# BA172

# Dual Channel Signal-Conditioning Amplifier

# I N D E X

# SECTION 1.0 GENERAL

## 1.1 Description

The BA172 is a dual channel signal conditioning amplifier plug-in module for the MC170 High Density, Modular Transducer Control System.

Each channel provides a high impedance differential or single-ended input for AC and DC signals and low impedance, single-ended DC output.

Overall gain of 1X to 1000X is obtained by changing one fixed resistor ($R_g$) in each circuit, using the bifurcated terminals provided. See Figure 1-1 for relative location of $R_g$ for each circuit on the printed circuit board assembly. The method for selecting the value of $R_g$ is described in Section 3.0 of this manual.

In addition, a gain vernier adjustment is provided on the front panel for each channel which allows continuous adjustment from 10% to 110% of the gain step determined by $R_g$.

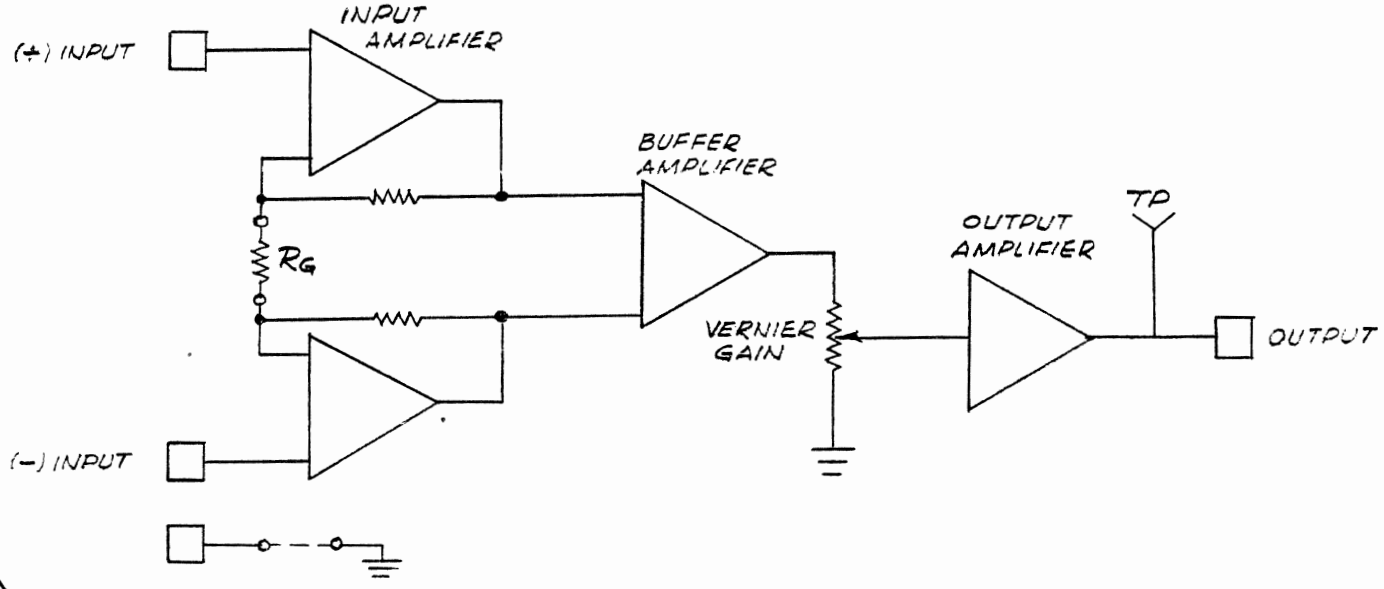
Other design features include (typical each channel):

a. Provision for up to 10Vdc potentiometer transducer excitation voltage, with current limiting for short circuit protection. (Voltage level factor adjustable to meet specific application needs.)

b. Output voltage limiting to 11 Volts, maximum.

c. Alternate input connections to provide signal ground points for differential or single-ended input mode, by simple field jumper change.

## 1.2 Functional Block Diagram (Typical Each Channel)



## 1.3 Adjustment and Test Points

Figure 1-1 shows the relative location and identification of available front panel and printed circuit board mounted adjustment potentiometers, test jacks, and bifurcated terminals referred to elsewhere in this manual. A brief description follows.

### 1.3.1 Front Panel

#### 1.3.1.1 Vernier Gain Controls (R18 and 39):

Separate 20 turn (nom.) screwdriver-adjust trimming potentiometers are provided, one for each channel, for continuous adjustment of gain from 10% to 110% of the overall gain step established by $R_g$. Circuit values and tolerances have been selected such that, by use of the appropriate value of $R_g$ and adjustment of the Vernier Gain Control, any specific overall gain value between 1X and 1000X may be precisely established.

#### 1.3.1.2 DC Test Points (TP1 and TP2):

A test jack is provided for each channel to allow monitoring of the analog DC output voltage at the front panel of the BA172 Module (used in conjunction with the "GND" jack on the PS176 Power Supply Module front panel).

### 1.3.2 Printed Circuit Board

#### 1.3.2.1 Off-set Voltage Adjust (R17 and R38):

Single-turn, continuous resolution adjustment potentiometers used to balance out DC off-set voltage.

#### 1.3.2.2 Common Mode Adjust (R11 and R32):

Single-turn, continuous resolution adjustment potentiometer for maximizing AC or DC common mode rejection.

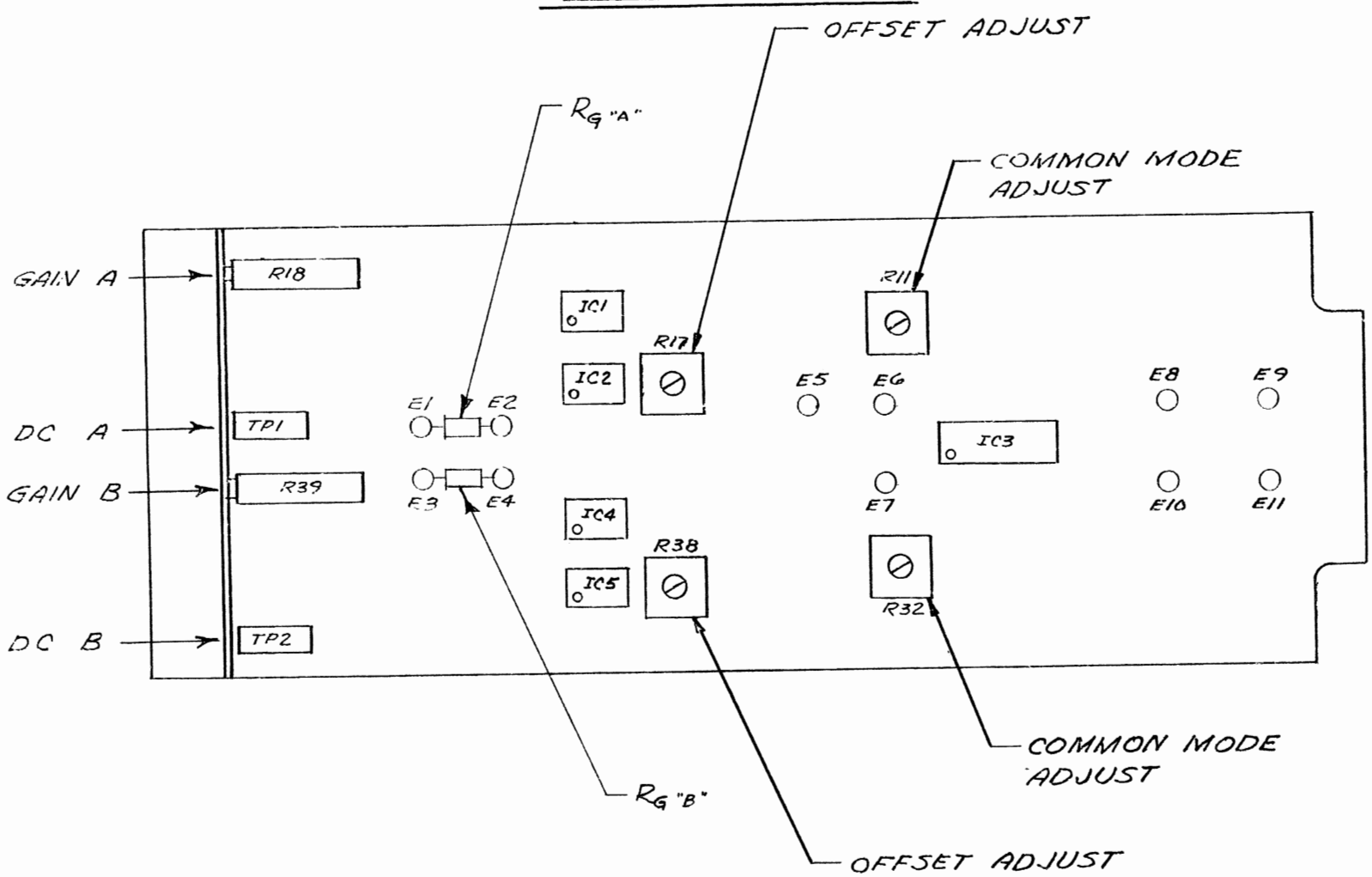



FIGURE 1-1 ADJUSTMENTS, TEST POINTS

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# SECTION 2.0 SPECIFICATIONS

## 2.1 Electrical (Each Channel)

| | |
|---|---|
| Input: | ±12 Volts, Will Not Be Damaged By Momentary Application of 115V |
| Input Impedance: | 22 Megohms, Each Input To Circuit Ground |
| Gain: | 1 to 1000 By Changing One Resistor Mounted On Bifurcated Terminals |
| Gain Vernier: | Provides 10% To 110% Adjustment At Each Gain Setting By 20-turn Trim Potentiometer |
| Output: | ±10Vdc Rated, ±11Vdc Maximum<br>Max. Load For 10V Nominal Output - 6K Ohms<br>Max. Load For 1V Nominal Output - 200 Ohms<br>No Damage If Output Terminals Shorted |
| Output Impedance: | Less Than 10 Ohms |
| Output Filter: | Flat, DC To 200Hz (Adjustable To 10K Hz By Internal Component Changes) |
| Common Mode Rejection: | 60 db Typical, DC To 1K Hz. May Be Further Increased By Internal Adjustment. |
| Off-set Voltage: | Adjustable To Zero |
| Input Bias Current: | 0.02 μA Typical, Each Input |
| Temperature: | Range - 0°F To 150°F<br>Zero Shift - ±20μV/°F Referred To Input<br>Span Shift - ±0.005%/°F |
| Power: | 15V DC, 12ma (Per Card), 6ma Per Channel |

## 2.2 Mechanical

| | |
|---|---|
| Size: | 2.76"H X 9.45"W X 7.5"D<br>(7.01cm X 1.14cm X 19.05cm) |
| Weight: | 6 oz. avdp (160 gms) |

# SECTION 3.0 OPERATION

## 3.1 Installation

The BA172 May be plugged into any open channel position of the MC170 Module Case. The module may be plugged in or removed while power is "on" without damage or effect on adjacent channels.

Unless otherwise specified at time of order, the BA172 is supplied less gain-determining fixed resistors ($R_G$"A" and $R_G$"B") and jumper connections for differential vs. single-ended input operation. Determination of Gain resistor values is covered in paragraph 3.3 below, and appropriate input mode jumper connections in paragraph 3.2.2.

## 3.2 Input/ Output Connections

Input and output connections to the BA172 Module are via the printed circut board connectors mounted on the rear panel of the MC170 Module Case. Figure 3-1 shows pin connections for Wire-wrap Terminal type connector.

The BA172 Modules contain board-mounted bifurcated terminals for field wiring to accomodate either single-ended or differential input modes. See Figure 1-1 for location and identification of terminals referenced in the discussions which follow.

### 3.2.1 Differential Input Mode:

Input connections for operation in the differential mode are as shown in Figure 3-1.

### 3.2.2 Single-ended Input Mode:

Connections per Figure 3-1 Except jumper is added between terminals E5 and E6 (Channel A), E6 and E7 (Channel B). In this arrangement, the (-) Input pin becomes the input signal ground connection.

## 3.3 Gain Resistor ($R_G$) Selection/Installation

Terminals E1 and E2 (Channel A) and E3 and E4 (Channel B) are provided for mounting selected fixed resistor to establish overall gain in the range of 1X to 1000X. With no connection between the terminals, the gain is 1X.

To determine the appropriate resistor value for specific gain requirement, the following relationship is used:

$$R_G = \frac{4.98 \times 10^4}{G-1}$$

where, $R_G$ = fixed resistor value, in ohms
$G$ = desired overall gain

## 3.4 DC Offset Adjustment

The DC offset may be adjusted using the following procedure:

A. Short both inputs to system ground. (This may be conveniently done by connecting (+) and (-) input pins and adding jumper between bifurcated terminals E5 and E6 for Channel "A", and between E6 and E7 for Channel "B".)

B. Connect a Digital Volt Meter to the Test Point appropriate to the channel being adjusted and to the "GND" jack on the PS176 Power Supply Module front panel.

C. Adjust potentiometer R17 (Channel "A") or R38 (Channel "B") for zero reading on DVM.

## 3.5 Common Mode Adjustments

### 3.5.1 DC Common Mode:

A. Connect a DC signal source between (+) and (-) input pins in common, and Signal Ground. (For a convenient ground connection for this adjustment, the (+) Excitation pin may be used with a jumper connection between bifurcated terminals E8 and E10 for channel "A", or E9 and E11 for Channel "B".)

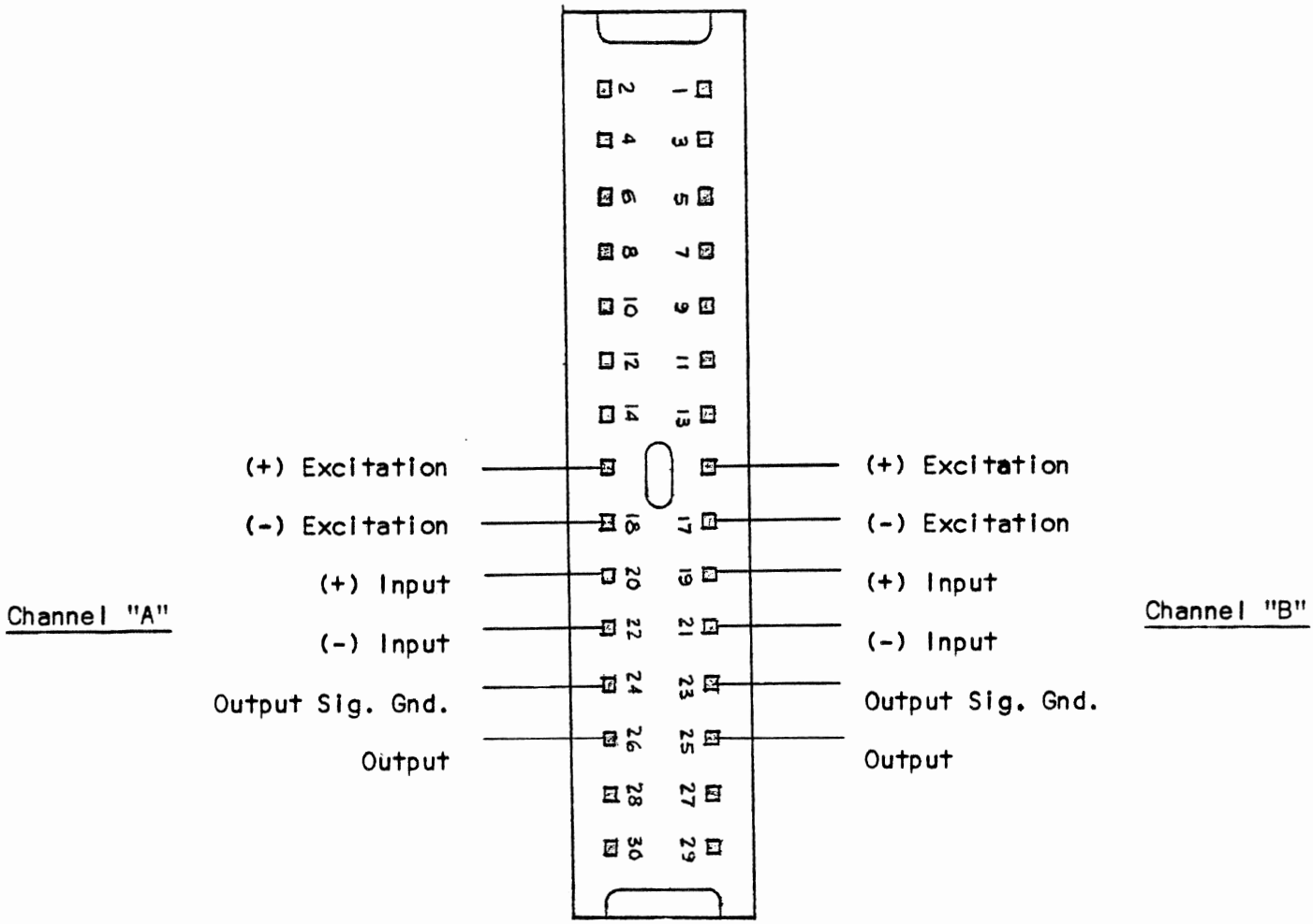
B. Connect a DVM to appropriate Test Point and PS176 "GND" jack.

C. While monitoring the DVM output indication, vary the input from plus 10Vdc to minus 10Vdc and adjust R11 (Channel "A") or R32 (Channel "B") to obtain a minimum change in output for the input change.

### 3.5.2 AC Common Mode:

Connect an AC signal source, using the same connections as in 3.5.1, above. Monitor the output using a suitable volt meter or oscilliscope. With application of an AC signal of the desired operating frequency, adjust R11 (Channel "A") or R32 (Channel "B") for minimum output.

Input and Output Connections: (Accessible through Printed Circuit Board Connector at Rear of MC170 Module Case.)



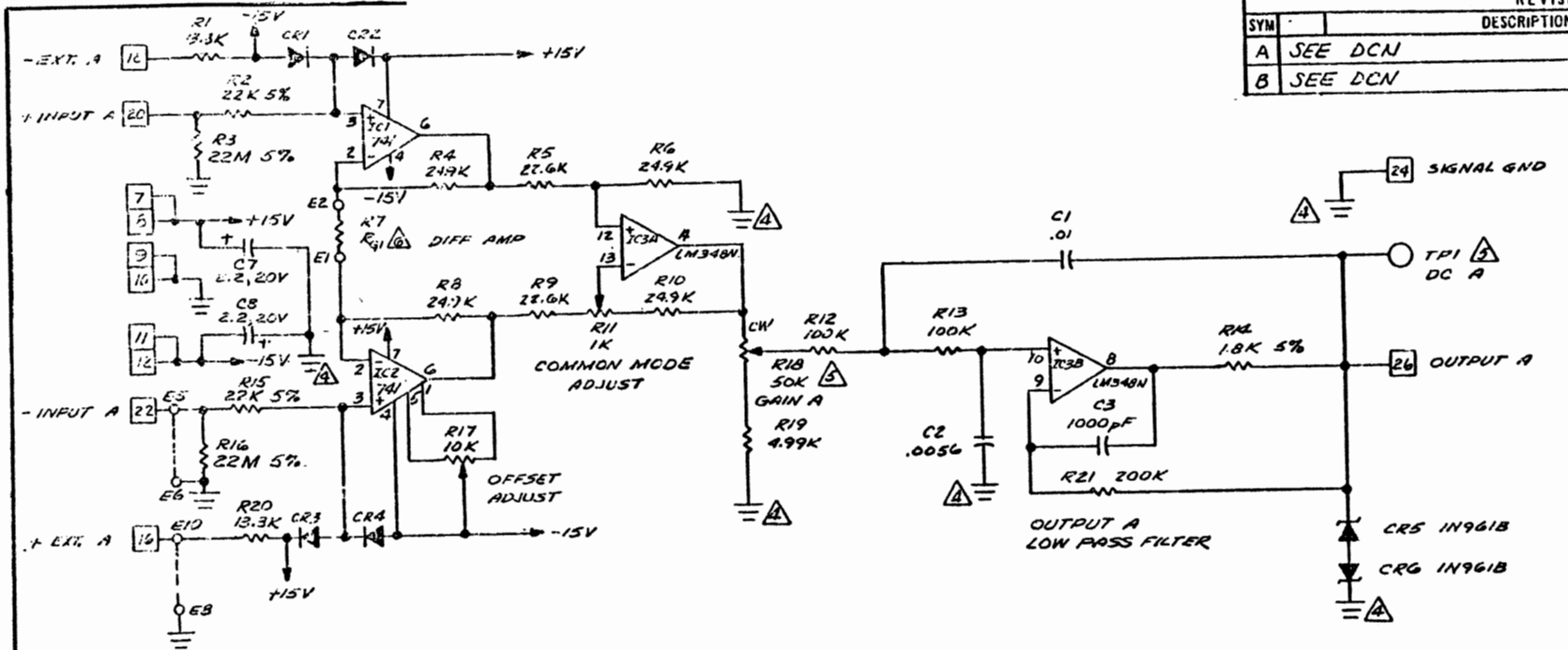

Printed Circuit Board Connector

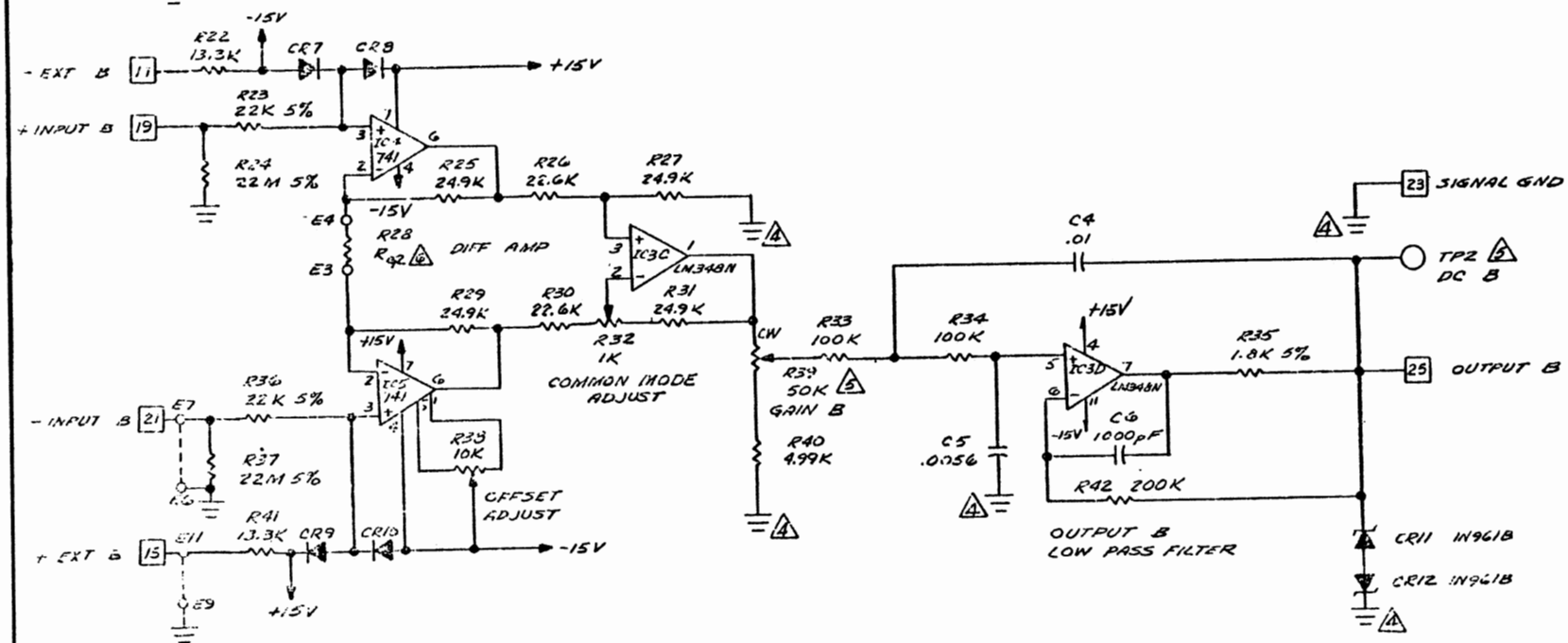
As Viewed from Rear of MC170 Module Case

(WIRE-WRAP TERMINAL VERSION)

Figure 3-1

| REVISIONS | | | | |
|---|---|---|---|---|
| SYM | DESCRIPTION | DATE | APPROVED | |
| A | SEE DCN | 3-28-77 | JLF | ED |
| B | SEE DCN | 3-21-77 | JLF | ED |




1. MOUNTED AT FRONT PANEL.
2. SIGNAL GROUND
3. DIODES ARE IN914.
4. CAPACITOR VALUES ARE IN MICROFARADS.
5. RESISTOR VALUES ARE IN OHMS ±1% 1/8 WATT.

NOTES: UNLESS OTHERWISE SPECIFIED:

6. $R_G = \frac{49.8K}{G-1}$

| HIGHEST REF DES USED | | | | | |
|---|---|---|---|---|---|
| C6 | CR12 | IC5 | R42 | TP2 | |
| REF DES NOT USED | | | | | |

TOL. UNLESS NOTED
DEC. XXX
FRAC. & DEC. XX
ANGLES ±1/2°
DIAMETERS WITH SAME ℄ SHALL BE CONCENTRIC WITHIN .005 TIR.
SURFACES MUST BE FLAT WITHIN .002 PER IN.
MAX FILLET .015 UNLESS NOTED.
DEBURR EDGES .005 MAX UNLESS NOTED.
SURFACE FINISH ▽ UNLESS NOTED.
DRILLED HOLE TOL. PER ANSI-B-387.

| | | | |
|---|---|---|---|
| SCALE | — | Validyne ENGINEERING CORPORATION NORTHRIDGE, CALIFORNIA 91324 | |
| DWN | ED | 12-75 | MODEL 84172 |
| CK'D | | | MAT'L |
| APPVD. | | | FINISH |
| TITLE | SCHEMATIC BUFFER AMPLIFIER | | |

## WARRANTY

VALIDYNE ENGINEERING CORPORATION warrants equipment of its own manufacture to be free from defects in material and workmanship under normal conditions of use and service.

VALIDYNE will repair or replace any component found to be defective on its return to VALIDYNE within the time specified below:

1. Pressure Transducers and Pressure Transmitters (including transducers supplied as part of Digital Manometer Systems) within three (3) years of its original purchase.
2. Electronic products (Transducer indicator, carrier demodulators, plug-in signal conditioners, module cases, etc.) within one (1) year of its original purchase.

Buyer is requested to secure authorization of VALIDYNE, and to describe defect prior to return of equipment under warranty. Shipment to VALIDYNE shall be at Buyer's expense, with return at VALIDYNE's expense. NON-VERIFIED problems or malfunctions whether warranty or not are subject to a $80.00 evaluation charge.

The warranty carries no liability, either expressed or implied, beyond our obligation to repair or replace, at VALIDYNE's option the unit which carries the warranty to the original purchaser. Prices, specifications and designs subject to change without notice. This warranty is void if the product is subjected to misuse, accident, neglect or improper application, installation or operation.

## REPAIR POLICY

Units returned to VALIDYNE for repair which are not under warranty will be subject to the following conditions.

1. A description of the problem or malfunction shall accompany the unit returned for repair, or be communicated to VALIDYNE prior to shipment. Otherwise there will be a minimum evaluation and/or calibration charge of $80.00.
2. Unit will be repaired automatically if charge is less than 65% of current list price unless other specific instructions are received. Above 65%, VALIDYNE will request authorization by buyer.
3. If quotation is required before proceeding with repairs, unit should be accompanied by paper so stating, or information communicated to VALIDYNE prior to shipment.
4. Buyer is to secure authorization and shipping method from VALIDYNE prior to return of equipment or shipment will be rejected. (Applies to Canada only)

## REPAIR WARRANTY

Warranty coverage on repairs is 90 days on work done, or to the end of the original warranty period, whichever is longest.

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