SAM-3

USER'S MANUAL

(DOCUMENT ID 000202)

December , 1996

MACINTYRE ELECTRONIC DESIGN ASSOCIATES, INC. (MEDA, INC)

22611 Markey Court, Suite #114

Dulles, VA 20166

SAFETY WARNING

This instrument is designed for operation from the AC power line as well as from batteries. When it is plugged into the AC line, full line voltage exists on traces on the printed circuit board. Be sure to unplug the instrument before removing the front or rear bezel and the top or bottom cover.

It is recommended that batteries be removed and the external battery disconnected before opening the instrument.

INADVERTENT BATTERY DISCHARGE

If the unit is merely unplugged after being operated on the power line, the internal or external battery will be discharged unintentionally. It is necessary to switch the unit off with the front panel POWER switch to avoid this inconvenience.

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1. INTRODUCTION

1.1 DESCRIPTION

The SAM-3 is a wideband signal conditioner specifically tailored to the needs of MEDA's MGCH-2 wideband magnetic field antenna probe. The SAM-3 provides power to the MGCH-2, buffers the signal from the probe, detects signal overload conditions, provides power line notch filtering, and allows the operator to select five (5) different gain settings.

The SAM-3 has two field replaceable NiCd batteries which allow it to operate for 8 to 10 hours on a single charge. It may also be operated from standard 110 VAC 50/60 Hz commercial power. When the SAM-3 is powered from commercial power, an internal AC-to-DC power supply replaces the batteries. An indicator light informs the operator that the unit is being line powered. The switch over from battery to line power is automatic whenever line voltage is present.

The batteries may be charged using a commercially available "Smart" charger which senses the state of the batteries' charge and determines the best method for charging the batteries. NiCd batteries are very sensitive to the discharge-charge cycle. Their discharge rate and number of useful cycles are directly affected by the charging method. A "Smart" charger maximizes the life of a NiCd battery by choosing the best charging method.

A connector on the rear of the SAM-3 chassis can be used to attach an external power supply which replaces the battery supply. This may be used, for example, to extend the battery operation of the SAM-3 by using a larger capacity battery.

A block diagram of the SAM-3 is given in Figure 1. The signal from the antenna is AC coupled to a buffer amplifier. The output of the buffer is routed to the Filter Selector Switch and to the inputs of the Power Line Notch Filters and a 500 Hz High Pass Filter.

The outputs of these filters are also connected to the Filter Selector Switch. This switch is used by the operator to select:

- o wideband (2.5 Hz to 100 kHz)
- o wideband with power line notches
- o high pass input filter (500 Hz to 100 kHz).

The operator may select the notch filter frequencies based on a 50 Hz or 60 Hz line power fundamental frequency.

The output of the Filter Selector Switch is fed to a level control potentiometer which can be used to adjust the input level to the Gain Amplifier. The Gain Amplifier provides operator selected gains of 1, 3, 10, 30, and 100.

Two Overload Detection circuits cause LED indicator lights on the front panel to turn on whenever the input or output exceeds 20 Volts p-p. Both of these lights should be off during normal operation to assure that the SAM-3 is operating in the linear range.

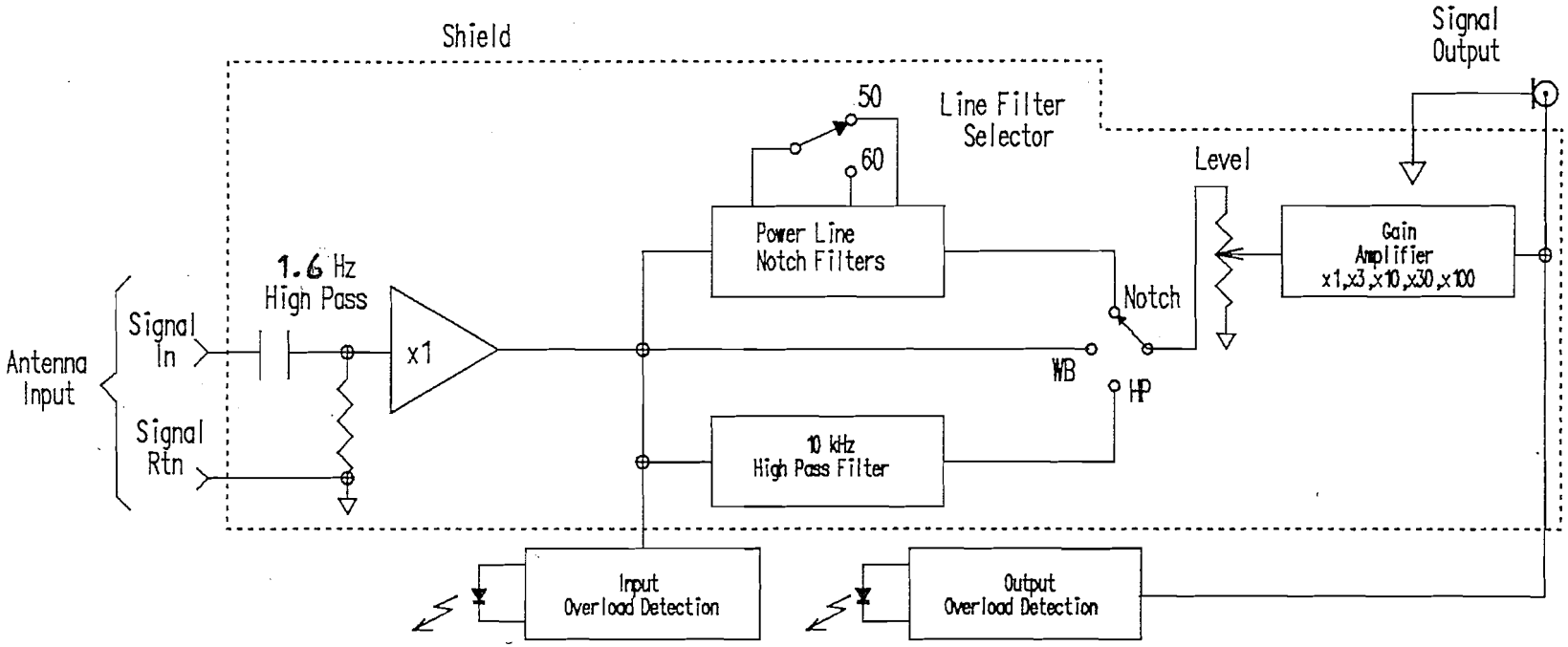


FIG-1. SAM-3 SIGNAL CONDITIONER
BLOCK DIAGRAM

The front panel of the instrument is shown in Figure 2. The power switch at the lower left has a built-in lampless indicator which shows orange when the power switch is on. Two (2) LED indicators are at the top left. The LINE indicator is lit whenever line power is present. The LOW BAT indicator glows when total battery voltage falls below 24.5 VDC to announce that batteries must be replaced with freshly charged ones or that line power must be provided.

The SENSOR connector attaches to a jack at the lower left of the panel. The output is a BNC connector at the far right. Each has an LED indicator directly above it which indicates voltage saturation of the associated signal. The FILTER selector switch is just to the right of the SENSOR connector.

The LEVEL potentiometer is about in the center of the panel. To its right is the GAIN potentiometer. The GAIN switch on the output amplifier is at the right of the panel.

The FILTER selector is a three-position rotary switch. In the left position, it selects the 500 Hz high pass filter. In the center position, it selects the power line notch filters. In the right position, it provides the wideband signal without filtration.

A 50-60 Hertz slide switch for the notch filters is provided on the rear panel. A power system fuse is also on the rear panel. Two trap doors through which the Nicad batteries slide are provided at the right and left sides of the rear panel so that the battery mass is balanced.

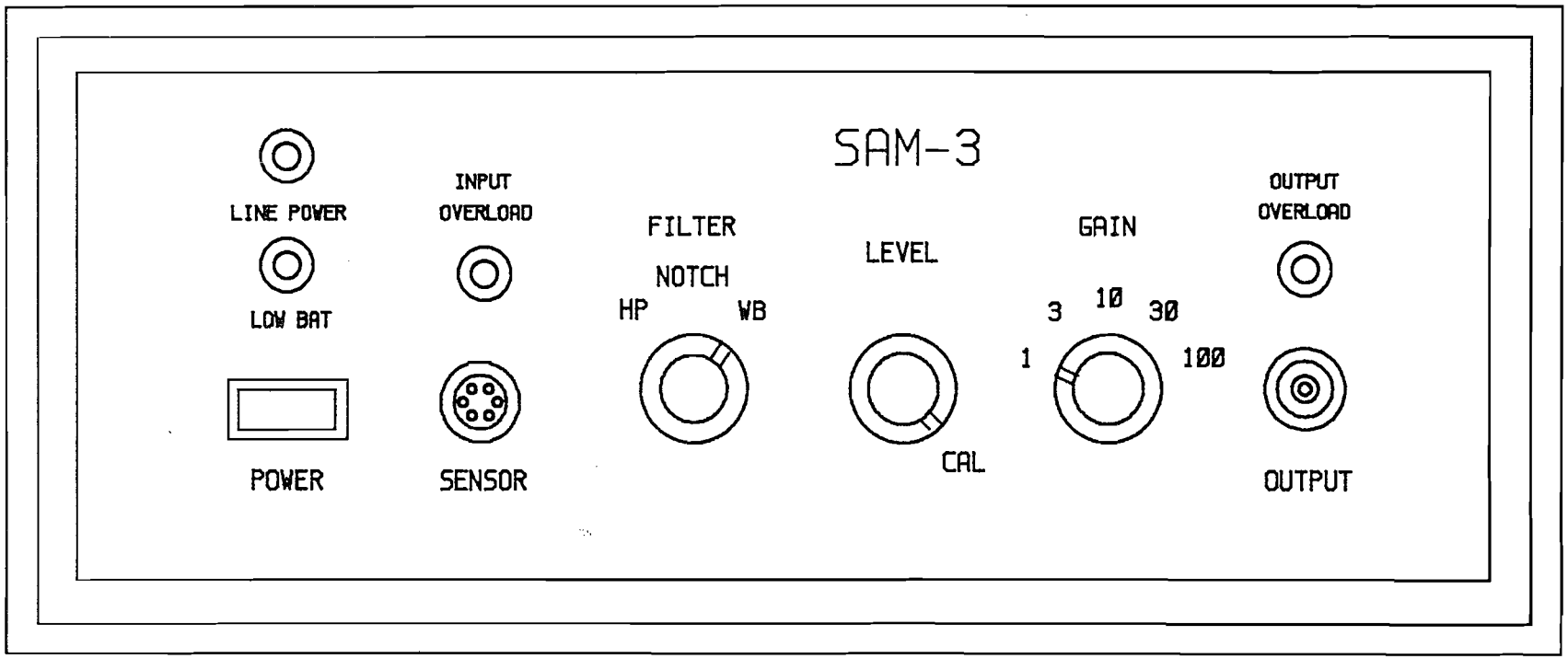


FIG-2. SAM-3 FRONT PANEL

1.2 FEATURES

- Wide Bandwidth: 2.5 Hz to 100 kHz
- Power Line Notch Filters: 60, 120, 180, 240, 300, or 50, 100, 150, 200, 250
- Portable, Battery and Line Powered
- Five (5) Gain Settings: 1, 3, 10, 30, 100
- Antenna Probe Power Source
- Input and Output Overload Indicators
- Battery Low Indicator
- Selectable 500 Hz 5-Pole High Pass Input Filter
- Connector for External Battery

1.3 SPECIFICATIONS

INPUT

CONNECTOR	6 Pin Lemo Model EPG.1B.306HLN
TYPE	Single Ended
IMPEDANCE	1 MΩ
VOLTAGE RANGE	20V p-p
COUPLING	AC (-3dB @ 2.5 Hz)
ANTENNA POWER	±12 to ±16 VDC @ 10 mA nom.
OVERLOAD INDICATOR	Input > 20V p-p

TRANSFER

GAIN	Selectable x1, x3, x10, x30, x100
GAIN ERROR	±1% with Level at x1
LEVEL	Continuous adjustment from 0 to x1

POWER LINE FILTERS

SELECTION	In, Out, 50 or 60 Hz
TYPE	Notch
FREQUENCIES	Fundamental power line frequency plus the first four (4) Harmonics
NOTCH ATTENUATION	40dB nominal
NOTCH BANDWIDTH	.1 f_n (3dB down BW)

HIGH PASS FILTER

SELECTION	In, Out
TYPE	Five Pole Butterworth
CORNER FREQUENCY	500 Hz Nominal

OUTPUT

CONNECTOR	Floating BNC
TYPE	Single Ended
IMPEDANCE	< 10Ω
RANGE	20V p-p
OVERLOAD INDICATOR	Output > 20V p-p

POWER REQUIREMENTS

INTERNAL BATTERIES	Two (2) Rechargeable Nickel Cadmium Batteries (Type H4463B) or Two (2) Single-Use Batteries (Type H568 or H568M)*
BATTERY REPLACEMENT	Through rear panel hatch doors
BATTERY OPERATING VOLTAGE RANGE	24 TO 32 VDC (both batteries in series)
BATTERY DRAIN CURRENT	60mA maximum with Power Line Filters in. 30 mA maximum with Power Line Filters out.
BATTERY CAPACITY	500mA-Hrs
BATTERY VOLTAGE INDICATOR	Turns on when battery voltage is less than 24.5 VDC

* Available in Regional Distributor Stock from:

Alexander Manufacturing Co.
P. O. Box 1508
Mason City, IA 50401

Phone: (515) 423-8955 or (800) 247-1821

INTERNAL LINE SUPPLY

INPUT	115 VAC ±5% @ 40 mAac
FREQUENCY	40 to 400 Hz
OUTPUT	+30 VDC ±5% @ 100mA

PHYSICAL

SIZE (Not including Handle)	3 5/8" H x 8 3/8" W x 11 1/4" D
WEIGHT	5 lbs.

2. OPERATING INSTRUCTIONS

2.1 INTRODUCTION

This section of the manual contains information on the operation of the instrument. Please read this section first before attempting to use the SAM-3. If you have any questions or problems, please call MEDA, Inc. for assistance.

2.2 SHIPPING INFORMATION

When the SAM-3 is received, inspect it for damages that might have occurred during shipping. If damages have occurred, immediately notify MEDA. MEDA will establish the best way for the equipment to be returned for repair.

2.3 POWER SOURCES

The SAM-3 is designed to be powered in four (4) ways:

1) Internal NiCd batteries

2) Internal line powered regulated supply

3) External battery of 24-32 volts for extended periods of operation

4) Internal primary (non-rechargeable) batteries are available for use in emergency situations.

The unit will be powered by the internal (or external) batteries when the power switch is on and when line power is not present. When line power is provided by plugging in the detachable power cord to 115 VAC, 50 or 60 Hz power line, the batteries are automatically switched out and the internal power supply takes over.

After operating the unit on line power, be sure to switch it off with the power switch on the front panel. Otherwise, if the unit is unplugged, it will continue on battery power and the batteries will be unintentionally discharged.

Recharging of the NiCd batteries is accomplished by placing them in a SM32000 Smart Charger or equivalent.

The SAM-3 can be operated without batteries installed.

The fuse on the rear panel protects the AC input to the internal supply. There is another fuse mounted on the front left of the printed circuit board near the power switch which protects the battery circuit - both internal and external. It is necessary to remove the top cover to gain access to this fuse. CAUTION: Unplug the unit before working on it. Line voltage is present on conductor traces on the bottom of the printed circuit board. To remove the top cover, it is necessary to remove either the front or rear bezel frame by removing four (4) 4-40 Phillips head screws on the sides of the unit. The top cover then slides out.

2.4 FRONT PANEL FUNCTIONS

The functions of the front panel indicators, switches, and connectors are described in Table 1. Their location can be found in Figure 2.

Table 1 FRONT PANEL CONTROLS, INDICATORS, AND CONNECTORS

ITEM	NAME	DESCRIPTION
1	POWER Switch	Controls all power to the instrument from whatever source. Lampless indicator button shows orange when in (ON) and black when out (OFF).
2	LOW BAT Indicator	Red LED indicator glows when battery needs recharging.
3	LINE POWER Indicator	Red LED Indicator glows when line power is present and power switch is ON.
4	SENSOR Connector	The sensor is connected to the SAM-3 signal conditioner at this connector.
5	INPUT OVERLOAD Indicator	Red LED glows when input signal exceeds 20 volts peak-to-peak.
6	FILTER Switch	Three-position rotary switch selects HP (500 Hz high-pass) filter, NOTCH power line rejection filters, or WB wideband (no filtration).
7	LEVEL Control	Potentiometer provides continuously variable attenuation of the signal. When in the CAL position, the signal conditioner gain is as given by the position of the GAIN selector switch. Allows continuous attenuation of the signal to zero in the CCW position.
8	GAIN Switch	Selector switch controls the signal conditioner amplification factor. The gain is as indicated when the LEVEL control is in the CAL position.
9	OUTPUT Connector	Floating BNC connector carries the output signal.
10	OUTPUT OVERLOAD Indicator	Red LED glows when output signal exceeds 20 volts peak-to-peak.

2.5 BASIC OPERATING PROCEDURE

This section gives a routine for getting the SAM-3 up and running which may be helpful to the new user.

1. Be sure that batteries are installed in the compartments with hinged doors on the rear panel of the instrument. The circular metal contacts on the ends of the batteries should face forward and be on the bottom so that they touch the contact springs in the battery compartment when the lid is closed. Alternatively, plug the line cord into the jack on the rear panel and connect to 115 VAC commercial power.

2. Connect the sensor plug to the SENSOR jack on the front panel being careful to align the red dots.

3. Connect a BNC cable between the OUTPUT jack and an oscilloscope, spectrum analyzer or other readout instrument. It is recommended that an oscilloscope always be used to monitor the output waveforms in addition to any other readout instrumentation.

4. Set the front panel FILTER switch to WB (wideband), the LEVEL control to CAL and the GAIN switch to 1.

5. Push the POWER button in. An orange color will appear on the POWER button denoting that the switch is on. If the unit is connected to line power, the red LINE POWER lamp will light.

6. If the INPUT OVERLOAD lamp glows red, the sensor is saturated by too strong a magnetic signal. It must be pointed in a different direction and/or placed in a different location.

7. Set the slide switch on the rear panel to 50 or 60 to correspond with the local power frequency.

8. If large power line waveforms appear on the oscilloscope, reduce them by changing the FILTERS switch to NOTCH or HP (high pass).

9. Adjust the GAIN switch and the LEVEL control until the signal of interest is suitably large at the output.

10. Only when the LEVEL control is at CAL is the SAM-3 scale factor precisely as indicated by the setting of the GAIN switch. It can otherwise only be estimated by multiplying the gain switch setting by the fractional rotation of the LEVEL potentiometer.

11. Be sure to turn the instrument off with the POWER button, which will turn black in the off position. Otherwise the internal batteries will be unintentionally discharged.

2.6 OPERATING SUGGESTIONS

The following sections describe suggested procedures that will make sure that the output signals are those being detected by the sensor and are not the result of incorrect instrument operation.

2.6.1 SATURATION AVOIDANCE

It is imperative that saturation be avoided in the amplifier chain of the instrument. The design of the SAM-3 makes this a straightforward matter of monitoring the overload indicators. The INPUT OVERLOAD indicator in effect detects saturation of the sensor amplifier. Given that the sensor is operating in its linear range, the FILTER, LEVEL, and GAIN controls can be used freely in combination to achieve maximum output signal without saturation.

If saturation of the sensor amplifier occurs, the sensor must be reoriented and/or relocated.

If possible, monitor the output signal with an oscilloscope to assess the line frequency pickup, and guide the filter selection and gain adjustment process.

Note that performance is penalized in two (2) ways when using the notch filters:

1. The noise of the signal conditioner is increased by a factor of about ten in the notch range of frequencies and by a factor of two above about 500 Hz.

2. The current drain of the instrument is nearly doubled. This means that the operating time on freshly charged NiCd batteries is increased from 8-10 to 16-20 hours when the notch filters are not used.

2.6.2 OVERLOAD INDICATION

The overload light indicates that the signal being monitored has exceeded the linear operating range of the instrument. It is not a sharp transition. The instrument will not reach saturation until the signal is roughly 20% above the level indicated by the light. The operator should adjust the gain of the SAM-3 until the light just goes out.

Even very fast overload events will light the overload indicator for about one second to make the condition more readily apparent to the operator.

2.6.3 LEVEL

The LEVEL control should be turned completely clockwise until it clicks into the CAL position if accurate measurements of the field strength are to be made. If this switch is not in the CAL position, the scale factor of the instrument is unknown and can only be estimated by the position of the control knob relative to its total adjustment range.

3. THEORY OF OPERATION

3.1 INTRODUCTION

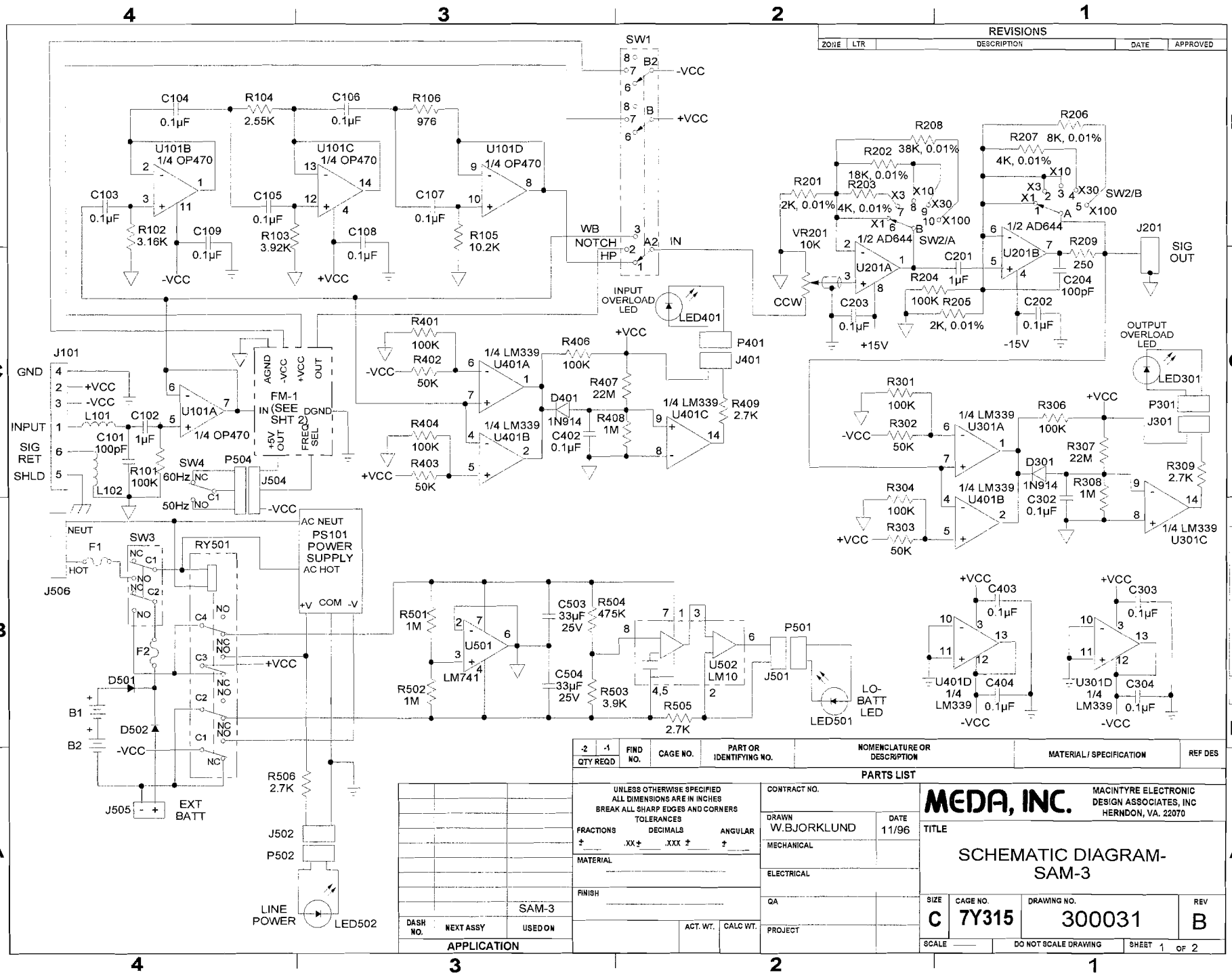
This section provides circuit descriptions for the Signal Conditioner. This information is provided so that the user may understand the operation and limitations of the instrument. It is not recommended that the user perform any repairs to the instrument. Once repairs have been executed, the SAM-3 should be recalibrated and its performance verified prior to use.

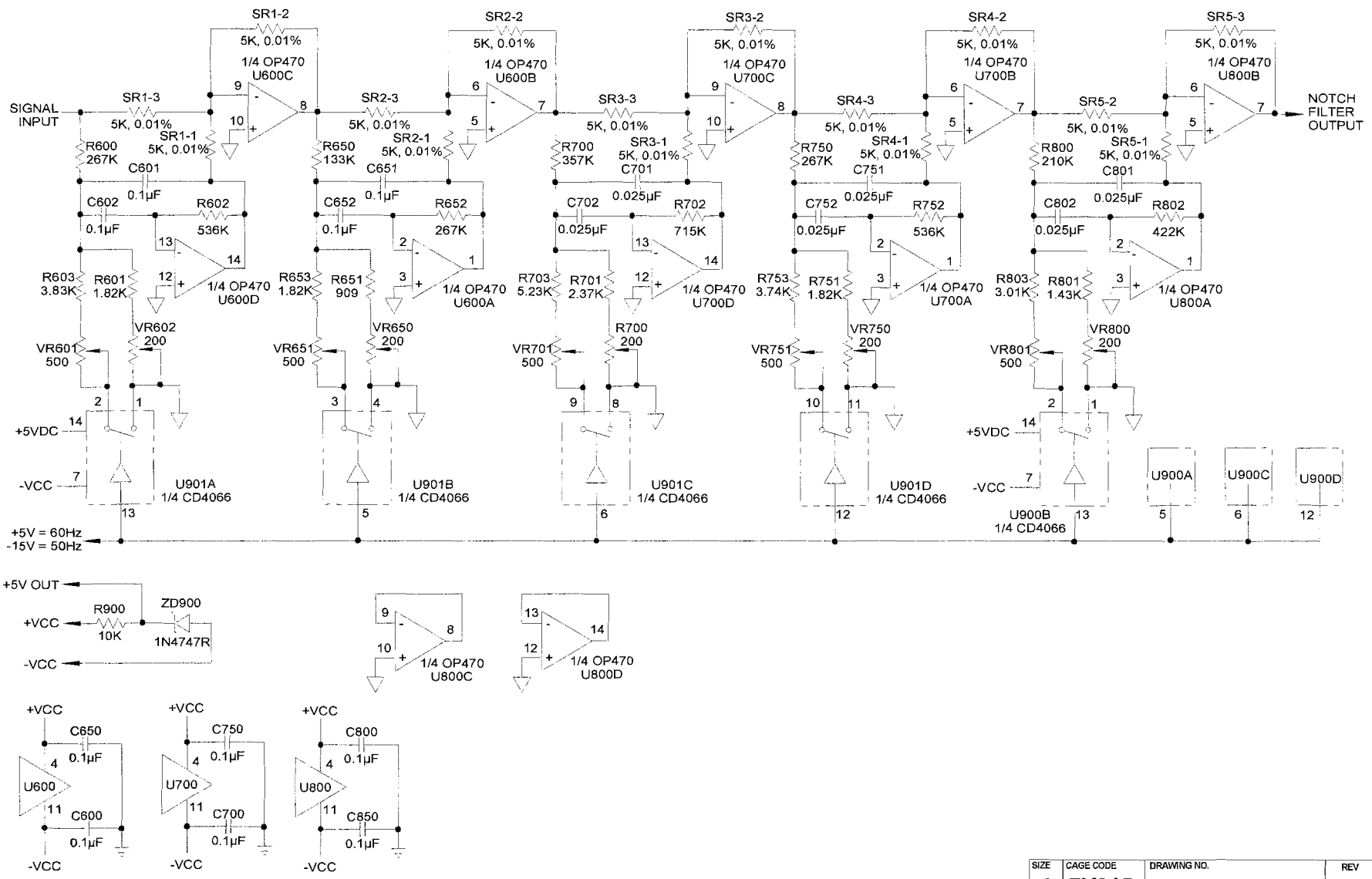
3.2 SIGNAL CONDITIONER

Refer to the Schematic Diagram (Drawing No. 300031, Rev. A) on page 20 for the schematic of the SAM-3 Signal Conditioner. The Signal Conditioner comprises a buffer amplifier, a high pass filter, a notch filter, a variable gain amplifier circuit, two identical saturation detection circuits and a power supply circuit. The following sections describe these circuits in detail.

3.2.1 INPUT BUFFER AMPLIFIER

The input signal enters from the sensor connector through an RF trap composed of inductors L101, L102 and capacitor C101. It is AC coupled by C102 and R101 to the positive input of unity gain follower U101/A.


REVISIONS
ZONE | LTR | DESCRIPTION | DATE | APPROVED
SW1
B2
B
-VCC
+VCC
C104 0.1µF
R104 2.55K
C106 0.1µF
R106 976
U101B 1/4 OP470
U101C 1/4 OP470
U101D 1/4 OP470
C103 0.1µF
R102 3.16K
C109 0.1µF
C105 0.1µF
R103 3.92K
C108 0.1µF
C107 0.1µF
R105 10.2K
WB
NOTCH
HP
IN
A2
R208
R202 38K, 0.01%
18K, 0.01%
R203
4K, 0.01%
R201 2K, 0.01%
4K, 0.01%
R206
R207 8K, 0.01%
4K, 0.01%
X10
X3
X1
X30
X100
SW2/A
SW2/B
VR201 10K
CCW
1/2 AD644
U201A
U201B
C201 1µF
R204 100K
R205 2K, 0.01%
C203 0.1µF
C202 0.1µF
+15V
-15V
R209 250
C204 100pF
J201
SIG OUT
INPUT OVERLOAD LED
LED401
P401
J401
OUTPUT OVERLOAD LED
LED301
P301
J301
J101
GND
+VCC
-VCC
INPUT
SIG RET
SHLD
L101
C102 1µF
C101 100pF
L102
R101 100K
U101A
1/4 OP470
FM-1
IN (SEE SHT 2)
AGND
-VCC
+VCC
OUT
+5V OUT
FREQ SEL
DGND
SW4
60Hz
50Hz
NC
NO
C1
P504
J504
R401 100K
R402 50K
R404 100K
R403 50K
1/4 LM339 U401A
1/4 LM339 U401B
1/4 LM339 U401C
R406 100K
R407 22M
R408 1M
D401 1N914
C402 0.1µF
R409 2.7K
R301 100K
R302 50K
R304 100K
R303 50K
R306 100K
R307 22M
R308 1M
D301 1N914
C302 0.1µF
R309 2.7K
1/4 LM339 U301A
1/4 LM339 U301B
1/4 LM339 U301C
NEUT
HOT
F1
J506
SW3
RY501
PS101 POWER SUPPLY
AC NEUT
AC HOT
+V COM -V
F2
D501
D502
B1
B2
J505
EXT BATT
R501 1M
R502 1M
U501 LM741
C503 33µF 25V
C504 33µF 25V
R504 475K
R503 3.9K
R505 2.7K
U502 LM10
P501
J501
LED501
LO-BATT LED
C403 0.1µF
C404 0.1µF
U401D 1/4 LM339
C303 0.1µF
C304 0.1µF
U301D 1/4 LM339
R506 2.7K
J502
P502
LINE POWER
LED502
SAM-3
DASH NO.
NEXT ASSY
USED ON
APPLICATION
QTY REQD
FIND NO.
CAGE NO.
PART OR IDENTIFYING NO.
NOMENCLATURE OR DESCRIPTION
MATERIAL / SPECIFICATION
REF DES
PARTS LIST
UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES
BREAK ALL SHARP EDGES AND CORNERS
TOLERANCES
FRACTIONS
DECIMALS
ANGULAR
MATERIAL
FINISH
ACT. WT.
CALC WT.
CONTRACT NO.
DRAWN W.BJORKLUND
DATE 11/96
MECHANICAL
ELECTRICAL
QA
PROJECT
MEDA, INC.
MACINTYRE ELECTRONIC DESIGN ASSOCIATES, INC
HERNDON, VA. 22070
TITLE
SCHEMATIC DIAGRAM-
SAM-3
SIZE C
CAGE NO. 7Y315
DRAWING NO. 300031
REV B
SCALE
DO NOT SCALE DRAWING
SHEET 1 OF 2



SIZE	CAGE CODE	DRAWING NO.	REV
C	7Y315	300031	B
SCALE		SHEET 2 OF 2	

3.2.2 HIGH PASS FILTER

A high pass Butterworth fifth (5th) order filter with corner frequency of 500 Hz is formed by U101/B, U101/C, and U101/D and the associated components R102 - R106 and C103 - C107. This is a Sallen and Key derived filter having equal valued capacitors throughout.

3.2.3 NOTCH FILTER

The power line rejection filter comprises five notch filters, identical except to tuned frequency, connected in cascade. (Refer to Drawing No. 300031, Rev. A on page 21). It provides fine notches at the power line frequency and each of its first four (4) harmonics. Switch SW4 on the back panel of the SAM-3 selects either the 50 or 60 Hz series of notches.

3.2.4 VARIABLE GAIN AMPLIFIER

The rotor of Filter Selector Switch SW1 drives the LEVEL potentiometer VR201. When the LEVEL control on the front panel is fully clockwise in the CAL position, the wiper is at the high end of VR201, and the signal is passed without attenuation to the input of the switched-gain amplifier U201. Resistors R201 - R203 and R205 - R208 determine the gain of the switched amplifier as given below in Table II, based on the position of GAIN switch SW2.

Table 2 SWITCH-AMPLIFIER GAIN SEQUENCE

GAIN Gain Switch Position (S1)	**U201A GAIN**	**U201B GAIN**
X1	1	1
X3	3	1
X10	10	1
X30	10	3
X100	20	5

Capacitor C201 and Resistor R204 form a 1.6Hz high pass network to prevent DC offset from being coupled to the final amplifier U201/B. This network and the similar one at the input buffer, C102 and R101, account for the overall 2.5 Hz lower 3dB point of the instrument.

3.2.5 OVERLOAD DETECTION

Two identical saturation detector circuits are employed, one connected to the output of buffer amplifier U101/A and the other connected to the output amplifier U201/B. The first will be described below, the second being identical in form and function.

The quad comparator IC U401 forms a window detector in cascade with a peak detect that turns the OVERLOAD light on whenever its input signal exceeds + or - 10 volts. Resistors R401 and R402 establish the negative threshold, and R403 and R404 establish the positive threshold.

The peak detector consists of CR401, C402, R407 and R408. As long as the signal remains inside 10 volts peak, the outputs of the window detector (U401/A and U401/B) remain at +15 volts and diode CR401 is back biased. If the input signal exceeds the negative or positive threshold, detector output goes to -15 volts which forward biases CR401, causing the positive input of the peak detector amplifier (U401/C) to go negative relative to the negative input. The output to this amplifier (U401/C) switches from +15 volts to -15 volts causing the OVERLOAD LED D401 to light. The R408-C402 time constant was selected such that even brief excursions of the signal keep the LED on long enough for the operator to notice them.

3.2.6 POWER SUPPLY

The coil of Relay RY501 is placed across the AC line downstream of the power switch SW3/A; the relay is thus energized when power is present, and the power switch is closed. The relay contacts 1 and 3 transfer +Vcc and -Vcc from battery to the internal power supply. When +15 volts are present on the output of the supply, LED 502 is illuminated to signify that LINE POWER is present.

A second pair of contacts on the front panel POWER switch, SW3/B, is in series with all batteries. Diode D502 prevents damage if the external battery is connected backwards. Diodes D502 and D501 form a selector which takes power from whichever battery has the greater terminal voltage.

Contacts 2 and 4 on Relay RY501 connect U501 and U502 to the +Vcc and -Vcc supplies. Amplifier U501 is a grounded output amplifier that functions to make +Vcc and -Vcc equal in absolute value during battery operation. A battery voltage monitor function is served by U502, an IC with an internal voltage reference and the ability to drive LED 501, the LOW BAT indicator, when the battery voltage falls below 24.5 VDC.

Fuse F1 on the rear panel protects the AC line. Both the internal and external batteries are protected by fuse F2, which is located on the printed circuit board near the power switch.

4.2 PARTS LIST

SAM-3 PARTS LIST

MEDA, Inc.
485 Spring Park Place
Herndon, Virginia 22070

Dwg #: 402107
Revision: C
Rev.Date: Dec 4, 1996

#	Description	MEDA P/N	Part Number [Manufacturer]	Rev	QTY/ Unit	Component Designation				
1	200 ohm Pot	404	3266W-1-201 [Bourns]		5	VR602	VR650	VR700	VR750	VR800
2	500 ohm Pot	405	3266W-1-501 [Bourns]		5	VR601	VR651	VR701	VR751	VR801
3	10K, MOD Pot CW Detent	452	97C2DD16A15-R56 [Bourns]		1	VR201				
4	249 ohm, 1%	268	RN55D2490F [Mepco,Dale,TRW,...]		1	R209				
5	909 ohm, 1%	270	RN55D9090F [Mepco,Dale,TRW,...]		1	R651				
6	976 ohm, 1%	289	RN55D9760F [Mepco,Dale,TRW,...]		1	R106				
7	1.43K ohm, 1%	263	RN55D1431F [Mepco,Dale,TRW,...]		1	R801				
8	1.82K ohm, 1%	69	RN55D1821F [Mepco,Dale,TRW,...]		3	R601	R653	R751		
9	2.37K ohm, 1%	460	RN55D2371F [Mepco,Dale,TRW,...]		1	R701				
10	2.55K ohm, 1%	273	RN55D2551F [Mepco,Dale,TRW,...]		1	R104				
11	2.74K ohm, 1%	274	RN55D2741F [Mepco,Dale,TRW,...]		4	R309	R409	R505	R506	
12	3.16K ohm, 1%	272	RN55D3161F [Mepco,Dale,TRW,...]		1	R102				
13	3.74K ohm, 1%	290	RN55D3741F [Mepco,Dale,TRW,...]		1	R753				
14	3.92K ohm, 1%	265	RN55D3921F [Mepco,Dale,TRW,...]		2	R103	R503			
15	3.83K ohm, 1%	281	RN55D3831F [Mepco,Dale,TRW,...]		1	R603				
16	5.23K ohm, 1%	462	RN55D5231F [Mepco,Dale,TRW,...]		1	R703				
17	10K ohm, 1%	74	RN55D1002F [Mepco,Dale,TRW,...]		1	R900				
18	10.2K ohm, 1%	269	RN55D1022F [Mepco,Dale,TRW,...]		1	R105				
19	49.9K ohm, 1%	301	RN55D4992F [Mepco,Dale,TRW,...]		4	R302	R303	R402	R403	
20	100K ohm, 1%	81	RN55D1003F [Mepco,Dale,TRW,...]		8	R101 R401	R204 R404	R301 R406	R304	R306
21	133K ohm, 1%	275	RN55D1333F [Mepco,Dale,TRW,...]		1	R650				
22	210K ohm, 1%	271	RN55D2103F [Mepco,Dale,TRW,...]		1	R800				
23	267K ohm, 1%	9	RN55D2673F [Mepco,Dale,TRW,...]		3	R600	R652	R750		
24	3.01K ohm, 1%	393	RN55D3011F [Mepco,Dale,TRW,...]		1	R803				
25	357K ohm, 1%	262	RN55D3573F [Mepco,Dale,TRW,...]		1	R700				
26	422K ohm, 1%	261	RN55D4223F [Mepco,Dale,TRW,...]		1	R802				
27	475K ohm, 1%	73	RN55D4753F [Mepco,Dale,TRW,...]		1	R504				
28	536K ohm, 1%	70	RN55D5363F [Mepco,Dale,TRW,...]		2	R602	R752			
29	715K ohm, 1%	260	RN55D7153F [Mepco,Dale,TRW,...]		1	R702				
30	1.0 Mohm, 1%	14	RN55D1004F [Mepco,Dale,TRW,...]		4	R308	R408	R501	R502	
31	2.00K ohm, 0.01% *4 PPM*	454	VMTA55 2K0000 0.01 [Vishay Resistor]		2	R201	R205			

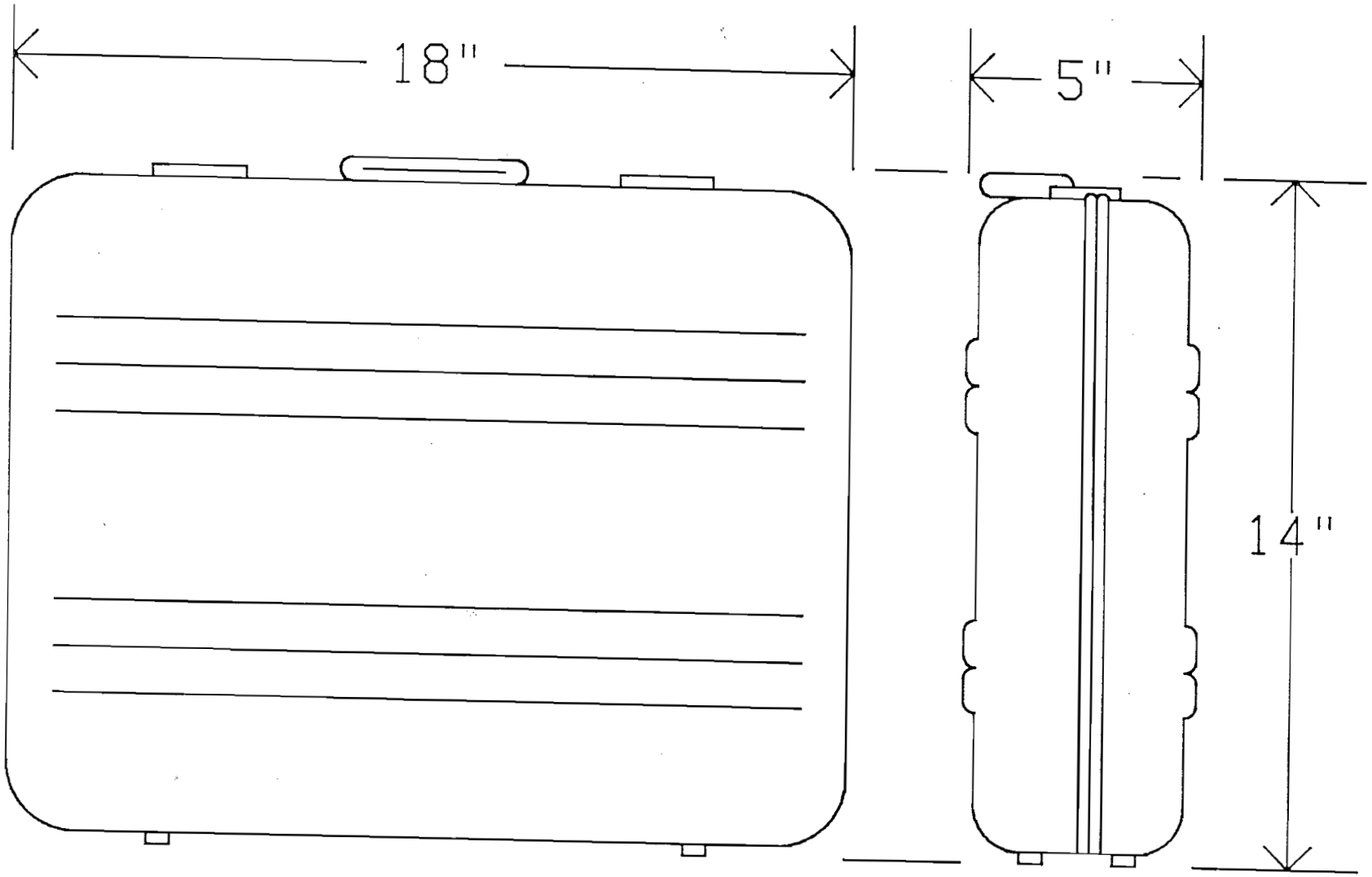
SAM-3 PARTS LIST

MEDA, Inc.
485 Spring Park Place
Herndon , Virginia 22070

Dwg #: 402107
Revision: C
Rev.Date: Dec 4, 1996

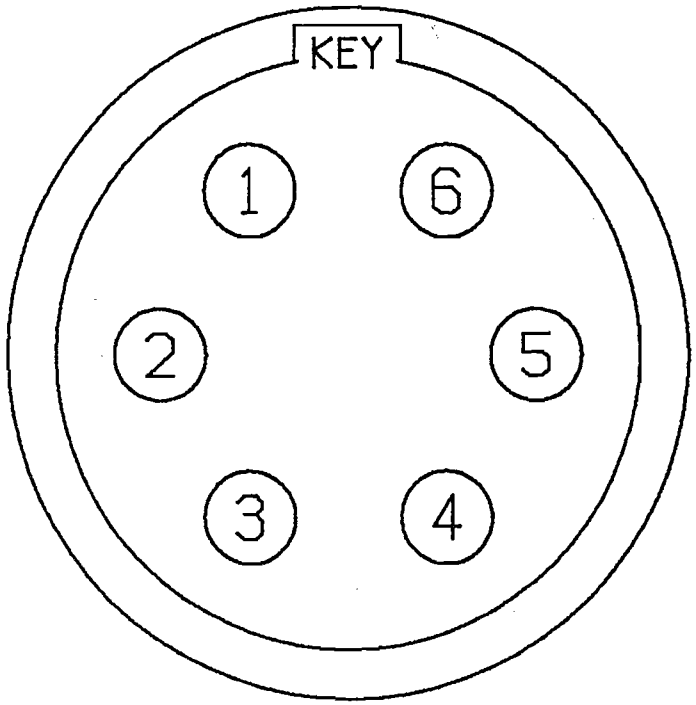
#	Description	MEDA P/N	Part Number [Manufacturer]	Rev	QTY/ Unit	Component Designation				
32	4.00K ohm, 0.01% *4 PPM*	455	VMTA55 4K0000 0.01 [Vishay Resistor]		1	R203	R207			
33	5.00K ohm, 0.01% *4 PPM*	300	VMTA55 5K0000 0.01 [Vishay Resistor]		15	SR1-1 SR2-3 SR4-2	SR1-2 SR3-1 SR4-3	SR1-3 SR3-2 SR5-1	SR2-1 SR3-3 SR5-2	SR2-2 SR4-1 SR5-3
34	8.00K ohm, 0.01% *4 PPM*	456	VMTA55 8K0000 0.01 [Vishay Resistor]		1	R206				
35	18.00K ohm, 0.01% *4 PPM*	458	VMTA55 18K0000 0.01 [Vishay Resistor]		1	R202				
36	38.00K ohm, 0.01% *4 PPM*	457	MTB60 38K0000 0.01 [Vishay Resistor]		1	R208				
37	22 Mohm, 5% *1/4 Watt*	315	RC05GF226J [AB, ...]		2	R307	R407			
	INDUCTORS									
38	Ferrite Bead	380	56-590-65/4A6 [Ferroxcube]		2	L101	L102			
	CAPACITORS									
39	33uf, 25V	381	VTL33S25 [Mallory]		2	C503	C504			
40	100pf	24	CK05BX101K [Any Vendor]		2	C101	C204			
41	.1uf	18	CK05BX104K [Any Vendor]		16	C108 C303 C600 C850	C109 C304 C650	C202 C402 C700	C203 C403 C750	C302 C404 C800
42	1.0 uf	388	C062C105Z5U5CA [Kemet,...]		2	C102	C201			
43	0.1 uf, Polypropylene 1%	78	.1-1-100PPA11 [F-Dyne]		9	C103 C601	C104 C602	C105 C651	C106 C652	C107
44	.025uf, Polycarbonate 100V, 1%	376	.025-1-100-PCA [F-Dyne]		6	C701 C802	C702	C751	C752	C801
	INTEGRATED CIRCUITS									
45	Op. Amp & Vref.	237	LM10CN [National]		1	U502				
46	Quad Op. Amp. *Low Noise*	227	OP470GP [AD,....]		4	U101	U600	U700	U800	
47	Dual Bi-Fet,Op Amp *High Speed*	445	AD712AH [AD,....]		1	U201				
48	Op Amp	444	AD741JN or LM741CN [AD,National]		1	U501				
49	Quad Comparator	243	LM339AN [NSC,....]		2	U301	U401			
50	Quad, CMOS Switch	214	CD4066BE [Harris,Mot.,NSC...]		2	U900	U901			
	DIODES									
51	Silicon Switching	319	1N914 [Mot,MSC,Uni,....]		2	D301	D401			
52	Silicon Rectifier 1Amp, 50V PIV	195	1N4001 [Mot,MSC,Uni,....]		2	D501	D502			
53	20V, Zener	317	1N4747 [Mot,MSC,Uni,....]		1	ZD900				
54	Red LED	318	SLD821-2 [ALCO,....]		4	LED301	LED401	LED501 (Part of #96)	LED502	
	POWER SUPPLIES / RELAY & PCB									
55	Power Supply		2.15.100 [Calex]		1	PS101				
56	15V, 500 MAH,Battery	461	H4463B [Alexander]		2	B1	B2			
57	115VAC, Relay 4PDT		W78APCX-5 [Magnecraft]		1	RY501				

4.3 DRAWINGS



SAM-3 VALISE DIMENSIONS

1. SIGNAL
2. +15V
3. -15V



4. PWR COM
5. SHIELD
6. SIG RET

FRONT PANEL
SENSOR INPUT CONNECTOR