx. $\pm 2\%$ of full scale adjustment control.
- (g) Release the Cal button and adjust Zero as needed. Re-install the front panel to the instrument. Minor adjustments and controls are assessable via the front of the unit.

4. CALIBRATION (cont.) – Shunt Calibration Equivalent Calculation

If *dead weight* calibration is not practical and the transducer calibration data is unknown, the *Equivalent Input* value for the factory-installed calibration resistor can be approximated as follows, assuming that the mv/v sensitivity rating of the transducer and the bridge resistance is known.

$$X = \frac{25000 \times R_b}{K \times R_c}$$

Where
 X = Equivalent Input, % of full scale
 R_b = bridge resistance, ohms
 K = transducer sensitivity, mv/v full scale
 R_c = calibration resistance, ohms (59 K installed)

Sample Calculation: Assume that K = 3.000 mv/v for a 5000-pound load cell (full scale) with a bridge resistance of 350 ohms and using the internal 59K Ohm shunt resistor.

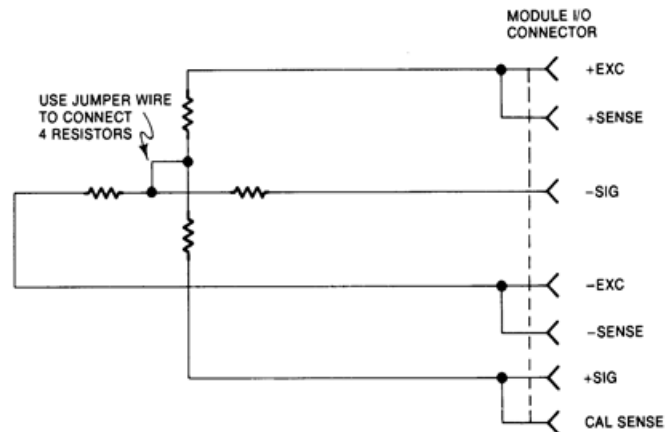
$$\frac{25000 \times 350}{59000 \times 3} = 49.44\% \text{ of full scale} = 2472 \text{ pounds}$$

When + CAL is depressed, input sensor is at zero, display is on the 5000 range, adjust the readout for 2472

Display Calibration The 3770 instrument display has separate adjustment controls that are independent of the analog controls which allow the user to alter the display reading to a value that is suited for the engineering units display reading required. The additional span controls allow the user the flexibility to adjust the display reading as referenced to the analog signal or referenced to the defaulted front panel display dip switches. In a standard – default “OFF” switch position of the Coarse Span control, the display has a full scale reading set by the display range switches of 5000, 10000 or 20000 counts. At the selected reading the full scale analog output signal will be 5 VDC or 10 VDC, as selected by the Analog Controls of the unit. To accomplish the display adjustment change, the user would first set the desired display range and decimal location using the display dip switches, adjust - calibrate the analog output to the desired amplitude level and then adjust the display Coarse and Fine span controls for the required digital readout.

Tech Tip: The inability to balance correctly where the unit output reads totally off scale and the zero controls have no authority can very likely be the result of a damaged or defective transducer or cable. This possibility can be confirmed (or eliminated) by substituting a transducer and cable known to be in good condition or by simulating a balanced transducer, using either a commercially available transducer simulator or the simple *star bridge* arrangement shown below. The *star bridge* simulates a conventional four-arm bridge in an exact condition of balance. To construct a *star bridge* connect four resistors as shown; use 180-ohm resistors to approximate a 350-ohm bridge.

Neither the resistor values nor temperature characteristics are critical. Solder two excitation resistors together, and then solder the two Signal resistors together. Next, connect the two junctions together using a separate wire as shown. There is a good reason for this method of construction, and it should be followed. Connect the substitute or simulated transducer to the module I/O connector using a short 4-wire cable configuration as shown in Figure 4. Attempt to balance the substitute or simulated transducer. If conditions now appear to be normal, the transducer or cable is at fault. If the previous difficulties persist, the meter is at fault.



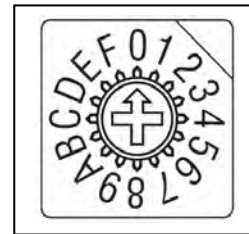
Tech Tip on use of wide range settings for the DC Strain Gage Conditioner

Due to multiple amplifier stages within the 3770 instrument, attention to the proper gain setting and understanding of the sensor inputs should be reviewed to produce a linear- amplified analog output signal and display reading.

The wide span – gain control (as shown in the front panel diagram) has 16 positions to amplify the incoming signal by incremental steps. Each step is positioned so the Coarse and Fine Span potentiometer controls overlap each step to provide a continuous linear gain of the signal from 0.5 mV/V to 10.00 mV/V full scale. Below is a table of each wide gain steps, indicating the nominal low and high input signal range per position – full scale in mV/V to the meter.

Note: When using 5 V excitation, increase the table values by a factor of 2.

Wide Span Position	SPAN-Low mV / V	SPAN-High mV / V
0	3.90	5.80
1	3.30	4.90
2	2.90	4.20
3	2.50	3.60
4	2.10	3.10
5	1.80	2.70
6	1.50	2.30
7	1.30	1.90
8	1.10	1.70
9	1.00	1.40
A	0.84	1.20
B	0.72	1.00
C	0.62	0.92
D	0.53	0.80
E	0.45	0.65
F	0.38	0.58



DC Strain Gage Sensors sensor:

DC Strain Gage Sensors will typically specify their electrical sensitivity in mV/V for traditional foil gage transducers or in mV full scale for semiconductor type sensors; either type will function with the 3770 unit as dictated by the excitation voltage needed along with the full scale output of the sensor. The 3770 has selectable excitation of 5 and 10 Vdc and a maximum specified input of 50.0 mV (with 20% over-range) into the meter. As a reference, the above table can be used as a guide to determine the working full scale range of the transducer during calibration and the proper position of the Wide Span control. Note that additional gain or less gain can be accomplished as needed if an expanded or reduced area of the sensor measurement level is required.

5. FUSE REPLACEMENT

Should you suspect a blown fuse proceed as follows.

WARNING

Installation, operation and maintenance of this instrument must be performed by qualified personnel only. The National Electrical Code defines a qualified person as “one who has the skills and knowledge related to the construction and operation of the electrical equipment and installations, and who has received safety training on the hazards involved.”

- a) Disconnect all power sources and cables connected to the instrument before servicing the instrument.
- b) On the rear panel remove the (2) clamp slide retaining screws and remove the clamp slides from both sides of the instrument. Next remove the (4) corner screws that retain the rear panel to gain access to the instrument.
- c) Open the rear panel and replace the fuse(s) as required , replace only with same type T Slow Blow, 1A, 250V (Littelfuse 218001.HXP, 1 A). The fuseholder wire conductors are appropriately labeled “L” for Line and “N” for Neutral on both halves of each of the fuseholder wires. When reassembling the fuseholder(s) make sure “L” and “L” are connected together and “N” and “N” labeled wires are connected together properly.
- d) Mate the rear panel to the enclosure and replace the clamp slides back in position and secure the clamp slides with the (2) screws previously removed from the instrument. Next, replace the (4) corner screws to secure the rear panel and ensure that all screws have been adequately tightened.
- e) Power ON the instrument with the appropriate power cord and verify the instrument is functioning properly before reconnecting the instrument to your installation.

WARNING

For continued protection against risk of fire or shock replace only with the same type and rating of fuse.

ADVERTENCIA

Para la protección continua contra el peligro de incendio o descarga, cambie sólo por fusibles del mismo tipo y capacidad nominal.

AVERTISSEMENT

Pour assurer une protection continue contre les risques d’incendie ou de choc, ne remplacez que par un fusible du même type et de la même valeur nominale.

WARNUNG

Zum anhaltenden Schutz gegen Brand oder einen elektrischen Schlag nur gegen eine Sicherung desselben Typs und mit demselben Nennwert austauschen.

WARNING

Do not replace fuse again if failure is repeated. Repeated failure indicates a defective condition that will not clear with replacement of the fuse. Refer condition to a qualified technician.

ADVERTENCIA

No reemplace el fusible nuevamente si se repite la falla. La repetición de las fallas indica una condición defectuosa que no se subsanará con el cambio del fusible. Acuda a un técnico calificado para evaluar la condición.

AVERTISSEMENT

Ne remplacez pas le fusible une nouvelle fois si la défaillance se répète. Une défaillance répétée indique une condition défectueuse qui ne disparaîtra pas avec le remplacement du fusible. Consultez un technicien qualifié.

WARNUNG

Die Sicherung nicht erneut austauschen, wenn der Fehler noch einmal auftritt. Ein wiederholtes Auftreten des Fehlers weist auf einen Defekt hin, der sich nicht durch Austauschen der Sicherung beheben lässt. Den Defekt einem qualifizierten Techniker mitteilen.

DC Strain gage Panel Meter 3770

Product Warranty and Repair

Daytronic Corporation warrants its products to be free from defects in material and workmanship, under normal and proper use in accordance with our instructions, for the period of time specified below. Our liability under such warranty or in connection with any other claim relating to the products shall be limited to, at our option, the repair or replacement of any products or parts or components thereof which are returned to us freight prepaid and which are defective in material or workmanship or the refund of the purchase price to the Buyer.

ANY PRODUCT FOUND TO BE DAMAGED THROUGH CUSTOMER NEGLIGENCE OR MISUSE MAY BE EXCLUDED FROM ANY AND ALL POLICIES CONTAINED IN THIS DOCUMENT.

ALL EQUIPMENT TO BE REPAIRED OR REPLACED UNDER WARRANTY MUST BE RETURNED TO THE FACTORY. Before returning a product or products for any reason, the customer must call **Daytronic Customer Support Services** at **(937) 866-3300** to request a *RETURN MATERIAL AUTHORIZATION (RMA)*. Once the customer has provided the necessary information and has been assigned a specific RMA, the product(s) in question may be returned to Daytronic by shipping it

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