

Model SCM-2 FM SCA MODULATION MONITOR

Guide to Operations

©



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WARRANTY AND ASSISTANCE

All Belar products are warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery, FOB factory or, in the case of certain major components listed in the instruction manual, for the specified period. Belar will repair or replace products which prove to be defective during the warranty period provided that they are returned to Belar prepaid. No other warranty is expressed or implied. Belar is not liable for consequential damages.

For any assistance, contact your Belar Sales Representative or Customer Engineering Service at the Belar factory.

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1 General Information

1-1 General Description

The Belar SCM-2 SCA Modulation Monitor, when added to the Belar FMM-2 Modulation Monitor, The Wizard with demod (Belar FMMA-1 with Option 01), or the older Belar FMM-1 Frequency and Modulation Monitor, provides complete monitoring and test functions for SCA storecasting, data transmission and remote telemetering applications. Up to four frequency switch positions allow four channels to be operated and tested. The first switch position is preset to 67 kHz.

Features include two deviation ranges for optimum operation of a particular subcarrier. The variable deviation feature offers a range of 2 kHz to 7 kHz for your particular needs. Normal operation (6 kHz deviation) is for storecasting and other background programming applications. The digital discriminator is wideband for minimum distortion. Maximum versatility is thus provided for future applications as well as for present needs.

The SCM-2 features unlimited SCA frequency selection by incorporating interchangeable clock oscillators into its unique design. Select the frequencies best suited to your application. Monitor four channels by means of push-button selection. The front panel push-button digital modulation calibrator allows the calibration accuracy to be checked at any time.

1-2 Specifications

Modulation Meter Range	133% to -80 dB absolute value for peak monitoring autoranging for test measurements
SCA Modulation Sensitivities	100% = 6 kHz or variable 2kHz to 7kHz
SCA Modulation Calibrator	6 kHz
SCA Subcarrier	24 kHz to 125 kHz 67 kHz and 3 additional switched positions (specify frequencies)
SCA Injection Level	133% to 1%
Internal Crosstalk	
Sub to Main	-80 dB
Main to Sub	Better than 60 dB
Stereo to Sub	Better than 60 dB
Remote Metering	Modulation meter may be remotely metered 5000 ohms external loop resistance
Dimensions	5.25"H x 10.5"D x 19"W (EIA Rack Mount)
Power Requirements	110/220 VAC, 50/60 Hz
Shipping Weight	14 lbs (6.4 kgs)

2 Installation

2-1 Initial Inspection

Check the shipping carton for external damage. If the carton exhibits evidence of abuse in handling (holes, broken corners, etc.) ask the carrier's agent to be present when the unit is unpacked. Carefully unpack the unit to avoid damaging the equipment through use of careless procedures. Inspect all equipment for physical damage immediately after unpacking. Bent or broken parts, dents and scratches should be noted. If damage is found, refer to Paragraph 2-2 for the recommended claim procedure. Keep all packing material for proof of claim or for possible future use.

The SCM-2 is shipped with a Guide to Operations, a coaxial cable patch cord, a 10 position dual readout remote connector, 4 beige rack-mount screws, and a three-wire line cord.

2-2 Claims

If the unit has been damaged, notify the carrier immediately. File a claim with the carrier or transportation company and advise Belar of such action to arrange the repair or replacement of the unit without waiting for a claim to be settled with the carrier.

2-3 Repacking for Shipment

If the unit is to be returned to Belar, attach a tag to it showing owner and owner's address. A description of the service required should be included on the tag. Please do NOT send any cords or cables. The original shipping carton and packaging materials should be used for reshipment. If they are not available or reusable, Belar can provide a replacement box and packaging at a nominal cost. Alternatively, the unit should be repackaged in the following manner:

- a) Use a double-walled carton with a minimum test strength of 275 lbs.
- b) Use heavy paper or sheets of cardboard to protect all surfaces.
- c) Use at least 4 inches of tightly packed, industry approved, shock absorbing material such as extra firm polyurethane foam or rubberized hair. **Newspaper is not sufficient for cushioning material!**
- d) Use heavy duty shipping tape to secure the outside of the carton.
- e) Use large **FRAGILE** labels on each surface.
- f) Return the unit, freight prepaid. Be sure to insure the unit for full value.

2-4 Preparation for Use

The SCM-2 SCA Monitor is designed to be mounted in a standard 19 inch rack mount. When mounted in a rack, a slight air space should be provided above and below the unit. When the monitor is mounted above high-heat generating equipment such as power supplies or amplifiers, consideration should be given to cooling requirements which allow a free movement of cooler air around the SCM-3. In no instance should the ambient chassis temperature be allowed to rise above 50°C (122°F). Mount the SCM-2 to the rack mount using the screws provided.

The Model SCM-2 can be operated from either a 105 to 125 Vac or 210 to 250 Vac single phase, 50 to 400 Hz power source. Make sure the unit is set for the proper voltage as follows:

Units with serial number 190111 and lower:

Unplug the line cord. Slide the switch (S1) to 115V or 230V position. Ensure that the fuse (F1) is the proper current rating for selected voltage (½A 250V for 115Vac, ¼A 250V for 230Vac). Plug the line cord back in.

Units with serial number 190112 and higher:

Unplug the line cord. Open the fuse compartment door and pull lever to remove fuse. Using needlenose pliers, pull the voltage select board straight out of the power entry module. While facing the rear of the unit, orient the voltage select board so the desired line voltage is face up and reads correctly ("120" for 115Vac operation, "240" for 230Vac operation. The "100" and "220" positions on the bottom of the board are not used.) Reinsert the board into the power entry module, install the proper fuse (½A 250V for 115Vac, ¼A 250V for 230Vac), close the fuse door, and plug the line cord back in.

The Model SCM-2 is supplied with a three-conductor power cable which, when plugged into an appropriate receptacle, grounds the unit. The offset pin on the power cable three-prong connector is the ground wire. To preserve the grounding feature when operating the unit from a two-contact outlet, use a three-prong to two-prong adaptor and connect the green pigtail on the adaptor to ground. Attach the power cable between the unit and the power source receptacle.

Connect jack J4 (composite input) of the SCM-2 to the source of composite (marked "SCA" on the Belar Model FMM-2, and "DEMOD OUT" on the Belar Model FMMA-1 "The Wizard". Detailed interconnection specifications are outlined below; for operation instructions, proceed to section 3, "Operation".

2-5 Interconnections

Front & Rear Panel Jacks (refer to Section 4 for a front and rear panel diagrams)

JACK	FUNCTION
J2	Scope output: follows meter function switch, 0.08 Vrms, 10K source
J3	SCA frequency output: (257 kHz IF frequency) 3.5V P-P, 2.2k ohm source
J4	Composite input: 4.2 V P-P, 220k ohm input impedance
J5	SCA channel test audio output: de-emphasized, 5 Vrms, 2.2k ohm source

NOTE: WE RECOMMEND COAXIAL CABLES 36" OR SHORTER WHEN CONNECTING THE SCM-2 TO THE FMM-2 MONITOR.

Remote Connector (A2-P1)

PIN	FUNCTION
1	Main channel audio output: 2.46 Vrms, 10k ohm unbalanced, de-emphasized
2&3	Main channel audio output: +10 dBm, 600 ohms balanced, de-emphasized
4	SCA channel audio output: 2.4 Vrms, 10k ohm unbalanced, de-emphasized, 6kHz deviation
5&6	SCA channel audio output: +10 dBm, 600 ohm, balanced, de-emphasized
7	Remote meter output
8	Remote +5 VDC for LED
9	Remote subcarrier loss alarm LED
10	Ground
A thru L	Ground

3 Operation

3-1 Initial Operation

1. Place the FMM-2 or The Wizard into normal operation, and connect your composite input (marked "SCA" on the FMM-2 and "DEMODOUT" on The Wizard) to the Composite Input jack (J4) on the SCM-2. Plug the power cord into the unit.
2. Depress the SCM-2 monitor function switch to TOTAL, the meter selector switch to OPER (peak) and allow a 15 minute warmup period.
3. Depress the CAL and SEMI pushbuttons on the FMM-2, or turn on the Calibrator on The Wizard. The FMM-2 meter (or Wizard Total Modulation display) and the SCM-2 meter should read the same (100%). If not, adjust the input level potentiometer, (R2 on the A2 board which is accessible from the chassis rear) until both meters read the same. This adjustment normalizes the SCM-2 with the FMM-2 or Wizard and will only be necessary during the initial set-up or installation.
4. Depress the OPERate pushbutton on the FMM-2, the OPERate pushbutton on the SCM-2 and the desired function pushbutton on the SCM-2.

3-2 Normal Operation

To monitor normal subcarrier modulation, depress the OPERate push-button and the desired SCA FREQUENCY pushbutton. Select the wanted deviation range (6kHz or VAR DEV). Note that the additional frequencies (X1, X2 and X3) are optional frequencies and do not come standard with the SCM-2.

3-3 Monitor Functions

1. SUBCARRIER ALARM - Indicates when the SCA subcarrier is missing from the composite input signal.

2. **MODULATION METER** - Measures TOTAL and MAIN channel modulation, measures the SCA INJection level modulation DEVIation on each of the four SCA channels, and is used to calibrate the 6kHz and VARiable DEVIation levels.
3. **METER FUNCTION SWITCH** - Selects the mode of operation of the modulation meter.
 - A. **OPERate** - When depressed, the meter is peak reading.
 - B. **AUTO** - When depressed, the meter is in the auto-ranging mode and is average responding. In this mode, the meter sensitivity is automatically adjusted in 10 dB steps to yield an on-scale reading. The RANGE display indicates the scale factor. The algebraic sum of the meter reading and the RANGE indication is the reading. For example, -2 dB indication on the meter with a RANGE indication of -60 dB yields a reading of -62 dB.
 - C. **HOLD** - When depressed, the meter range is held to the indicated RANGE setting. Note that the meter is average responding in this mode.
 - D. **DE-EMP** - When depressed, the meter reading is de-emphasized in the AUTO or HOLD settings. Note that the OPERate (peak) position is not de-emphasized.
4. **METER RANGE INDICATOR** - Indicates the operating range of the meter (0dB in OPERate and 0 to -60 dB in AUTO and HOLD).
5. **MONITOR FUNCTION SWITCH** - Selects the mode of operation of the monitor.
 - A. **TOTAL** - When depressed, the meter indicates the total composite modulation level.
 - B. **MAIN** - When depressed, the meter indicates the main channel modulation through a 15 kHz low-pass filter.
 - C. **INJ** - When depressed, the meter indicates the injection level of the selected subcarrier. The meter switch should be on AUTO so that it will down-range to indicate the level. Note that under some modulation conditions, the injection level

reading may vary and be slightly lower than an unmodulated reading. For greatest accuracy, read the injection level without modulation.

- D. VAR DEV - When depressed, the 100% indication may be user set to between 2 and 7kHz deviation.
 - E. 6KHZ DEV - When depressed, 100% meter indication is 6kHz deviation.
 - F. 6KHZ CAL - When depressed, a 6kHz peak deviation calibrating signal is generated and applied to the SCA demodulator.
 - G. SCA FREQUENCY - Depressing one of these four pushbuttons selects which of the SCA channels is to be measured (67kHz or one of the three optional frequencies from 24 to 125kHz).
6. SCA TEST - Provides a de-emphasized SCA channel audio test output, 5 Vrms, 400Hz, 6kHz deviation.

3-4 Field Changes

1. SCA AUDIO DE-EMPHASIS - The SCM-2 is normally shipped with 75 μ Sec de-emphasis. It may be changed to 150 μ Sec by moving plug-in jumpers on the A1 metering board and the A2 demodulator board. A2-P2 controls the SCA audio output de-emphasis and A1-P1 controls the de-emphasis in the average voltmeter circuit. See the A1 and A2 connections and Adjustments drawings for the location and settings of the de-emphasis select jumpers.
2. OPTIONAL SCA FREQUENCY CHANGE - With the SCM-2 power off, unplug the appropriate clock oscillator (X0) from the A2 board if necessary. U21 is for the SCA frequency X1, U22 for X2 and U23 for X3. U20 must not be changed since the 6kHz calibrating frequency is derived from it as well as the 67kHz SCA frequency. Insert the new clock oscillator while making sure that the index mark on the corner of the case of the oscillator is toward the unit front panel.
3. SUBCARRIER ALARM - Subcarrier alarm and mute threshold settings may be changed by adjusting the mute level adjust potentiometers R90 to R93 (marked 67, 1, 2, 3 on the rear chassis panel). 67 is for 67kHz, 1 for X1 etc. In this manner a different mute level may be set for each individual SCA channel.
4. VAR DEV - Variable deviation may be calibrated as follows: With the 6KHZ pushbutton depressed, apply a test tone to the SCA generator and adjust it to the desired level. For example, if a 4.2kHz deviation is desired, then adjust the modulation on the SCA generator for 70% as read on the SCM-2 (4.2 divided by 6 equals 0.70). Depress the VAR DEV pushbutton and adjust A2-R64 (marked DEV on the rear chassis panel) to read 100% on the meter. Now when the VAR DEV pushbutton is depressed, the deviation is calibrated so that 100% equals 4.2kHz deviation. If the MOD CAL pushbutton is depressed with this calibration, the meter will be off scale since 6kHz will equal 143%. Note that with the 6kHz pushbutton depressed, the SCM-2 is always calibrated to 6kHz deviation.
5. IF Filter (S2) - This filter should be switched IN for normal operation. It may be switched out during proofs if only SCA modulation is being applied.

4 Diagrams, Schematics, and Parts Lists

Replaceable Parts. This page contains information for ordering replaceable parts for the monitor. The tables that follow list the parts in alphanumeric order by reference designation and provides a description of the part with the Belar part number.

Ordering Information. To order a replacement part from Belar, address the order or inquiry to Belar and supply the following information:

- a. Model number and serial number of unit.
- b. Description of part, *including the reference designation and location.*

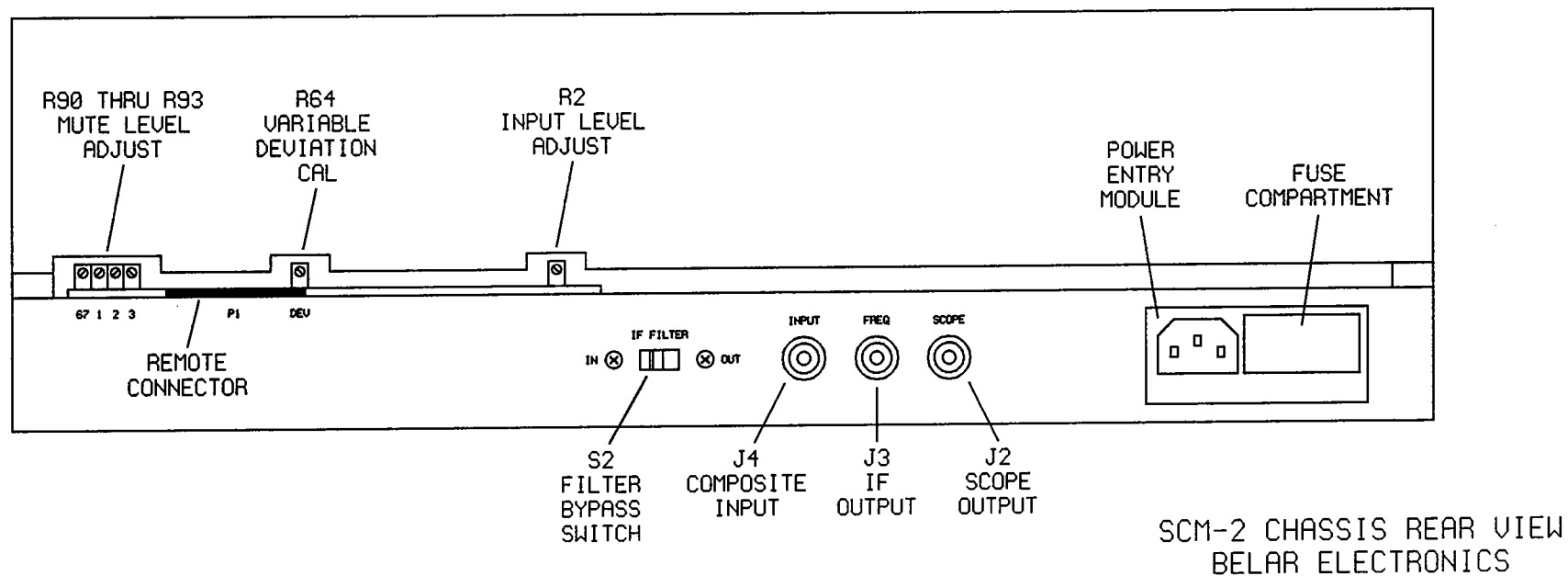
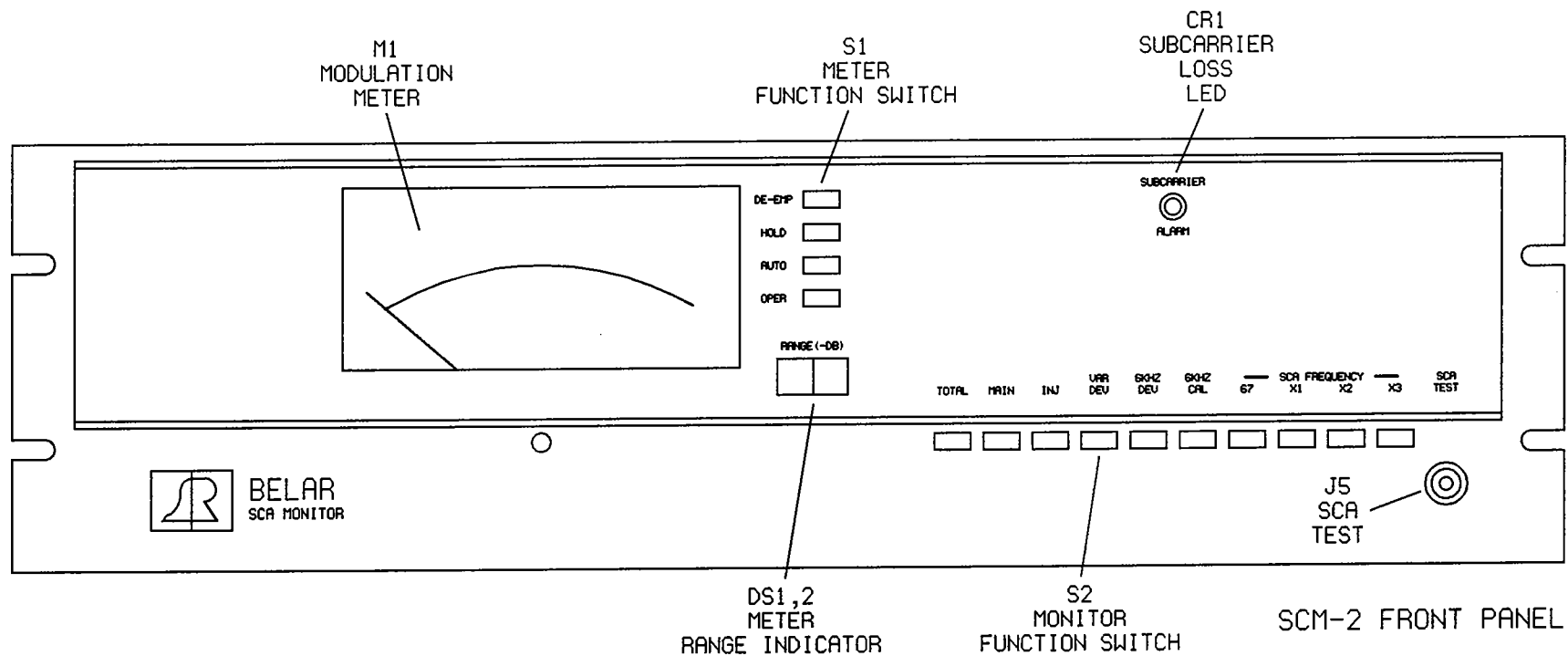
Orders may also be taken over the telephone. Parts orders can be put on your VISA, MasterCard, or American Express card, or we can ship them COD.

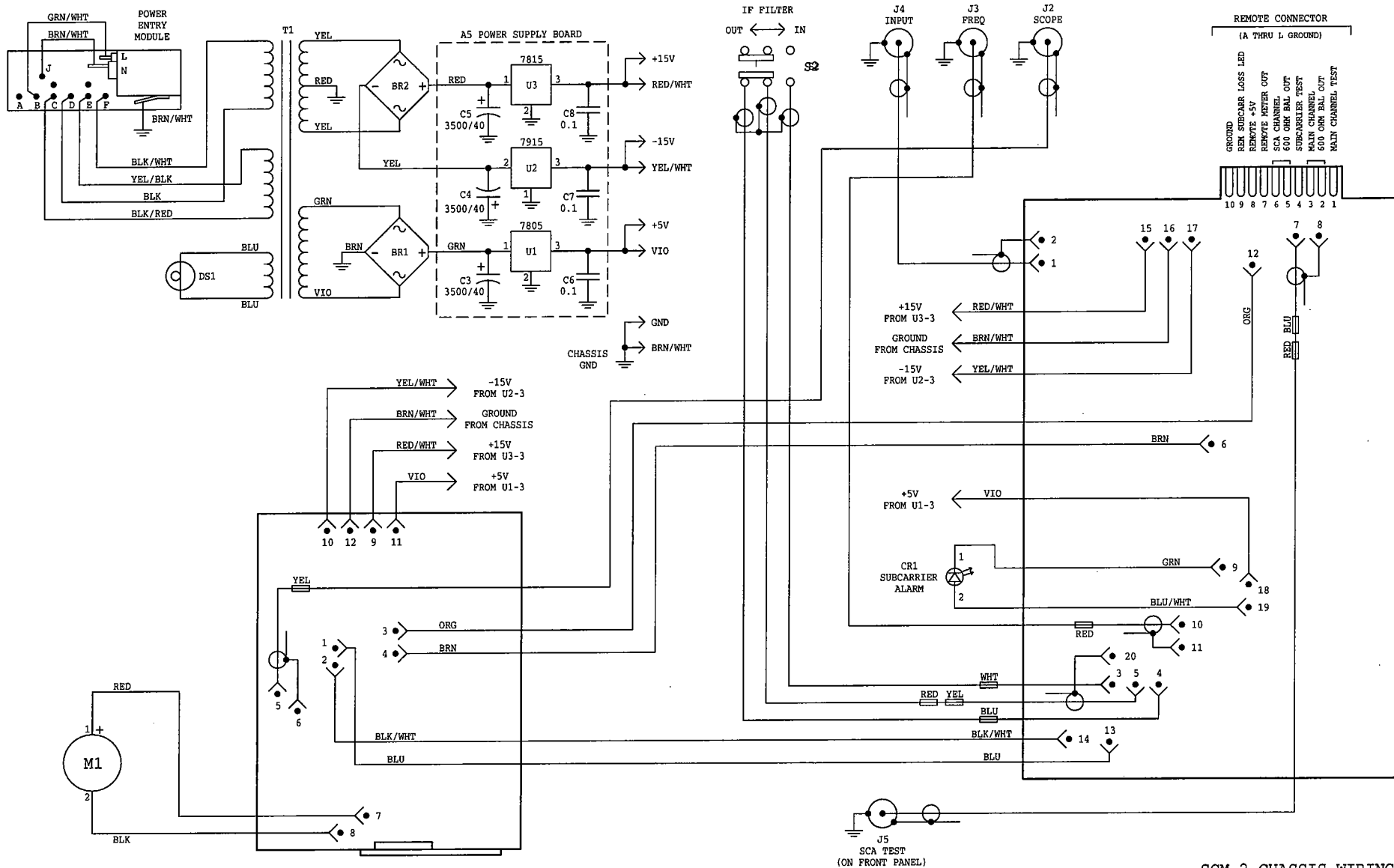
REFERENCE DESIGNATORS

A	= assembly	J	= jack	S	= switch
BR	= diode bridge	L	= inductor	T	= transformer
C	= capacitor	M	= meter	TB	= terminal block
CR	= diode or LED	P	= plug	U	= integrated circuit
DS	= display or lamp	Q	= transistor	W	= cable
F	= fuse	R	= resistor	X	= socket
FL	= filter	RL	= relay	Y	= crystal
HDR	= header connector	RN	= resistor network		

ABBREVIATIONS

BCD	= binary coded decimal	PIV	= peak inverse voltage
CER	= ceramic	POLY	= polystyrene
COMP	= composition	PORC	= porcelain
CONN	= connector	POT	= potentiometer
DPM	= digital panel meter	SEMICON	= semiconductor
ELEC	= electrolytic	SI	= silicon
GE	= germanium	TANT	= tantalum
IC	= integrated circuit	uF	= microfarads
k	= kilo = 1,000	V	= volt
M	= meg = 1,000,000	VAR	= variable
MOD	= modulation	VDCW	= dc working volts
MY	= mylar	W	= watts
PC	= printed circuit	WW	= wirewound
pF	= picofarads		





— DENOTES COLOR BAND ON COAXIAL CABLE

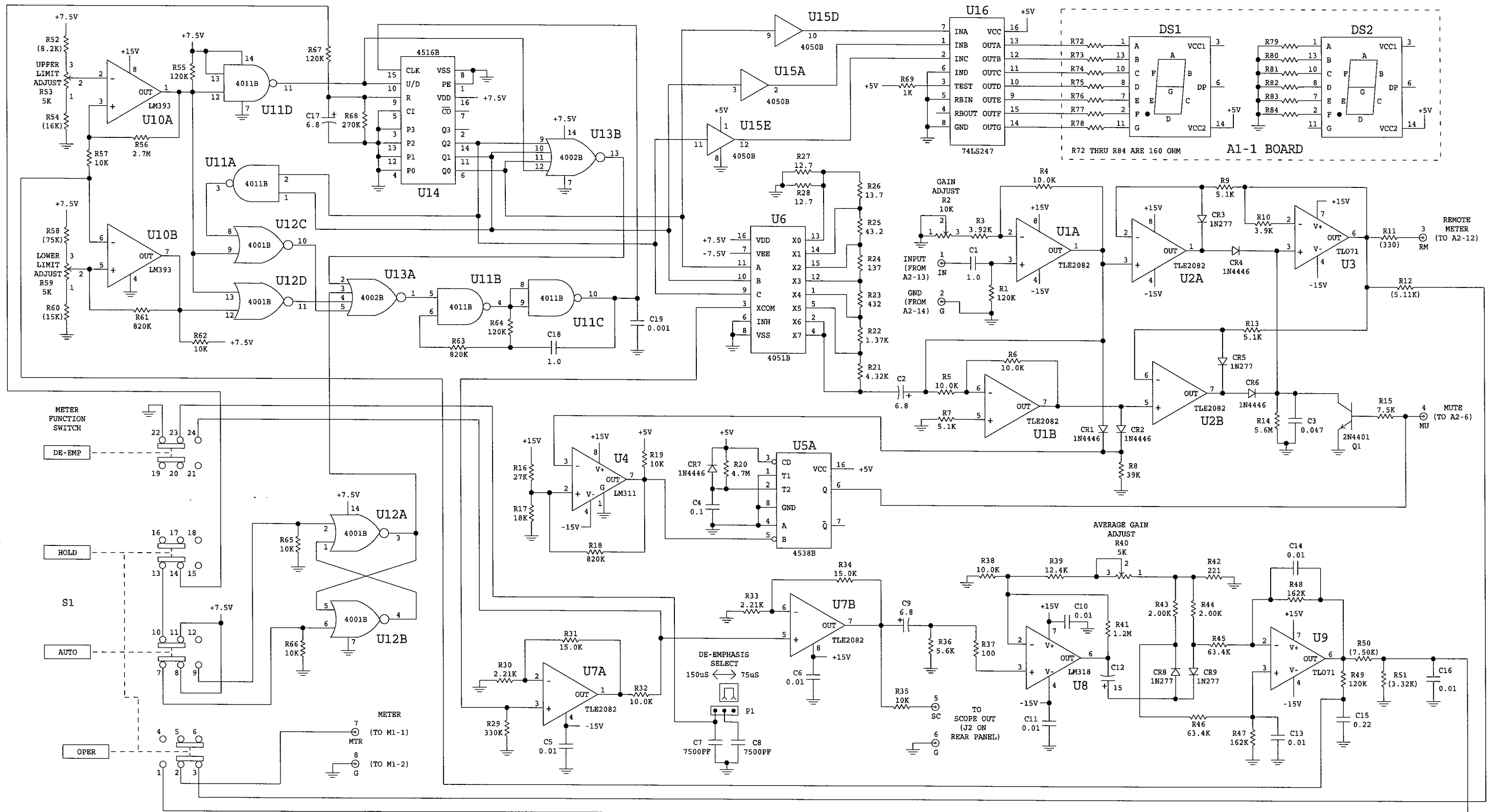
SCM-2 CHASSIS WIRING
BELAR ELECTRONICS

SCM-2 PARTS LISTS

MAIN CHASSIS

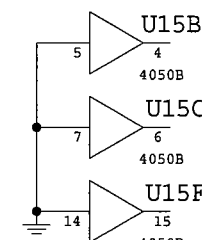
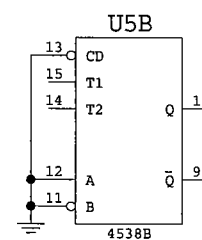
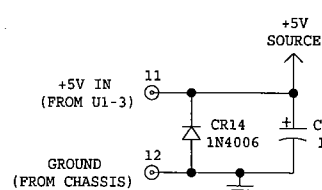
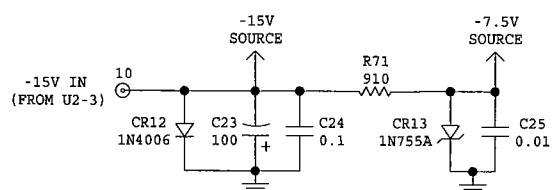
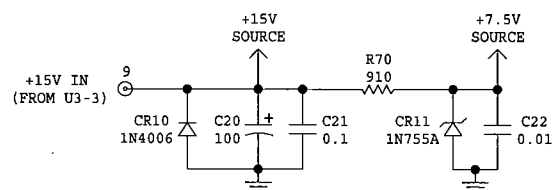
Reference Designation	Description	Part Number
BR1,BR2	DIODE: BRIDGE KBPC602 GI	1900-0025
C1,C2	C: FIXED CERAMIC 0.01uF 1.4kV (NOTE 1)	0151-0010
C3 thru C5	C: FIXED ELECT 3500uF 40V	0180-0026
C6 thru C8	C: FIXED CERAMIC 0.1uF 50V	0151-0006
CR1	LED: RED MV5053	1910-0001
DS1	LAMP: 755	2140-0005
--	SOCKET: LAMP	1450-0012
F1	FUSE: AGC 1/2A 250V (115 Vac line voltage)	2110-0001
	AGC 1/4A 250V (230 Vac Line voltage)	2110-0002
--	FUSEHOLDER: (NOTE 1)	2110-0003
J1	JACK: POWER (NOTE 1)	0360-0010
J2 thru J5	JACK: BNC	0360-0005
M1	METER: MOD 0-133%	1120-0012
S1	SWITCH: SLIDE 115/230V SELECTOR (NOTE 1)	3102-0002
S2	SWITCH: SLIDE	3102-0001
T1	TRANSFORMER: POWER	9100-0010
U1	IC: 7805C	1826-0014
U2	IC: 7915C	1826-0033
U3	IC: 7815C	1826-0031
--	LINE CORD (115 Vac line voltage)	8120-0002
--	LINE CORD (230 Vac line voltage)	8120-0004
--	CONNECTOR: CARD EDGE, 20 PIN (CINCH 50-20SN-9 or equivalent)	0365-0023

NOTE 1: Beginning serial number 190112, these parts are replaced by the 6J4 power entry module (0360-0020).

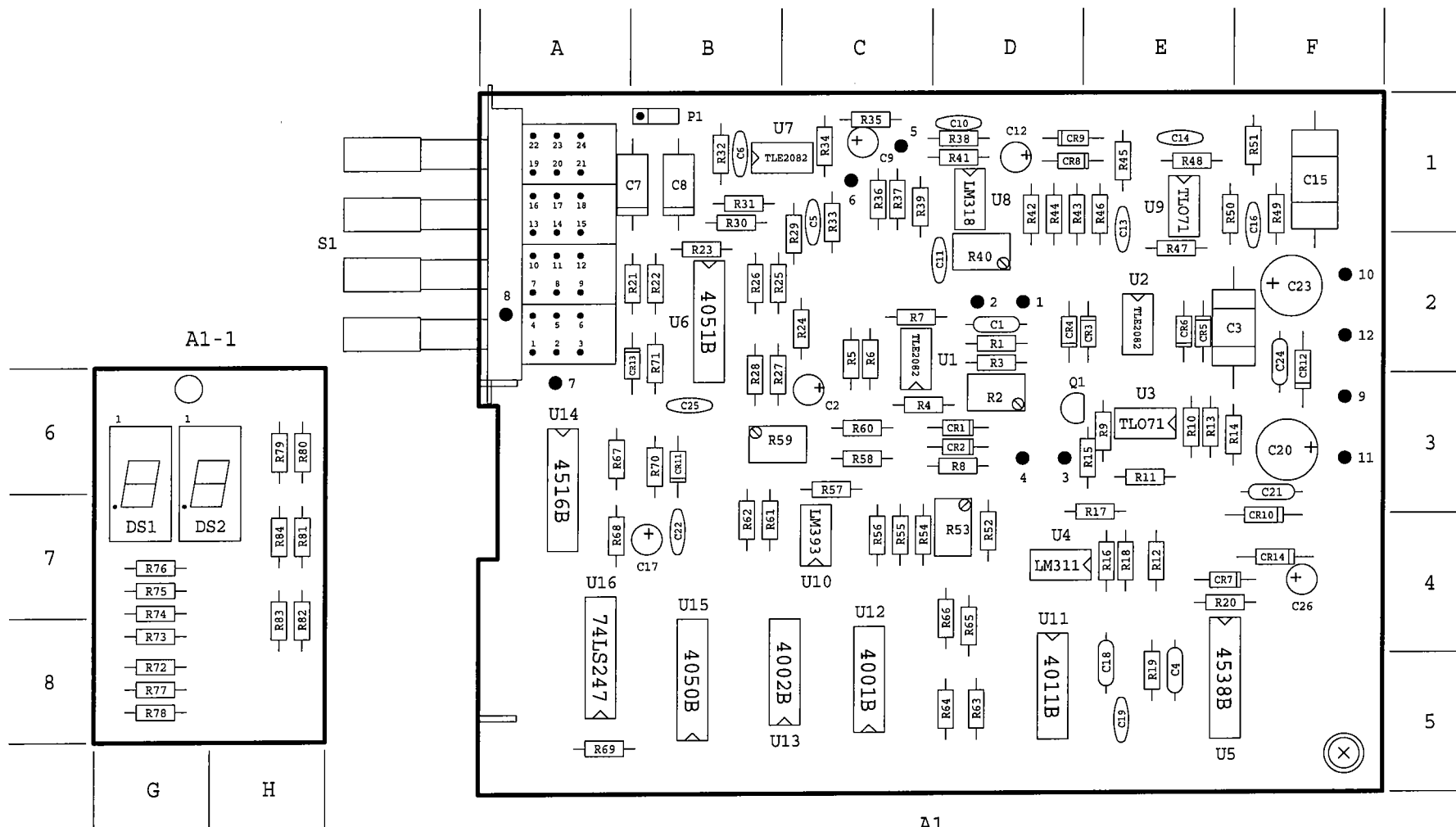


NOTES:

1. $\oplus$ INDICATES PRINTED CIRCUIT BOARD PIN.
2. () DENOTES EXACT VALUE TO BE DETERMINED BY MANUFACTURER, NOMINAL VALUE SHOWN.
3. ALL RESISTANCE VALUES ARE IN OHMS.
4. ALL RESISTORS ARE 1/4 WATT.
5. ALL CAPACITANCE VALUES ARE IN UF UNLESS OTHERWISE INDICATED.
6. FOR INTERCONNECTION DETAILS, REFER TO CHASSIS WIRING DIAGRAM.



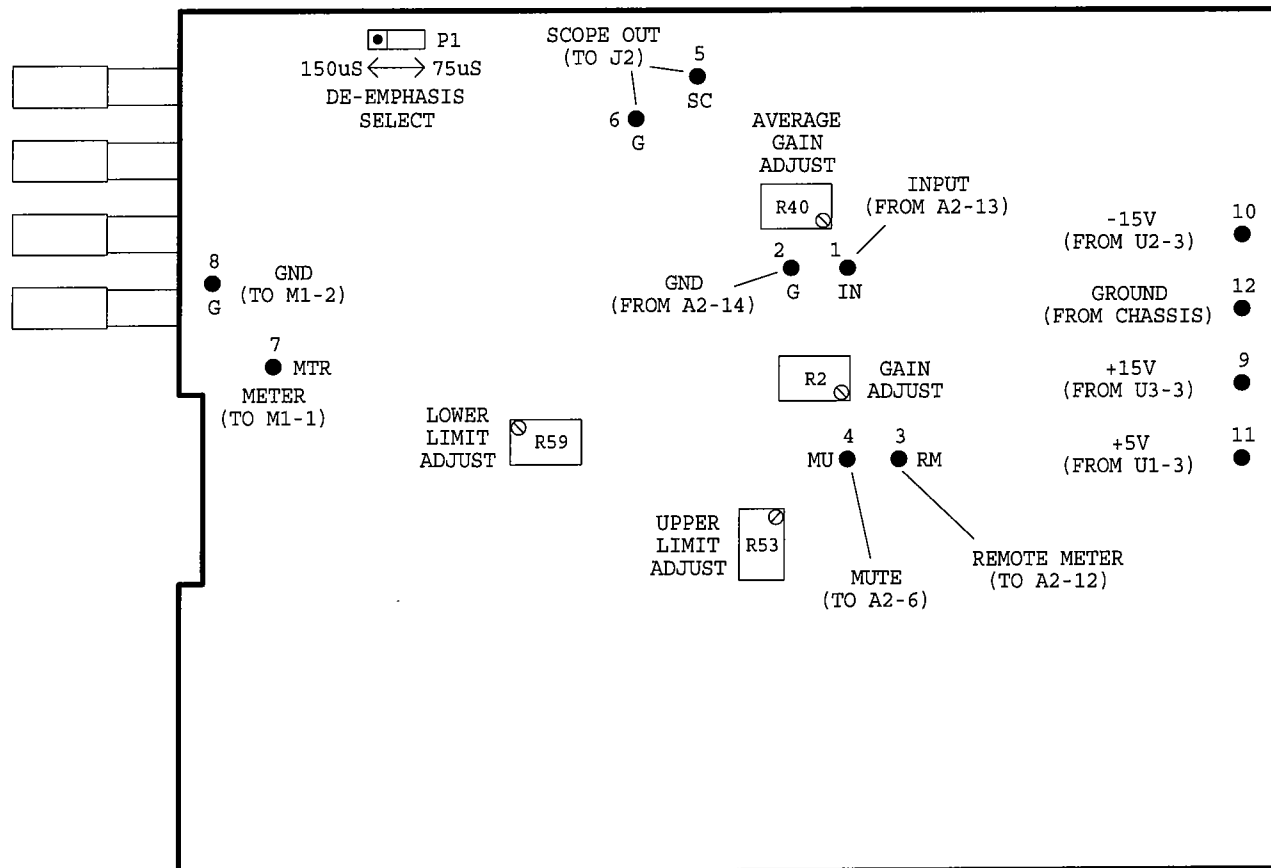
SCM-2 A1
METERING BOARD
BELAR ELECTRONICS
9-17-03



SCM-2
A1 & A1-1 BOARDS
COMPONENT LAYOUT
BELAR ELECTRONICS

SCM-2 A1 & A1-1 BOARD
PART LOCATIONS

Desig/Loc	Desig/Loc	Desig/Loc	Desig/Loc	Desig/Loc	Desig/Loc	Desig/Loc	Desig/Loc	Desig/Loc
C1	D2	DS1	G6	R35	C1	R76	G7	pins
C2	C3	DS2	G6	R36	C1	R77	G8	----
C3	E2			R37	C1	R78	G8	1 D2
C4	E5	P1	B1	R38	D1	R79	H6	2 D2
C5	C1			R39	C1	R80	H6	3 D3
C6	B1	Q1	D3	R40	D2	R81	H7	4 D3
C7	B1			R41	D1	R82	H8	5 C1
C8	B1	R1	D2	R42	D1	R83	H8	6 C1
C9	C1	R2	D3	R43	D1	R84	H7	7 A3
C10	D1	R3	D2	R44	D1			8 A2
C11	D2	R4	C3	R45	E1	S1	A2	9 F3
C12	D1	R5	C2	R46	E1			10 F2
C13	E1	R6	C2	R47	E2	U1	C2	11 F3
C14	E1	R7	C2	R48	E1	U2	E2	12 F2
C15	F1	R8	D3	R49	F1	U3	E3	
C16	F1	R9	E3	R50	E1	U4	D4	
C17	B4	R10	E3	R51	F1	U5	E5	
C18	E5	R11	E3	R52	D4	U6	B2	
C19	E5	R12	E4	R53	D4	U7	C1	
C20	F3	R13	E3	R54	C4	U8	D1	
C21	F3	R14	E3	R55	C4	U9	E1	
C22	B4	R15	E3	R56	C4	U10	C4	
C23	F2	R16	E4	R57	C3	U11	D5	
C24	F2	R17	E3	R58	C3	U12	C5	
C25	B3	R18	E4	R59	B3	U13	C5	
C26	F4	R19	E5	R60	C3	U14	A3	
		R20	E4	R61	B4	U15	B5	
CR1	D3	R21	B2	R62	B4	U16	A5	
CR2	D3	R22	B2	R63	D5			
CR3	E2	R23	B2	R64	D5			
CR4	D2	R24	C2	R65	D4			
CR5	E2	R25	B2	R66	D4			
CR6	E2	R26	B2	R67	A3			
CR7	E4	R27	B3	R68	A4			
CR8	D1	R28	B3	R69	A5			
CR9	D1	R29	C2	R70	B3			
CR10	F4	R30	B1	R71	B2			
CR11	B3	R31	B1	R72	G8			
CR12	F2	R32	B1	R73	G8			
CR13	B2	R33	C1	R74	G7			
CR14	F4	R34	C1	R75	G7			



SCM-2 A1 BOARD
CONNECTIONS & ADJUSTMENTS
BELAR ELECTRONICS

A1 BOARD SCM-2

Reference Designation	Description	Part Number
C1	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C2	C: FIXED TANT 6.8uF 25V	0185-0002
C3	C: FIXED FILM 0.047uF 10% 200V	0120-4731
C4	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C5,C6	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C7,C8	C: FIXED POLY 7500pF 2.5% 160V	0130-7522
C9	C: FIXED TANT 6.8uF 25V	0185-0002
C10,C11	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C12	C: FIXED TANT 15uF 15V	0185-0003
C13,C14	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C15	C: FIXED FILM 0.22uF 10% 80V	0120-2241
C16	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C17	C: FIXED TANT 6.8uF 25V	0185-0002
C18	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C19	C: FIXED CERAMIC 0.001uF 1kV	0151-0002
C20	C: FIXED ELEC 100uF 35V	0180-0018
C21	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C22	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C23	C: FIXED ELEC 100uF 35V	0180-0018
C24	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C25	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C26	C: FIXED TANT 15uF 15V	0185-0003
CR1,CR2	DIODE: 1N4446	1900-0002
CR3	DIODE: 1N277 GERMANIUM	1900-0001
CR4	DIODE: 1N4446	1900-0002
CR5	DIODE: 1N277 GERMANIUM	1900-0001
CR6,CR7	DIODE: 1N4446	1900-0002
CR8,CR9	DIODE: 1N277 GERMANIUM	1900-0001
CR10	DIODE: 1N4006	1900-0016
CR11	DIODE: 1N755A	1900-0023
CR12	DIODE: 1N4006	1900-0016
CR13	DIODE: 1N755A	1900-0023
CR14	DIODE: 1N4006	1900-0016
P1	PLUG: 3 PIN, PC MOUNT	0365-0030
--	JUMPER: 2 PIN (USED WITH P1)	0365-0028
Q1	TRANSISTOR: 2N4401	1850-0028
R1	R: METAL FILM 120k 2% 1/4W	0751-1242
R2	R: VAR COMP 10k, 10 TURN	2100-0024
R3	R: METAL FILM 3.92k 1%	0721-3921
R4 thru R6	R: METAL FILM 10.0k 1%	0721-1002
R7	R: METAL FILM 5.1k 2% 1/4W	0751-5122
R8	R: METAL FILM 39k 2% 1/4W	0751-3932
R9	R: METAL FILM 5.1k 2% 1/4W	0751-5122
R10	R: METAL FILM 3.9k 2% 1/4W	0751-3922
R11	R: METAL FILM 330 2% 1/4W	0751-3312

A1 BOARD SCM-2 CONT.

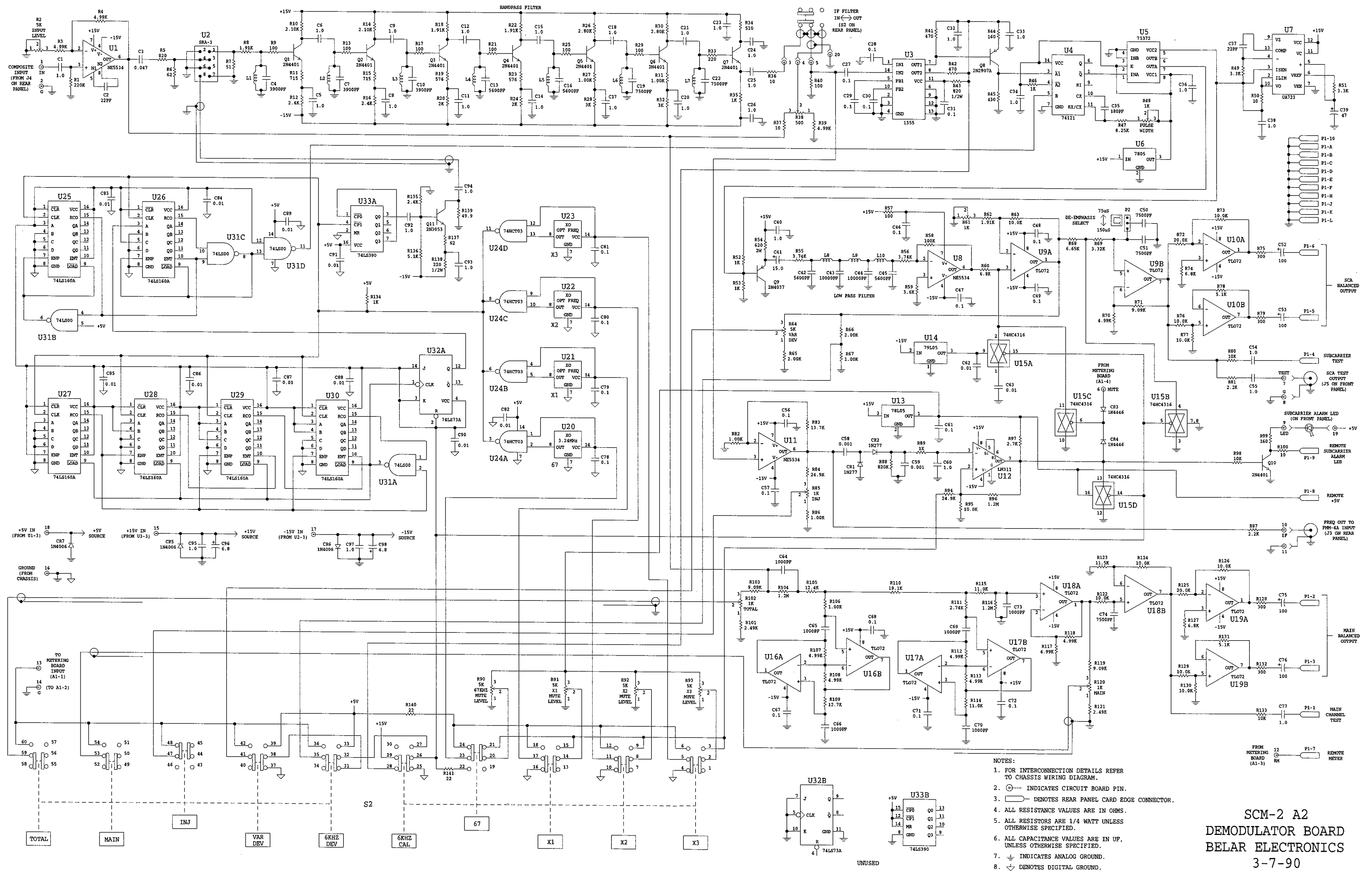
Reference Designation	Description	Part Number
R12	R: METAL FILM 5.11k 1%	0721-5111
R13	R: METAL FILM 5.1k 2% 1/4W	0751-5122
R14	R: FIXED CARBON 5.6M 5% 1/4W	0683-5655
R15	R: METAL FILM 7.5k 2% 1/4W	0751-7522
R16	R: METAL FILM 27k 2% 1/4W	0751-2732
R17	R: METAL FILM 18k 2% 1/4W	0751-1832
R18	R: METAL FILM 820k 2% 1/4W	0751-8242
R19	R: METAL FILM 10k 2% 1/4W	0751-1032
R20	R: FIXED CARBON 4.7M 5% 1/4W	0683-4755
R21	R: METAL FILM 4.32k 1%	0721-4321
R22	R: METAL FILM 1.37k 1%	0721-1371
R23	R: METAL FILM 432 1%	0721-4320
R24	R: METAL FILM 137 1%	0721-1370
R25	R: METAL FILM 43.2 1%	0721-43R2
R26	R: METAL FILM 13.7 1%	0721-13R7
R27, R28	R: METAL FILM 12.7 1%	0721-12R7
R29	R: METAL FILM 330k 2% 1/4W	0751-3342
R30	R: METAL FILM 2.21k 1%	0721-2211
R31	R: METAL FILM 15.0k 1%	0721-1502
R32	R: METAL FILM 10.0k 1%	0721-1002
R33	R: METAL FILM 2.21k 1%	0721-2211
R34	R: METAL FILM 15.0k 1%	0721-1502
R35	R: METAL FILM 10k 2% 1/4W	0751-1032
R36	R: METAL FILM 5.6k 2% 1/4W	0751-5622
R37	R: METAL FILM 100 2% 1/4W	0751-1012
R38	R: METAL FILM 10.0k 1%	0721-1002
R39	R: METAL FILM 12.4k 1%	0721-1242
R40	R: VAR COMP 5k, 10 TURN	2100-0020
R41	R: FIXED CARBON 1.2M 5% 1/4W	0683-1255
R42	R: METAL FILM 221 1%	0721-2210
R43, R44	R: METAL FILM 2.00k 1%	0721-2001
R45, R46	R: METAL FILM 63.4k 1%	0721-6342
R47, R48	R: METAL FILM 162k 1%	0721-1623
R49	R: METAL FILM 120k 2% 1/4W	0751-1242
R50	R: METAL FILM 7.50k 1%	0721-7501
R51	R: METAL FILM 3.32k 1%	0721-3321
R52	R: METAL FILM 8.2k 2% 1/4W	0751-8222
R53	R: VAR COMP 5k, 10 TURN	2100-0020
R54	R: METAL FILM 16k 2% 1/4W	0751-1632
R55	R: METAL FILM 120k 2% 1/4W	0751-1242
R56	R: FIXED CARBON 2.7M 5% 1/4W	0683-2755
R57	R: METAL FILM 10k 2% 1/4W	0751-1032
R58	R: METAL FILM 75k 2% 1/4W	0751-7532
R59	R: VAR COMP 5k, 10 TURN	2100-0020
R60	R: METAL FILM 15k 2% 1/4W	0751-1532
R61	R: METAL FILM 820k 2% 1/4W	0751-8242
R62	R: METAL FILM 10k 2% 1/4W	0751-1032
R63	R: METAL FILM 820k 2% 1/4W	0751-8242
R64	R: METAL FILM 120k 2% 1/4W	0751-1242

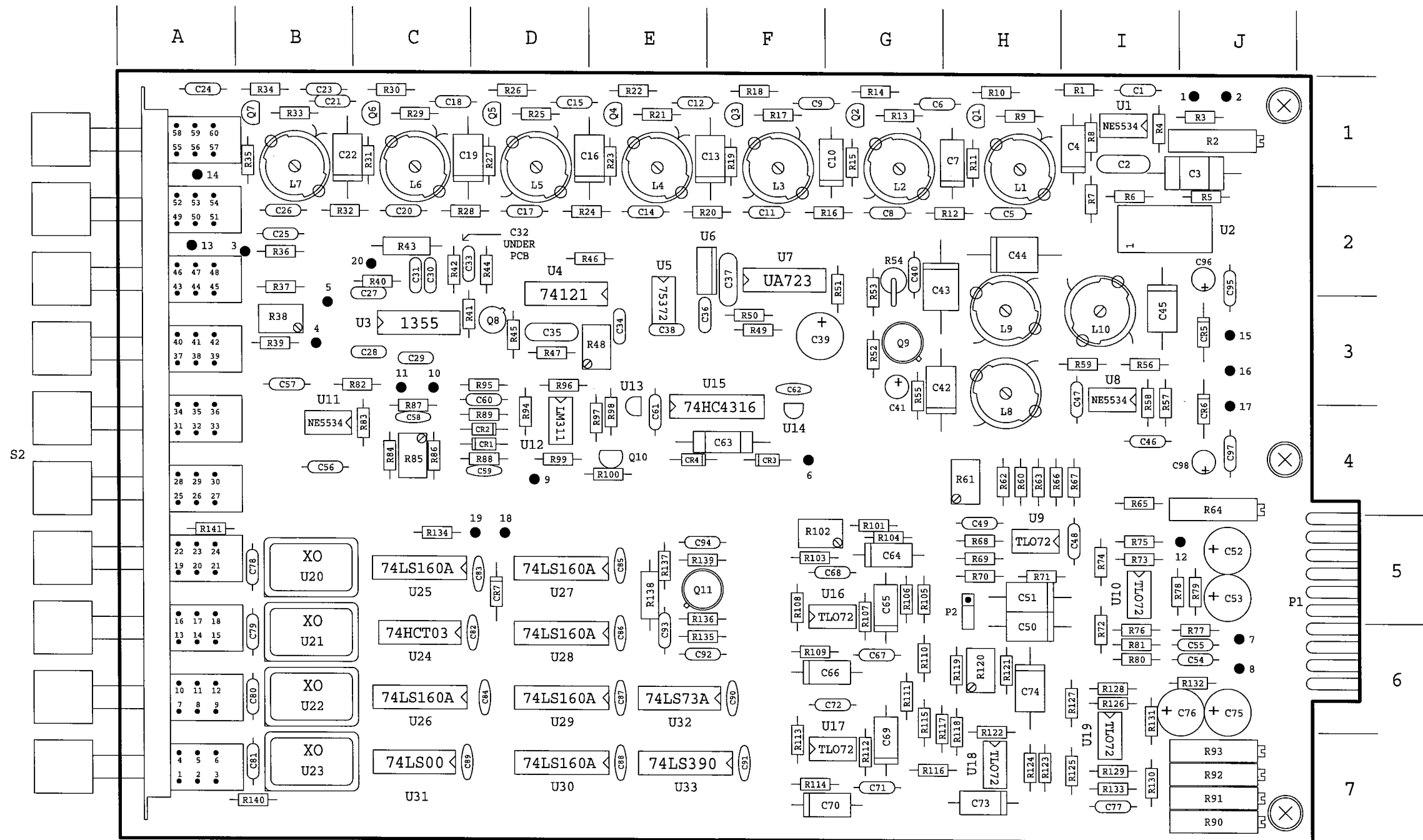
A1 BOARD SCM-2 CONT.

Reference Designation	Description	Part Number
R65,R66	R: METAL FILM 10k 2% 1/4W	0751-1032
R67	R: METAL FILM 120k 2% 1/4W	0751-1242
R68	R: METAL FILM 270k 2% 1/4W	0751-2742
R69	R: METAL FILM 1k 2% 1/4W	0751-1022
R70,R71	R: METAL FILM 910 2% 1/4W	0751-9112
S1	SWITCH: PUSHBUTTON (4 BUTTON)	3101-0026
U1,U2	IC: TLE2082	1826-0069
U3	IC: TLO71	1826-0004
U4	IC: LM311	1826-0009
U5	IC: 4538B	1822-0023
U6	IC: 4051B	1822-0007
U7	IC: TLE2082	1826-0069
U8	IC: LM318	1826-0010
U9	IC: TLO71	1826-0004
U10	IC: LM393	1826-0011
U11	IC: 4011B	1822-0002
U12	IC: 4001B	1822-0015
U13	IC: 4002B	1822-0001
U14	IC: 4516B	1822-0012
U15	IC: 4050B	1822-0006
U16	IC: 74LS247	1826-0026

A1-1 BOARD SCM-2

Reference Designation	Description	Part Number
DS1,DS2	DISPLAY: MAN3820A	1930-0004
R72 thru R84	R: METAL FILM 160 2% 1/4W	0751-1612





SCM-2 A2 BOARD
COMPONENT LAYOUT
BELAR ELECTRONICS

SCM-2 A2 REV B BOARD
PART LOCATIONS

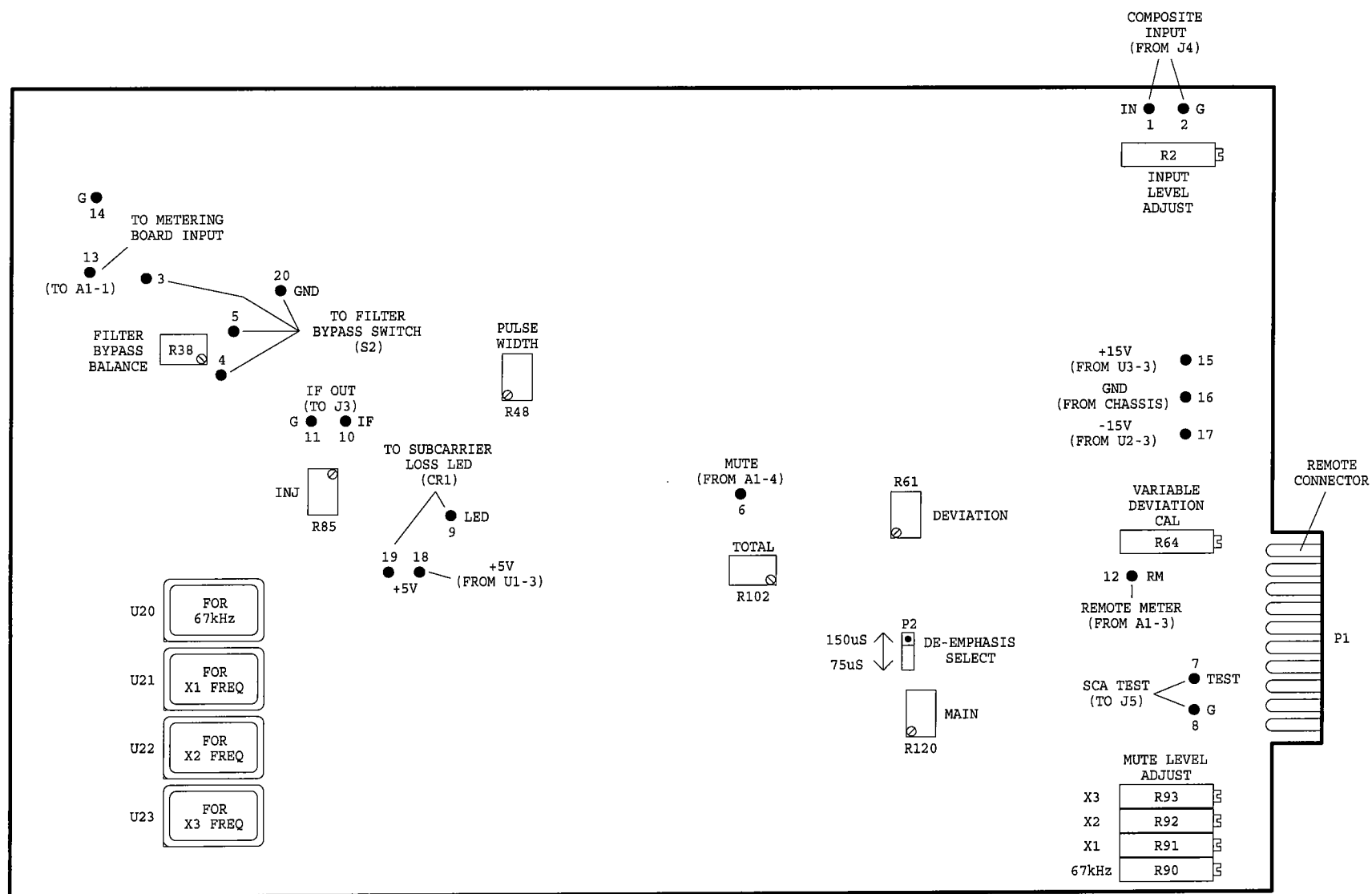
Desig/Loc	Desig/Loc	Desig/Loc	Desig/Loc	Desig/Loc	Desig/Loc
C1 I1	C49 H5	C97 J4	R12 H2	R60 H4	R108 F5
C2 I1	C50 H6	C98 J4	R13 G1	R61 H4	R109 F6
C3 J1	C51 H5		R14 G1	R62 H4	R110 G6
C4 I1	C52 J5	CR1 D4	R15 G1	R63 H4	R111 G6
C5 H2	C53 J5	CR2 D4	R16 G2	R64 J4	R112 G7
C6 G1	C54 J6	CR3 F4	R17 F1	R65 I4	R113 F7
C7 H1	C55 J6	CR4 E4	R18 F1	R66 H4	R114 F7
C8 G2	C56 B4	CR5 J3	R19 F1	R67 I4	R115 G6
C9 F1	C57 B3	CR6 J4	R20 E2	R68 H5	R116 G7
C10 G1	C58 C4	CR7 D5	R21 E1	R69 H5	R117 G6
C11 F2	C59 D4		R22 E1	R70 H5	R118 H6
C12 E1	C60 D3	L1 H1	R23 E1	R71 H5	R119 H6
C13 F1	C61 E4	L2 G1	R24 D2	R72 I6	R120 H6
C14 E2	C62 F3	L3 F1	R25 D1	R73 I5	R121 H6
C15 D1	C63 F4	L4 E1	R26 D1	R74 I5	R122 H6
C16 D1	C64 G5	L5 D1	R27 D1	R75 I5	R123 H7
C17 D2	C65 G5	L6 C1	R28 C2	R76 I6	R124 H7
C18 C1	C66 F6	L7 B1	R29 C1	R77 J6	R125 I7
C19 C1	C67 G6	L8 H3	R30 C1	R78 I5	R126 I6
C20 C2	C68 G5	L9 H3	R31 C1	R79 J5	R127 I6
C21 B1	C69 G7	L10 I3	R32 B2	R80 I6	R128 I6
C22 B1	C70 F7		R33 B1	R81 I6	R129 I7
C23 B1	C71 G7	P1 J5**	R34 B1	R82 C3	R130 I7
C24 A1	C72 G6	P2 H5	R35 B1	R83 C4	R131 I6
C25 B2	C73 H7		R36 B2	R84 C4	R132 J6
C26 B2	C74 H6	Q1 H1	R37 B2	R85 C4	R133 I7
C27 C3	C75 J6	Q2 G1	R38 B3	R86 C4	R134 C5
C28 C3	C76 I6	Q3 F1	R39 B3	R87 C4	R135 E6
C29 C3	C77 I7	Q4 E1	R40 C2	R88 D4	R136 E5
C30 C2	C78 B5	Q5 D1	R41 C3	R89 D4	R137 E5
C31 C2	C79 B6	Q6 C1	R42 C2	R90 J7	R138 E5
C32 C2*	C80 B6	Q7 B1	R43 C2	R91 J7	R139 E5
C33 C2	C81 B7	Q8 D3	R44 D2	R92 J7	R140 B7
C34 E3	C82 C6	Q9 G3	R45 D3	R93 J7	R141 A5
C35 D3	C83 D5	Q10 E4	R46 D2	R94 D4	
C36 E3	C84 D6	Q11 E5	R47 D3	R95 D3	S2 A4
C37 F2	C85 E5		R48 E3	R96 D3	
C38 E3	C86 E6	R1 I1	R49 F3	R97 E4	U1 I1
C39 F3	C87 E6	R2 J1	R50 F3	R98 E4	U2 I2
C40 G2	C88 E7	R3 J1	R51 G2	R99 D4	U3 C3
C41 G3	C89 C7	R4 I1	R52 G3	R100 E4	U4 D3
C42 G3	C90 F6	R5 J2	R53 G2	R101 G5	U5 E3
C43 G2	C91 F7	R6 I2	R54 G2	R102 F5	U6 E2
C44 H2	C92 E6	R7 I2	R55 G3	R103 F5	U7 F2
C45 I3	C93 E6	R8 I1	R56 I3	R104 G5	U8 I3
C46 I4	C94 E5	R9 H1	R57 I3	R105 G5	U9 H5
C47 I3	C95 J2	R10 H1	R58 I3	R106 G5	U10 I5
C48 I5	C96 J2	R11 H1	R59 I3	R107 G5	U11 B4

*C32 IS ON BOTTOM OF PCB

**P1 IS CARD EDGE CONNECTOR

SCM-2 A2 REV B BOARD
PART LOCATIONS
CONT.

Desig/Loc	Desig/Loc		
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		pins	
U12 D4	1	J1	
U13 E4	2	J1	
U14 F4	3	B2	
U15 F4	4	B3	
U16 G5	5	B3	
U17 G7	6	F4	
U18 H7	7	J6	
U19 I7	8	J6	
U20 B5	9	D4	
U21 B6	10	C3	
U22 B6	11	C3	
U23 B7	12	I5	
U24 C6	13	A2	
U25 C5	14	A1	
U26 C6	15	J3	
U27 D5	16	J3	
U28 D6	17	J4	
U29 D6	18	D5	
U30 D7	19	D5	
U31 C7	20	C2	
U32 E6			
U33 E7			



SCM-2 A2 BOARD
CONNECTIONS & ADJUSTMENTS
BELAR ELECTRONICS

Reference Designation	Description	Part Number
C1	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C2	C: FIXED MICA 22pF 5%	0140-2205
C3	C: FIXED FILM 0.047uF 10% 200V	0120-4731
C4	C: FIXED POLY 3900pF 2.5% 160V	0130-3922
C5,C6	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C7	C: FIXED POLY 3900pF 2.5% 160V	0130-3922
C8,C9	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C10	C: FIXED POLY 3900pF 2.5% 160V	0130-3922
C11,C12	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C13	C: FIXED POLY 5600pF 2.5% 160V	0130-5622
C14,C15	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C16	C: FIXED POLY 5600pF 2.5% 160V	0130-5622
C17,C18	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C19	C: FIXED POLY 7500pF 2.5% 160V	0130-7522
C20,C21	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C22	C: FIXED POLY 7500pF 2.5% 160V	0130-7522
C23 thru C26	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C27 thru C31	C: FIXED CERAMIC 0.1uF 50V	0151-0015
C32 thru C34	C: FIXED CERAMIC 1.0uF 50V	0151-0016
C35	C: FIXED MICA 180pF 5%	0140-1815
C36	C: FIXED CERAMIC 1.0uF 50V	0151-0016
C37	C: FIXED MICA 22pF 5%	0140-2205
C38	C: FIXED CERAMIC 1.0uF 50V	0151-0016
C39	C: FIXED ELEC 47uF 50V	0180-0017
C40	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C41	C: FIXED TANT 15uF 15V	0185-0003
C42	C: FIXED POLY 5600pF 2.5% 160V	0130-5622
C43,C44	C: FIXED POLY 10,000pF 2.5% 160V	0130-1032
C45	C: FIXED POLY 5600pF 2.5% 160V	0130-5622
C46 thru C49	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C50,C51	C: FIXED POLY 7500pF 2.5% 160V	0130-7522
C52,C53	C: FIXED ELEC 100uF 35V	0180-0018
C54,C55	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C56,C57	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C58,C59	C: FIXED CERAMIC 0.001uF 1kV	0151-0002
C60	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C61	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C62	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C63	C: FIXED FILM 0.01uF 10% 200V	0120-1031
C64 thru C66	C: FIXED POLY 1000pF 2.5% 160V	0130-1022
C67,C68	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C69,C70	C: FIXED POLY 1000pF 2.5% 160V	0130-1022
C71,C72	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C73	C: FIXED POLY 1000pF 2.5% 160V	0130-1022
C74	C: FIXED POLY 7500pF 2.5% 160V	0130-7522
C75,C76	C: FIXED ELEC 100uF 35V	0180-0018
C77	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C78 thru C81	C: FIXED CERAMIC 0.1uF 50V	0151-0006
C82 thru C91	C: FIXED CERAMIC 0.01uF 100V	0151-0003
C92 thru C95	C: FIXED CERAMIC 1.0uF 50V	0151-0008

A2 BOARD SCM-2 CONT.

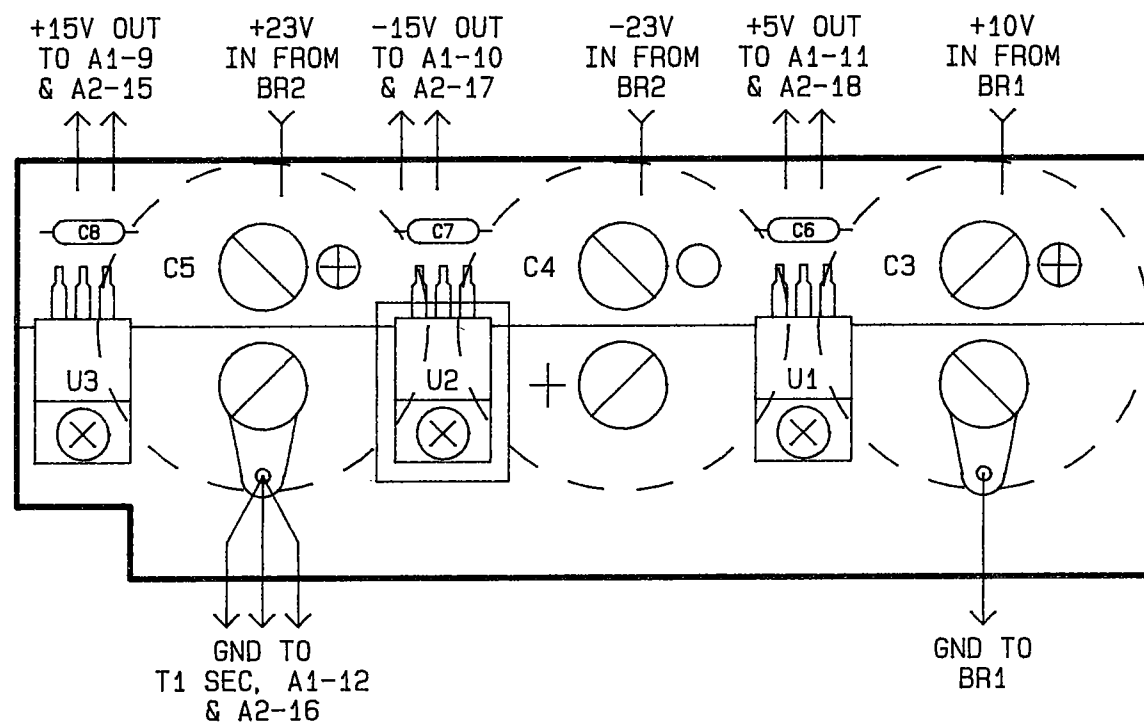
REV B

Reference Designation	Description	Part Number
C96	C: FIXED TANT 6.8uF 25V	0185-0002
C97	C: FIXED CERAMIC 1.0uF 50V	0151-0008
C98	C: FIXED TANT 6.8uF 25V	0185-0002
CR1,CR2	DIODE: AA119	1900-0001
CR3,CR4	DIODE: 1N4446	1900-0002
CR5 thru CR7	DIODE: 1N4006	1900-0016
L1 thru L10	INDUCTOR:	Belar
P2	PLUG: 3 PIN, PC MOUNT	0365-0030
--	JUMPER: 2 PIN (USED WITH P2)	0365-0028
Q1 thru Q7	TRANSISTOR: 2N4401	1850-0028
Q8	TRANSISTOR: 2N2907A	1850-0027
Q9	TRANSISTOR: 2N4037	1850-0011
Q10	TRANSISTOR: 2N4401	1850-0028
Q11	TRANSISTOR: 2N3053	1850-0008
R1	R: METAL FILM 220k 2% 1/4W	0751-2242
R2	R: VAR COMP 5k, 10 TURN	2100-0026
R3,R4	R: METAL FILM 4.99k 1%	0721-4991
R5	R: METAL FILM 820 2% 1/4W	0751-8212
R6	R: METAL FILM 62 2% 1/4W	0751-6202
R7	R: METAL FILM 51 2% 1/4W	0751-5102
R8	R: METAL FILM 1.91k 1%	0721-1911
R9	R: METAL FILM 100 2% 1/4W	0751-1012
R10	R: METAL FILM 2.10k 1%	0721-2101
R11	R: METAL FILM 715 1%	0721-7150
R12	R: METAL FILM 2.4k 2% 1/4W	0751-2422
R13	R: METAL FILM 100 2% 1/4W	0751-1012
R14	R: METAL FILM 2.10k 1%	0721-2101
R15	R: METAL FILM 715 1%	0721-7150
R16	R: METAL FILM 2.4k 2% 1/4W	0751-2422
R17	R: METAL FILM 100 2% 1/4W	0751-1012
R18	R: METAL FILM 1.91k 1%	0721-1911
R19	R: METAL FILM 576 1%	0721-5760
R20	R: METAL FILM 2k 2% 1/4W	0751-2022
R21	R: METAL FILM 100 2% 1/4W	0751-1012
R22	R: METAL FILM 1.91k 1%	0721-1911
R23	R: METAL FILM 576 1%	0721-5760
R24	R: METAL FILM 2k 2% 1/4W	0751-2022
R25	R: METAL FILM 100 2% 1/4W	0751-1012
R26	R: METAL FILM 2.80k 1%	0721-2801
R27	R: METAL FILM 1.00k 1%	0721-1001
R28	R: METAL FILM 3k 2% 1/4W	0751-3022
R29	R: METAL FILM 100 2% 1/4W	0751-1012
R30	R: METAL FILM 2.80k 1%	0721-2801
R31	R: METAL FILM 1.00k 1%	0721-1001
R32	R: METAL FILM 3k 2% 1/4W	0751-3022

Reference Designation	Description	Part Number
R33	R: METAL FILM 220 2% 1/4W	0751-2212
R34	R: METAL FILM 510 2% 1/4W	0751-5112
R35	R: METAL FILM 1k 2% 1/4W	0751-1022
R36, R37	R: METAL FILM 10 2% 1/4W	0751-1002
R38	R: VAR COMP 500, 10 TURN	2100-0027
R39	R: METAL FILM 4.99k 1%	0721-4991
R40	R: METAL FILM 100 2% 1/4W	0751-1012
R41, R42	R: METAL FILM 470 2% 1/4W	0751-4712
R43	R: METAL FILM 820 2% 1/2W	0771-8212
R44	R: METAL FILM 160 2% 1/4W	0751-1612
R45	R: METAL FILM 430 2% 1/4W	0751-4312
R46	R: METAL FILM 1k 2% 1/4W	0751-1022
R47	R: METAL FILM 8.25k 1%	0721-8251
R48	R: VAR COMP 1k, 10 TURN	2100-0021
R49	R: METAL FILM 3.3k 2% 1/4W	0751-3322
R50	R: METAL FILM 10 2% 1/4W	0751-1002
R51	R: METAL FILM 3.3k 2% 1/4W	0751-3322
R52, R53	R: METAL FILM 1k 2% 1/4W	0751-1022
R54	R: WIRE WOUND 620 5% 2W	0811-0012
R55, R56	R: METAL FILM 3.74k 1%	0721-3741
R57	R: METAL FILM 100 2% 1/4W	0751-1012
R58	R: METAL FILM 100k 1%	0721-1003
R59	R: METAL FILM 3.6k 2% 1/4W	0751-3622
R60	R: METAL FILM 6.8k 2% 1/4W	0751-6822
R61	R: VAR COMP 1k, 10 TURN	2100-0021
R62	R: METAL FILM 1.91k 1%	0721-1911
R63	R: METAL FILM 10.0k 1%	0721-1002
R64	R: VAR COMP 5k, 10 TURN	2100-0026
R65, R66	R: METAL FILM 2.00k 1%	0721-2001
R67	R: METAL FILM 1.00k 1%	0721-1001
R68	R: METAL FILM 6.65k 1%	0721-6651
R69	R: METAL FILM 3.32k 1%	0721-3321
R70	R: METAL FILM 4.99k 1%	0721-4991
R71	R: METAL FILM 9.09k 1%	0721-9091
R72	R: METAL FILM 20.0k 1%	0721-2002
R73	R: METAL FILM 10.0k 1%	0721-1002
R74	R: METAL FILM 6.8k 2% 1/4W	0751-6822
R75	R: METAL FILM 300 2% 1/4W	0751-3012
R76, R77	R: METAL FILM 10.0k 1%	0721-1002
R78	R: METAL FILM 5.1k 2% 1/4W	0751-5122
R79	R: METAL FILM 300 2% 1/4W	0751-3012
R80	R: METAL FILM 10k 2% 1/4W	0751-1032
R81	R: METAL FILM 2.2k 2% 1/4W	0751-2222
R82	R: METAL FILM 1.00k 1%	0721-1001
R83	R: METAL FILM 13.7k 1%	0721-1372
R84	R: METAL FILM 24.9k 1%	0721-2492
R85	R: VAR COMP 1k, 10 TURN	2100-0021
R86	R: METAL FILM 1.00k 1%	0721-1001

Reference Designation	Description	Part Number
R87	R: METAL FILM 2.2k 2% 1/4W	0751-2222
R88	R: METAL FILM 820k 2% 1/4W	0751-8242
R89	R: METAL FILM 1k 2% 1/4W	0751-1022
R90 thru R93	R: VAR COMP 5k, 10 TURN	2100-0026
R94	R: METAL FILM 24.9k 1%	0721-2492
R95	R: METAL FILM 10.0k 1%	0721-1002
R96	R: FIXED CARBON 1.2M 5% 1/4W	0683-1255
R97	R: METAL FILM 2.7k 2% 1/4W	0751-2722
R98	R: METAL FILM 10k 2% 1/4W	0751-1032
R99	R: METAL FILM 160 2% 1/4W	0751-1612
R100	R: METAL FILM 10 2% 1/4W	0751-1002
R101	R: METAL FILM 2.49k 1%	0721-2491
R102	R: VAR COMP 1k, 10 TURN	2100-0021
R103	R: METAL FILM 9.09k 1%	0721-9091
R104	R: FIXED CARBON 1.2M 5% 1/4W	0683-1255
R105	R: METAL FILM 12.4k 1%	0721-1242
R106	R: METAL FILM 1.00k 1%	0721-1001
R107, R108	R: METAL FILM 4.99k 1%	0721-4991
R109	R: METAL FILM 12.7k 1%	0721-1272
R110	R: METAL FILM 19.1k 1%	0721-1912
R111	R: METAL FILM 2.74k 1%	0721-2741
R112, R113	R: METAL FILM 4.99k 1%	0721-4991
R114, R115	R: METAL FILM 11.0k 1%	0721-1102
R116	R: FIXED CARBON 1.2M 5% 1/4W	0683-1255
R117, R118	R: METAL FILM 4.99k 1%	0721-4991
R119	R: METAL FILM 9.09k 1%	0721-9091
R120	R: VAR COMP 1k, 10 TURN	2100-0021
R121	R: METAL FILM 2.49k 1%	0721-2491
R122	R: METAL FILM 10.0k 1%	0721-1002
R123	R: METAL FILM 11.5k 1%	0721-1152
R124	R: METAL FILM 10.0k 1%	0721-1002
R125	R: METAL FILM 20.0k 1%	0721-2002
R126	R: METAL FILM 10.0k 1%	0721-1002
R127	R: METAL FILM 6.8k 2% 1/4W	0751-6822
R128	R: METAL FILM 300 2% 1/4W	0751-3012
R129, R130	R: METAL FILM 10.0k 1%	0721-1002
R131	R: METAL FILM 5.1k 2% 1/4W	0751-5122
R132	R: METAL FILM 300 2% 1/4W	0751-3012
R133	R: METAL FILM 10k 2% 1/4W	0751-1032
R134	R: METAL FILM 1k 2% 1/4W	0751-1022
R135	R: METAL FILM 2.4k 2% 1/4W	0751-2422
R136	R: METAL FILM 5.1k 2% 1/4W	0751-5122
R137	R: METAL FILM 62 2% 1/4W	0751-6202
R138	R: METAL FILM 220 2% 1/2W	0771-2212
R139	R: METAL FILM 49.9 1%	0721-49R9
R140, R141	R: METAL FILM 22 2% 1/4W	0751-2202
S2	SWITCH: PUSHBUTTON (10 BUTTON)	3101-0025

Reference Designation	Description	Part Number
U1	IC: NE5534	1826-0025
U2	IC: SRA-3	1845-0003
U3	IC: 1355	1826-0045
U4	IC: 74121	1821-0014
U5	IC: 75372	1823-0004
U6	IC: 7805CT	1826-0014
U7	IC: UA723	1820-0012
U8	IC: NE5534	1826-0025
U9, U10	IC: TL072	1826-0038
U11	IC: NE5534	1826-0025
U12	IC: LM311	1826-0009
U13	IC: 78L05CP	1826-0012
U14	IC: 79L05CP	1826-0017
U15	IC: 74HC4316	1822-0051
U16 thru U19	IC: TL072	1826-0038
U20	IC: XO, 3.24MHz	0415-0324
U21 thru U23	IC: XO, (USED FOR OPTIONAL SCA FREQUENCIES)	
U24	IC: 74HCT03	1822-0028
U25 thru U30	IC: 74LS160A	1821-0031
U31	IC: 74LS00	1821-0029
U32	IC: 74LS73A	1821-0030
U33	IC: 74LS390	1821-0033



SCM-2
 A5 POWER SUPPLY BOARD
 COMPONENT LAYOUT
 BELAR ELECTRONICS