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ASM 54 Non-Isolated Adder Subtractor Module Instruction Manual

1.0 INTRODUCTION

These instructions refer to the above model. Supplementary sheets are attached if the unit has special options or features. For detailed specifications, see page 4 or refer to the Data Bulletin. All ADTECH instruments are factory calibrated and supplied with a label detailing the calibration. Adjustments are normally not necessary. A simple check should be performed to verify calibration before installation to ensure that it matches the field requirement.

2.0 GENERAL DESCRIPTION

The ADTECH ASM 54 is a Non-Isolated Adder Subtractor Module that accepts two to four process input signals of 1-5 vdc or 4-20 ma dc and adds (sums) and/or subtracts (difference) them to a single process signal output representing the sum and/or difference of the inputs.

Each of the four inputs provides an individual scaling factor of 0-1.25 with the output bias adjustable 0-50% of full scale.

The setting of potentiometers KA through KD determines the magnitude and (+) or (-) coefficients for each input.

A loss of input signal(s) is treated as a zero value, not a negative value, for the highest security.

Power Option P 1 Non-Isolated 24 vdc provides negative output signal and negative DC power common rail connection.

The output is a true current source and provides process signals such as 4-20 ma, 0-1 ma, 0-10 ma, 1-5 ma and 10-50 ma dc or alternatively, a voltage signal of 5 vdc full scale. Other current and voltage **Inputs/Outputs (I/O)** are available as specified on the Data Bulletin.

3.0 INSTALLATION

The instrument is supplied in a general purpose enclosure as standard. NEMA 4, 7 or 12 and plug in chassis enclosures are optionally available. Installation area/location must agree with the supplied instruments including operating temperature and ambient conditions.

Mounting

Refer to the appropriate outline drawing for mounting and clearance dimensions. The instrument is surface mounted with two #10-32 screws on 8.00 inch centers.

Electrical Connections

The wire used to connect the instrument to the control system I/O should be a twisted pair(s) and sized according to normal practice. Shielded cable is not normally necessary (if used, the shield must be grounded at the input negative of the ADTECH instrument and left floating at the sensor).

A 12 position barrier terminal block with #6-32 screws and 3/8" spacing is provided for I/O and power connection. A housing ground terminal marked G is also provided.

Controls

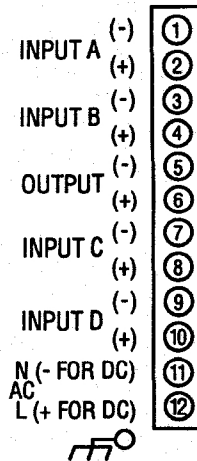
Multiturn OUTPUT ZERO, KA, KB, KC, KD and Internal ZA, ZB, ZC, ZD controls are provided to calibrate the instrument. The multiturn controls are accessible through the instrument front panel and are clearly marked for ease of use.

4.0 MAINTENANCE

These instruments are electronic and require no maintenance except periodic cleaning and calibration verification. If the unit appears to be mis-operating it should be checked as installed per section 6.0 or removed for a bench check per sections 6.0-7.0. MOST problems are traced to field wiring and/or associated circuits. If the problem appears to be with the instrument, proceed to sections 6.0 and 7.0.

5.0 CONNECTIONS

Standard connections are shown below and on the instrument face plate, Data Bulletin or on attached supplementary sheets.



6.0 CALIBRATION

To perform a calibration check or re-calibration of the instrument follow this procedure.

- A. Carefully remove the instrument from its housing to gain access to the four internal zero potentiometers and test points observing normal safety and equipment precautions.
- B. Make sure the I/O wiring is properly connected and that the correct power source per the label is also connected. The instrument must be at normal power for a minimum of 2 minutes before proceeding to C.
- C. The input signal source(s) must be adjustable from 0 to 100% in steps of 10% or at least 25%. The source(s) should be either precalibrated or an accurate meter must be used to monitor the input(s).
- D. The output may be monitored either as a direct voltage for a voltage output signal or as a current that can be represented as a voltage across a resistor shunt.
- E. Per the table given below, set the input source(s) to the minimum input value and adjust the corresponding potentiometer to provide a 0.000 vdc at the corresponding Test Point (as measured from Terminal #1).

Input	Internal Zero Potentiometer	Test Point
A	R31	TPA
B	R32	TPB
C*	R33	TPC
D*	R34	TPD

*If an input is not used install a jumper on the input terminals for that input and adjust the corresponding zero potentiometer per the above table to provide 0.000 vdc at the Test Point.

- F. Set all the used input sources to the minimum input value(s) and adjust the multiturn potentiometer marked OUT-ZERO to provide the minimum calibrated output (e.g.) 4.00 ma \pm 0.01 ma dc.
- G. Follow the steps given below to calculate the contribution of each input to the output span. Note that the K factor potentiometers offer center zero capability; therefore no jumper changes are required to make an input either an adding or subtracting type.
 1. Write down the input/output equation.
(e.g.) $0.625 A + 0.5 B - 0.125 C = \text{Full span output}$
 2. Algebraically add all the K factors to verify that the sum = 1.
(e.g.) $0.625 + 0.50 - 0.125 = 1$
 3. If the algebraic sum is not equal to 1, divide each K factor by the algebraic sum to calculate the required values of K factors.
 4. Calculate the individual contribution of each input by multiplying the corresponding K factor by the output span.
(e.g.)

Input	K Factor	Contribution
A	0.625	+ 0.625 x 16* = + 10 ma
B	0.500	+ 0.5 x 16 = + 8 ma
C	-0.125	- 0.125 x 16 = - 2 ma

*See note.

7.0 FIELD TROUBLE SHOOTING GUIDE

This section offers a simple, first level trouble-shooting aid for an apparent instrument malfunction.

SYMPTOM	CORRECTIVE ACTION
No output	<ol style="list-style-type: none"> 1. Check the input and output connections carefully. 2. Check that the power supply polarity is correct and that power is present on the instrument terminals. 3. Check that the input source(s) is correct and that it changes magnitude between zero and full scale values when so adjusted. 4. If the output is a current signal (4-20 ma, etc.), make sure the output loop is complete and that the correct meter range is selected. <p>All external checks are complete. Problem seems to be internal.</p>

The following information is provided for a qualified technician or serviceman as check points for use in internal troubleshooting.

CHECKPOINT/ COMPONENT	VOLTAGE/ RANGE
(across) C9	12 \pm 0.6 vdc
(across) C12	26 \pm 4 vdc
(across) VR2	6.9 \pm 0.35 vdc
(across) R67	0.2 - 1 vdc

SPECIFICATIONS

- H. To calibrate the output span:
 1. Set the input source A to the maximum input value and all the other used input sources at the minimum input value and adjust the corresponding multiturn potentiometer marked kA to provide an output equal to: output zero + contribution of A.
(e.g.) $4.00 + 10.00 = 14.00 \text{ ma} \pm 0.01 \text{ ma}$
 2. Repeat the same procedure for all the other adding inputs one at a time.
 3. To calibrate a subtracting input, set the subtracting input source to maximum and also the largest contribution adding input source to the maximum (with all the others at the minimum input). Now adjust the multiturn K factor potentiometer for the subtracting input to provide an output equal to: output zero + contribution of adding input - contribution of subtracting input.
(e.g.) $4.00 + 10.00 - 2.00 = 12.00 \text{ ma} \pm 0.01 \text{ ma}$
- I. Check the total full span output, by setting all the inputs to the maximum input value.
- J. This completes the calibration.

*Note: 16 ma is the output span for 4-20 ma, for 1-5 vdc use 4 volts for the output span.

8.0 TABLES, PCB LAYOUT

INPUT TABLE

INPUT SIGNAL FULL SCALE	INPUT SHUNT RI
50 ma dc	100 ohm, 1/2 W
20 ma dc	250 ohm, 1/2 W
10 ma dc	499 ohm
1 ma dc	4.99K ohm
10 vdc	See Note 1
5 vdc	None

All selected resistors are 1%, M.F.,
1/4 W, 50 PPM, unless otherwise noted

NOTE 1: Input A R24 = 150 K RC2 = 100 K
 B R23 = 150 K RC1 = 100 K
 C R38 = 150 K RC4 = 100 K
 D R37 = 150 K RC3 = 100 K

OUTPUT TABLE

OUTPUT SIGNAL FULL SCALE	OUTPUT SHUNT RL	FEEDBACK RES RF
50 ma dc	NONE	20 ohm
20 ma dc	NONE	49.9 ohm
10 ma dc	NONE	100 ohm
1 ma dc	NONE	1K ohm
10 vdc	604 ohm, 1/4 W	49.9 ohm
5 vdc	250 ohm, 1/2 W	49.9 ohm

All selected resistors are 1%, M.F., 1/4 W, 50 PPM, unless otherwise noted.

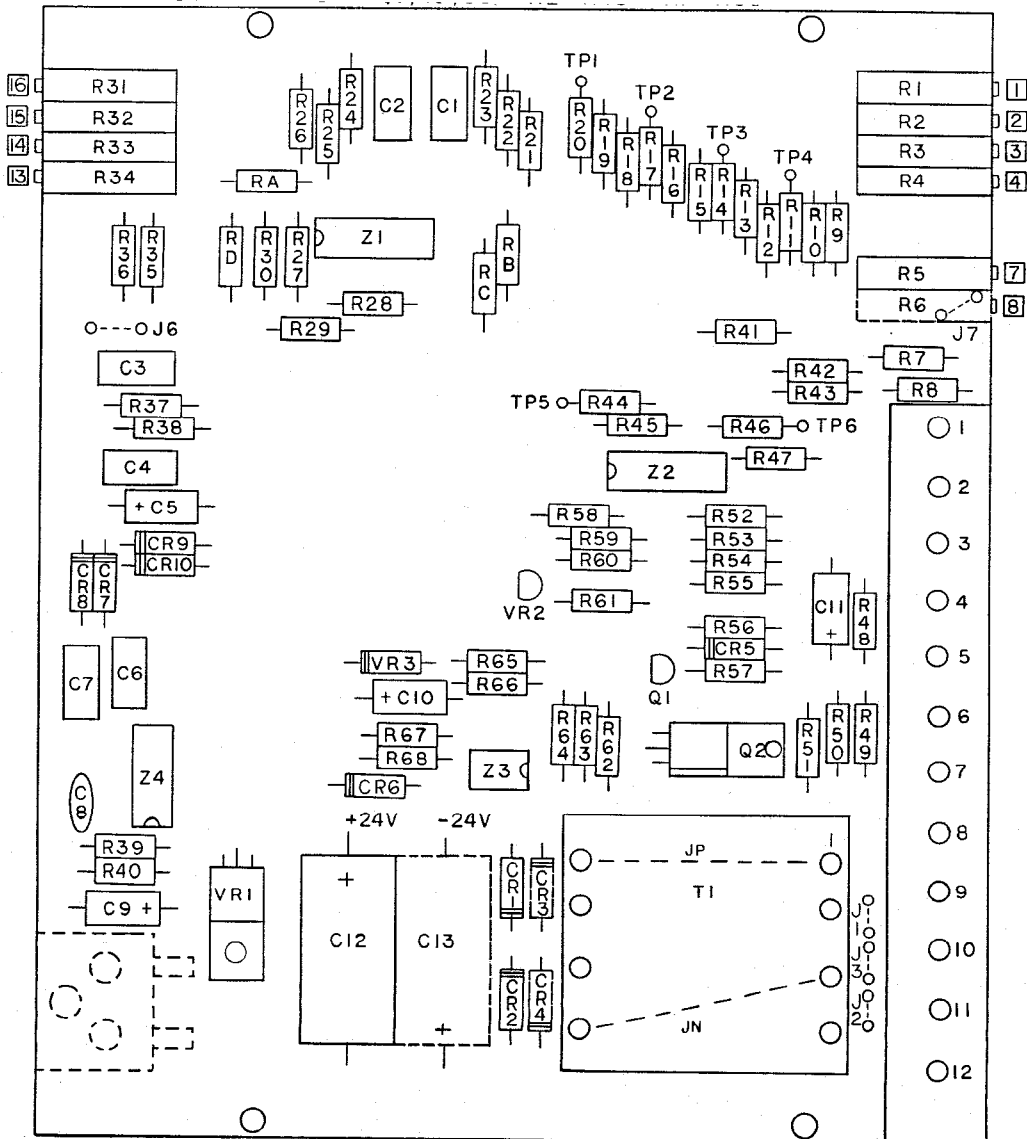
NOTE A: Components as shown may or may not be present on the p.c. board due
to design updates or options.

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RI = R7,8,49,50

RL = R48

RF = R66



9.0 SPECIFICATIONS

INPUT/OUTPUT

INPUT SIGNALS

- 4-20 ma dc (Z in 250 ohms)
- 10-50 ma dc (Z in 100 ohms)
- 0-1 ma dc (Z in 5K ohms)
- 0-10 ma dc (Z in 500 ohms)
- 1-5 vdc (Z in 10 megohms)
- 0-5 vdc (Z in 10 megohms)
- 0-10 vdc (Z in 100K ohms)
- Other zero based current and voltages available
- Low impedance current inputs, 1/10 standard (Option I 18)

OUTPUT SIGNALS/OUTPUT DRIVE

	AC Power	DC Power
a. 4-20 ma dc	0-1000 ohms max.	0-900 ohms max.
b. 10-50 ma dc	0-400 ohms max.	0-350 ohms max.
c. 0-1 ma dc	0-20,000 ohms max.	0-18,000 ohms max.
d. 1-5 vdc	250 ohms Z out	250 ohms Z out
e. 0-10 vdc	500 ohms Z out	500 ohms Z out

Zero based current and voltages in the above ranges are standard (e.g.) 0-20 ma, 0-5 vdc. Other voltage and currents optional.

PERFORMANCE

- Calibrated Accuracy:** $\pm 0.1\%$
- Linearity:** $\pm 0.1\%$ maximum, $\pm 0.04\%$ typical
- Repeatability:** $\pm 0.05\%$ maximum
- Temperature Stability:** $\pm 0.01\%/^{\circ}\text{F}$ maximum, $\pm 0.004\%/^{\circ}\text{F}$ typical
- Load Effect:** $\pm 0.01\%$ zero to full load
- Output Ripple:** 10 mv P/P maximum
- Response Time:** 150 milliseconds
- Temperature Range:** 0° to 140°F (-18° to 60°C) operating
 -40° to 185°F (-40° to 85°C) storage
- Power Supply Effect:** $\pm 0.05\%$ for a $\pm 10\%$ power variation

Note: All accuracies are given as a percentage of span

POWER

- 115 vac: $\pm 10\%$, 50/60 Hz, 3 watts, 0.7 Pf (standard)
- 24 vdc: $\pm 10\%$ non-isolated, 3 watts (Option P1)
- 24 vdc: $\pm 10\%$ isolated, 3 watts (Option P2)
- 48 vdc: $\pm 10\%$ isolated, 3 watts (Option P3)
- 125 vdc: Nominal (105-140 vdc) isolated, 3 watts (Option P4)
- 230 vac: $\pm 10\%$, 50/60 Hz, 3 watts, 0.7 PF (Option P5)

10.0 OUTLINE & MOUNTING

