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# ACA 140 – ACA 142

## AC Current/Voltage Alarms

### Instruction Manual

### 1.0 INTRODUCTION

These instructions refer to the above models. Supplementary sheets are attached if the unit has special options or features. For detailed specifications, 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 ACA 140 and ACA 142 alarms are single and dual alarms accepting an AC Current or Voltage input signal and providing relay contact output(s).

The input can be either 0-5 AMPS or an AC voltage of 0-20 V to 0-300 V range. The instruments can respond either to RMS value or average value of the input signal. The true RMS allows wave forms with 5:1 as crest factor.

The input frequency range is 25 Hz to 400 Hz. For the highest accuracy calibrate the instrument at the installed operating frequency.

The ACA 140 is a single alarm providing a DPDT output and the ACA 142 is a dual alarm providing 2 SPDT outputs as standard. DPDT output is optionally available and requires the "Wide Line" enclosure.

The single alarm may be a Hi or Low alarm; the dual alarm may be Hi-Low, Low-Hi, Hi-Hi, or Low-Low. Internal jumpers determine the proper relay(s) action.

The relay coil may be power fail safe (i.e.) energized for normal conditions or NON-power fail safe (i.e.) energizes on abnormal conditions.

Unless otherwise specified, the single alarm is set as Hi trip, power fail safe and the dual alarm as Hi-Low trip power fail safe.

LED indicator(s) for alarm condition is provided as standard. Green indicates normal condition and red indicates alarm condition.

### 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 **Input/Output** 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 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

Internal ZERO and SPAN controls are provided for calibration. External multiturn trip set control(s) is provided to set the trip point(s) level on all units. Adjustable dead band and adjustable time delay control(s) may also be provided if specified. If optional calibrated dial(s) for trip set and/or adjustable dead band control(s) is supplied, they are normally mounted in the "Wide Line" enclosure.

The external multiturn control(s) is accessible through the instrument front panel and is clearly marked for ease of use.

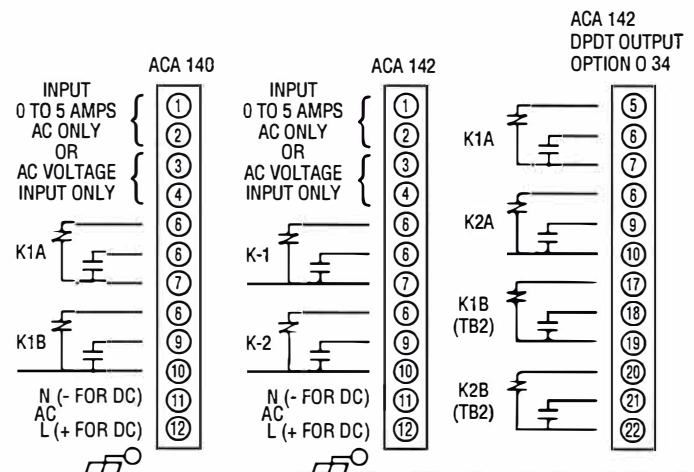
### 4.0 MAINTENANCE

These instruments are electronic except for the relay(s) and require no maintenance except for periodic cleaning and calibration verification. Relay output(s) should be verified at user established time intervals. If the unit appears to be mis-operating it should be checked in place per section 6.0 or removed for a bench check per sections 6.0 and 7.0. MOST problems are traced to field wiring and/or associated circuits. If the problem appears to be within 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.

ACA 140 SINGLE  
 ACA 142 DUAL



## 6.0 SET UP AND CALIBRATION

All ADTECH units are factory calibrated per your instructions. Usually, a complete recalibration is not required unless it is required to change input types, relay action, or the range of the unit. Most calibrations will only require an alarm SET POINT adjustment and the associated options like adjustable DEAD BAND or TIME DELAY.

The calibration process is broken into 5 separate steps as follows:

Input and Output Configuration .....	Sec 6.1
Determining the MAJOR RANGE setting .....	Sec 6.2
Determining the COARSE ZERO and SPAN settings .....	Sec 6.3
FINE ZERO and SPAN adjustment .....	Sec 6.4
Alarm SET POINT, DEAD BAND, and TIME DELAY adjustment.....	Sec 6.5

### 6.1 INPUT AND OUTPUT CONFIGURATION

#### 6.11 INPUT CONFIGURATION

The ACA 140/141 alarms offer either True RMS or Average Responding measurements. Table 4 is used to select the type of measurement for the application. NOTE: While making jumper selections on the pc-board it is important that no external input is applied to the terminal block.

#### 6.12 OUTPUT CONFIGURATION

All ADTECH series 100 alarms allow the customer to change the factory set relay action. The Alarm(s) may be configured for LOW alarm (Alarm condition when the input falls below the set point) or HIGH alarm (Alarm condition when input rises above the set point) as required by your particular application. Table 1 shows the jumper(s) setting required to set the appropriate alarm type.

In addition to the alarm type, the mode in which the relay is energized may be changed. The Relay(s) may be either energized in a FAILSAFE mode (Relay energized under normal, non alarm conditions) or NON-FAILSAFE mode (Relay De-energized under normal, non alarm conditions) as per the application. Use Table 1 to set the jumper(s) as required.

#### 6.13 COMMON EXAMPLES

Example 1 – Single Alarm (K1), High Alarm and Failsafe.

- Jumper J03 set to position A, sets the High Alarm type for relay K1.
- Jumper J01 set to position A, sets the relay to be energized in the Failsafe Mode.

Example 2 – Dual Alarm (K1 and K2), K1 – High Alarm and Failsafe; K2 – Low Alarm and Failsafe.

- Jumper J03 set to position A, sets the High Alarm type for relay K1.
- Jumper J01 set to position A, sets the Relay K1 to be energized in the Failsafe Mode.
- Jumper J04 set to position B, sets the LOW Alarm type for relay K2.
- Jumper J02 set to position A, sets the Relay K2 to be energized in the Failsafe Mode.

### 6.2 DETERMINING MAJOR RANGE

The ADTECH 100 Series of Alarms is designed to provide a wide input range compatibility. This is accomplished with a technique that first conditions the input to a MAJOR RANGE. This ranging technique assures the highest performance from our units and maintains a standard, easy to use calibration method. You can then elevate or suppress up to 85% of the MAJOR RANGE with the COARSE ZERO settings, and also scale to less than 15% of the MAJOR RANGE with the COARSE SPAN settings. The FINE ZERO and SPAN controls provide 12% adjustment of the MAJOR RANGE.

The input SPAN and ZERO values are used to select the MAJOR RANGE from table 4. The MAJOR RANGE is determined from the larger of the SPAN, or ZERO x 1.17 (ignoring the sign) as per the following examples.

Example 1: Input of 1 to 5 am pac

$$\text{SPAN} = (5 - 1) = 4$$

$$\text{ZERO} = 1 \times 1.17 = 1.17$$

Span dominates the selection in this case. You would select the MAJOR RANGE that is greater than or equal to 4 amp-ac from table 4 (selected value 5.76 Aac).

Example 2: Input of 80 to 100 Vac (RMS)

$$\text{SPAN} = (100 - 80) = 20$$

$$\text{ZERO} = 80 \times 1.17 = 93.6$$

This example shows the selection based on the ZERO value. From table 4, you would select a MAJOR RANGE of 97.26 Vac.

### 6.3 COARSE ZERO AND SPAN SETTINGS

Once the MAJOR RANGE is selected, one can determine the COARSE ZERO and SPAN settings. The procedure involves dividing both the ZERO and SPAN values by the MAJOR RANGE to determine a percentage. Then look up the proper settings from tables 2 and 3. We will use values from the first example above to illustrate the procedure.

Example 1: Input of 1 to 5 amp-ac (AVG)

$$\text{SPAN of } (5 - 1) = 4$$

$$\text{ZERO of } 1 \times 1.17 = 1.17$$

$$\text{MAJOR RANGE of } 5.76 \text{ Aac}$$

$$\% \text{SPAN of MAJOR RANGE } (4/5.76) \times 100\% = 69.4\%$$

$$\% \text{ZERO of MAJOR RANGE } (1/5.76) \times 100\% = 17.4\%$$

Simply find the range that includes the percentages you just calculated in the appropriate table, and select the appropriate jumpers.

### 6.4 FINE ZERO AND SPAN ADJUSTMENT

The FINE ZERO and SPAN controls provide an adjustment of 12% of the MAJOR RANGE selected. This is an INTERNAL adjustment. You will need a voltmeter with resolution to 1 mV to do the fine adjustment. The procedure is as follows:

6.41 Connect the voltmeter from GND(-) to VNORM1(+) on the test point header H3 (Refer to figure 2 for locations.) Apply ZERO input to the unit, and adjust the ZERO ADJ. potentiometer until the meter reads 0 Vdc +/- 2 mV.

6.42 Connect the voltmeter from +VR(-) to VNORM1(+) on the test point header. Apply full scale to the unit, and adjust the SPAN ADJ. potentiometer until the

meter reads 0 Vdc +/- 2 mV.

- 6.43 Recheck ZERO and SPAN values per step 1 and 2 above, and adjust the appropriate controls as necessary.

### 6.5 ALARM SET POINT, DEAD BAND AND TIME DELAY ADJUSTMENT

Alarm SET POINT, and the optional DEAD BAND and TIME DELAY controls are accessed from the front of the unit. The adjustment procedure is described for one alarm, and applies to each alarm of a dual alarm unit.

#### 6.51 SET POINT

The Alarm SET POINT adjustment is made by applying the desired input value, and adjusting the SET POINT potentiometer until the alarm changes from normal (GREEN LED indication) to alarm (RED LED indication). IT IS VERY IMPORTANT that the potentiometer be adjusted from the non-alarm condition to the alarm condition to insure the proper alarm setting.

**TABLE 1  
RELAY ACTION JUMPER SELECTION**

RELAY CONFIGURATION	RELAY	
	K1	K2
Low Alarm	JO3=B	JO4=B
High Alarm	JO3=A	JO4=A
Non-Failsafe	JO1=B	JO2=B
Failsafe	JO1=A	JO2=A

**TABLE 2  
COURSE SPAN**

PERCENT OF MAJ. RANGE	JUMPER POSITION		
	JS3	JS2	JS1
100 - 90	A	A	A
90 - 79	A	A	B
79 - 68	A	B	A
68 - 57	A	B	B
57 - 46	B	A	A
46 - 35	B	A	B
35 - 24	B	B	A
24 - 11	B	B	B

**TABLE 3  
COURSE ZERO**

PERCENT OF MAJ. RANGE	JUMPER POSITION		
	JZ3	JZ2	JZ1
88 - 74	A	A	A
74 - 63	A	A	B
63 - 52	A	B	A
52 - 40	A	B	B
40 - 29	B	A	A
29 - 17	B	A	B
17 - 6	B	B	A
6 - (-6)	B	B	B

**TABLE 4  
ACA 140/ACA 142 MAJOR RANGE JUMPER SELECTION**

INPUT TYPE	MAJOR RANGE	JUMPER				
		J1	J2	JR1	JR2	JR3
VOLTAGE (RMS)	24.32V	A	B	B	OUT	B
	97.26V	A	B	B	OUT	A
VOLTAGE (AVG)	389.12V*	A	A	B	OUT	A
	21.9V	B	B	B	OUT	B
CURRENT (RMS)	87.58V	B	B	B	OUT	A
	350.33V*	B	A	B	OUT	A
CURRENT (AVG)	1.6A	A	B	B	OUT	A
	6.4A	A	B	B	OUT	A
CURRENT (AVG)	1.44A	B	B	B	OUT	A
	5.76A	B	A	B	OUT	A

\*Maximum applied input voltage is 300 Vrms

#### 6.52 DEAD BAND

All ADTECH Alarms come with a fixed 0.5% of SPAN DEAD BAND setting. We supply an adjustable DEAD BAND as an option to the unit. This procedure applies only to the optional DEAD BAND adjustment.

The SET POINT should be set per the instructions. Adjust the input to the unit until it goes into an alarm state (RED LED indication). Turn the DEAD BAND potentiometer clockwise (to increase the DEAD BAND beyond your desired setting). Re-adjust the input to the level you want to return to normal alarm state. Adjust the DEAD BAND potentiometer counterclockwise until the unit returns to normal (GREEN LED indication).

#### 6.53 TIME DELAY

ADTECH alarms can be supplied with adjustable TIME DELAY. The function helps prevent nuisance alarms when the input signal is noisy.

The TIME DELAY is adjustable from less than 1 second to a maximum of 25 seconds. Turning the TIME DELAY potentiometer clockwise increases the time delay. Since the adjustment is a blind setting, you adjust to a desired TIME DELAY through repeated trials. Toggle the input value from normal to alarm and measure the time until the relay operates (GREEN to RED LED indication).

### 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"> <li>1. Check the input and output connections carefully.</li> <li>2. Check that the power supply polarity is correct and that power is present on the instrument terminals.</li> <li>3. Check that the input source(s) is correct and that it changes magnitude between zero and full scale values when so adjusted.</li> </ol>

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

CHECKPOINT (H3 LABEL)	VOLTAGE (Vdc)
+24V	26+/-4
+V	8+/-0.5
+VR	-5+/-0.5
-V	-8+/-0.5
-VR	-5+/-0.25
VNORM1	0 to 5*

Note:

All Test Points Located at Header, (H3).

All Test Points With Respect to "GND" at Head.

\*Varies with Zero to Full scale Input

# 8.0 COMPONENT LAYOUT

FIG. 2

