

## THE AMA-RM-044 SIGNAL CONDITIONING UNIT

### GENERAL

The RM-044 has been designed as a low cost stand alone unit to provide signal conditioning for strain gauge type transducers such as Pressure Transducers and Load Cells.

The electronics is housed in a 100 x 115 x 20 mm plastic housing.

Four, three 3 pin connectors are provided for signal, transducer and power connections.

The RM-044 is normally supplied to provide + 10 volts output for the full range of the transducer but the output will drive over the full range of  $\pm 10$  volts. The output is also configured to provide 4 to 20 mA signals if required.

### SPECIFICATIONS

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POWER SUPPLY:	+24 V NOM. (18 TO 30 V) .
TRANSDUCER SUPPLIES:	+1.3 -> +10 VOLT @ 50 mA MAX. or $\pm 15$ VOLT @ 35 mA MAX (Link Selectable).
INPUT IMPEDANCE:	> 100 M $\Omega$ (DIFFERENTIAL)
CMRR:	100 dB @ 50 Hz TYP.
LINEARITY:	0.01% TYP.
ZERO STABILITY:	0.001% / $^{\circ}$ C OF F.R.O.
GAIN STABILITY:	0.001% / $^{\circ}$ C.
EXCITATION STABILITY:	0.02%/ $^{\circ}$ C.
GAIN RANGE:	120 TO 3200.
ZERO SUPPRESSION:	$\pm 10$ VOLTS RTO
FREQUENCY RESPONSE:	20 Hz OR 1 KHz 4 POLE MAX FLAT – (FACTORY CONFIGURED).
OUTPUTS:	$\pm 10$ VOLTS @ 5 mA MAX. 4 TO 20 mA ( 500 $\Omega$ MAX ).
OUTPUT NOISE:	1 mV RMS .
ENVIRONMENT:	0 TO 70 $^{\circ}$ C 90% R.H. N/C.
PHYSICAL:	100 x 115 x 20 mm (LWH)

NOTE: SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

### MODULE CALIBRATION DETAILS

Module S/N	
Transducer Type	
Transducer S/N	
Input	
Output	
Frequency Response	-3 dB @ 20Hz
Cable/Transducer connections	
TRANSDUCER TERMINAL/WIRE COLOUR	RM044 TERMINALS
	7 - SIGNAL +
	8 – SIGNAL -
	9 - SHIELD
	10 - EXCITATION +
	12 - EXCITATION -

## GETTING STARTED

Listed below are the terminal numbers and descriptions, refer to below text and diagrams for all connection and configuration details.

### Mounting:

**Note: The units should be mounted vertically to allow normal convection cooling through the units. A space of 50mm should be left above and below the unit. Incorrect installation may void manufactures warranty.**

### Connecting power:

Listed in table one are the power connection details for 24 volt operation . The unit can be configured for 12V operation by placing LK12 in position A (see fig 1 for link positions). In this configuration the maximum signal output and excitation available is 5 volt. If the 12 volt option is used the supply must be well regulated and filtered.

Table 1 POWER CONNECTIONS

TERMINAL NUMBER	DESCRIPTION
1	+ 24 V in
2	COMMON
3	EARTH

### Connecting output:

There are two options for output configurations, voltage output terminals 4 and 6 and current output, terminals 5 and 6. (see table below). Both outputs may be used simultaneously but their calibration is not independently adjustable ie when using the 4 – 20 mA output, the voltage output will be 0 – 10V +/- 1%.

Table 2 OUTPUT CONNECTIONS

TERMINAL NUMBER	DESCRIPTION
4	VOLTAGE OUT
5	CURRENT OUT
6	COMMON

### Transducer connections:

The RM-044 module can be configured for a variety of transducers, for specific transducer connections see transducer manufactures data sheet.

**Excitation configuration:**

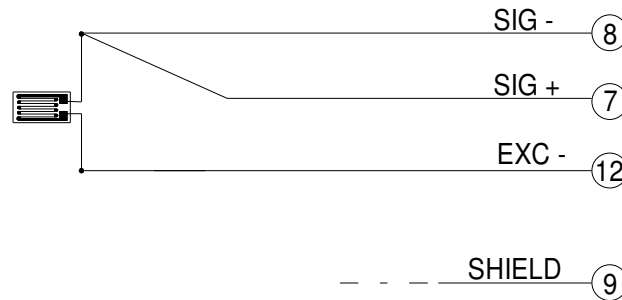
The excitation can be configured two ways:

1. Variable supply mode (variable excitation) with LK 11 in B position, connect transducer to terminals 10 and 12 (see table 3). In this configuration a regulated voltage output of 1.3 – 10 volt is available to the user and is adjustable from the front panel EXC control.
2. Fixed supply mode, +/- 15 volts is available on terminals 10, 11 and 12 with LK11 in position A +15V terminal 10, COMMON terminal 12 and -15V terminal 11.

**Signal connections:**

The signal connections can be configured in five ways:

1. Differentially – this the most common configuration used with load cells, pressure transducers and most strain gauge based transducers. In this configuration R25, R26, R40 and LK8 are not installed. Link 16 is in position B.
2. Single ended – this is normally for use with transducers with a high level output ie 0 – 5V or 0 - 10V. In this configuration LK 8 should be installed and LK16 should be in position B
3. Single ended ratiometric – For use with ratiometric transducers ,i.e. Lucas Accustar Clinometers. In this configuration LK8 is not installed and 2 1K resistors are installed in R25 and R26.
4. Three wire quarter bridge strain gauge. In the configuration LK 16 is in position A, LK 8 is not installed and two 350 ohm 0.01% high precision resistors are placed in positions R25 and R26. R39 is either a 350R or 120R 0.01% high precision resistor, depending on gauge type. See below diagram for ¼ bridge connections. See table 2 for gain setting. The figures stated in table 2 assume a gauge factor of 2.1. R5 = 6.19K
5. Half bridge strain gauge. For use with half bridge strain gauges. R25 and R26 are factory installed 350Ω 0.01% resistors.
6. Current input (4-20mA). This is a factory installed option. In this configuration, R40 is installed.



¼ BRIDGE CONNECTIONS.

Table 3  
 TRANSDUCER CONNECTIONS

TERMINAL NUMBER	DESCRIPTION
7	+ SIGNAL
8	- SIGNAL
9	CABLE SHEILD
10	+ EXCITATION
11	See text not used for load cells.
12	EXCITATION COMMON

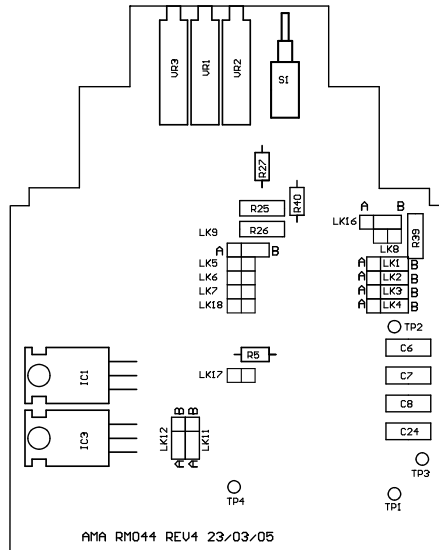


Fig 1.  
 PCB Overlay showing link positions and programmable resistor.

**Setting Excitation Voltage:**

(Only applicable for variable supply mode.)

Connect transducer, power and output connections as detailed above.

Connect multimeter probes to pins 10 and 12.

Adjust excitation voltage to desired level.

**GAIN SETTING**

For standard strain gauge based transducers, the Table 1 below details the link position required for various transducer sensitivities. In all link positions the full scale output is 10 volt (or 4-20mA). The table shows the mV/V range for minimum and maximum span potentiometer positions. If unity gain is

required (ie 10 volt in for 10 volt out (or 4 – 20 mA) resistor R5 will have to be changed to 46.4 K $\Omega$ . For quarter bridge strain gauge work refer to Table 2 for gain setting. The units are supplied with 150K Calibration resistors in position R27 which equates to a cal factor of 380.7 me for 120 ohm bridges and 1108.9 me for 350R bridges. Span and zero will have to be re-adjusted in if the user switches between gain ranges.

Installed links	mV/V RANGE	GAIN RANGE
No links	166 to 333	3 to 6
LK4	4.2 to 8.4	118 to 236
LK3	2.2 to 4.5	223 to 447
LK2	1.3 to 2.5	387 to 775
LK2&LK4	1 to 2	503 to 1006
LK1	0.5 to 1	1003 to 2006
LK1&LK2&LK3	0.3 to 0.62	1608 to 3216

Table 1

Installed Link – B POSITION	$\mu\epsilon$ STRAIN RANGE
LK1	500
LK2	1000
LK3	2000
LK4	2500

Table 2

### Zero setting

Once the gain has been set up and transducer connected the offset can be adjusted, the front panel offset control provides +/- 20% variation. Further offset adjustment range is available by using internal links, this is normally required when compensating for large gross offsets, ie when taring out the weight of an empty bin in a bin weighing application.

For ranges available see below Table 2. Note when using links for larger offsets, for positive offset LK9 is in position B and for a negative offset LK9 is in position A.

Installed links	OFFSET MIN	OFFSET MAX
No Links	-20%	+20%
LK7	--3.5%	38%
LK6	13%	55%
LK7+LK6	31%	72%
LK5	46%	88%
LK7+LK5	63%	105%

Table 2

### Technical Description.

#### Input stage:

The input stage is formed by IC2 and associated components. IC2 is an dedicated instrumentation amplifier whose gain is set by links LK1 to LK4, when all links are removed the gain of IC2 is unity. Components L1,L2 and C1 form a filter to remove common mode EMI noise, resistors r25 and R26 are for half bridge completion when using strain gauges requiring half bridge completion or ratiometric half bridge transducers, this option is factory installed. Push button S1 and resistor R27 form the calibration circuit.

Integrated circuit IC5:A is the gain and offset stage, as shown in the table above, the offset range

without links is +/- 20% and up to +/-100% zero suppression can be obtained by installing the appropriate links as detailed in the table above. Resistor R5 is a programmable resistor (nominally 10K) which can be changed for applications which fall outside the modules normal gain requirements (consult factory).

IC5:b and IC9:b forms a 4 pole butterworth filter which is nominally configured for a cut off frequency of 20 Hz (other frequency's available , consult factory), the rate of roll-off is 24dB per octave. Integrated circuit ic6 and associated components form the 4-20mA current output stage. IC6:B is the gain and offset stage and IC6:A is the voltage to current converter. IC4 is a voltage inverter, it converts the on board + 15 Volt regulated supply to -15V. IC1 is the regulator for the excitation circuitry, its range is adjustable from 1.3 to 11 volts. IC's 7 and 8 are on board references for zero and offset controls. IC3 and associated components form the on board regulation and input RFI filtering. Please refer to fig 1 for link positions.

### SET UP CHECK LIST

Unit s/n:  
 Customer:  
 Date:

R5 =	C6 =
R25=	C7=
R26=	C8=
R27=	C24=
R39=	
R40=	

Links

	LK1	A	B
	LK2	A	B
	LK3	A	B
	LK4	A	B
	LK5		
	LK6		
	LK7		
	LK8		
	LK9	A	B
	LK11	A	B
	LK12	A	B
	LK16	A	B
	LK17		
	LK18		

Notes:

**Other details:**

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