Route

INDUSTRIAL
AUTOMATION

Route

2500 AND 2700

# CONTENTS

## 1. GENERAL DESCRIPTION

The ROUTE 2500 AND 2700 ARE low cost,high accuracy loadcell indicator/transmitters especially suitable for field mounted applications (IP65 enclosure).

These units have a four and a half digit LED (Route 2500) or LCD (Route 2700) display and offers retransmission signals of 0-10V and 4-20 mA as standard.

These units are fully self-contained only requiring a 110V or 220V AC supply. They provide a 10V excitation supply capable of supplying up to four load cells.

The whole instrument is fully enclosed in an alucast enclosure and suitable for harsh environments.

## 2. SETTING UP

### 2.1 Initial Start up

Before power is connected to the instrument, a visual check should be performed:
Check if the correct fuse (500ma) is inserted.
Check if the correct supply voltage is selected as per the jumper links:
JP4 jumper on the middle two pins ( 220 volts )
JP4 jumper on the pin 1 & 2 and 3 & 4 ( 110 volts )
JP5 Excitation jumper on the first two pins.
JP6 & JP7 must be in place.
Check if the connection from the main board to the display board is present ( ribbon cable )
Check the wiring carefully ( avoid loose connections )
If a 4-wire loadcell cable is used, check that jumpers JP6 JP7 are in place (behind loadcell connection terminal).
If a 6-wire loadcell cable is used, remove jumpers JP6 JP7.

Initial Measurement:

Connect a loadcell ( or loadcells ) and then:

* Apply Power
* Verify d.c supply voltage
* Verify reference voltage
  (+15 V dc +- 0,1 V measured between TP1 and TP2)
  (-15 V dc +- 0,1 V measured between TP3 and TP2

### 2.2 Excitation Supply

Adjust Potentiometer VRI to obtain an excitation voltage of 10 volt dc, measured between terminals 6 and 8. The excitation voltage can also be measured between TP4 and ground (TP2). This is factory preset to 10Vdc.

### 2.3 PreAmplifier

The input signal to the amplifier can be measured between terminals 10 (+) and 11 (-). For proper functioning of the instrument the following input signals should not be exceeded:

| | |
|---|---|
| Live signal ( full scale ) | minimum 3,3mV |
| | maximum 30mV |
| Tare signal | minimum 0mV |
| | maximum 14mV |
| Gross signals ( full scale ) | minimum 3,3mV |
| | maximum 30mV |

The amplified signal (gain of 30) is measured between TP5 and TP2

The gain of the preamplifier is determined by the ratio of R8:R9 and R10:R11 respectively. The standard values are: R8 = R10 = 1K, R9 = R11 = 330K

Should it be necessary to further increase the gain of the instrument, the values of R11 and R9 can be increased of the values of R11 = R9 and R8 = R10.

## 3. CALIBRATION

### 3.1 Procedure

Calibration of the route 2700 is to be done in the following sequence:

1. Zero Adjustment
2. Gain Adjustment
3. Display Adjustment

### 3.2 Zero Adjustment

After installation of the loadcells and initial setup (paragraph 2) the tare mass that needs to be zeroed is done as follows:

1. Adjust the course zero (rotary switch) SW1 until the display is closest to zero (hopper empty).
2. Adjust the fine pot VR2 until exactly zero is displayed.
3. Measure the voltage between TP6 and TP2 ( it should be 0,00 V ).

### 3.3 Gain Adjustment

Load ( or simulate ) at least 50% of full capacity onto The weigh element and adjust the gain as follows (NB: Ignore the digital display at this stage) :

1. Measure the voltage between TP6 and TP2 (0-10 volts);
2. Calculate what portion of full capacity is applied (if full capacity is 10 t and only 5 t is applied, then adjustment is 50% of 10 V);
3. Turn rotary switch SW2 until closest reading to value determined in 2. is achieved ( e,g, 5 V);
4. Fine tune to exact value with potentiometer VR3.

## 3.4a Display Adjustment LCD

With the mass still loaded as described in the previous paragraph, follow the steps below to adjust the display:

1. Decide what engineering units, resolution and decimal point position is required;
2. Select the decimal position with SW2-3, 4, 5 or 6 on the display board;
3. Adjust rotary switch "Course Span" CODESW until the display is closest to the required value. Adjust span fine adjustment VR1. Span can be multiplied or divided by switching SW1 1 (UP divide DOWN multiplied)
4. Blank the last digit with SW1-2 if necessary;

Note: Under normal circumstances, do not exceed the resolution of the loadcells.

## 3.4b Display Adjustment LED

With the calibration mass still loaded as described in the previous paragraph, follow the steps below to adjust the display:

1. Decide what engineering units, resolution and decimal point position is required;
2. Select the decimal position with SW1-3, 4, 5 or 6 on the display board;
3. Adjust rotary switch "Course Span" CODESW until the display is closest to the required value. Adjust span fine adjustment VR1. Span can be multiplied or divided by switching SW1 1 (UP divide DOWN multiply).
4. Blank the last digit with SW2-2 if necessary;

Note: Under normal circumstances, do not exceed the resolution of the loadcells.

## 3.5 Analog Output Adjustment

The current (4-20mA) and\or voltage (0-10 V) outputs can now be fine tuned by connecting a multimeter in series to terminals 14 and 15 for current, or in parallel to 12 and 13 for voltage.
Adjust potentiometer VR4 for 4 mA ( current ) or 0,0 V.
Adjust potentiometer VR5 for 20 mA (current) or 10,0 v or a calculated portion as required.
JP8 jumper in = 4 - 20mA output.
JP8 jumper out = 0 - 20mA output.

Note: 4-20mA is preset. On a zero load (0 Volts across TP3 and TP6) 4mA will be present, while on full load (that is 10 Volts across TP3 and TP6) a 20 mV reading will be present.

3.6 <u>Setpoint or Alarm Outputs - Relay Board</u>

Decide on normally open or normally closed setpoints and connect up at the appropriate two positions on the motherboard (SEE 2500/2700 MOTHERBOARD Pg.12)
Ensure jumper jp1 on the motherboard is in position (bridged) before relay card is inserted.
Ensure jumper jp5 on the relay card is in position (bridged)
Select the appropriate position for jumper caps by choosing either pins 1 @ 2 for lo alarm and 2 @ 3 for hi alarms.Jumper jp6 is for relay 1,jumper jp7 for relay 2,etc.

TO SET:
Setting of the relays requires the use of a multi-meter.
-) Switch multi-meter to DC volts and test between TP5 (black probe) and TP1 (red probe)
2)To set relay 1, adjust VR1 to between 0 volts and -10 volts being 100% of full load.
3)to set relay 2,move red probe to TP2 and set VR2, etc.
Adjust JP6,JP7,JP8 and JP9 for normally on or normally off.

RELAY1=JP6
RELAY2=JP7
RELAY3=JP8
RELAY4=JP9

NOTE 1:One jumper position must always be selected, high or low level, otherwise the relays cannot be activated.
NOTE 2:If relay card is removed,JP1's jumper cap must also be removed from the motherboard to allow proper functioning of the ROUTE 2500/2700.

3.7 <u>Alternative Calibration Methods</u>
3.7.1 <u>Simulation</u>

By simulating an input signal to the amplifier, zero and span adjustments can be done without using a live mass. Loadcell simulators are a available for this purpose, but few of them offer an adjustable impedance. The total resistance of the simulator should be the same as the total resistance of the loadcells in use (e.g. 3 * 350ohm loadcells = 116,7 ohms).
If a 350 ohm simulator is used, it can be connected in place of one of the loadcells with the other loadcells signal connections disconnected. This however only offers a 30% span adjustment (for a 3 loadcell system) as the signals are parallelled.

### 3.7.2 Without known masses.

Calibrating a weighing system with known masses is the most accurate method to use. The system can be checked for repeatability and linearity to within the accuracy of the loadcells in use.

However, it is not always possible to handle 200, 50, or even 10 tons of test weights! Two procedures can be followed to calibrate such systems.

1. using minimum test weights:

   E.g. use 1 ton test weights and calibrate the system to 1 ton. Remove the 1 ton of weights and fill the vessel with make - up material such as product or water. Replace the 1 ton of weights calibrate for 2 ton. Repeat until 50% of maximum capacity is calibrated. This procedure is tedious and might be impractical for large hoppers.

2. Utilising the loadcell signal and tare mass

   Loadcells are linear transducers and their signals can be used to calibrate a system within reasonable accuracy.

   Follow the steps below:

   a. Measure the excitation signal closest to the load-cells (i.e. at the field junction box). Record "EXC V"

   b. With the weight element empty, first disconnect the loadcell signal cables from terminals 10 and 11. Measure (0-10 mV) and record "EMPTY mV".

   c. Connect the signal cables. Now short wires and zero system. Disconnect the short and the display will display the hopper's empty mass. Set the measured mV.
   Re-zero the system (display) via SW1 and VR2 on bottom board.

d. Use the following formula to calculate the nett mass:

$$\frac{\text{FULL mV} - \text{EMPTY mV}}{\text{EXC V X SENSITIVITY}} \times \text{TOTAL LOADCELL CAPACITY}$$

= NETT MASS

Where: "TOTAL LOADCELL CAPACITY" = Sum of the load cells in use (e.g. 3 X 10t=30t)

"SENSITIVITY" = Rated loadcell sensitivity or output (e.g. 2 mV/V)

e. Connect the signal cables and adjust the gain and display as described earlier.

f. Reset display to previous reading before gain was adjusted.

# 4. TECHNICAL SPECIFICATION

## 4.1 Power Requirement

- Supply voltage : 230V ± 10% / 110V ± 10%
- Power requirement : Approximately 16VA

## 4.2 Supply to load Cells

- Excitation voltage: 10V ± 1,0%(adjustable)
- Load on excitation supply : 4 x 350 ohm cells in parallel 6 x 350 ohm on special request
- Short circuit protection : Current limit at approximately 180mA

## 4.3 Input Signals

- Live signal (range) : Min. 0 to 3.3mV
  Max. 0 to 30mV
- Tare signal : Min. 0mV. max 14 mV
- Gross signal : Min. 3.3mV, max. 30mV

## 4.4 Voltage Output

- Range : 0 to 10V
- Maximum current : 10 mA

## 4.5 Current Output

- Range : 4 to 20mA Jumper JP8 Cap on
  0 to 20mA Jumper JP8 Cap off
- Max. loop Res. : 1000 ohm

## 4.6a LED Display (for the Route 2500)

- Readout : 4½ digit (last digit blanking option)
- Independent span adjustment
- Character height : 15 mm
- Decimal point : Switch selectable pos.

4.6a LCD Display (for the Route 2700)

- Readout : $4\frac{1}{2}$ digit (last digit blanking option)
- Independent span adjustment
- Character height : 25 mm
- Decimal point : Switch selectable pos.

4.7 Alarm or Setpoint Relays (Optional)

Four independent adjustable setpoint relays

- potential free contacts : 220V AC 2A

NB! JP1 must be bridged (jumper cap on) when two or 4 relay card is installed.

4.8 BCD Output (only available on Route 2500)

- 1.5 digit parallel BCD code
- Run/hold mode facility.

4.9 Zero Stability

- App. 0.05% / 10°C. max to full scale

4.10 Span Stability

- App 0.05% / 10°C. max (input 20 mV)

4.11 Ambient Temperature Range

- 10°C to 50°C.

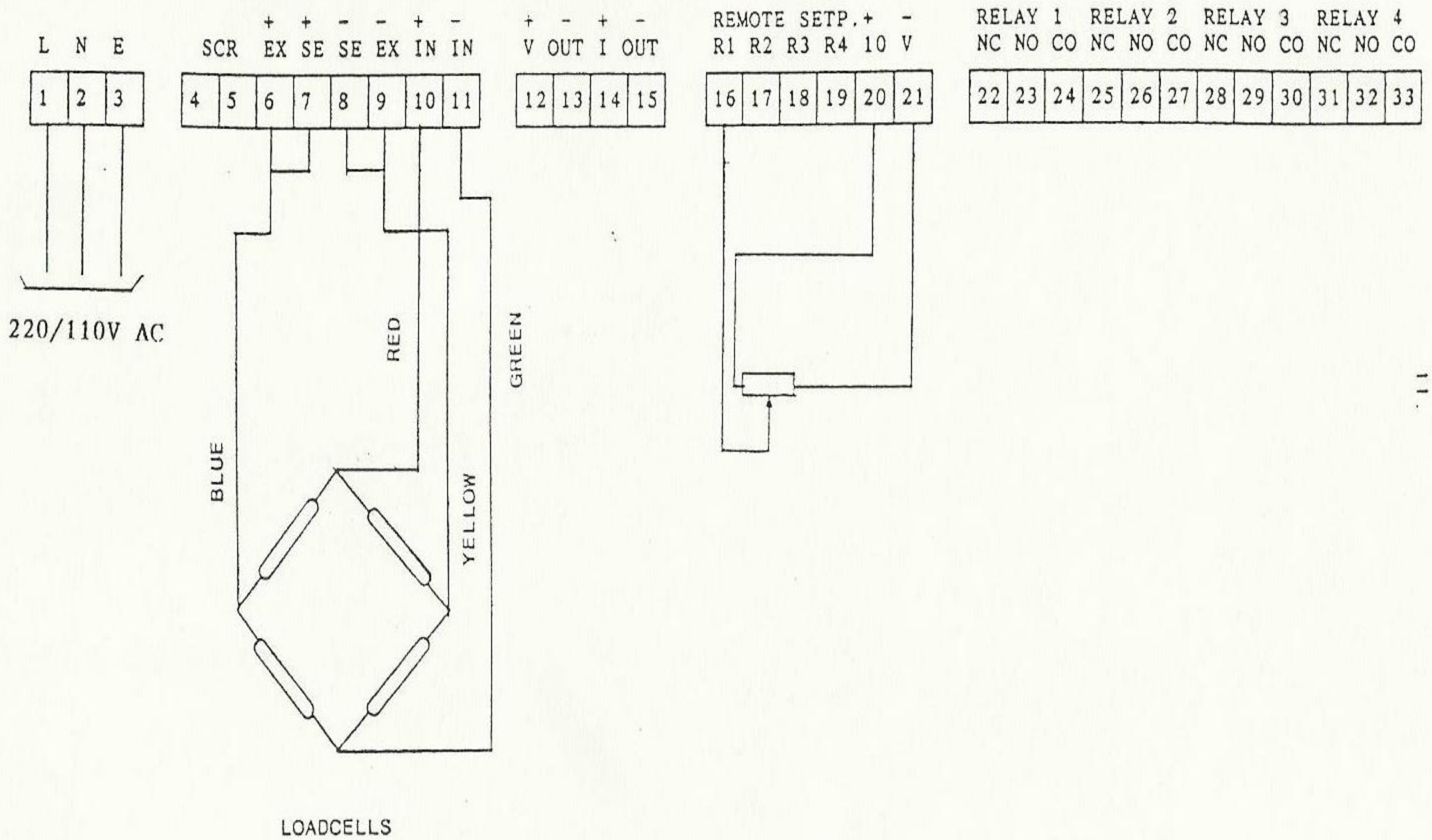
4.12 Enclosure

- Alucast
- 260mm x 160 mm x 90mm.

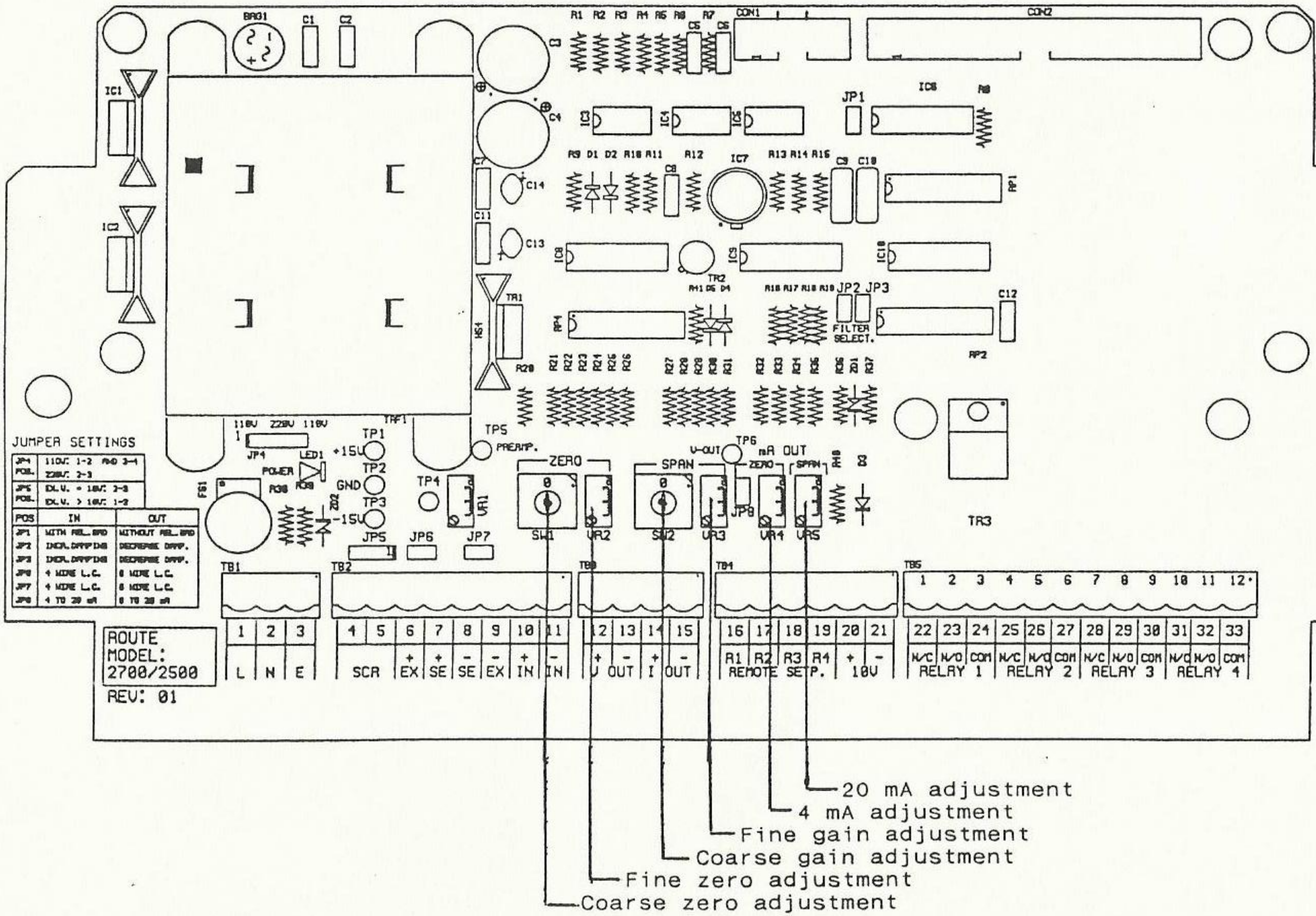
4.13 Protection Class

- IP65.

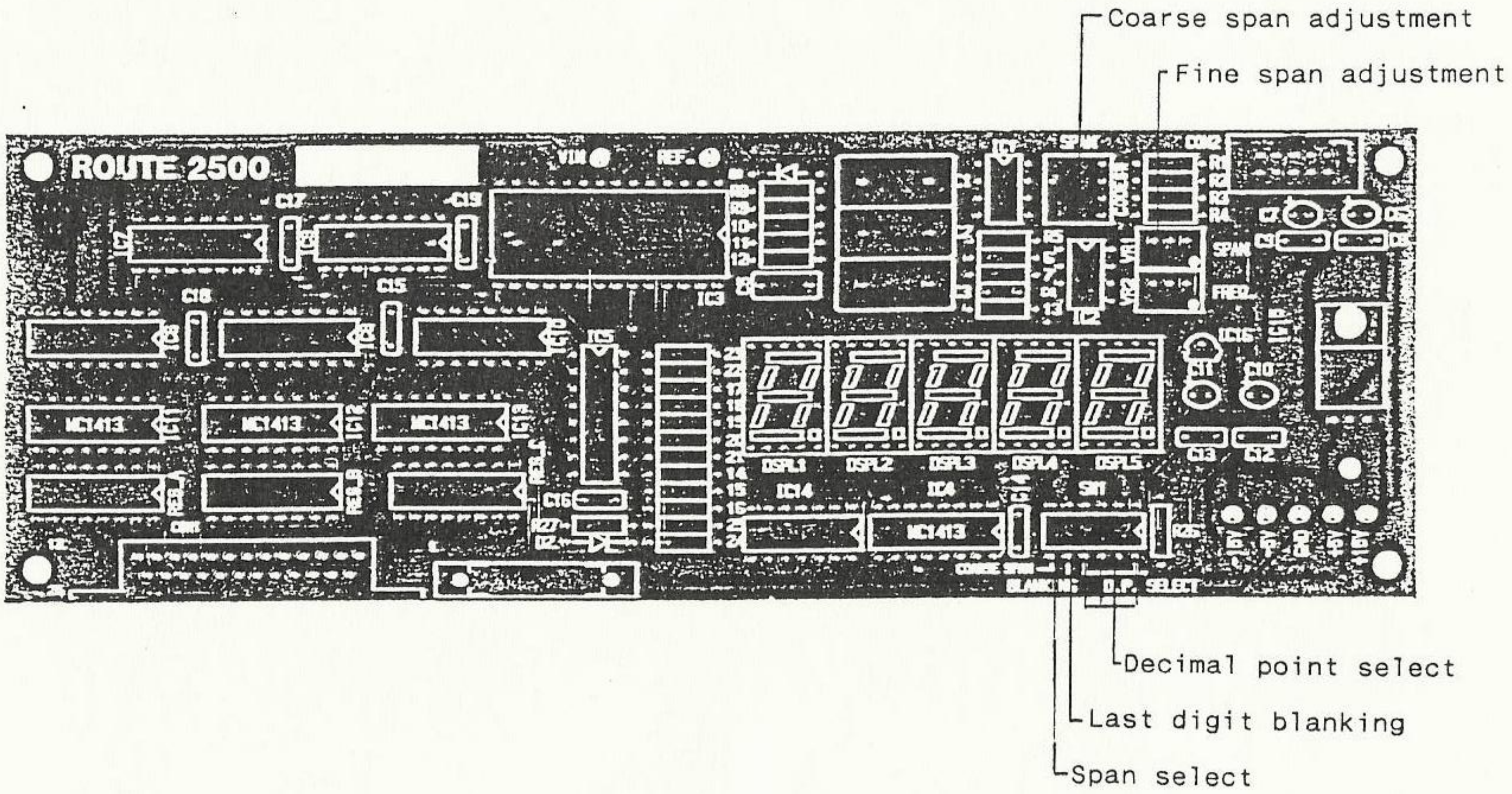
# ROUTE 2500/2700 SCHEMATIC



# 2500/2700 MOTHER BOARD



# 2500 DISPLAY



# 2500/2700 RELAY CARD