INSTRUCTION MANUAL FOR MODEL 7530-115 AND 7540-115

IM 352

TABLE OF CONTENTS

DESCRIPTION

The Model 7530--115 and 7540-115 Digital Strain Gage Indicators are designed to provide digital and analog readouts from a wide variety of strain gage transducers.

Unless otherwise specified when ordered, This indicator has not been set up to operate with a particular transducer. The calibration of this indicator with a particular transducer should be done by the user before each use and whenever different transducers are connected to it.

It is recommended that the user thoroughly read this manual, paying particular attention to the installation, set up and operation, and set up example sections prior to attempting to use this indicator.

The Model 7530-115 and 7540-115 Strain Gage Signal Conditioners are basically a combination of constant voltage power supplies, amplifiers, filters, and digital conversion and display circuitry. The indicator supplies balanced voltage to the transducer. We call these balanced voltages "+" and "-" excitation.

The output from the the strain gage transducer is typically a very low level signal on the order of 30 millivolts, or less. We label this signal as "+" and "-" signals. The difference between these signal levels is in direct proportion to the amount of load or torque sensed by the transducer and is commonly referenced to the excitation voltage. In this way the amount of force applied to the transducer produces a certain number of millivolts signal per volt of excitation supply.

This signal is amplified and filterd by the indicator and then converted to a digital display which can be set by the user to read directly in engineering units (IE: FT. LBS., IN. OZ.....ETC.) by adjusting the gain of the instrument.

These indicators are useful when readings of speed (RPM) and work (Horsepower and Kilowatts) are required in addition to readings of torque.

The RPM signal is usually taken from a magnetic or Hall Effect sensor mounted on the torque sensor housing. Each time a gear tooth passes by the sensor a current is induced in the RPM sensor and conveyed to the indicator. This signal is converted by the indicator to an accurate square wave at a frequency proportional the the speed of the torque shaft. The square wave is then converted to a DC level, filtered and converted to a digital indication.

The horsepower signal is derived from the RPM signal, in it's square wave form, and the torque signal, in it's analog form, as inputs to a multiplexer. The multiplexer samples both inputs and gives us output that consists of a wave form at at DC level. This is converted to a DC voltage, filtered and coverted to a digital indication.

To insure that the readings on the display and the analog output are accurate it is necessary for the user to calibrate each function (Torque, RMP, and HP) for the particular transducer being used. speed the system will be used at, and required HP reading resolution.

For the Model 7530-115 and 7540-115 the calibration procedure is identical. The only difference lies in the identification and location of the "-CAL" symmetry and torque analog output controls.

NOTE: Please inspect this indicator and thoroughly check it's operation. If any defects are noted within the first 12 months of use, please contact the factory.
DO NOT ATTEMPT REPAIR AS THIS WILL VOID THE WARRANTY!

APPLICATIONS:

This indicator can be used with virtually any strain gage bridge capable of being operated with 5, 10, or 20 volts DC (7530) or 5 volts AC RMS at 3.28 KHz (7540). The instrument will accept, and display, full scale tranducer outputs from slightly less the .5 mV/V to 7 mV/V for a full scale indication. In addition, zero offsets of 100%, depending on the output of the transducer, can effectively be balanced out with the front panel zero controls for a display of zero. Strain gage bridge resistances of 85 to 1000 ohms are readily accepted by these instruments. When using these instruments with multiple transducers whose bridge resistances are less than 85 ohms the transducers or the instrument could be damaged by high current.

The Model 7530 is based on a DC excitation system and offers a number of advantages such as excellent frequency response and over all simplicity of operation. There are however some precautions which should be observed in order to assure dependable instrument readings with any DC system.

Effects which can influence DC systems to varying degrees include thermocouple voltages, galvanic voltages, homopolar voltages, if noise, and various stray AC pickup voltages. Care should be exercised in initial installation in many systems to minimize these effects.

The Model 7540 is based on an AC Carrier Type Excitation Supply. The single most important advantage to using a carrier type system over a DC system is the ability of the carrier system to operate at higher sensitivites while rejecting electrical noise which may be present on the signals.

Again,some precautions must be observed if the advantages of the carrier system are to be fully realized. The most commn source difficulty occurs in the cabling system. It is extremely important that the cable conform to specifications outlined in this manual.

Failure to use recommended practice could degrade overall system performance.

For most sensors (other than Lebow 1600 and 1800 series sensors), where the temperature is reasonably constant and cable length will be 20 feet or less, a four wire cable system can be used with good results. For applications where longer cable length is required or where substantial temperature variations occur, an eight wire cable system is recommended. More importantly, in systems that depend on using shunt calibration techniques, the 8 wire system should be used as it is virtually free of shunt calibration errors caused by voltage drops across the cable.

Bear in mind that if the instrument was supplied as part of a calibrated system with a tranducer and shunt calibration resistor and it is necessary to change the system cable length, then the eight wire system must be used to assure valid transfer of calibration data.

INSTALLATION

SAFETY INFORMATION: Your instrument is designed to operate from a single phase power source with one of the current carrying conductors (The Neutral Conductor) at earth ground protential. Operation from power sources where both current carrying conductors are live, with respect to ground, is not recommended since only the line conductor has over current protection inside the instrument.

A three conductor power cord with a polarized plug is supplied for connection to the power source and safety earth ground. The ground terminal of the plug is connected directly to the chassis of the instrument. To maintain electric shock protection this plug should only be connected to a power outlet that is properly grounded to earth.

LOCATING AND MOUNTING: The model 7530-115 and Model 7540-115 are "Half Rack" size and can be adapted to a variety of mounting configurations such as:

1) A Bench Top Instrument. The standard unit is equipped with a swing away bail bar and feet which hold the instrument at a convenient viewing angle when the bar is locked down.

2) A Dual Bench Top Unit when mounted together side by side with another instrument. In this configuration, when factory ordered, it is equipped with a full length swing away bail bar.

3) A Dual Rack Mount Unit that may be installed in a standard 19 inch instrument rack panel.

NOTE: Rack mounting plates may be easily installed by removing the normal side plates. The hardware is captive to simplify this change. In addition, the mounting feet may be easily removed for installation in a rack panel.

CAUTION: Rack mounted instruments will withstand normal shock and vibration incident to such use, but rack mounted instruments should not be shipped in a rack unless bracing is provided to support the instrument chassis.

ENVIORNMENT: The 7530-115 and 7540-115 are intended to be used in controlled enviornments such as those found in laboratories. Ambient temperature changes during use may cause some shift in readings. Conditions of extreme humidity, corrosive atmospheres, and restricted ventilation should be avoided to assure longer instrument life and prevent permanent damage to the instrument.

POWER AND GROUND

POWER

Either 120 or 240 VAC 50/60 HZ power is required to operate this instrument. The instrument is set for 120 VAC operation as shipped from the factory, though it may be easily converted to 240 VAC operation following this procedure.

1) Remove the line cord from the power socket at the rear of the instrument.

2) Slide the clear plastic cover to the left.

3) Remove the fuse by pulling the Fuse Puller lever out and to the left.

4) Remove the voltage program printed circuit card by engaging the hole in the center with a pointed instrument, such as a ball point pen, and prying outward.

5) Turn the card over and re-insert so that the 240 volt marking is facing up.

6) Replace the fuse, slide the plastic cover to the right, and install the line cord.

GROUND

A high quality earth ground is needed for proper operation of this instrument. Many obscure problems in equipment of this kind can be traced to poor or inadequate grounds. Fortunately this instrument will function well with only a modest ground such as provided by most wall receptacles.

SOME PRECAUTIONS TO OBSERVE:

1) Insure the ground pin on the power plug is terminated. (If the wall plug does not have a ground pin and a three wire to two wire adapter is used, then the ground wire must connected to a good ground).

2) Avoid power receptacles that have a high inductive load connected to them. Transients generated by this type of load can cause unstable readings in the instrument.

3) Use an isolation transformer or an additional line filter on power lines with high transient voltages (SPIKES).

TRANSDUCER CONNECTIONS:

Various cable options are described below and schematics of each are on page 8. These transducer connection drawings should be studied carefully. Whichever wiring system is selected, all connections must be carefully soldered and then inspected for possible shorts between adjacent pins. Use of shielded wire is essential. Shield drain wires should be twisted together and connected as shown.

Use cable that has twisted shielded pairs of wires. Wire should be stranded AWG 22.

The user should review the three following cable options and decide which is most appropriate for his installation.

FULL BRIDGE, 4 WIRE:

Ideal where cable lengths of 20 feet or less are used under reasonably controlled temperatures. Note, however, that assurance of optimum accuracy requires the use of the full 8 wire cable system and that all performance specifications are based on the use of an 8 wire system. The jumper connections must be completed in the connector at the instrument.

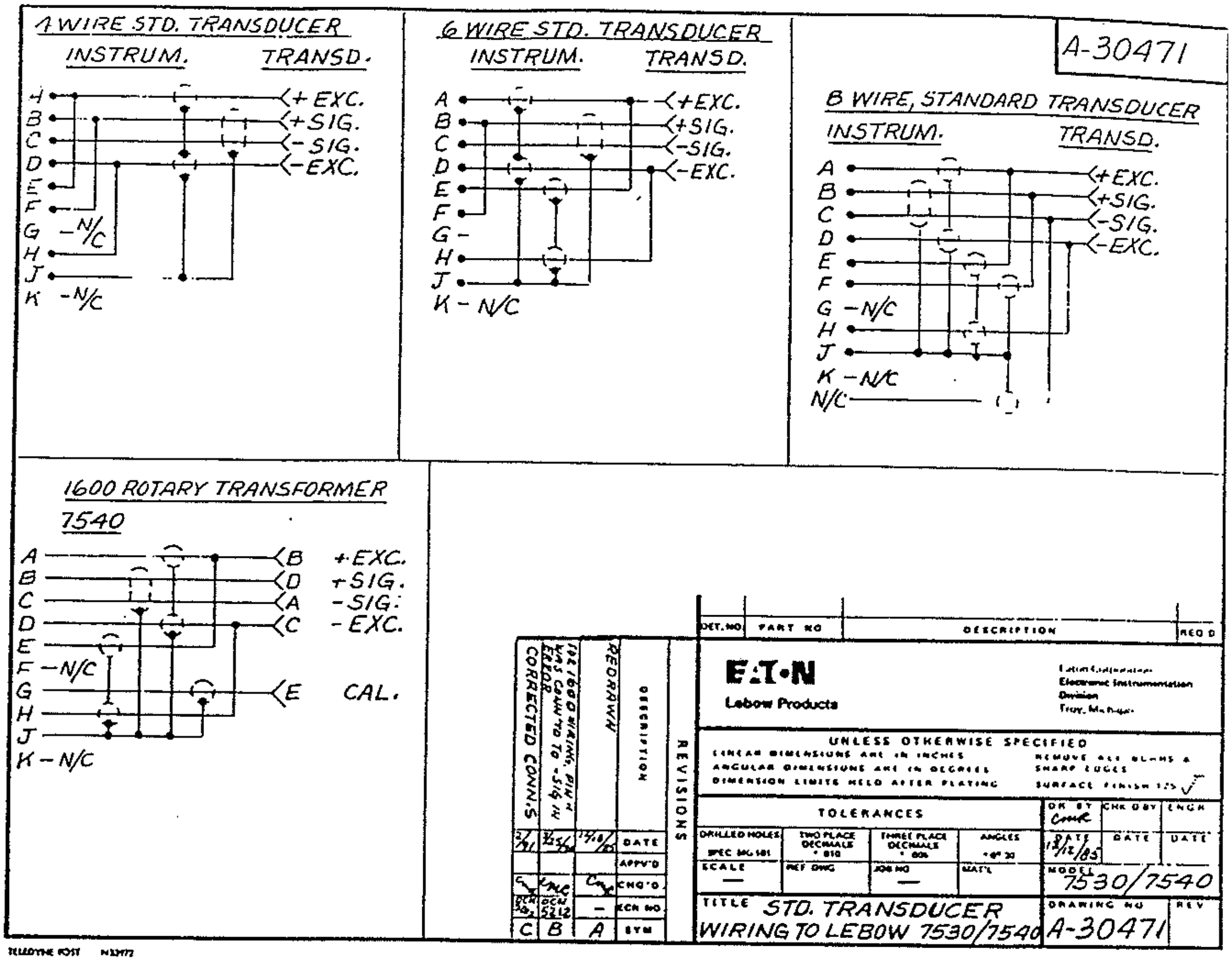
FULL BRIDGE, 6 WIRE:

This system includes a pair of non-current carrying remote sensing leads which allow determination of the precise excitation voltage at the transducer bridge. Using only a 4 wire system the excitation sensing must be done through the current carrying excitation leads. With long cable lengths the lead resistane can be appreciable and a significant voltage drop can occur. If the cable resistance or current changes with change in temperature or gage, a variation in the excitation voltage is created which the instrument cannot detect and erroneous reading result.

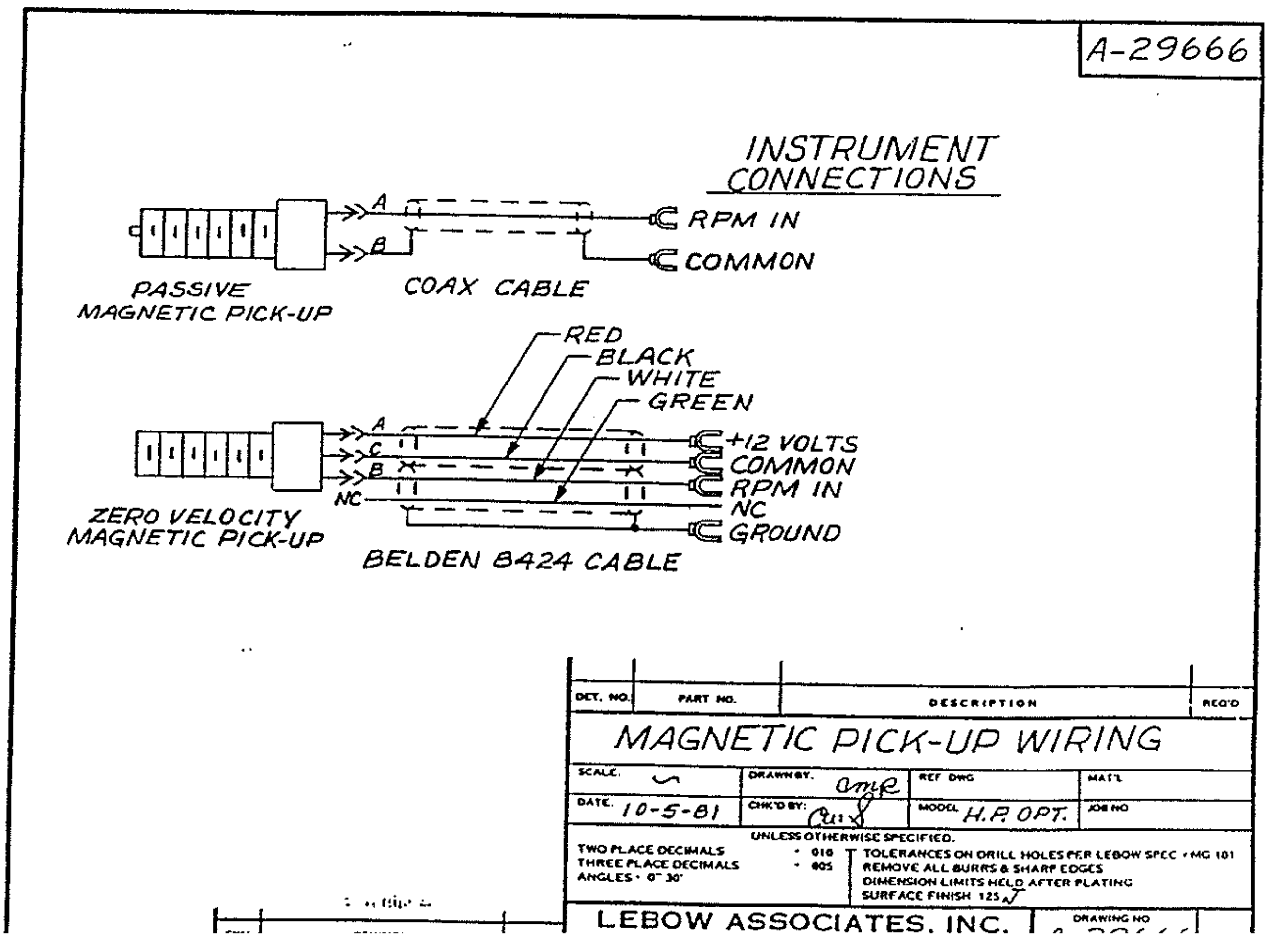
FULL BRIDGE, 8 WIRE

This system adds a seventh wire which is used for the purpose of shunting one arm of the bridge with the calibration resistor without having to make use of a signal lead. An eighth wire is added to balance capacitive loading in the cable. Using the 4 wire or 6 wire system, the current drawn by the shunt calibration resistor, located at the instrument must flow through one of the signal leads creating an additional voltage drop which is additive to the signal, and hence, created an error in reading during the calibration procedure. Although the effects are small, when it is considered that the instrument is resolving a few micro-volts per digit, it can be seen that the error can be considerably larger than the combination of all other instrument errors, particularly if the cable length is significant.

The effect of the error causes the equivalent input value of a particular calibration resistor to become a function of the cable length of cable resistance. It is important to note that the effect is on the calibration only and not on measurement during normal operation. If the system is calibrated (and the calibration resistor determined) with the particular cables in place, it is acceptable to associate the calibration resistor with the particular transducer and cable, then the seventh amd the eighth wire are not necessary. If the transducer, however, was calibrated at another location using an eight wire system and it is necessary to make a valid transfer of the calibration to a new installation with the same cable length then it is necessary to use the eight wire system.



A-30471
4 WIRE STD. TRANSDUCER
INSTRUM.
TRANSD.
A
B
C
D
E
F
G -N/C
H
J
K -N/C
+EXC.
+SIG.
-SIG.
-EXC.
6 WIRE STD. TRANSDUCER
INSTRUM.
TRANSD.
A
B
C
D
E
F
G -
H
J
K - N/C
+EXC.
+SIG.
-SIG.
-EXC.
8 WIRE, STANDARD TRANSDUCER
INSTRUM.
TRANSD.
A
B
C
D
E
F
G -N/C
H
J
K -N/C
N/C
+EXC.
+SIG.
-SIG.
-EXC.
1600 ROTARY TRANSFORMER
7540
A
B
C
D
E
F -N/C
G
H
J
K - N/C
B +EXC.
D +SIG.
A -SIG.
C -EXC.
E CAL.
DET. NO.
PART NO.
DESCRIPTION
REQ'D
EATON
Lebow Products
Eaton Corporation
Electronic Instrumentation Division
Troy, Michigan
UNLESS OTHERWISE SPECIFIED
LINEAR DIMENSIONS ARE IN INCHES
ANGULAR DIMENSIONS ARE IN DEGREES
DIMENSION LIMITS HELD AFTER PLATING
REMOVE ALL BURRS & SHARP EDGES
SURFACE FINISH 125
TOLERANCES
DRILLED HOLES SPEC MG 101
TWO PLACE DECIMALS ±.010
THREE PLACE DECIMALS ±.005
ANGLES ±0° 30'
DR BY
CHK D BY
ENGR
DATE 12/12/85
SCALE —
REF DWG
JOB NO —
MAT'L
MODEL 7530/7540
TITLE STD. TRANSDUCER WIRING TO LEBOW 7530/7540
DRAWING NO A-30471
REV
REVISIONS
DESCRIPTION
REDRAWN
1600 WIRING, PIN 4 WAS CONN TO -SIG IN ERROR
CORRECTED CONN'S
DATE
APPV'D
CHG'D
ECN NO
SYM
A
B
C
TELEDYNE POST



A-29666
INSTRUMENT CONNECTIONS
A
B
RPM IN
COMMON
PASSIVE MAGNETIC PICK-UP
COAX CABLE
RED
BLACK
WHITE
GREEN
A
C
B
NC
+12 VOLTS
COMMON
RPM IN
NC
GROUND
ZERO VELOCITY MAGNETIC PICK-UP
BELDEN 8424 CABLE
DET. NO.
PART NO.
DESCRIPTION
REQ'D
MAGNETIC PICK-UP WIRING
SCALE
DRAWN BY
REF DWG
MAT'L
DATE 10-5-81
CHK'D BY
MODEL H.P. OPT.
JOB NO
UNLESS OTHERWISE SPECIFIED
TWO PLACE DECIMALS ±.010
THREE PLACE DECIMALS ±.005
ANGLES ±0° 30'
TOLERANCES ON DRILL HOLES PER LEBOW SPEC MG 101
REMOVE ALL BURRS & SHARP EDGES
DIMENSION LIMITS HELD AFTER PLATING
SURFACE FINISH 125
LEBOW ASSOCIATES, INC.
DRAWING NO

ROTARY TRANSFORMER CABLING (7540-115 ONLY)

All of the preceding information concerning cabling systems applies to the Rotary Transformer Sensor with one exception. Rotary Transformers Sensor use a slightly different shunt calibration method.

The Model 1600 series has the calibration resistor located within the sensor. One lead of the resistor is brought out through the cable and is connected to either plus or minus excitation by the front panel calibration switches. The calibration resistor mounted on the rear panel of the indicator is bypassed and not used, so it may be left in place.

This wire connecting the sensors internal calibration resistor must be shielded independently of all other wires and the shield terminated at the 7540-115 instrument.

The model 1800 series does not use an internal calibration resistor and cannot be shunt calibrated in the normal nanner. In most cases these sensors are calibrated using the Model 7927 calibrator which is installed between the instrument and the sensor cable. Refer to the Model 1800 series instruction manual for more detailed information.

HALF BRIDGE USE:

If Half Bridge operation is desired it will be necessary to complete the other half of the bridge. This can be done by installing resistors at, or near, the active legs of the bridge.

The resistor chosen must be of high quality such as a noninductive wire-wound type. A resistance of 1000 Ohms may be used regardless of the resistance of the strain gage. It must be carefully matched within one Ohm or less. If this is not done, the zero control of the instrument may not be able to balance out the circuit. A one half watt size will be adequate.

Do not use composition resistors. Even though they may be matched, their temperature coefficient could cause serious drift problems and should be avoided for this reason.

<u>PRELIMINARY</u> <u>SET</u> <u>UP</u>:

REQUIRED MATERIALS:

A) Manual for the transducer being used. (This includes the cal values and the shunt cal resistor. Shunt cal resistor is not included with 1600 series and model 1800 series manuals).

B) Adjustment tool (Included with manual).

C) Number 2 phillips head screwdriver (To remove top panel).

D) Normal hand tools and soldering iron (No larger than 35 Watts)

PROCEDURE:

1) Connect the torque transducer to the indicator using a cable wired to one of the configurations in drawing A-30471 on page number 8.

2) Connect the speed sensor to the RPM input terminals on the indicator rear panel using a cable wired to a configuration on drawing A-29666 on page number 8.

3) Install the shunt calibration resistor (supplied with the torque transducer manual) on the "R CAL" terminals on the instrument rear panel. (Model 1600 series use internal shunt cal network, no resistor is required).

4) Remove the instrument top cover.

5) Check to ensure instrument is programmed for proper line voltage.

6) Check to ensure instrument excitation voltage is properly selected for the transducer being used. (7530 Only) see figure 3 for switch location. (Use the 5 volt position when using transducers with 85 to 120 ohm bridges.).

7) Connect the line cord to the indicator and turn on power.

8) Allow indicator to warm up 15 to 30 minutes before proceeding with set up.

SYSTEM CAPABLILITIES AND SET UP EXAMPLES:

The Digital Display has a full scale limitation of 1000. If the full scale number for Torque, RPM, or HP is higher than 1000 it will be necessary to use a multiplication factor for that function. This factor is set in by choosing a series of rocker switches on the digital panel meter circuit board inside the instrument.

Each function has its own set of four rocker switches that control multiplication factors for that function only. This function affects the digital display and has no effect on the analog outputs.

Each function has a 0 to 1 volt DC output available on the rear panel of the instrument. One volt represents a full scale indication for each function regardless of what the actual full scale values are in engineering units.

Each function has its own switch to select decimal points that essentially divide the displayed value by factors of ten. This coupled with multipliers, can be used to increase the resolution of displayed values. (See figure #3 for location of decimal and multiplier switches. For the torque function the multiplier switches are numbered 1 through 4 on switch S-2. RPM multiplication factors are set using switches 5 through 8 on switch S4. Horsepower multiplication factors are set using switches 1 through 4 on switch S4.

For each set of switches the switch setting combinations are the same for the same multiplication factors. In each set of switches the combinations should be as follows to effect the needed multiplication factor. (Zero indicates switch off, one indicates switch on).

MULTIPLICATION	SWITCH COMBINATION
X1	0000
X2	0001
X4	0010
X5	0011
X10	1000
X20	1001
X40	1010
X50	1011

The correct factor to use for each function is determined by the maximum possible indication in each function. For instance, when reading Torque or Load:

MAXIMUM LOAD	USE MULT.	DISPLAY STEPS
0 - 1,000	No. Mult	ONES
1,000 - 2,000	X2	TWOS
2,000 - 4,000	X4	FOURS
4,000 - 5,000	X5	FIVES
5,000 - 10,000	X10	TENS
10,000 - 20,000	X20	TWENTIES
20,000 - 40,000	X40	FORTIES
40,000 - 50,00	X50	FIFTIES

When reading speed (or RPM):

RPM CAL	USE MULT.	DISPLAY STEPS
0 - 1,000	No Mult	ONES
1,000 - 2,000	X2	TWOS
4,000 - 4,000	X4	FOURS
5,000 - 10,000	X5	FIVES
10,000 - 20,000	X20	TENS
20,000 - 40,000	X40	FORTIES
40,000 - 50,000	X50	FIFTIES

Since HP is a function of both RPM and Torque, the necessary Cal settings will be determined by the degree of accuracy required and the maximum Torque and RPM values expected.

Essentially, when maximum HP values fall below 50 it will be necessary to use a X2 multiplier factor to allow the display to be set to the nearest HP. Horsepower values between 50 and 1000 can be set using the HP Span Controls and turning off any multiplier, provided accuracy is only required to the nearest HP.

When accuracy is required to the nearest tenth or hundredth of a HP it will be necessary to use a combination of decimal point and multiplier.

An example of this would be to assume a Torque cal number of 1000 in. lbs. and an RPM Cal number of 5000.

This yields a HP cal number of 79.334.

If we only wish to read to the nearest HP, the HP multiplication and decimal point can be turned off and the HP Span Controls set so the display reads 79 when calibrating.

If we wish to read to the nearest tenth of a HP, then select one decimal place on the HP display and adjust the Span Controls for a display reading of 79.3 when calibrating.

If we wish to read HP in hundredths then it will be necessary to use a multiplier and a decimal point selection. Since the display is limited to 1000 counts normally and out Cal number is 79.33, we would select a X10 factor and two decimal places so that a full scale reading would be 100.00.

In this case it would cause the display to increment in steps of .10. This would yield information no better in resolution than the set up used to read to the nearest tenth of a HP. So in this case the readings could be no better than the nearest tenth.

For many applications where HP readings are lower it is possible to get readings in the hundredths using different combinations of multipliers and decimal points.

SCALE CONVERSION

The Torque Display is also capable of performing mathematical functions to convert from one enginieering unit to another, such as inch pounds to foot pounds, without calculating the current value and then changing the display by readjusting the span controls. This type of conversion is done by selecting certain sequences of switches 5 through 8 on switch S-2 on the Digital Panel Meter Circuit Card. (See Figure 3 for switch location).

The following conversions are possible with the indicated switch sequence selection. (Zero indicates switch off; one indicates switch on).

CONVERSIONS	SWITCH # 5	6	7	8
LB. to Newton	0	0	0	1
Newton to LB.	0	0	1	0
LB. to KG.	0	0	1	1
KG. to LB.	0	1	0	0
NM. to LB. FT.	0	1	0	1
LB. FT. to NM.	0	1	1	0
NM. to LB. IN.	0	1	1	1

LB. IN. to NM.	1 0 0 0
KGM. to LB. FT.	1 0 0 1
LB. FT. to KGM.	1 0 1 0
LB. FT. to LB. IN.	1 1 0 0
LB. IN. to LB. FT.	1 0 1 1
LB. FT. to OZ. IN.	1 1 0 1
OZ. IN. to LB. FT.	1 1 1 0
NO CONVERSION	1 1 1 1

Selecting the scale conversion will mulltiply the previously displayed value by the appropriate factor to display a value in the desired engineering units.

Usually, it will not be necessary to use this control if readings are desired in the same units as those of the calibration information supplied with the transducer. If readings are desired in other than inch pounds or pounds then it is recommended that the display first be set to read the calibration values supplied with the transducer and then select the desired conversion factor to convert the calibration value to the desired units.

The following examples are intended to illustrate some typical applications and set up procedures.

NOTE: The calibration numbers used in these examples are hypothetical and are for illustration only.

Torque calibration values for actual set up should be those values in the manual for the transducer. RPM and HP values for calibration will have to be selected depending on the particular application.

It is recommended that the following examples be reviewed prior to actual system set up.

<u>SET UP EXAMPLE</u>

Example #1 - Find the horsepower curve of a 1 HP electric motor as load is applied in even increments.

GIVEN: RPM AT NO LOAD = 3600
RPM PICK UP GEAR = 60 TOOTH
RATED HP = 1 HP

TORQUE SENSOR RATING = 100 IN. LBS.

SET UP:

1) Turn on instrument and allow at least 15 minutes warm up time.

2) Mechanically decouple either end of Torque Sensor from the drive line.

3) TORQUE CALIBRATION

A) Remove the top cover from the instrument and set torque filter select swtich (on bottom board) to 4 HZ. position. Set analog out/in switch to "IN~ position. Select Torque Display on the front panel.
B) Set torque decimal select switch to position #3 so display indicates 0.
C) Set display to read .0 In. Lbs. using the coarse and fine torque zero controls on the front panel.
D) Consult torque sensor manual for the positive shunt calibration number. (Assume, in this example, it is 71.5 In. Lbs.)
E) Press, and Hold, "+ CAL" Button in and adjust the coarse and fine torque zero controls so the display reads 71.5.
F) Release "+ CAL" switch and check zero setting. If not zero (.0) then repeat steps C and E.

4) RPM CALIBRATION

A) Select RPM display
B) Set "RPM frequency range" switch on HP/RPM circuit board to 1K-10HZ. (Position #2).
C) Set "RPM CALIBRATION FREQUENCY SELECT" switch on HP/RPM circuit board to 5 KHZ. (Postion #4.)
D) Set RPM multiplier on digital board for X5 multiplication. (Switch S-4B; #7 and #8 on).
E) If display does not read zero, adjust potentiometer P-6 on the HP/RPM board (RPM ZERO CONTROL) For a display indication of Zero.
F) Press and hold "R CAL" switch on the front panel.
G) Adjust coarse and fine RPM Span Screwdriver controls on front panel for a display indication of 5000.
H) Release "R CAL" switch and check zero setting. If display is not zero, then repeat steps D through G.

5) HORSEPOWER CALIBRATION:

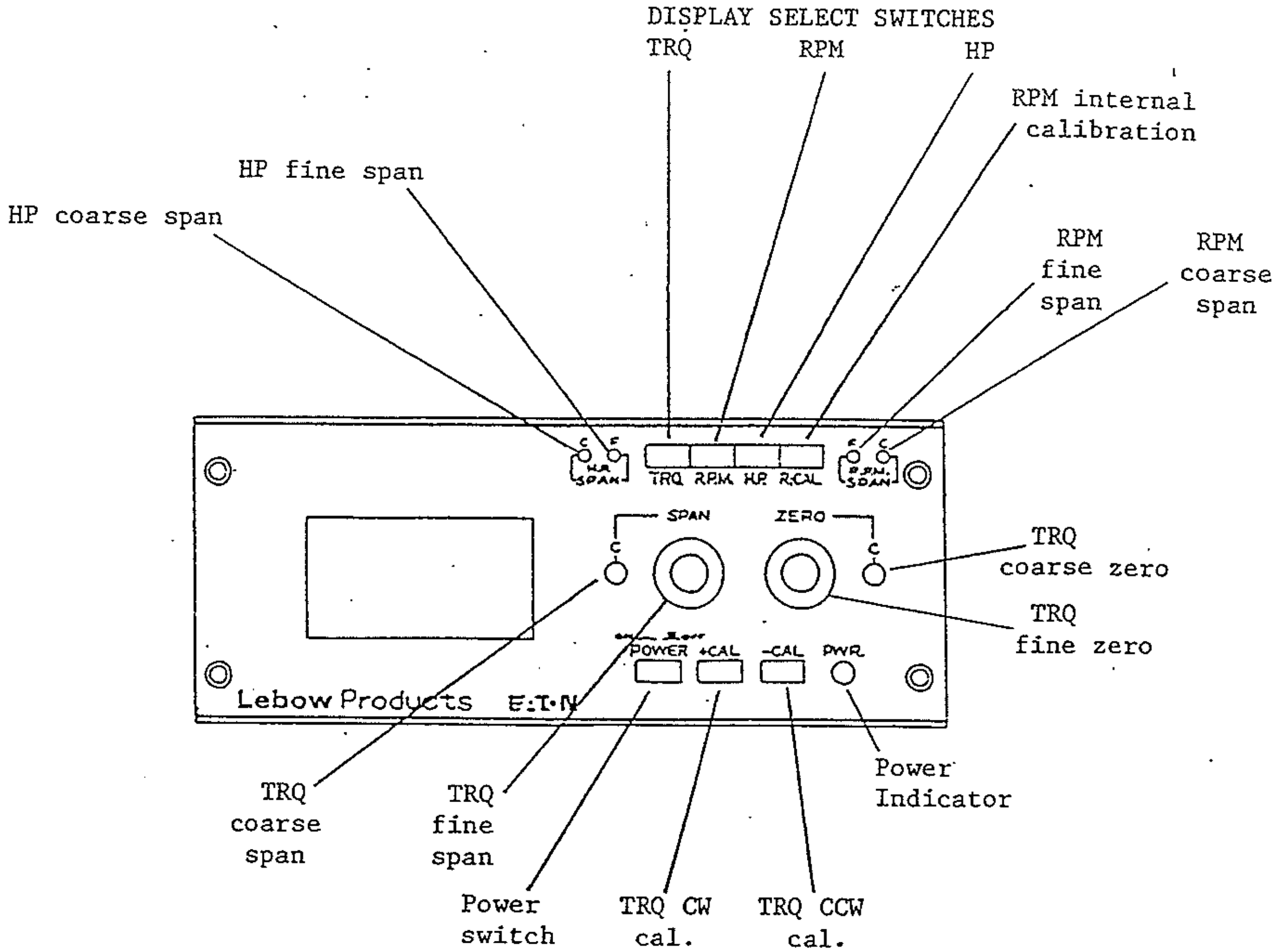
A) Calculate HP reading by using 71.5 IN. LBS. Torque calibration number and 5000 RPM calibration number in the following formula:

HP CAL # = TORQUE CAL # (IN. LBS.) X RPM CAL # / 63024

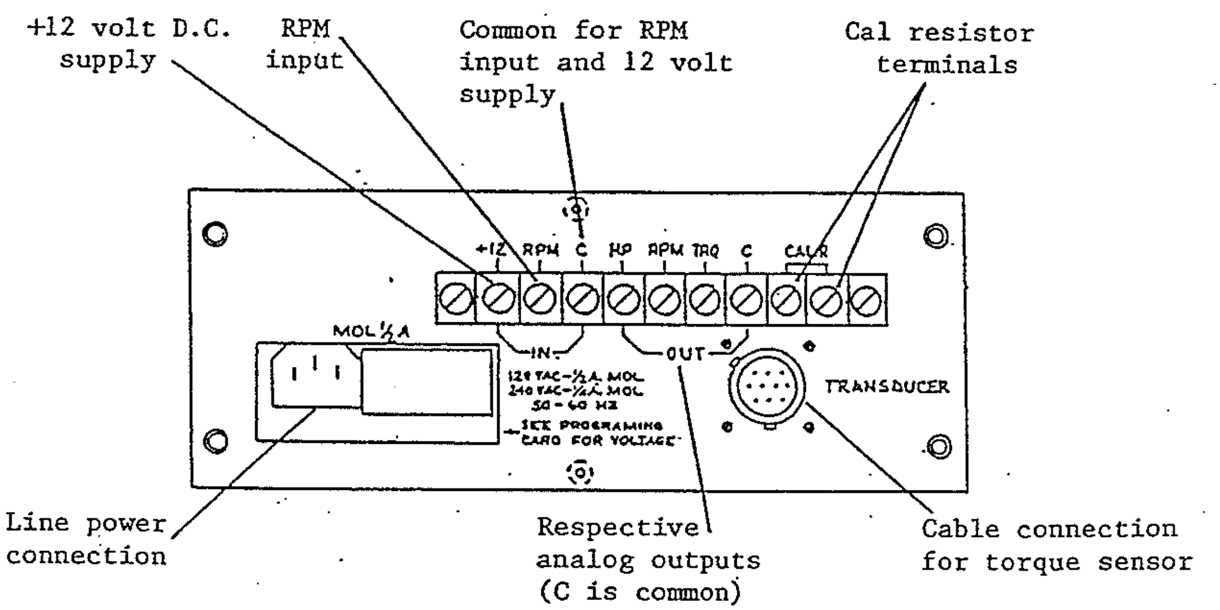
The calibration number for HP in this example is:
71.5 x 5000 / 63024 = 5.672

B) Select HP Display
C) Use HP Decimal Select Switch on the Digital Board to select two decimal places. Display indicates ".00".
D) Insure no multiplicatiion is selected for HP Multiplier on digital board. (S4-A switches 1-4 off).
E) If display does not indicate Zero with no torque or RPM inputs, then adjust Potentiometer P-8 on the HP/RPM board (HP ZERO CONTROL) for a display of ".00".

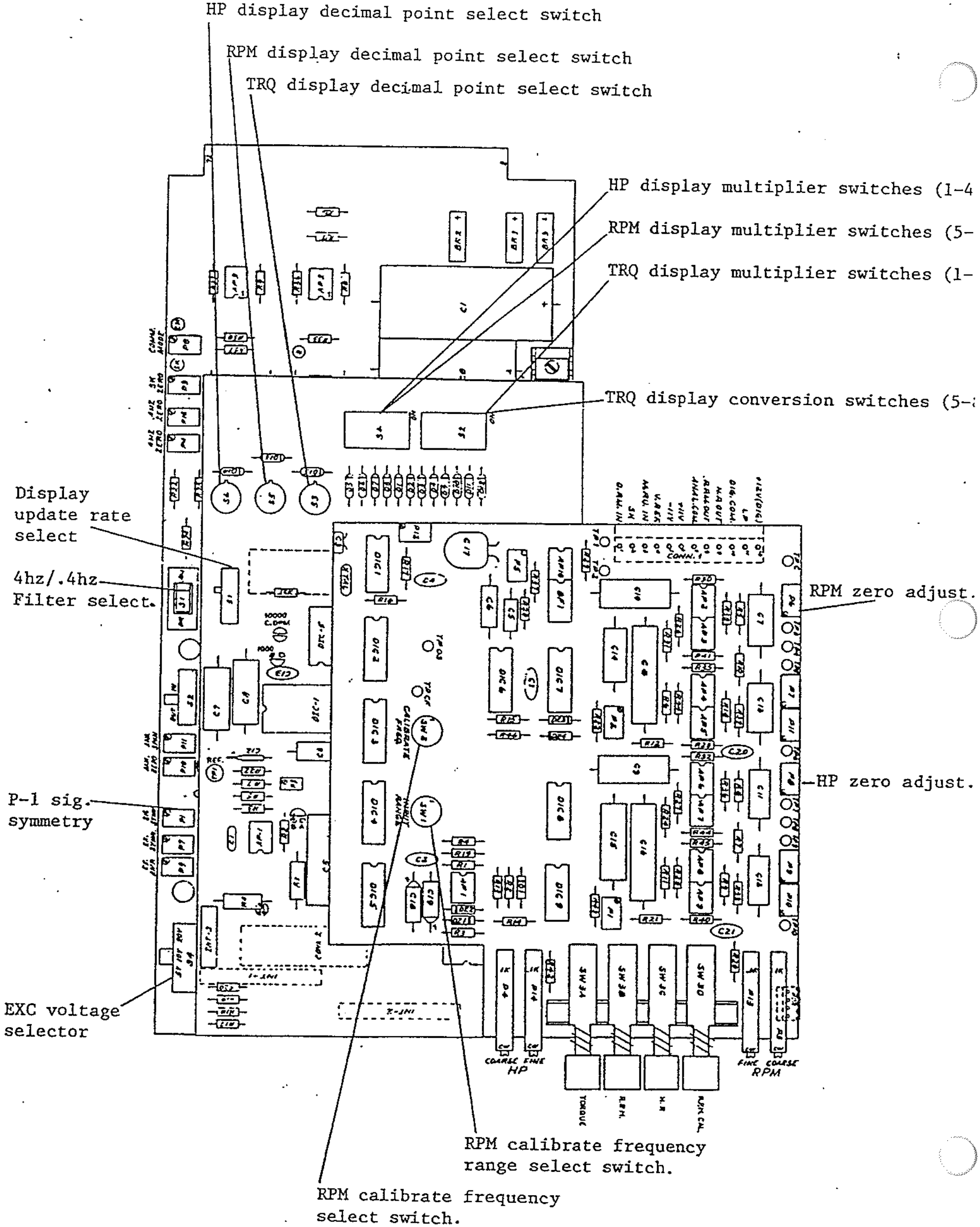
F) Recheck both torque and RPM calibration values to insure they are set correctly.
G) Press and hold both "+ CAL" and "R CAL" buttons on front panel.
H) Adjust HP Span Controls on front panel for a display indication of "5.67".
I) Release "CAL" and "R CAL", and check Zero setting. If display is not zero repeat step E through H.



MODEL 7530-115 & 7540-115 FRONT PANEL LAYOUT
FIGURE #1

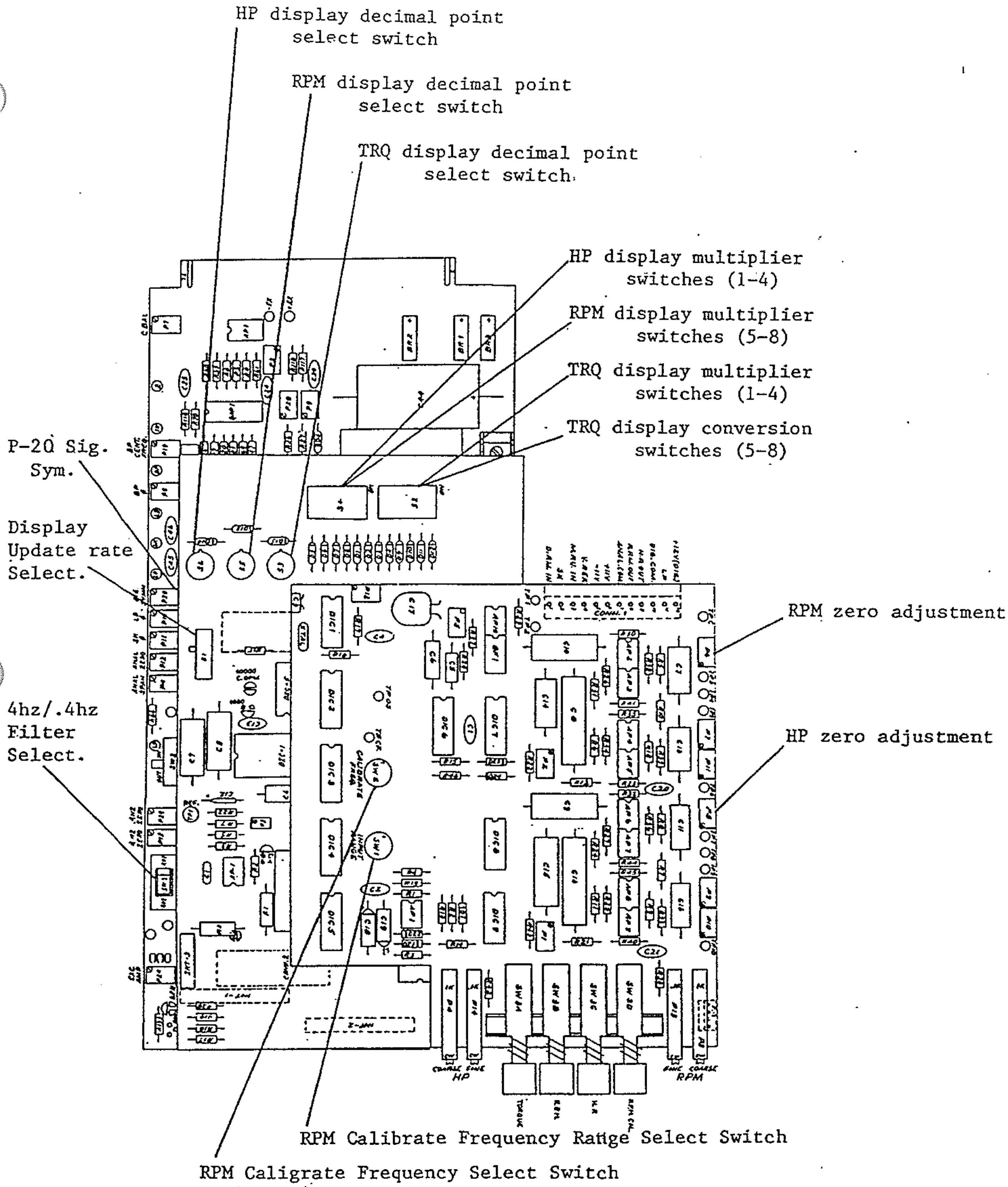


MODEL 7530-115 & 7540-115 REAR PANEL LAYOUT
FIGURE #2



TOP VIEW OF MODEL 7530-115

FIGURE #3



<u>TOP VIEW OF MODEL 7540-115</u>
<u>FIGURE #4</u>

6) CONNECT ANALOG OUTPUTS

A) The analog outputs for each function can be connected to a recording instrument to plot HP curves and peak torque and full load RPM values.

NOTE: Remember that these voltages are limited to 1 Volt DC Maximum.

7) REINSTALL TOP COVER AND PROCEED TO TEST.

Example #2 - Find the efficiency curve of an automatic transmission. This requires the use of two torque sensors and readout instruments. One is used to sense the input Torque and RPM and the other is used to sense output and RPM.

GIVEN: Input shaft maximum RPM = 2400
Output shaft maximum RPM = 2750
Input shaft maximum HP = 195
Output shaft maximum HP = 155
Input shaft torque sensor rating = 10,000 In. Lbs.
Output shaft torque sensor rating = 15,000 In. Lbs.

1) Turn on instrument and allow at least 15 minutes warm up time. Install the Shunt Cal Resistor supplied with the Torque Sensor.

2) Decouple either end of both Torque Sensors from the drive line.

3) TORQUE CALIBRATION (INPUT SHAFT):

A) Remove top cover from instrument connected to input shaft sensor.
B) Select torque display on front panel.
C) Set torque multiplier switches on digital board for X10 multiplication. (Switch S2-A, #1 on).
D) Set display to read zero using the coarse and fine torque zero controls on the front panel.
E) Consult the torque sensor manual for the positive shunt calibration number. (Assume, in this case, it is 7,150 In. Lbs.).
F) Press, and hold, "+ CAL" button and adjust coarse and fine torque span controls on front panel so the display reads the shunt calibration number. (7,150 In. Lbs. in our example).
G) Release "+ CAL" and check zero setting. If display is zero then repeat steps C throgh F.
H) Press, and hold, "-Cal" button on front panel.
I) Adjust the signal symmetry adjustment inside the instrument on bottom circuit board for the negative shunt cal value in the torque sensor manual. (See figure 3 for location on 7530 and figure 4 for location on 7540).

4) RPM CALIBRATION: INPUT SHAFT

A) Select RPM display
B) Set "RPM frequency range" switch on HP/RPM board to 1K-10Khz (Position #3))
C) Set "RPM calibration frequency" switch on HP/RPM board to 5Khz (Postiion #4)
D) Set RPM multiplier on digital board for X5 multiplication (Switch S4-B, #7 and #8 on).
E) If display does not read zero, adjust pontentiometer P-6 on HP/RPM board (RPM zero control) for a display indication of zero.
F) Press, and hold, "R CAL" switch on front panel.
G) Adjust coarse and fine RPM span controls on front panel for a display indication of 5000.
H) Release "R CAL" switch and check zero setting. If display is not zero then repeat steps E through G..

5) HORSEPOWER CALIBRATION: INPUT SHAFT

A) Calculate HP calibration number using torque and RPM calibration numbers.

HP CAL # = 7,150 X 5,000 / 63024 = 567.2

B) Insure no multiplication or decimal points are selected for the HP display on the digital board.
C) If display does not indicate zero with no torque or RPM inputs, adjust potentiometer P-8 on HP/RPM board (HP zero control) for a display indication of zero.
D) Recheck both torque and RPM calibration values to insure they are set correctly.
E) Press, and hold, both "+ CAL" and +R CAL" buttons on front panel.
F) Adjust coarse and fine HP span screwdriver controls on front panel for a display indication of "567".
G) Release "+ CAL" and "R CAL" and check zero setting. If display is not zero then repeat steps C through F.

6) This completes the set up of the input shaft instrument calibration. Repeat this process for the output shaft substituting CAL numbers for the output shaft torque sensor and calculating a new value for HP calibration.

<u>SET UP PROCEDURES FOR USE</u>

TORQUE CALIBRATION

1) Locate the Torque "Zero" controls on the front panel. The black knob is the fine control and the coarse control is labeled "C" directly to the right of the fine control and recessed behind the front panel.

2) Select the torque display by pressing the "TRQ" button on the front panel. Set the display indication to zero using the front panel zero controls.

3) Find the calibration numbers to be used for the Torque calibration. They will be located in the torque transducer manual or on the supplied calibration data sheet (Usually labeled "Equivalent Load").

4) Locate the Torque span controls on the instrument front panel . The black knob is the fine control and the coarse control is the screwdriver adjustment directly to the left of the black knob (See Figure #1 for location).

5) Push, and hold, the button labeled "+ CAL" to simulate a clockwise torque indication. Adjust the Torque span controls for a digital indication equal to the clockwise calibration number supplied.

NOTE: It may be necessary to use a multiplication and/or a conversion factor to allow the display to read the correct value. See the section on System Capablilities.

6) Release "+ CAL" button on the front panel.

7) Push,and Hold, the "- CAL" button on the front panel.

8) Adjust the signal symmetry control inside the instrument for the counter clockwise calibration value found in the torque sensor manual. Always set the clockwise value found in the torque sensor manual prior to attempting this step. (Refer to Figure #3 for adjustment location i 7530-115 and Figure #4 for adjustment location in 7540-115).

9) Select "RPM" display button on the front panel. If the display does not read Zero with no speed input, then set the display to read zero by adjusting potentiometer P-6 (RPM zero control) Inside instrument on HP/RPM board. (See figure #3 for location).

10) Determine maximum RPM expected and set the "Calibration Frequency Select" switch on the HP/RPM board to the frequency value nearest to, but just over, the maximum RPM expected. (See Table #1 and Figure #3 for switch position and location of switch).

EXAMPLE: If the maximum expected RPM is 3600, then the calibration frequency to use would be 5000 HZ. The calibration frequency select switch should therefore be set to position #4. The X5 multiplier factor should also be used for direct readout in RPM.

NOTE: RPM calibration when using counter gears other than 60 teeth will require calculating a calibration factor and number to compensate for the difference in the number of teeth. This procedure requires calculating a factor that relates the number of teeth on the counter gear to 60. The formula to use is:

60 / # of teeth on gear used = cal factor

11) Set the Frequency Range Slect Switch for the range for the calibration frequency selected. (See Table #1 and Figure #3 for the proper range position and location of the switch).

TABLE #1

FREQUENCY RANGE (HZ)	RANGE SWITCH POSITION	CAL FREQUENCY (HZ)	SWITCH POSITION
10K - 50K	1	50K	1
		20K	2
1K - 10K	2	10K	3
		5K	4
		2K	5
100 - 1K	3	1K	6
		500	7
		200	8
		100	9
		100	10

NOTE: When using calibration frequencies over 1000 HZ it will be necessary to use a multiplication factor for the display read correctly.

12) Push, and hold, the button labeled "R CAL" on the front panel. Using the small screwdriver, adjust the the two RPM span control directly to the right of the "R CAL" button for a display reading equal to the calibration frequency selected.

HP CALIBRATION

13) Release the "R CAL" button and select the HP display by pressing the button labeled "HP".

14) Calculate the HP calibration number by using the calibration numbers set for Torque and RPM and the following formulas:

(FOR TRQ = IN. LBS. : HP = TRQ X RPM / 63024)
(FOR TRQ = FT. LBS. : HP = TRQ X RPM / 5252)

15) If the display does not read zero with no torque or speed inputs, adjust potentiometer P-8 on HP/RPM board for a display of zero. (See Figure #3 for location).

16) Set in the proper multiplaction factor and decimal point (if needed) for the HP CAL number calculated.

17) Push, and hold "R CAL" and "+ CAL" buttons on the front panel simultaneously. Set the "HP SPAN" Screwdriver controls (Just to the

left of the "TRQ" Select Button on the front panel) for a display indication equal to the value calculated in step 14.

18) This completes the user calibration. Replace the top cover of t instrument.

19) The calibration values should be checked periodically and readjusted if needed. Lebow products recommends checking calibration before each test is run.

TROUBLE SHOOTING:

The basic function of trouble shooting a Load or Torque Measuring System is to isolate the cause of the problem.

The easiest method is to substitute known good components for those that are suspected of being defective. If this is possible the defective component can be found relatively easily.

In those cases where it is not feasible to use the substitute method of trouble shooting, then it will be necessary to isolate the cause of the problem in another way.

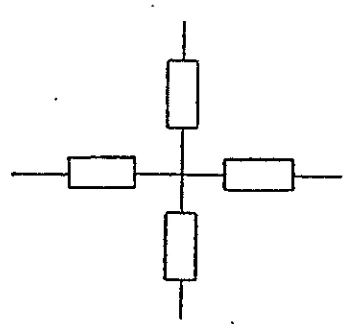
Usually, it is difficult to remove the transducer from the system, so the easiest approach is to simulate the transducer and first check the operation of the electronics being used to monitor the transducer output.

This can be done very simply by taking four resistors of the sa value, and soldering one end of all four resistors together (Se diagram below) Next, disconnect the cable connection at the transducer. Now insert the unsoldered end of each resistor in the pin connections where the strain gage bridge would normally be connected.

If the instrument can be set for a Zero Indication, and the Shunt Calibration Circuit works, the cable and the readout instrument are most likely operating correctly.

The following tables may provide some possible solutions to typical problems encountered when using strain gage tranducers and instrumentation. These solutions might also be applied to similar transducers of other manufacturers.

If, after trying these solutions, the problem still persists, then please contact the factory for further assistance.



TROUBLE	SOLUTION
NO POWER INDICATION	-POWER SWITCH NOT ON -LINE CORD NOT PLUGGED IN -FUSE BLOWN -LINE CORD BAD -NO POWER AT RECEPTACLE
UNABLE TO SET ZERO	-CABLE NOT CONNECTED -CABLE NOT WIRED CORRECTLY -CABLE DEFECTIVE -TRANSDUCER UNDER LOAD -TRANSDUCER OVERLOADED
UNABLE TO CAL	-CABLE NOT WIRED CORRECTLY -SHUNT RESISTOR NOT CONNECTED -SHUNT RESISTOR BROKEN -TRANSDUCER DAMAGED
OUTPUT DRIFTS	-EXCITATION VOLTAGE TOO HIGH -SLIP RINGS/BRUSH CARRIER NEEDS CLEANING -1600 SERIES TRANSDUCER HOUSING NOT GROUNDED -LARGE TEMPERATURE VARIATION -TRANSDUCER DAMAGED -EXC LEADS WIRED TO SIGNAL CONNECTIONS
OUTPUT FLUCTUATES	-MISALIGNMENT IN DRIVE LINE -INCORRECT COUPLINGS USED -CHECK FOR GROUND LOOPS -TORQUE TRANSDUCER USED IN MAGNETIC FIELD
ZERO POINT SHIFT	-TRANSDUCER BEING FATIGUED OR OVERLOADED DURING USE -TRANSDUCER DAMAGED -LOCKED IN LOAD -PARALLEL PATH FOR LOAD

LIMITED WARRANTY
(Liability for Repair and Replacement Only)

The Company's products are warranted to be free from defects in material and workmanship for one year from date of shipment from the factory. The Company's obligation is limited to repairing, or at their option, replacing products and components which, on verification, prove to be defective, at the factory in Troy, Michigan. The Company shall not be liable for installation charges, for expenses of Buyer for repairs or replacements, for damages from delay or loss of use, or other indirect or consequential damages of any kind. The Company extends this warranty only upon proper use of the product in the application for which intended and does not cover products which have been modified without the Company's approval or which have been subjected to unusual physical or electrical stress, or upon which the original identification marks have been removed or altered. Transportation charges for material shipped to the factory for warranty repair are to be paid by the shipper. The Company will return items repaired or replaced under warranty prepaid. No item shall be returned for repair without prior authorization from the Company.

Whenever the design of the equipment to be furnished or the system in which it is to be incorporated originate with the buyer, manufacturer's warranty is limited specifically to matters relating to furnishing of equipment free of defects in material and workmanship and assumes no responsibility for implied warranties of fitness for purpose or use.

CERTIFICATE OF CONFORMANCE AND CALIBRATION TRACEABILITY

This is to certify that the products described herein meet the specifications and performance requirements described in this manual. Test reports and other pertinent information are on file and available for inspection by your representative and/or the U.S.Government representative upon request.

Calibration was performed with a test system utilizing a reference load cell or deadweights and an electronic indicator. The test system was within current calibration requirements at the time of the test and is traceable to the U.S. National Bureau of Standards.