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TM-8108603501

DIGITAL SELECTIVE CALLING CONTROLLER

MD-2700

OPERATION AND MAINTENANCE MANUAL

SUNAIR 3101 SW Third Avenue, Ft. Lauderdale, FL 33315-3389

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Conventions Used in this Manual

- Button names, names of screens and key names are printed in **bold**.
- **Notes:** provide information to help you accomplish tasks efficiently or to avoid problems.
- Mouse clicks:

  Unless otherwise specified, the *left* mouse button is used for all mouse actions.
  Single-click on an item to activate buttons.
  Double-click on most other items to activate function.

- Dialog boxes (combo boxes, list box, text box, drop-down menus)

  A combo box is a control, similar to a list box and text box combined in which you enter a value or select an item from a list.

  A list box is a control that provides a list of items to choose from.

  A text box is a control that allows you to enter or view text in a form. Usually, text boxes hold a single line of text

  Some options require that you enter additional information. You either type additional information in a text box (field), select from a drop-down list accessed by up or down arrows, or select (click on) a button.

- ☞ Directs you to additional references about a subject.

TABLE of STANDARD ABBREVIATIONS

ADDR Address
AGC Automatic Gain Control
ALC Automatic Level Control
AM Amplitude Modulation
AME Amplitude Modulation Equivalent
AMP/AMPL Amplifier
ARQ Automatic Request
AUD Audio
AUTO Automatic
AUX Auxiliary
BAUD A variable unit of data transmission speed (bits per second)
BELL U.S. Telephone standards
BFO Beat Frequency Oscillator
BITE Built In Test Equipment
BRD Board
CH /CHAN /CHL/CHN Channel
CLR Clear
CMOS Complementary Metal Oxide Semiconductor
CPLR Coupler
CPU Computer
CW Carrier Wave
dB Decibel
dBm Decibels referred to 1 milliwatt across 600 ohms
DSBSC Double Sideband Suppressed Carrier
DSP Display
DUART Dual Asynchronous Receive/Transmit
EEPROM Electrically Erasable and Programmable Read Only Memory
EPROM Electrically Programmable Read Only Memory
EMI Electromagnetic Radiation Interference
ENTR Enter
FAX Facsimile
FEC Forward Error Correction
FREQ Frequency
FSK Frequency Shift Keying
FWD Forward
GRP Group
HF High Frequency
Hz Hertz
IC Integrated Circuit
IF Intermediate Frequency
I/O Input/Output
IONCAP Ionospheric Communications Analysis and Prediction
ISB Independent Sideband
kHz Kilohertz
kW Kilowatt
LCD Liquid Crystal Display
LCL Local
LED Light Emitting Diode
LK Link
LO Local Oscillator
LP/LPX Lincompex
LRU Lowest Repairable Unit
LSB Lower Sideband
LT Light
LVL Level
MAN Manual
M CH Manual Channel
MED Medium
MHz Megahertz
MIC Microphone
MIL-STD Military Standard
MNL Manual
ms Millisecond
MTTR Mean Time To Repair
MTR Meter
NAR Narrow
O.D. Olive Drab
PA Power Amplifier
PC Printed Circuit
PEP Peak Envelope Power
PLL Phase-Locked Loop
P/N Part Number
PNL Panel
POSTSL Post-Selector
PRESEL Pre-Selector
PTT Push-To-Talk
PWR Power
RCV/RX Receive
REFL Reflected
REV Revision
RF Radio Frequency
RFI Radio Frequency Interference
RFL Reflected
RMT Remote
RS232 Computer control, hardwired up to 50 feet maximum
RS422 Computer control, hardwired up to 4000 feet maximum
RS485 Computer control, hardwired for multiple users
RTTY Radio Teletype
SEL Select
SLO Slow
S MTR Signal Strength Meter
SPKR Speaker
SPLX Simplex
SRAM Static Random Access Memory
SSB Single Sideband
TCXO Temperature Controlled Crystal Oscillator
TGC Transmit Gain Control
THD Total Harmonic Distortion
TTL Transistor Transistor Logic
TX/XMT Transmit
USB Upper Sideband
UTC Universal Time
VCO Voltage Controlled Oscillator
VHF Very High Frequency
VRMS Volts Root Mean Square
VSWR Voltage Standing Wave Ratio
W Watt
WPM Words Per Minute

* Asterisk indicates function selected

SAFETY INFORMATION

The following safety information is not necessarily related to a specific procedure in this particular document. However, the information should be reviewed, understood and applied in all phases of operation and maintenance before operating the equipment described here.

Standard practice uses hazard notices that are ranked in order of severity and designed to prevent damage, injury, or death.

- A ***caution*** prevents mistakes that could result in injury or equipment damage. For example, Electrostatic Discharge Sensitive Devices (ESDS) must be handled with certain precautions to minimize the effect of static build-up.

- A ***warning*** alerts users to potential hazards to life or limb. For example, to avoid casualties, always remove power and discharge circuits to ground before touching any circuit components.

- A ***danger*** identifies an immediate hazard to life or limb. For example, dangerous voltages exist in certain equipment. Before removing any cover, disconnect primary power.

Some personnel in the work place should be trained in rendering first aid. In those places where high voltages are present, they should be familiar with methods of resuscitation.

Keep Away from Live Circuits

Operating personnel must observe at all times all safety regulations. Do not replace components inside the equipment with the power supply turned on. Under certain conditions, dangerous potentials may exist when the power control is in the off position due to circuit design or charges retained by capacitors. Remove watches and rings before performing any maintenance procedures.

Do not service or adjust alone

Under no circumstances should any person reach into or enter the enclosure to service or adjust the equipment except in the presence of someone who is capable of rendering aid.

Resuscitation

Personnel working with or near high voltage should be familiar with methods of resuscitation.

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SECTION I
GENERAL

1.1 SCOPE

This manual contains information necessary to install, operate, and maintain the MD-2700 DSC Controller.

1.2 PURPOSE OF EQUIPMENT

The MD-2700 provides an RT-9000A HF/SSB Radio with the ability to send and receive Digital Selective Calling messages and Global Maritime Distress and Safety System distress calls.

1.3 GENERAL DESCRIPTION

The MD-2700 is a Digital Selective Calling (DSC) Controller designed to transmit and receive DSC messages. It can transmit a preformatted call to any other vessel or coast station equipped with DSC. Once the call is received by the intended party, the MD-2700 displays an acknowledgment, leaving no doubt as to whether the call was received. Because each DSC station has a unique identification number, only the intended party will respond.

When the MD-2700 is on the receiving end of a call, an alarm will sound to alert the operator to an incoming call, and proceed to log the call if the call goes unanswered. After the operator views the log, an automated call back can be made with a few keystrokes.

In addition to routine calling, the MD-2700 offers distress calling capability that is fully compatible with the Global Maritime Distress and Safety System (GMDSS). With a single button, the operator can send a distress call identifying both vessel and location (automatic position reporting requires an NMEA 0183 compatible navigation receiver). The distress call will be received by every ship and coast station monitoring the international DSC distress frequencies. If the vessel is within range of a DSC equipped coast station, a response should be received immediately. If no response is detected, the MD-2700 will repeat the distress message automatically every 4 minutes until it is acknowledged. If a coast station is not nearby, DSC-equipped vessels in the vicinity can respond and relay the message.

All ships calling is also provided. "All ships" formats are useful for initiating safety messages such as weather reports and navigational warnings.

1.4 TECHNICAL SPECIFICATIONS

CCIR Recommendations:	493-4 and 541-3
IMO Resolution:	A610 (15)
Supply Voltage:	10.8VDC to 16.3VDC @ 1.8A max. or 20VDC to 30VDC @ 1.2A max. (Operation from supply voltages between 16.3V and 20V is not recommended)
Operating Temperature Range:	-15C to +60C
Safe Compass Distance:	1 meter
Navigation Interface:	NMEA 0183 Version 2.0 compatible with Loran, GPS, Transit. Reads RMA, RMC, GLL, GCA, TRF sentences.

Position Update Interval:	3 minutes
Alarms:	One internal, output for 1 or 2 Watt remote speaker alarms, externally available uncommitted normally open relay contact.
Display:	40 character by 4 line backlit LCD
Keypad:	18 key backlit w/ audible feedback
Memory:	Nonvolatile memory for its own DSC individual and group Ids, and Necode transmit and receive codes. Nonvolatile memory for 45 frequently called DSC IDs, 45 Necode Ids, 45 radio voice channels, and 8 DSC scan channels. Nonvolatile memory log for 40 most recently received distress and urgency calls and 40 routine calls.
Clock:	Date and time of day, battery backed
Transmit and Receive Formats:	All formats per ITU-R Recommendation 493 class A as well as Necode calls.

1.5 EQUIPMENT SUPPLIED

The following is a list of equipment, with appropriate Sunair part numbers, supplied with the MD-2700 DSC Controller.

Supplied Equipment	Sunair Part Numbers
Final Assy, Tested, MD-2700	8108604290
Manual, Maintenance, MD-2700	8108603501
Mounting Bracket	8108601401
Mounting Bracket Hardware	8108601509
Connector Kit, MD-2700	8108605407

1.6 OPTIONAL EQUIPMENT - NOT SUPPLIED

Optional Equipment	Sunair Part Numbers
Cable Assembly 9000A/9800 Serial Control, 6 ft (Also works with the MD-2700).	8110005896
Connector, Power, 19 Pin Male (Mating connector for J4, R-2701)	1012810038
Cable Clamp MS3057-8A (For use with 1012810038)	1000200001
Cable Assy, R-2701 to MD-2700, 4 ft	8108701694

SECTION II

INSTALLATION

2.1 GENERAL

This section contains all necessary instructions for proper installation of the MD-2700 DSC Controller in conjunction with the RT-9000A HF/SSB Radio.

2.2 INSTALLATION

The MD-2700 should be installed using the supplied mounting bracket (P/N 8108601401) and hardware kit (P/N 8108601509). Install the mounting bracket using the hole pattern shown in Figure 2.2.1. If a fixed mount is not desired, the hardware kit includes 4 self-adhesive bumpers which can be applied to the bottom of the mounting bracket.

See Figure 2.2.2 for the system interconnect of an RT-9000A GMDSS system.

See Figure 2.2.3 for a drawing of the cable connecting the RT-9000A Audio to the MD-2700 DSC Controller

See Figure 2.2.4 for a drawing of the cable connecting the RCU-9310 Control Head Audio to the MD-2700 DSC Controller.

2.3 CONNECTOR PINOUTS

2.3.1 J1 Power Supply Connector

Pin	Function
J1-A	12VDC or 28VDC Supply (+)
J1-B	Supply Return (-)

Mating connector is Sunair P/N 1010520032 with clamp Sunair P/N 0754450007 (MS3057-6).

2.3.2 J2 Alarms Connector

no J2 on diagrams.

Pin	Function
J2-A	12VDC from MD-2700 for use by alarm circuits
J2-B	DSC Relay 1 (normally open contact)
J2-C	DSC Relay 2 (other side of normally open contact)
J2-D	Alarm Common
J2-E	2 Watt Alarm (audio alarm)
J2-F	Not Used
J2-G	Not Used
J2-H	Logic alarm input
J2-J	Logic alarm output
J2-K	Logic alarm common

Mating connector is Sunair P/N 1010650025.

2.3.3 J3 Connector to RT-9000A Audio

Pin	Function
J3-A	
J3-B	
J3-C	
J3-D	
J3-E	
J3-F	GND
J3-G	Keyline Remote Audio
J3-H	Transmit Audio A
J3-J	Transmit Audio A
J3-K	
J3-L	Receive Audio A
J3-M	Receive Audio A
J3-N	
J3-P	
J3-R	
J3-S	
J3-T	
J3-U	
J3-V	

Mating connector is Sunair P/N 1011140004 with clamp Sunair P/N100020000 (MS3057-8A).

2.3.4 J4 Connector to R-2701 Watch Receiver

Pin	Function
J4-A	EXT RX Audio (RT-9000A Audio)
J4-B	EXT RX Audio RETURN (RT-9000A Audio Return)
J4-C	R-2701 Audio
J4-D	R-2701 Audio Return
J4-E	R-2701 Detect
J4-F	Seabus High
J4-G	Seabus Low
J4-H	Seabus Return
J4-J	12VDC Supply (+)
J4-K	12VDC Supply (+)
J4-L	12VDC Supply (-)
J4-M	12VDC Supply (-)
J4-N	
J4-P	
J4-R	
J4-S	
J4-T	
J4-U	
J4-V	

Note that though this connector is similar in appearance to J3 and J7, it's a pin rotated version of those connectors, and consequently requires a different mating connector.

Mating connector is Sunair P/N 1012810038 clamp Sunair P/N100020000 (MS3057-8A).

2.3.5 J5 Navigation Receiver Connector

The navigation receiver connector provides a 4800 bits per second serial input compatible with NMEA Standard 0183 Version 2.0.

Pin	Function
J5-1	NMEA HI
J5-2	NMEA LO
J5-3	NMEA GND
J5-4	Not Used

Mating connector is Sunair P/N 1012870031.

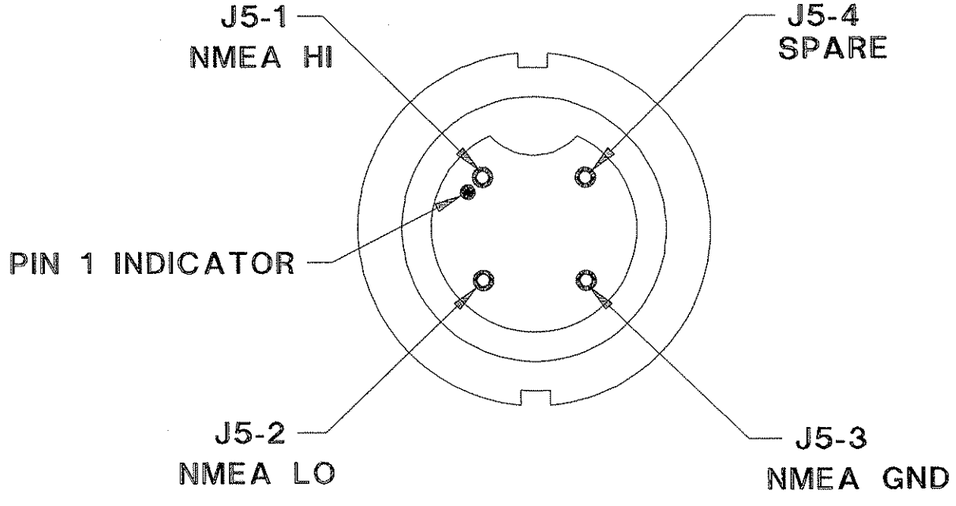

Figure 2.3.5.1 Navigation Receiver Connector (J5).

2.3.6 J6 Serial Printer Connector

The printer connector is a standard 2400 bits per second RS-232 serial interface for use with serial printers. Pins not described below are not connected. If the printer does not provide a ready signal or a hardware handshake line for connection to CTS, RTS can be looped back to CTS. In this case the printer must accept data continuously at 2400 bits per second.

Pin	Function
J6-1	Not Used
J6-2	Not Used
J6-3	TXD Transmit data from MD-2700 to printer
J6-4	DTR Data terminal ready, -10V, 100 ohm output impedance
J6-5	SG Signal Ground
J6-6	Not Used
J6-7	RTS Request to send from MD-2700 to printer
J6-8	CTS Clear to send from printer to MD-2700

Mating connector is Sunair P/N 1011960010 with hood Sunair P/N 1011970015.

2.3.7 J7 Connector to RCU-9310 Audio

Pin	Function
J3-A	
J3-B	
J3-C	
J3-D	
J3-E	
J3-F	GND
J3-G	
J3-H	Transmit Audio A
J3-J	Transmit Audio A
J3-K	
J3-L	Receive Audio A
J3-M	Receive Audio A
J3-N	
J3-P	
J3-R	
J3-S	
J3-T	
J3-U	
J3-V	

Mating connector is Sunair P/N 1011140004 with clamp Sunair P/N100020000 (MS3057-8A).

2.3.8 J8 RT-9000A Remote Connector

J8 should be connected to the Remote connector on the RT-9000A. J8 is a female DB-9.

J8-1 RS-232 XMT (TXD)
J8-2 RS-232 RCV (RCV)
J8-3 Not Used
J8-4 Not Used
J8-5 GND
J8-6 RS-422 XMT-HIGH
J8-7 RS-422 XMT-LOW
J8-8 RS-485 HIGH or RS-422 RCV-HIGH
J8-9 RS-485 LOW or RS-422 RCV-LOW

Mating connector is Sunair P/N 1013320000 with hood Sunair P/N 1011970015.

A cable assembly is available from Sunair which converts from the DB-15 on the back of the RT-9000A to the DB-9 at J8 of the MD-2700. This cable is P/N 8110005896. This is the same cable that is used to connect a F-9800 Pre/Postselector to a RT-9000A. See Figure 2.3.1 for construction details of this cable.

2.3.9 J9 RCU-9310 Remote Connector

J9 should be connected to the Remote connector on the RCU-9310 (if it is present). J9 is a female DB-9.

J9-1 RS-232 XMT (TXD)
J9-2 RS-232 RCV (RCV)
J9-3 Not Used
J9-4 Not Used
J9-5 GND
J9-6 RS-422 XMT-HIGH
J9-7 RS-422 XMT-LOW
J9-8 RS-485 HIGH or RS-422 RCV-HIGH
J9-9 RS-485 LOW or RS-422 RCV-LOW

Mating connector is Sunair P/N 1013320000 with hood Sunair P/N 1011970015.

2.3.10 J10 AC

This is the AC power input to the MD-2700.

The AC input voltage range is 90 to 260 VAC, 50 to 60 Hz.

Pin	Function
A	AC HOT
D	AC Neutral
E	Ground

2.4 JUMPER SETTINGS

2.4.1 Jumper Settings for the Serial Expansion Board (1A4)

The jumpers on this board set the type of interface used to communicate with the RT-9000A and RCU-9310. The choices are RS-232, RS-485, and RS-422. The interface does not have to be the same for both the RT-9000A and the RCU-9310. For instance, communication with the RT-9000A could be set for RS-422, while communication with the RCU-9310 could be set to RS-232.

The jumper settings are as follows:

RCU-9310

	RS-232	RS-422	RS-485
JP1	**1-2**	**2-3**	**Open**
JP2	**Open**	**Open**	**2-3**
JP5	**2-3**	**2-3**	**1-2**
JP6	**2-3**	**2-3**	**1-2**

RT-9000A

	RS-232	RS-422	RS-485
JP3	**1-2**	**2-3**	**Open**
JP4	**Open**	**Open**	**2-3**
JP7	**2-3**	**2-3**	**1-2**
JP8	**2-3**	**2-3**	**1-2**

The factory default settings are for RS-485 operation for both the RCU-9310 and the RT-9000A.

2.4.2 Jumper Settings for the Embedded Controller (1A5)

The jumpers for the Embedded Controller control a wide variety of parameters, such as memory size and memory type. These jumpers should never be changed.

JP3	**1-2**
JP4	**1-2**
JP5	**1-2**
JP6	**OUT**
JP7	**2-3**
JP8	**1-2**
JP9	**2-3**
JP10	**1-2**
JP11	**1-2**
JP24	**2-3**
JP13	**OUT**
JP12	**OUT**

JP14	**1-2**
JP15	**1-2**
JP16	**1-2**
JP17	**2-3**
JP25	**IN**
JP26	**OUT**
JP27	**OUT**
JP28	**OUT**
JP29	**OUT**
JP30	**OUT**
JP31	**OUT**
JP37	**IN**

JP1	**OUT**
JP39	**2-3**
JP43	**1-2**
JP19	**OUT**
JP44	**OUT**

2.5 DIP SWITCH SETTINGS

The Dip Switch (SW1) on the 1A5 Embedded Controller sets the baud rate for communication between the MD-2700 and the RT-9000A and between the MD-2700 and the RCU-9310. See Section 3.3.8 of the *RT-9000A Manual* and Section 3.3.6 of the *RCU-9310 Manual* for information on setting the baud rate of these units.

The RT-9000A and the RCU-9310 must be set to the same baud rate.

RT-9000A RCU-9310 BAUD RATE	SW-1	SW-2
2400	OFF	OFF
4800	OFF	ON
9600	ON	OFF
19200	ON	ON

Table 2.5.1 Dip Switch Settings

The factory default setting is for 19,200 bps.

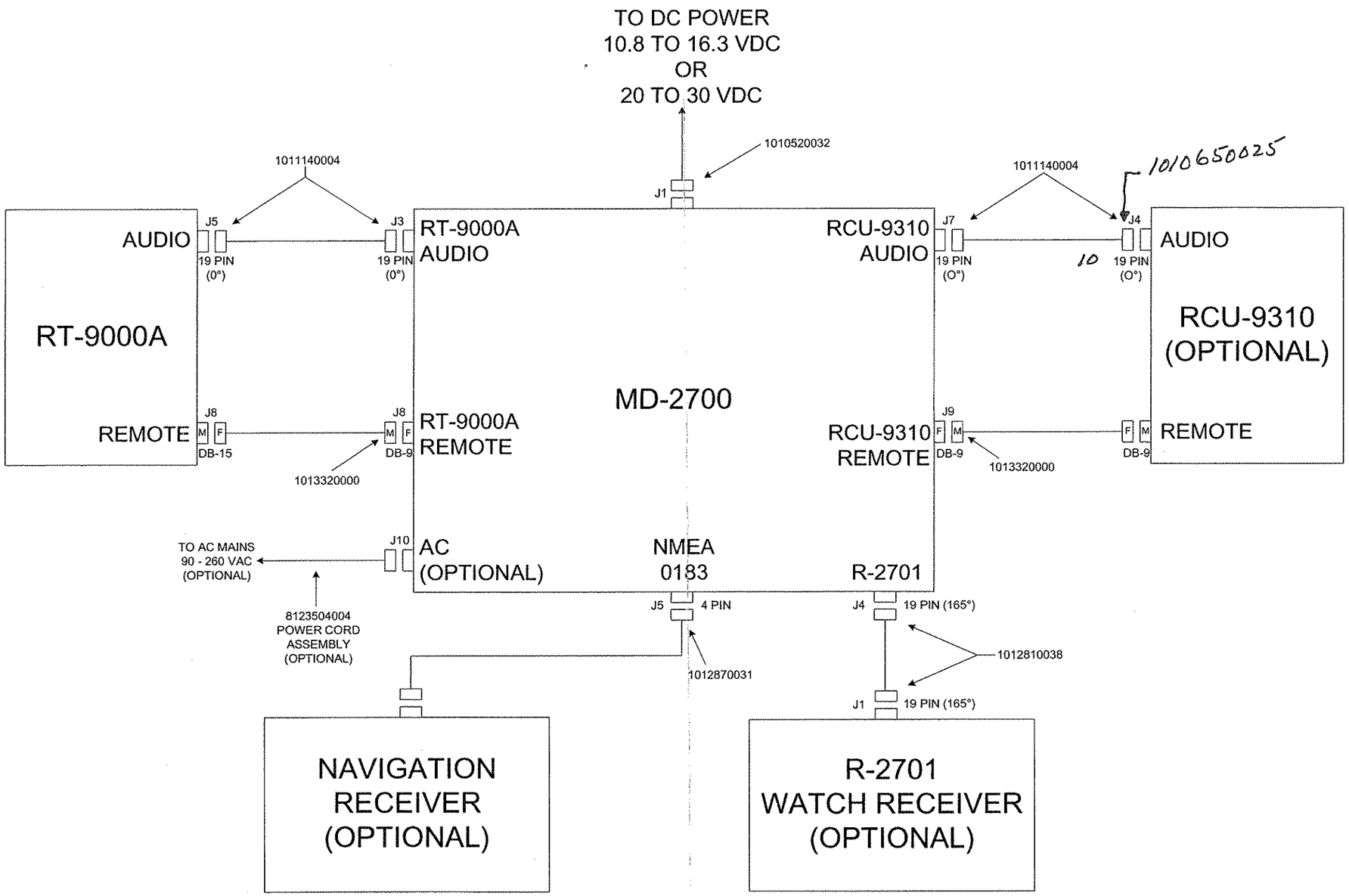

Figure 2.2.2 System Interconnect for RT-9000A GMDSS System

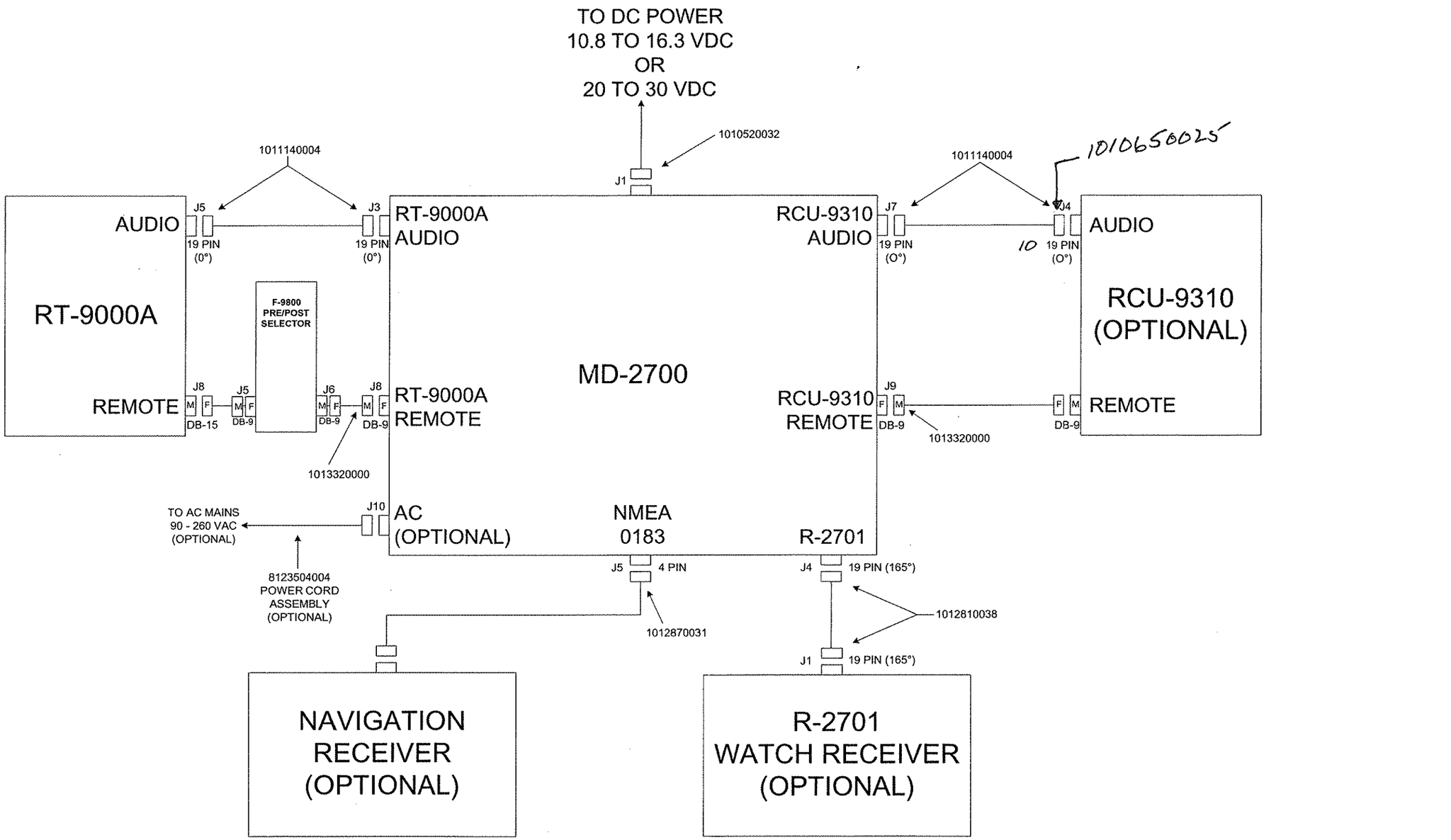

Figure 2.2.3 System Interconnect for RT-9000A GMDSS System with F-9800 Pre/Post Selector

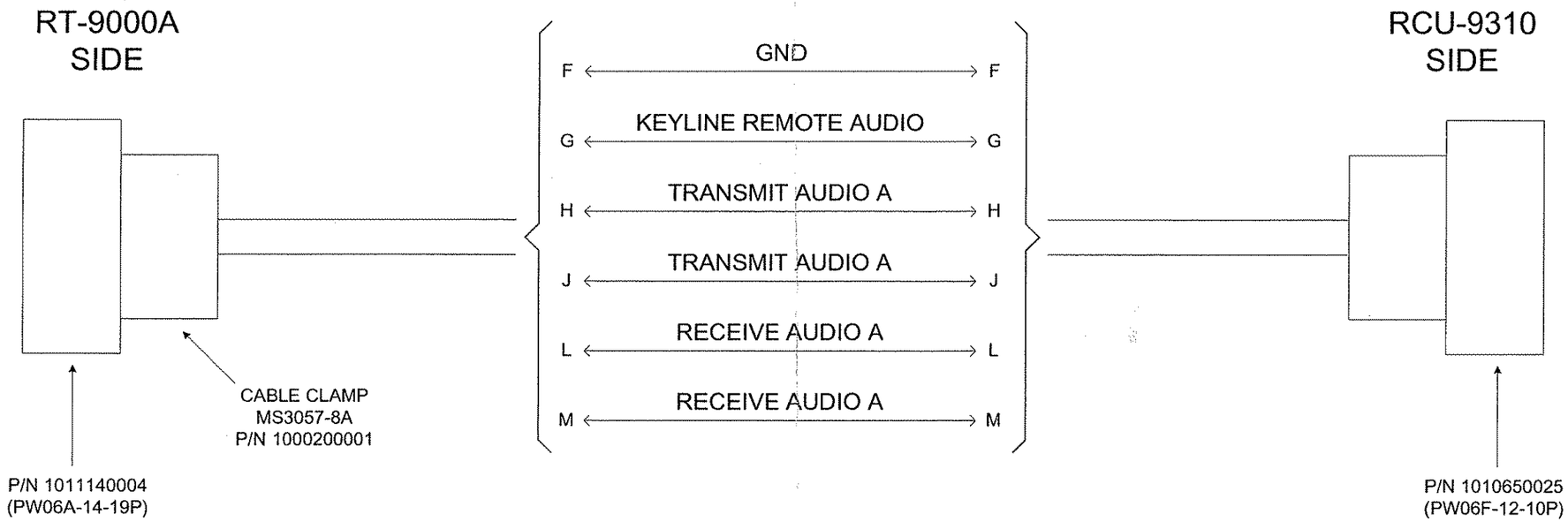

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Figure 2.2.4 Interconnect Cable RT-9000A Audio to MD-2700

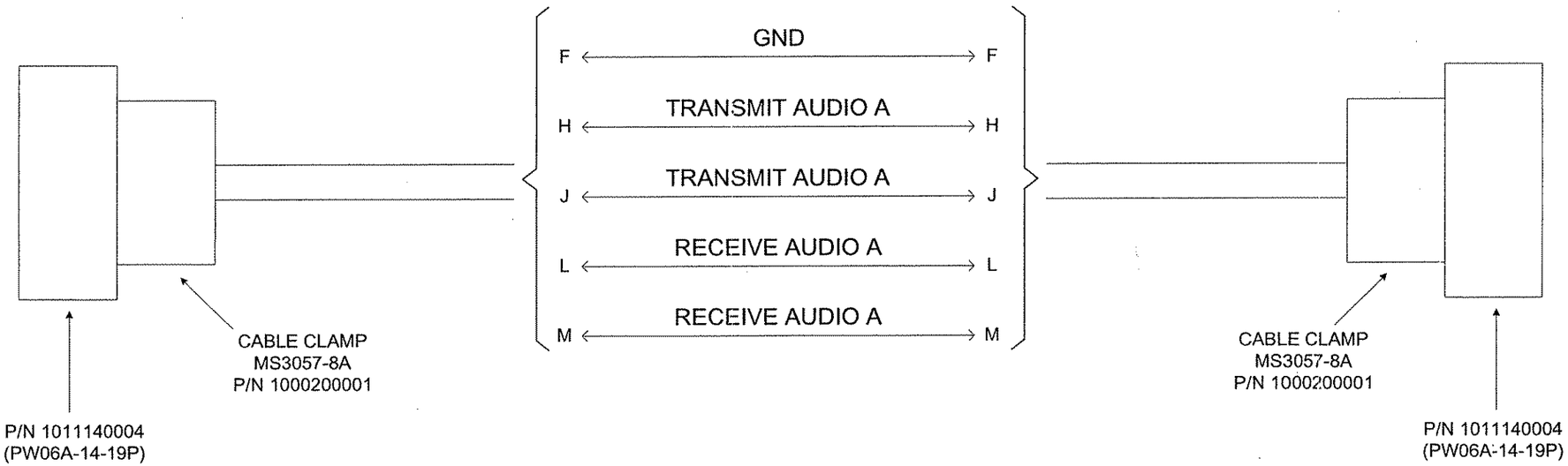

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Figure 2.2.5 Interconnect Cable RCU-9310 Audio to MD-2700

A2209B

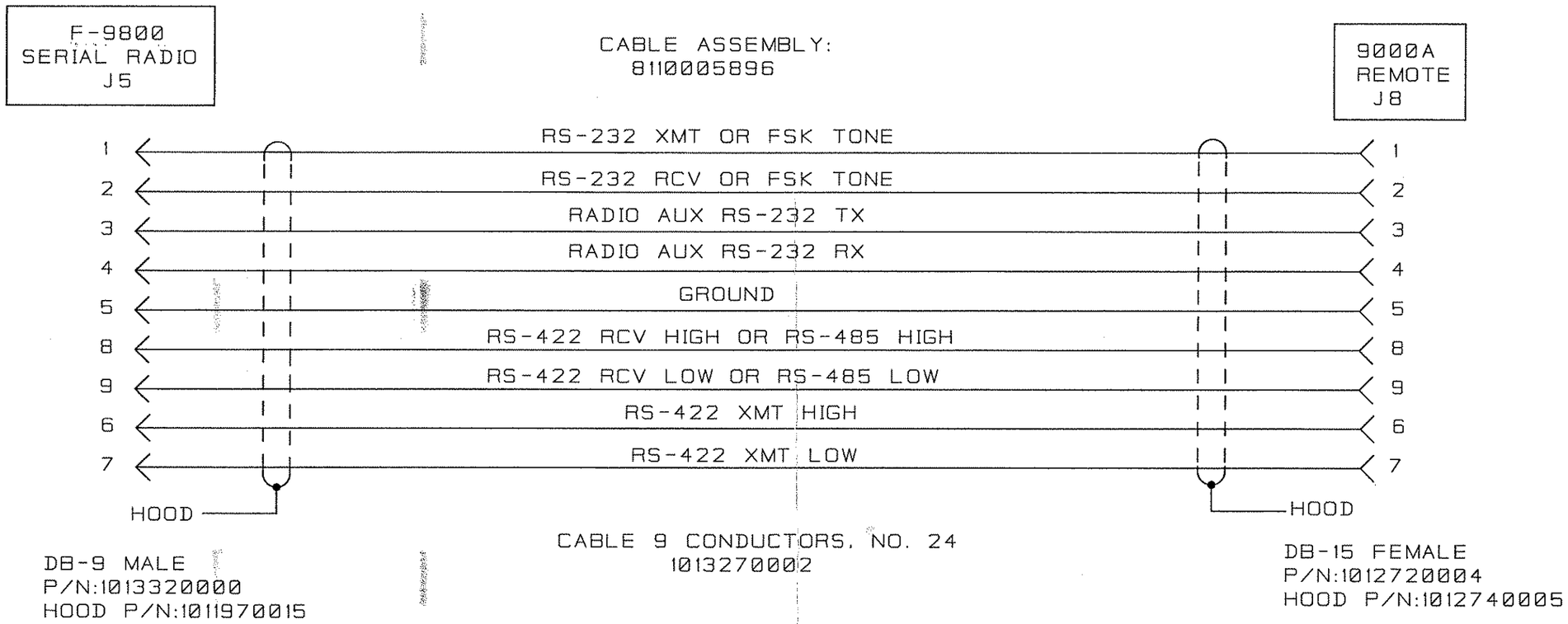

Figure 2.3.1 Cable Assembly 9000A/9800 Serial Control, 6 ft (Also works with the MD-2700)

SECTION III
OPERATION

3.1 FREQUENCY ALLOCATION

The Frequencies allocated for GMDSS use are as follows:

DSC (Center kHz)	VOICE (Carrier kHz)
2187.5	2182.0
4207.5	4125.0
6312.0	6215.0
8414.5	8291.0
12577.0	12290.0
16804.5	16420.0

Table 3.1 GMDSS System Frequencies

3.2 CHANNEL ALLOCATION

Program the RT-9000A with the following frequencies (USB, AGC-M):

Channel	Frequency
90	2185.8 kHz
91	4205.8 kHz
92	6310.3 kHz
93	8412.8 kHz
94	12575.3 kHz
95	16802.8 kHz
100	2182.0 kHz
101	4125.0 kHz
102	6215.0 kHz
103	8291.0 kHz
104	12290.0 kHz
105	16420.0 kHz

Tune the antenna coupler (if present) on channels 90 through 95 and 100 through 105. This is necessary because the MD-2700 does not automatically tune the antenna coupler.

Antenna coupler tuning is only necessary when the system is first installed, and when the antenna characteristics have changed (due, for example, to ice build up).

Note that these are international distress frequencies, so coupler tuning activity should be kept to a minimum.

In order to begin using the RT-9000A Radio with the MD-2700 DSC Controller, the channels in the DSC Controller need to be programmed with the frequencies intended for DSC. The DSC Controller will use channels 90 through 97 and 100 through 105 in the Radio. Once the DSC is programmed, it will query the Radio as to which frequencies are programmed into Channels 90-97 and 100 through 105 on each power-up. If there are any channels in the Radio with frequencies that do not match what is programmed in the DSC Controller, the DSC Controller will prompt the user whether to program the Radio to match. See the section below on programming the DSC controller.

Note that channels 96 and 97 are not programmed with distress frequencies. These channels are intended for use when passing routine DSC traffic.

3.3 PROGRAMMING THE MD-2700 DSC CONTROLLER

When powering up the DSC System for the first time, the user needs to program the DSC Controller for use with the other components in the system. Turn on the Radio using the Volume knob. The Radio is now operating in a standalone mode, and will function according to its front panel settings. Now power up the MD-2700 DSC Controller by pressing the power (**PWR**) button on its front panel.

The MD-2700 will blink its backlight for several seconds as it reads status information from the RT-9000A.

If the EEPROM in the DSC is un-initialized the display will say "EEPROM appears to be Un-initialized....Select 1=Initialize EEPROM 0=Continue 1". In this case, Press 1 to select Initialize-EEPROM, and 1 again to initialize Directories. Then press RESET (RST) as instructed. Continue with the instructions in the following paragraph.

After displaying the unit and firmware version information, the DSC Controller will display the following on the bottom of its LCD: SELECT: XMT 1=REV 2=PROG 3=SCAN 3. Select 2 for PROGram, and then 1 for UNIT SETUP. You should see "-- UNIT SETUP --" at the top of the screen.

Now select 2 for RADIO, and then 1 for SEAbuss Radio, and finally 2 for SEA 330. If you have a Watch Receiver in your system, press 2 for No Scan, then press 1 for yes. With no Watch Receiver present, press 1 for Scan and then press 2 for No WR. Next, press 2 for SEATOR 3000 NOT Present. Lastly, press 2 for Globe Wireless not present. When the programming is complete, the programmed scan channels will appear on the DSC screen. Press ENT to continue as instructed.

Now that the Radio type has been programmed, the Channel information needs to be programmed. Select 2 for Channels, and 1 for Scan. The frequency information for Channels 90 through 97 should now be displayed and the prompt "Select Channel to Modify (1-7) 0=Exit 0" should appear at the bottom. The system has previously programmed channel 90 with 2187.5 kHz, the standard distress frequency. So channel 90 is not a programmable choice.

To program channel 91 for example, press 1. Channel 91 and a flashing cursor appears over the first digit of the current value. Press the digits 4,2,0,7 and 5 and then ENT for 4207.5 kHz, the second standard distress frequency. Now press 1 for telex you should see "PROGRAMMING SCAN CHANNEL BE PATIENT" displayed across the screen. When programming is complete, the table of channels and frequencies is shown again.

Repeat the channel programming steps for each channel up to 95 with the frequencies given before in the "Frequency Allocation" section. Channels 96 and 97 may be left blank or programmed with other frequencies if you do not use a Watch Receiver. If you do use a R-2701 Watch Receiver, you do not need to program these channels as it will scan only the six standard channels for you. Now follow this sequence once all channels have been programmed- user input is in **bold**:

Select Channel to Modify (1-7) 0=Exit 0	**0**
ENTER Top Channel (91-97)	**9,5,ENT**
ENTER Top DISTRESS Channel (91-97)	**9,5,ENT**
Channels OK? 1=Change 0=EX 0	**0**
Modify Talking Channels 1=Yes 0=EX 0	**0**
SELECT PROGRAM MENU (1-4) 0=EX 0	**0**

The MD-2700 DSC Controller and the RT-9000A Radio have now been programmed.

If an R-2701 Watch Receiver is present, turn on it's power using the **PWR** button. You should see the LEDs for each channel light up in sequence. The system is now operational.

To use the Radio independently of the DSC, see the section below on "Returning to non-DSC Operation".

If the frequency in any of the channels 90-97 have changed in the Radio since the DSC Controller was last powered up, it will display a message indicating a mismatch exists. The bottom line of the controller screen reads "Leave=0 Prog Radio=1 SEACALL=2". Pressing 1 will program the frequency displayed above (SEACALL: XXXXXX) into the indicated radio channel. Pressing 2 will accept the frequency that is displayed after RADIO: in the line above and not re-program the Radio. Either way, after programming, the controller ends up either in the "Monitoring Radio" mode or the "Scanning" mode.

If an antenna coupler is present in the system, the coupler must be tuned on each channel that the MD-2700 has changes. To do this, stop the MD-2700 from scanning and take local control of the RT-9000A or the RCU-9310. Perform a coupler tune on the channel that has been programmed with a new frequency.

3.4 DISTRESS MODE OPERATION

To send a distress call, press the red button labeled **DISTRESS** on the DSC Controller. It will respond with a confirmation prompt. To continue and send a distress call, press **DISTRESS** again. Next, the controller asks if the user wishes to enter position information manually (1), or take the data automatically from the Navigation Receiver (2). If a manual position entry is desired and 1 is selected, the user is prompted for the Quadrant (a number between 0 and 3), and then Latitude and Longitude Degrees and Minutes. Press enter after each numeric entry.

After the location has been entered, press 1 and then XMT to transmit the call.

The DSC Controller will instruct the Radio Set to tune to channel 90 (2187.5 kHz) and it will transmit a distress call. The controller listens for an acknowledgment signal on the same frequency. If there is no reply, the distress call is repeated every 3 and one half minutes. At the bottom of the distress call mode screen, the text "SEND 1=SINGLE-FREQ 2=MULTI-FREQ 0=EXIT" is displayed. Pressing 2 will cause the unit to transmit the distress call on all distress channels (typically 90-95). The unit now commands the Radio to scan all the programmed channels (typically 90-97) for an acknowledgment. The message will be repeated on all distress channels every two and one half minutes if no response is detected.

During scanning for an acknowledgment, the Radio Set will stop on each channel for a half of a second if there is no activity on the channels. The Radio is instructed to pause on channels that have some sort of signal present. If not commanded to stop scanning, the radio will continue scanning after a maximum of 10 seconds on any one channel. When an acknowledgment is received, an alarm is sounded and the user is advised to stay on the current frequency for voice communication. Press 0 to return to "Normal" mode.

3.5 R-2701 WATCH RECEIVER DISTRESS OPERATION

When no distress calls are present on the six scanned channels, the Watch Receiver will continue to cycle through them as indicated by the front panel LEDs. When a possible distress call appears on one of the frequencies, the receiver will stop on that channel and transmit a notification to the MD-2700 DSC Controller. If the MD-2700 DSC Controller recognizes the call on the channel given by the Watch receiver message, it will signal an alarm. The user is prompted by the DSC to hit any button to stop the audible alarm. The system is now listening for an acknowledgment of the distress call by a shore station. This will continue for 5 minutes. Any repeat transmissions of the call received within the 5 minutes will cause the audible alarm to sound again.

If there is no response after 5 minutes, the DSC Controller will prompt the user for relay transmission of the call by pressing XMT. If the distress call was received on 2187.5 kHz, the user is also prompted to acknowledge the call (also by pressing XMT). Acknowledgments on the other five higher frequencies may

only be transmitted by the coastal authorities. Once an acknowledgment has been transmitted, in order to provide for voice traffic, the Radio is switched to the voice frequency that corresponds to the DSC distress frequency. See Table 1 above for the associated voice frequencies. After relaying or acknowledging and voice communications have completed, press ENT return to normal scanning mode.

3.6 RETURNING TO NON-DSC OPERATION

During the time that the MD-2700 DSC is controlling the RT-9000A, the RT-9000A will display 'RMT' (as opposed to 'LCL') on its status screen. To take control of the RT-9000A from the front panel, first stop the MD-2700 if it is scanning using the RT-9000A. Then press the **LCL/RMT** button on the RT-9000A to take local control of the radio.

3.7 RCU-9310 CONTROL HEAD OPERATION

During the time that the MD-2700 DSC is controlling the RT-9000A, the RCU-9310 Control head will display 'RMT' (as opposed to 'LCL') on its status screen. To control the RT-9000A from the RCU-9310, first stop the MD-2700 if it is scanning using the RT-9000A. Then press the **LCL/RMT** button on the RCU-9310 to take control of the radio.

Since all audio and digital control paths are routed through the MD-2700, the MD-2700 must be turned on in order to use the RCU-9310 Control Head.

SECTION IV

THEORY OF OPERATION

4.1 DEMODULATON OF RECEIVED DATA

In receive mode audio from the radio is routed through K1 and T1, a 600 ohm isolation transformer. The audio is then routed through K2 to active bandpass filters U41A and U41B. Filter U41A is centered at 2050 Hz. This is the center frequency of the two Necode tones which are 1950 Hz (space) and 2150 Hz (mark). Filter U41B is centered at the DSC subcarrier of 1700 Hz midway between the two tones which are 1785 Hz (space) and 1615 Hz (mark). These filters have a small gain of about 3 dB and a rolloff of about 3 dB at +/- 500 Hz. The filter center frequencies can be adjusted by modifying R16 and R26 respectively. The filters are followed by limiters U41B and U41D which clamp the audio to approximately 1 V peak to peak. Each limiter drives an FSK decoder.

Decoders U39 and U40 are centered at 2050 Hz and 1700 Hz respectively. The active high carrier detect pin on U39 is the bottom end of the 2.5 V bias divider for U41C and U41D. Similarly the active high carrier detect pin on U40 is the bottom of the bias divider for U41A and U41B. The result of this crosscoupling is that if one decoder captures a signal in its bandpass, the filter and limiter feeding the other decoder will be shut off. Thus the unit can detect either DSC or Necode signals.

The center frequencies of the detectors are set by R37 and R45 and adjusted by VR6 and VR5. The bandwidth (and response time) of U39 is determined largely by the combination of R36, C46 and C47. C47 can be switched in and out by Q6 under processor control. This allows the detector to lock quickly when the radio is scanning and then narrow the bandwidth to confirm the presence of a desired signal. Similarly the bandwidth of U40 is determined by R44, C53 and C54 which is switched by Q5.

Recovered data from both U39 and U40 is gated in U36 by the active low carrier detect pins of U39 and U40. In addition U36 inverts the Necode data to match the polarity of DSC data. The data is then fed to U20, the peripheral port interface, along with both carrier detect signals for further processing by the microcomputer. The data is also fed to the synchronization pulse generator circuit described below. The carrier detects also drive the front panel receive lamp. This is a bicolor lamp which illuminates red when a DSC signal is present and green when a Necode signal is present. This lamp is also driven by the data outputs of U39 and U40 so that noise within the detector bandpasses will cause the lamp to flicker indicating to the user that the system is operating.

4.2 SYNCHRONIZATION AND BAUD RATE GENERATION

A stable 100 Hz clock is needed for proper bit timing. This is produced from U10, the 8 MHz master clock oscillator. This is divided down to 1 MHz by binary counter U11. This is further divided to 100 Hz by two dual decade counters, U30 and U31. This clock has the required stability but still needs to be synchronized to the incoming data. Data bits are 10 msec long so the center of the bit is 5 msec after the leading edge.

Receive data from U36 is coupled through C56 and CR17 to one input of a Schmitt NAND gate, U35A. The other input of U35A is connected to a processor port so the processor can disable the synchronization circuit. When it is enabled the rising edge of the data bit generates a short pulse which is inverted by U34D and resets the counters U30 and U31. This synchronizes the falling edge of U31's 100 Hz output to the data edge. The rising edge will come 5 msec later in the center of the bit. Once the clock is synchronized the processor disables the synchronization circuit as it is not needed until the next incoming message. It is also not needed during transmit.

To ease the processor burden it is also desirable to flag the processor when a new bit has been received. To accomplish this the synchronized 100 Hz clock is coupled through C58 and CR18 and U358 to one input of U35C. The rising edge of the clock produces a short pulse at the input of U35C which is latched by the combination of U35C and U35D. The output of U35D can be read by the processor as a flag indicating that a

bit is ready. Once the bit is read the processor can reset the flag by sending a pulse to U35D. This circuit is also used when transmitting to time bit transitions.

4.3 TRANSMIT TONE GENERATION

Two pairs of tones are needed for encoding DSC and Necode data respectively. These are all generated from the 8 MHz master clock oscillator, U10. U11 is a binary counter which divides this down to 4 MHz. This is fed into the dividers U26 and U27 which are configured as a single prescaler to divide by 49 or 59 under control of a port pin from the processor. The prescaler is set for 59 for DSC encoding and 49 for Necode decoding. The output of this circuit is used as the clock input of U28 and U29 which are counters configured as a divide by 19 or 21 depending on the data bit from the processor. The output of this divider is passed through the flip flop, U32B, for a final divide by 2 to give a 50% duty cycle square wave. The four tones generated are:

Format Data Divisor Frequency (Hz) DSC 044841784.1 DSC 149561614.2 Necode 041161943.6 Necode 137242148.2

These dividers are operating at all times except that U32B can be disabled by the processor when not actually transmitting. U32A is used to latch the data from the processor and is clocked by the 100 Hz baud clock from U31. At the same time this clock sets the data ready flag (described in the previous section) to indicate that the data has been latched and the next bit can be sent.

An inverted version of the square wave output is fed through R74 to the audio amp, U44 to provide sidetone to the user. The noninverted square wave output is fed through R35 into the filters U41A and U41B to suppress harmonics. As described in the section on the demodulator the decoders are crosscoupled so that the transmitted signal will turn off the unneeded filter. This also provides a loopback mode useful for test purposes.

The outputs of the active filters is fed to emitter follower Q1 through resistors, R102 and R103. The potentiometer VR1 in the emitter circuit allows the user to adjust the drive level to the transmitter. The wiper of VR1 is capacitively coupled by C92 to the transmit audio input of the radio through a couple relays and an audio transformer.

4.4 PTT OPERATION

Transmission of the encoded tones requires that K2 and K1 be switched to their transmit positions. These dual relays switch both the audio and the PTT signals to the radio. These relays are driven by transistor switches Q2 and Q3 both of which must be switched on to drive the relays. Q2 is switched on by an encoder enable output from the processor. A transmit enable output from the processor triggers U42A which is a timer chip configured as a one shot. The output of U42A drives Q3. Four conditions can reset U42A consequently turning off PTT. The processor can reset the transmitter enable port resetting U42A through R108. This is the normal mode of operation. Either a powerup or a reset from the keypad will reset U42A through C96 preventing transmission while the processor is initializing. Finally U42A can timeout. This timeout is determined by R92 and C86 and occurs after about 55 seconds. This prevents the equipment from hanging up in transmit mode due to a hardware or software failure.

4.5 MICROPROCESSOR STARTUP AND RESET

When power is applied or the reset key is pressed U42B is triggered as a one second one-shot. The active high output is inverted by U4A, U4B, and U4C. These provide reset and halt signals to the processor, U1, while the master clock oscillator, U10 powers up. Reset pulses are also provided to U21 (DUART) and U20 (PPI). Finally U6 is also reset.

When U42B releases reset, the processor begins to run and U6 provides a low output for the next eight address strobes. This disables the normal address decoder, U7, and forces a chip select on the boot EPROM, U13 via U9B and U4D. This ensures that the processor reads the startup vector from the EPROM.

4.6 CHIP SELECT AND DATA TRANSFER ACKNOWLEDGMENT

Address lines A16-A18 are decoded by U7 into one of eight chip select lines. U17 and U18 further decode two of these lines as well as A3 and A15 to provide an additional two lines for a total of ten chip select lines for four memory circuits, a dual UART, a real time clock and timer, a programmable peripheral interface, a keypad, an LCD display, and a spare. The eight outputs of U7 are tied to the eight inputs of NAND gate U8 which satisfies the processor's requirement for an acknowledgment.

4.7 MEMORY

Firmware is contained in U13 and U14 which together contain up to 128 kilobytes of code in address space 0x20000-0x3FFFF. U15 is a 32 kilobyte static RAM chip used for storing temporary data as well as the program stack in address space 0x00000- 0x07FFF. U16 is an 8 kilobyte nonvolatile EEPROM at addresses 0x08000-0x09FFF. It is used for storing configuration data, directories, and message logs. This memory is protected during low power conditions (such as startup and shutdown) by Q10 and Q9. If a low voltage is detected by U45A then this circuit will disable writes preserving the system data integrity.

4.8 REAL TIME CLOCK AND PROGRAMMABLE PERIPHERAL INTERFACE

U19 is a real time clock and timer chip with a battery backup. This chip is used to maintain date and time of day. This is particularly important to timestamp incoming calls and to indicate time and position in distress calls. The chip also contains a timer function used to provide precise interval timing. Timing is derived from a 32.768 kHz oscillator. This frequency is crystal controlled by Y1 and can be trimmed by variable capacitor C18. A buffered test point has been provided for adjusting this frequency. A 3.6V lithium battery provides backup power when main power is lost or the unit is turned off. Low voltage detector, U45B, triggers the switch to battery power. The clock can be accessed by the processor on the data bus at addresses 0x40000-0x4FFFF.

U20 is an 82C55A programmable peripheral interface (PPI) ccessed at addresses 0x10000-0x1FFFF. It is configured to provide one byte of input ports and two bytes of output ports which provide a control interface between the processor and all those circuits in the unit not directly connected to the processor bus.

4.9 SERIAL PORTS AND INTERRUPTS

U21 is a dual universal asynchronous receiver/transmitter (DUART) providing two serial ports with independent receive and transmit functions. It also provides an additional output port and an additional input port as well as a counter/timer function.

Receiver A is used as a 4800 baud input port for a navigation instrument such as a LORAN-C or GPS. This port is optically coupled via U38 to provide compatibility with the NMEA 0183 standard.

Transmitter A is used as a 2400 baud printer output. This port provides a data output as well as a hardware handshake protocol. When data is ready to send to the printer, a request to send (RTS) is asserted on the chips OP0 line. The data will actually be sent when a clear to send (CTS) acknowledgment is received from the printer on the chips IP0 line.

Transmitter and receiver B are used as a 9600 baud SEABUSS port for communicating with and controlling compatible radios. The chip is interfaced to the RS485 compatible SEABUSS by line transceiver U46. The RTSB signal on OP1 controls the transceivers data direction.

The various serial ports can be enabled or disabled under software control. When they are enabled a transmitter ready condition or reception of a character will cause an interrupt to the processor with priority level 5. The processor reads an interrupt vector from the input port of the DUART and jumps to the appropriate interrupt service routine to read the new character from a receiver or supply a new character to a transmitter.

4.10 KEYPAD AND POWER SWITCH

The keypad is a panel of 18 normally open switches with conductive rubber actuators. The reset key is connected directly to the trigger input of the one-shot, U42B, which initiates a hardware reset as described above.

The power key is attached to a latching switch circuit. When the power is off and the power key is pressed the input of timer circuit U47 is grounded. This brings the output of U47 high which turns on Q7 which in turn turns on the pass transistor, Q8. When the power is on, pressing the power key pulls up the input of U47 to the positive rail which in turn turns off Q8.

The other 16 keys have a common ground. Each switch pulls down a separate line to one of two 1-of-9 BCD priority encoders, U24 and U25. Any active low output (i.e. any keypress) from one of these encoders will cause a positive pulse at the output of U23, an eight input NAND gate. The RC network of R73 and C68 prevents short pulses from being detected. The pulse, if long enough, not only sets a flag to the processor at the output of U9D indicating a key is ready, but also sends a clock pulse to U22 which latches the keypress. The processor can then read the key from the latch when time allows. Once the key is read, the processor resets the keypad flag by sending a reset pulse to U9D.

4.11 DISPLAY

An LCD module provides four 40-character lines of display. The processor accesses the display at addresses 0x60000-0x6FFFF. U12 buffers all the data lines between the processor and display while U3 is used to buffer the control lines as well as invert the R/W line for proper polarity.

4.12 SCAN STOP

U37 is an optically isolated scan stop switch. It is controlled by the processor via a PPI port and depending on its state presents either an open circuit or a 100 ohm impedance. The use of an optoisolator preserves the floating ground allowing the unit and the radio to operate at different potentials. This output is used to indicate to a scanning radio that it should stop. The polarity is user programmable.

4.13 BACKLIGHTING

Both the keypad and the LCD display are backlit by LEDs. R1 and CR22 provide voltage regulation for the display backlighting. R14 and CR23 provide a similar function for the keypad. R97 and R100 limit the maximum current going to the LEDs and thus determine the maximum illumination. Q11 and Q12 shunt current away from the LEDs when switched on by the processor. Thus the four possible states of Q11 and Q12 represent four different light levels. If both Q11 and Q12 are switched on all the current will be shunted and the lighting will be extinguished.

The **ENTER** key has separate backlighting that can be turned on by the processor to indicate to the operator that the **ENTER** key is required for the current function. This lamp is controlled by the PPI through driver U45F.

4.14 AUDIO AMPLIFIER AND ALARMS

U44 is a small audio power amplifier driven by a tone generator, U43. The tone generator produces beeps for error signals and keypress feedback as well as alarm tones for incoming calls. U43 is controlled by three lines from the PPI. This audio is combined with an audio signal from the FSK encoder to provide sidetone when transmitting. The level of the combined signal can be adjusted using VR2, the master volume control. The audio amplifier output is directed to a small internal speaker. VR3 controls the volume level at this speaker. The audio may also be connected to an external speaker or alarm through a relay. The relay, driven by 04 under processor control, is closed only when a call comes in or an error condition exists requiring operator attention. Q4 simultaneously drives the red CALL annunciator on the front panel. K3 is a dual relay so there is a spare contact available to the user.

4.15 LOW VOLTAGE DETECTOR

U45A and U45B form the core of a low voltage detector monitoring the positive 12 volt supply rail. When the supply begins to drop but before the 5 volt regulator, U48, drops out at 7.5 V, the Schmitt trigger, U45A triggers. This disables writes to EEPROM, U16. The real time clock, U19, requires a signal of the opposite polarity, provided by U45B, to switch to battery power and disable bus operation. When the power rises again to about 10 V the low voltage signal is removed.

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SECTION V

FAULT ISOLATION/MAINTENANCE AND REPAIR

5.1 NO RECEIVE SIGNAL

-- Check cable connection between MD-2700 and RT-9000A.

-- Tune the RT-9000A to 4500.00 kHz. Using a signal generator, inject a -70 dBm signal to 4501.00 kHz into the antenna connector of the RT-9000A. Check for a 2.2 Vp-p differential signal between J3-L and J3-M of the MD-2700.

5.2 NO TRANSMIT POWER OUTPUT

-- Check cable connection between MD-2700 and RT-9000A.

-- Tune the RT-9000A 4500.00 kHz. Connect a 50 ohm dummy load to the antenna connector of the RT-9000A (J4). Start a distress call from the MD-2700. Check for a 2.2 Vp-p signal between MD-2700 J3-H and J3-J.

5.3 NO CONTROL OF RT-9000A

-- Check cable connection between MD-2700 J8 and RT-9000A J8 (Remote).

5.4 RCU-9301 DOES NOT HAVE CONTROL OF THE RT-9000A BUT THE MD-2700 DSC DOES HAVE CONTROL OF THE RT-9000A

-- Check cable connection between MD-2700 J9 and RCU-9310 J6 (Remote).

5.5 SCHEMATICS AND PARTS LISTS

The following pages contain schematics and parts lists for the MD-2700, see Table 5.5.1 below.

DESIGNATOR		DESCRIPTION	SUNAIR PART NUMBER
ASSEMBLY	SUBASSEMBLY		
1A1		MAIN BOARD	8108612004
1A2		FRONT PANEL	8108612101
1A3		REAR INTERFACE	8108620091
1A4		SERIAL EXPANSION BOARD	8108630096
1A5		EMBEDDED CONTROLLER	1013680006

Table 5.1.1 MD-2700 Table of Assemblies

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PC ASSY, SERIAL EXPANSION BOARD 1A4

	PC ASSY, SERIAL EXPANSION BOARD	8108630207
C3	CAP. 1UF, 35V	0281660000
C4	CAP. 0.1UF, 50V, X7R	1011180014
C5	CAP. 0.1UF, 50V, X7R	1011180014
C6	CAP. 0.1UF, 50V, X7R	1011180014
C7	CAP. 1UF, 35V	0281660000
C8	CAP. 0.01UF, 50V, X7R, 20%	0281730008
C10	CAP. 47UF, 20V	0281700001
C11	CAP. 0.01UF, 50V, X7R, 20%	0281730008
C12	CAP. 0.1UF, 50V, X7R	1011180014
C13	CAP. 0.1UF, 50V, X7R	1011180014
C14	CAP. 0.1UF, 50V, X7R	1011180014
C15	CAP. 0.1UF, 50V, X7R	1011180014
J1	CONNECTOR, HEADER, 60 PIN	1013590007
J2	CONNECTOR, HEADER, 26 PIN MALE	1010810022
J3	CONNECTOR, HEADER, 10 PIN MALE	1010800027
J4	CONNECTOR, HEADER, 10 PIN MALE	1010800027
JP1	HEADER, PIN STRIP, 3 PIN	1011230020
JP2	HEADER, PIN STRIP, 3 PIN	1011230020
JP3	HEADER, PIN STRIP, 3 PIN	1011230020
JP4	HEADER, PIN STRIP, 3 PIN	1011230020
JP5	HEADER, PIN STRIP, 3 PIN	1011230020
JP6	HEADER, PIN STRIP, 3 PIN	1011230020
JP7	HEADER, PIN STRIP, 3 PIN	1011230020
JP8	HEADER, PIN STRIP, 3 PIN	1011230020
R1	RESISTOR 150, 5%, 1/8W	1010801511
R2	RESISTOR 150, 5%, 1/8W	1010801511
R3	RESISTOR 150, 5%, 1/8W	1010801511
R4	RESISTOR 150, 5%, 1/8W	1010801511
R5	RESISTOR 560, 5%, 1/8W	1010805614
R6	RESISTOR 560, 5%, 1/8W	1010805614
R7	RESISTOR 560, 5%, 1/8W	1010805614
R8	RESISTOR 560, 5%, 1/8W	1010805614
R9	RESISTOR 10K, 5%, 1/8W	1010801031
R10	RESISTOR 10K, 5%, 1/8W	1010801031
R11	RESISTOR 10K, 5%, 1/8W	1010801031
U1	IC. DIGITAL LT1134	1013240031
U2	CRYSTAL OSCILLATOR, 14.7456MHZ	1012550001
U4	IC. DIGITAL 16550	1013460014
U5	IC. DIGITAL 75176	1011100011
U6	IC. DIGITAL 75176	1011100011
U7	IC DIGITAL, MAX 490	1013240022
U8	IC DIGITAL, MAX 490	1013240022
	KEY, POLARIZING	1008070033
	SHUNT, .100 SPACING	1011220024

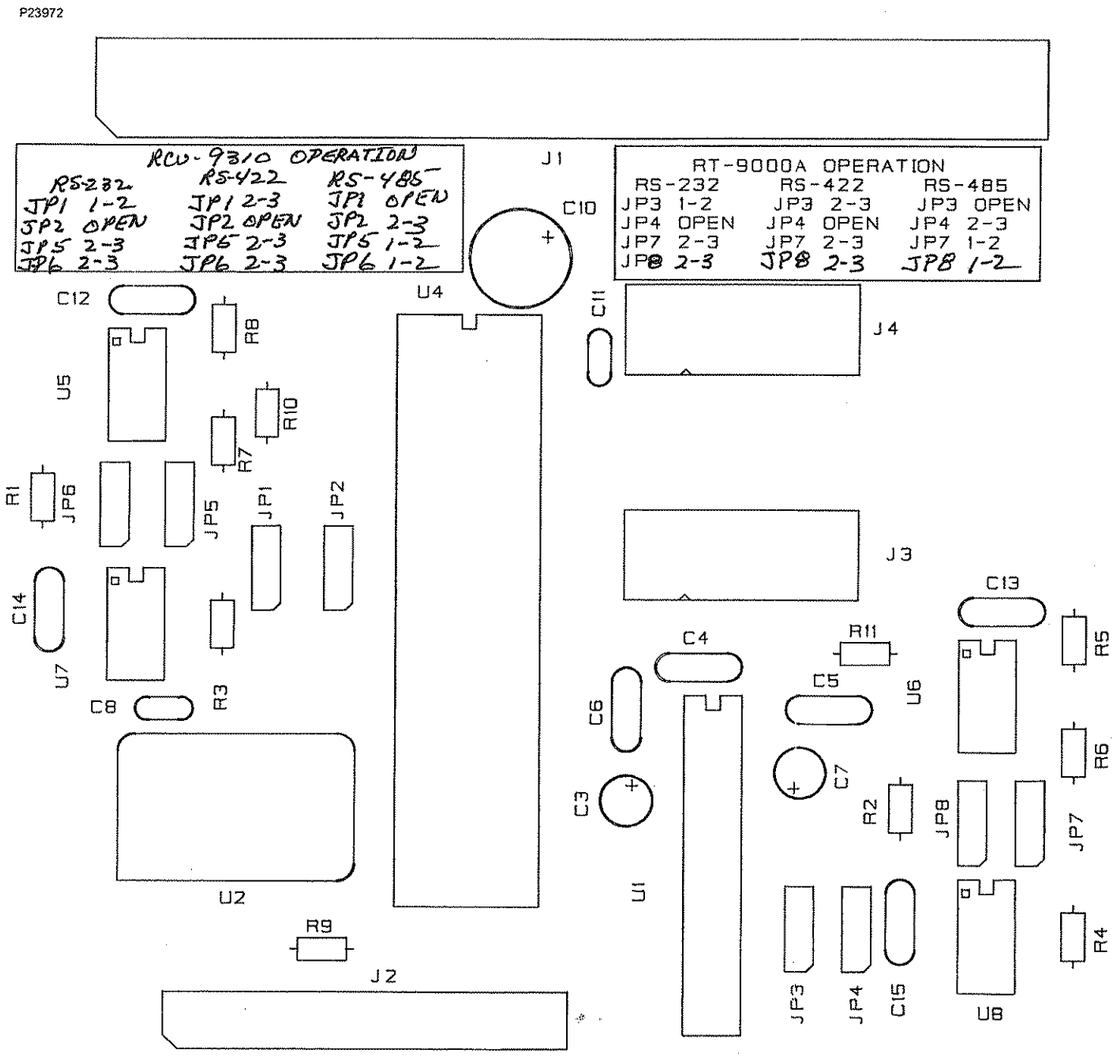
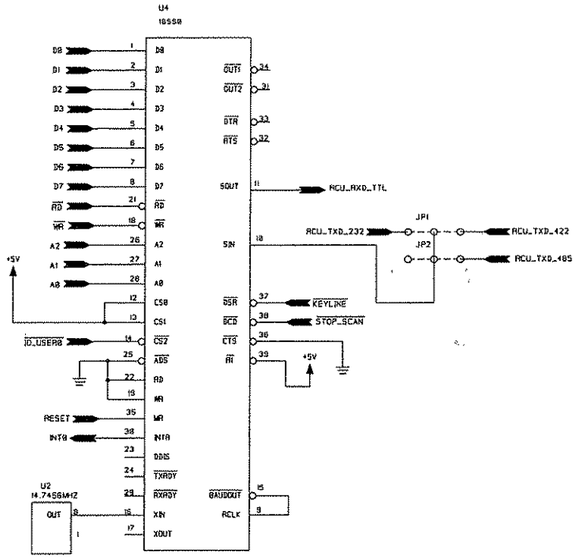
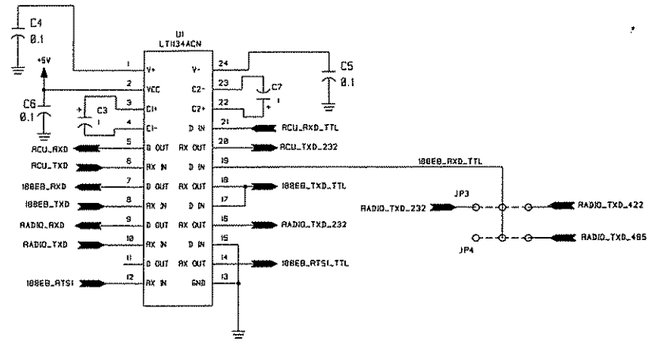


Figure 5.5.1 PC Assembly Serial Expansion Board 1A4, page 1 of 2

A23973

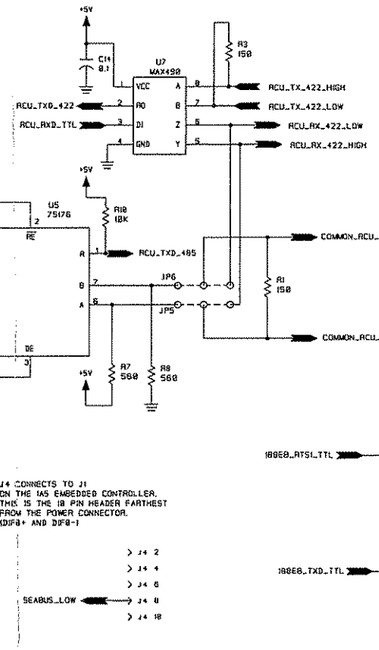


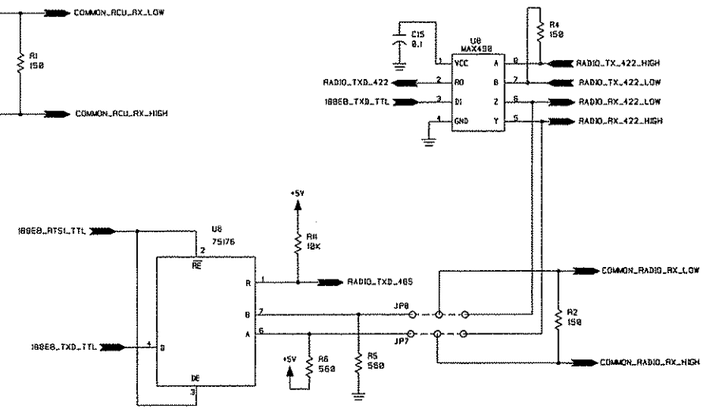


ED: COPY THESE TABLES AND PUT THEM IN THE BOARD SILKSCREEN

RCU-9310 OPERATION		
RS-232	RS-422	RS-485
JP1 1-2	JP1 2-3	JP1 OPEN
JP2 OPEN	JP2 OPEN	JP2 2-3
JP5 2-3	JP5 2-3	JP5 1-2
JP8 2-3	JP8 2-3	JP8 1-2

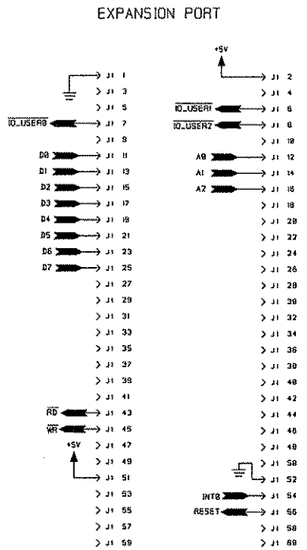
AT-9000A OPERATION		
RS-232	RS-422	RS-485
JP3 1-2	JP3 2-3	JP3 OPEN
JP4 OPEN	JP4 OPEN	JP4 2-3
JP7 2-3	JP7 2-3	JP7 1-2
JP8 2-3	JP8 2-3	JP8 1-2

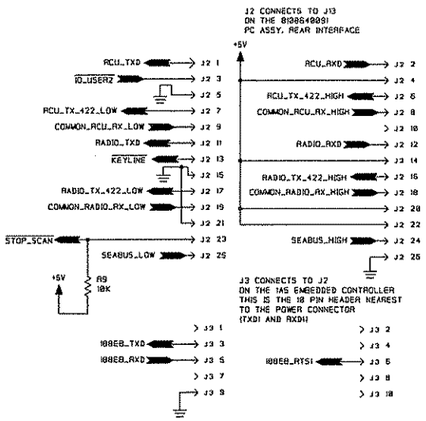




LAST USED	NOT USED

EXPANSION PORT





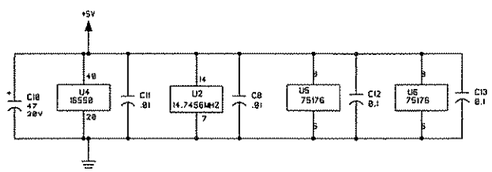


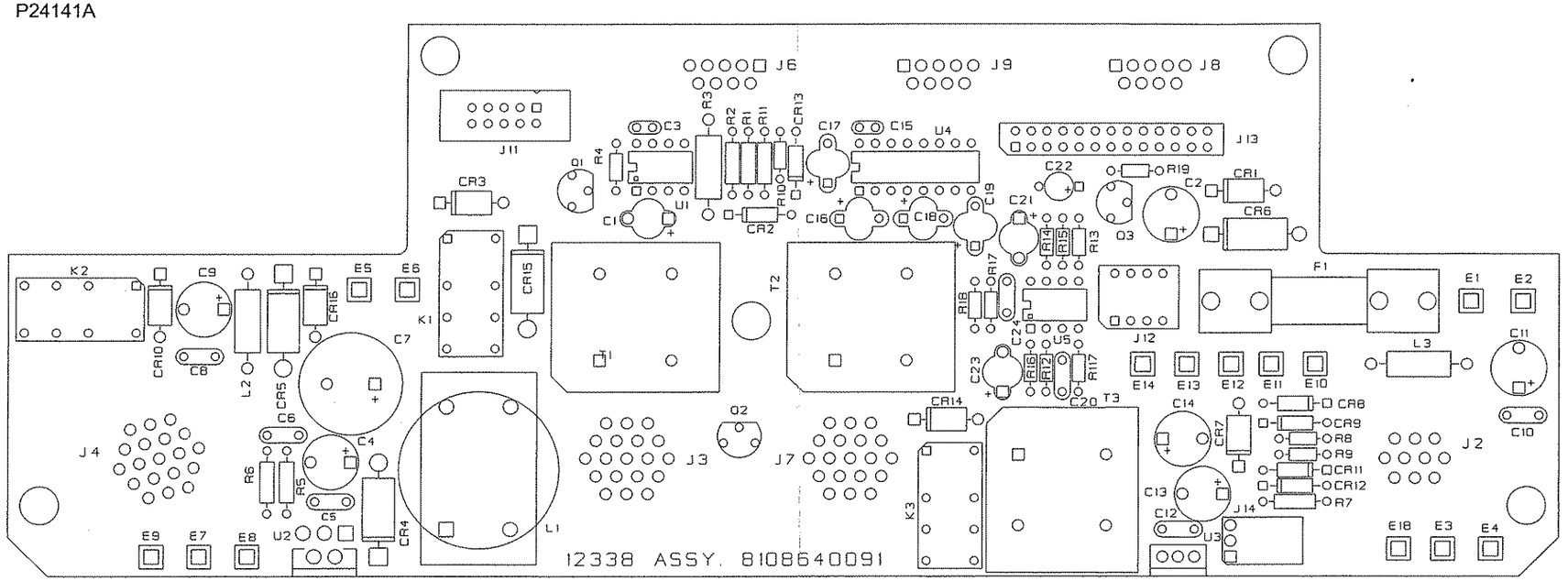
Figure 5.5.1 PC Assembly Serial Expansion Board 1A4, page 2 of 2

PC ASSY, REAR INTERFACE 1A3

	PC ASSY REAR INTERFACE 1A3	**8108640202**
C1	CAP. 10UF, 20V	1007290005
C2	CAP. 47UF, 35V	0282190007
C3	CAP. 0.01UF, 50V, X7R, 20%	0281730008
C4	CAP. 47UF, 35V	0282190007
C5	CAP. 0.1UF, 50V, X7R	1011180014
C6	CAP. 0.1UF, 50V, X7R	1011180014
C7	CAP. 1000UF, 35V, 105C	1011420031
C8	CAP. 0.1UF, 50V, X7R	1011180014
C9	CAP. 47UF, 20V	0281700001
C10	CAP. 0.1UF, 50V, X7R	1011180014
C11	CAP. 47UF, 20V	0281700001
C12	CAP. 0.1UF, 50V, X7R	1011180014
C13	CAP. 47UF, 20V	0281700001
C14	CAP. 47UF, 20V	0281700001
C15	CAP. 0.01UF, 50V, X7R, 20%	0281730008
C16	CAP. 22UF, 15V	0281690006
C17	CAP. 22UF, 15V	0281690006
C18	CAP. 22UF, 15V	0281690006
C19	CAP. 22UF, 15V	0281690006
C20	CAP. 0.1UF, 50V, X7R	1011180014
C21	CAP. 10UF, 20V	1007290005
C22	CAP. 1UF, 35V	0281660000
C23	CAP. 10UF, 20V	1007290005
C24	CAP. 0.1UF, 50V, X7R	1011180014
CR1	DIODE, RECTIFIER 1N4004	0405180004
CR2	DIODE, ZENER 1N5231B	1008530000
CR3	DIODE, RECTIFIER 1N4004	0405180004
CR4	DIODE, RECTIFIER 1N5822	1010630032
CR5	DIODE, TRANSIENT SUP. 1.5KE22A	1012880036
CR6	DIODE, TRANZORB 1N6283A	1011260000
CR7	DIODE, RECTIFIER 1N4004	0405180004
CR8	DIODE, SIGNAL, SIL. 1N4454	0405270003
CR9	DIODE, SIGNAL, SIL. 1N4454	0405270003
CR10	DIODE, RECTIFIER 1N4004	0405180004
CR11	DIODE, SIGNAL, SIL. 1N4454	0405270003
CR12	DIODE, SIGNAL, SIL. 1N4454	0405270003
CR13	DIODE, SIGNAL, SIL. 1N4454	0405270003
CR14	DIODE, RECTIFIER 1N4004	0405180004
CR15	DIODE, RECTIFIER 1N5822	1010630032
CR16	DIODE, RECTIFIER 1N4004	0405180004
F1	FUSE, MDQ, 5 AMP, 250V	0858660008
J2	CONNECTOR, POWER, 10 PIN FEM.	1010640020
J3	CONNECTOR, POWER, 19 PIN FEM.	1011110008
J4	CONNECTOR, POWER, 19 PIN FEM.	1012800032
J6	CONNECTOR, DB-9, 9 PIN MALE	1013560001
J7	CONNECTOR, POWER, 19 PIN FEM.	1011110008
J8	CONNECTOR, DB-9, 9 PIN FEMALE	1013570006
J9	CONNECTOR, DB-9, 9 PIN FEMALE	1013570006
J11	CONNECTOR, HEADER, 10 PIN MALE	1010800027
J12	SOCKET, IC, 8 PIN	1012830039
J13	CONNECTOR, HEADER, 26 PIN MALE	1010810022
J14	CONNECTOR, PC, 3 PIN	1008050008
K1	RELAY, DPDT, 12VDC	1005090009
K2	RELAY, DPDT, 12VDC	1005090009
K3	RELAY, DPDT, 12VDC	1005090009
L1	INDUCTOR, POWER, 220 UH	1011100037
L2	INDUCTOR, MOLDED, 0.47UH, 5%	0648500004
L3	INDUCTOR, MOLDED, 0.47UH, 5%	0648500004
Q1	TRANSISTOR, N-CH, FET 2N7000	1011050013
Q2	TRANSISTOR, N-CH, FET 2N7000	1011050013
Q3	TRANSISTOR, N-CH, FET 2N7000	1011050013
R1	RESISTOR 21.5K, 1%, 1/8W	1004060017
R2	RESISTOR 8.06K, 1%, 1/8W	1008500003
R3	RESISTOR 2.2K, 10%, 1/2W	0167360001
R4	RESISTOR 10K, 5%, 1/8W	1010801031
R5	RESISTOR 56.2K, 1%, 1/8W	1008910015
R6	RESISTOR 6040, 1%, 1/8W	1010580019
R7	RESISTOR 0.0, 0%, 1/4W	1011600021
R8	RESISTOR 2.2K, 5%, 1/8W	1010802224
R9	RESISTOR 2.2K, 5%, 1/8W	1010802224
R10	RESISTOR 100, 5%, 1/8W	1010801015
R11	RESISTOR 1M, 10%, 1/4W	0170650006
R12	RESISTOR 10K, 5%, 1/8W	1010801031
R13	RESISTOR 10K, 5%, 1/8W	1010801031
R14	RESISTOR 560, 5%, 1/8W	1010805614
R15	RESISTOR 68K, 5%, 1/8W	1010806831
R16	RESISTOR 22K, 5%, 1/8W	1010802232
R17	RESISTOR 560, 5%, 1/8W	1010805614
R18	RESISTOR 560, 5%, 1/8W	1010805614
R19	RESISTOR 10K, 5%, 1/8W	1010801031
R117	RESISTOR 560, 5%, 1/8W	1010805614
T1	TRANSFORMER, MODEM V.90	1013280032
T2	TRANSFORMER, MODEM V.90	1013280032
T3	TRANSFORMER, MODEM V.90	1013280032
U1	IC. LINEAR LM2903	1011410036
U2	IC. LINEAR LM2576-ADJ	1010610031
U3	IC. LINEAR LM340T5	0448600005
U4	IC. DIGITAL ICL232	1010510011
U5	IC. LINEAR 5532	1006270019
	FUSECLIP, PC MOUNT	0534610005

Figure 5.5.2 PC Assembly Rear Interface 1A3, page 1 of 4

P24141A



P24141B

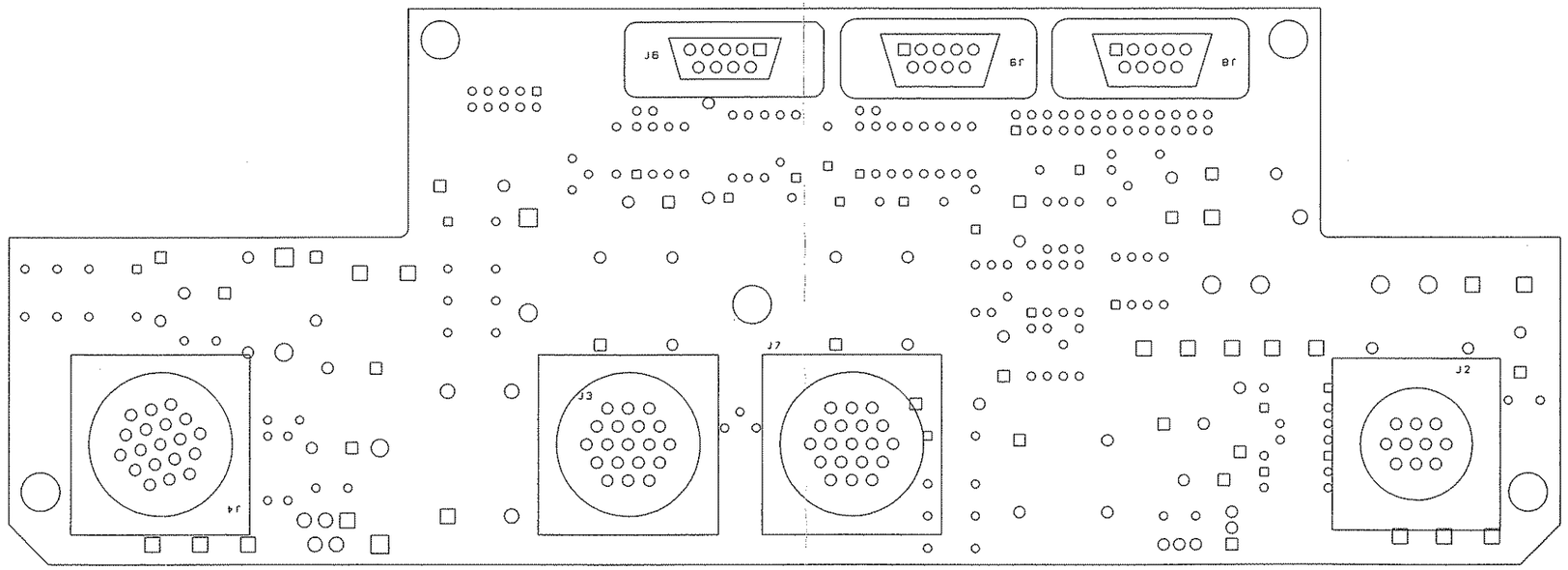


Figure 5.5.2 PC Assembly Rear Interface 1A3, page 2 of 4

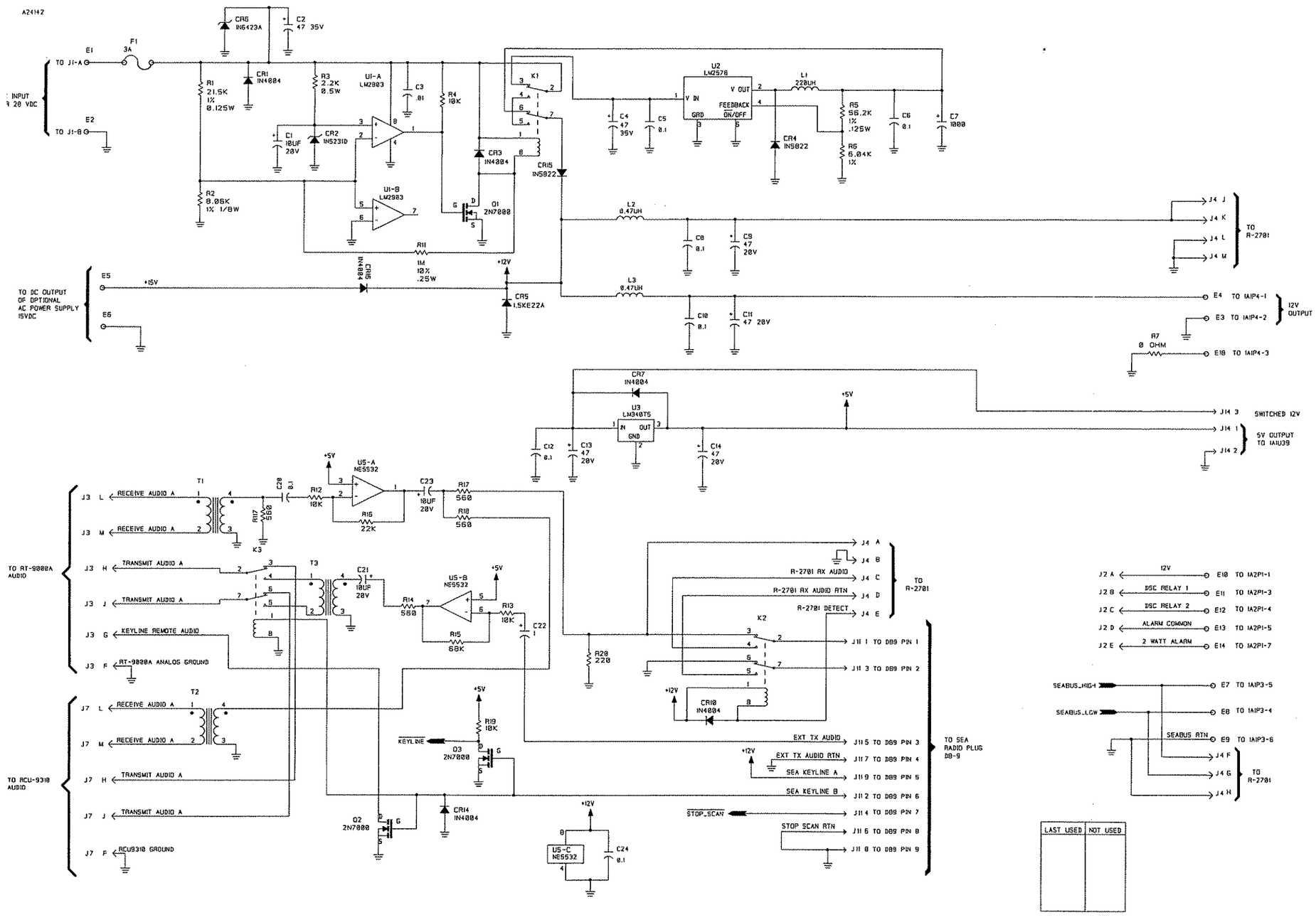
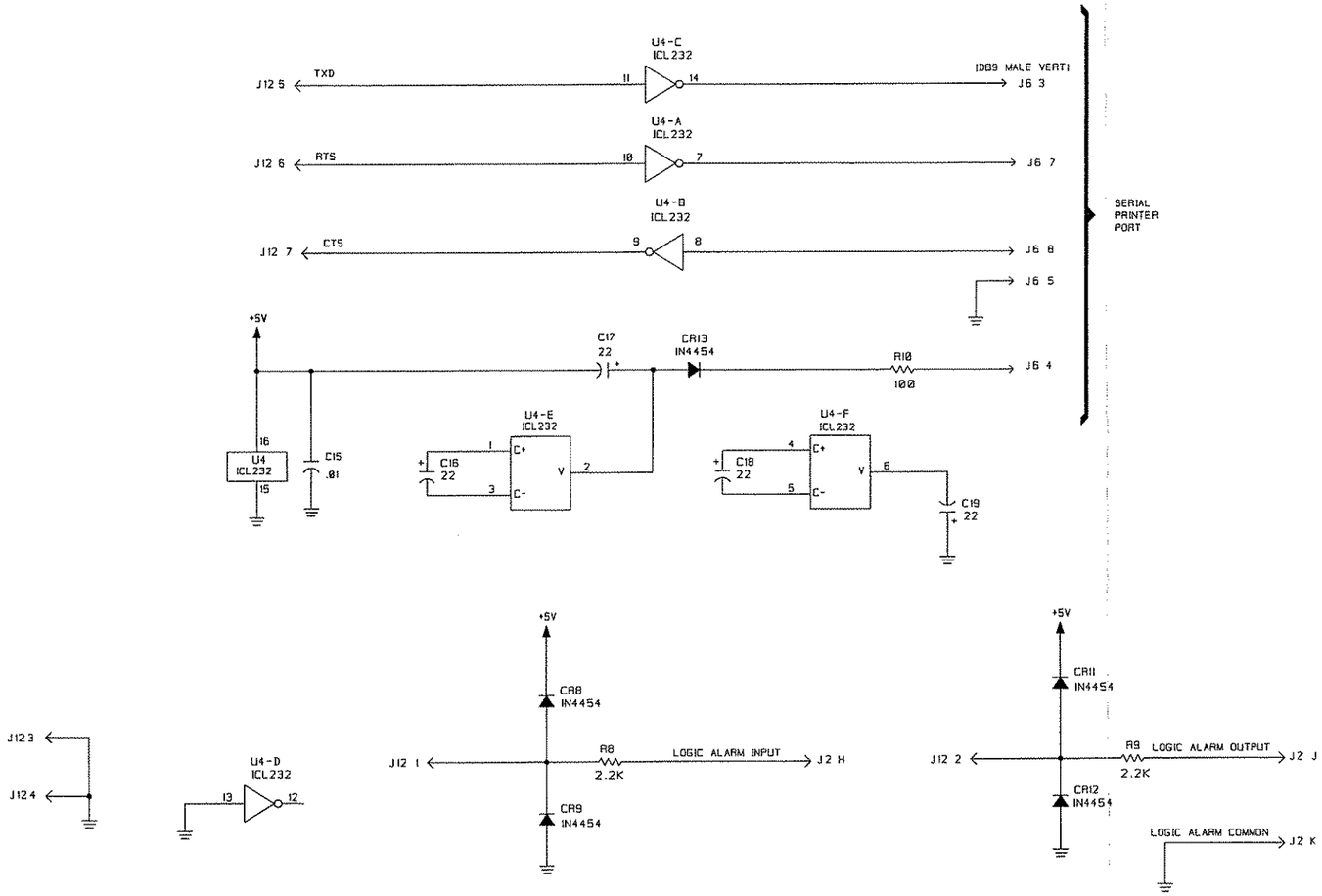
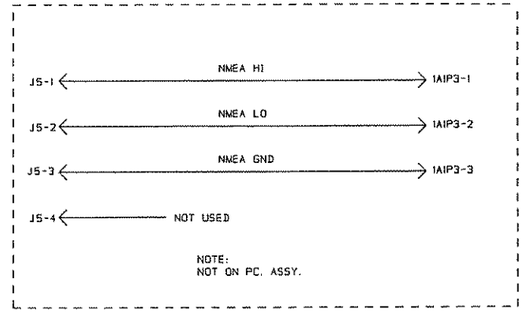


Figure 5.5.2 PC Assembly Rear Interface 1A3, page 3 of 4

B24141





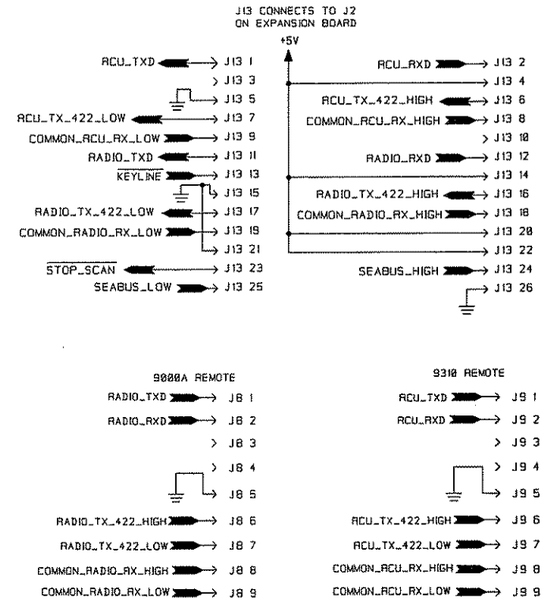


Figure 5.5.2 PC Assembly Rear Interface 1A3, page 4 of 4

PC ASSY MAIN BOARD 1A1

SEQN	COMPONENT	DESCRIPTION	MB	CT	QT	QUANTITY	UM
000	CAP-0025-001	CAPACITOR TRIMMER 2-20PF C40,C49	B	N	I	2	EA
000	CON-0028-005	HEADER,4 TERM KALE,GREEN P1	B	N	I	1	EA
000	CON-0028-008	HADER,3 TERM MALE, GREEN P1,P2,P3,P4	B	N	I	4	EA
000	CRY-0020-001	CRYSTAL,32.768KZ,NC38,SERIES,TUNING Y3	B	N	I	1	EA
000	CRY-0021-003	CRYSTAL 3.6864MHz HC49 Y2	B	N	I	1	EA
000	CRY-0021-007	CRYSTAL, 8.00 MHz,20PF,LO PROFILE Y1	B	N	I	1	EA
000	FUS-0002-003	FUSE, 3 AMP 3AG F1	B	N	I	1	EA
000	HAR-0029-007	CRYSTAL INSULATOR,MYLAR Y1,Y2	B	N	I	2	EA
000	LAB[R]ASSY	LABOR, ASSEMBLY	M	N	I	0.333	HR
000	STF-7000-12	7000 MAINBOARD STUFFED	M	N	I	1	EA
000	CAP-0021-001	CAPACITOR DISC .001µF C102,C103,C104,C105	B	N	I	4	EA
000	CAP-0039-107	CAP, ELECT. 100µF 35V C33,C35,C96,C100	B	N	I	4	EA
00	CON-0020-007	CONNECTOR,9 PIN D-SUB MALE RT.ANGLE P2	B	N	I	1	EA
000	CON-0044-026	HEADER, 2 X 13 .100 SP KYPD	B	N	I	1	EA
000	CON-0240-020	2 PIN SINGLE ROW HEADER SPKR	B	N	I	1	EA
000	FUS-0007-003	FUSE CLIP, PC MOUNT W/O E F1A,F1B	B	N	I	2	EA
000	MSK-7000-12	SMT-7000-12, MASKING	M	N	I	1	EA
000	REL-0016-001	RELAY, DPDT 5VDC K1,K2,K3	B	N	I	3	EA
000	RES-0025-103	TRIMMER, 10K OHM VR4	B	N	I	1	EA
000	RES-0025-251	TRIM, 250 OHM VR5	B	N	I	1	EA
000	RES-0025-252	TRIM, 2.5K OHM VR6	B	N	I	1	EA
000	RES-0027-502	TRIM,5K VR1,VR2,VR3	B	N	I	3	EA
000	SEM-0027-003	TMOS FET P-CH 5A 50V (369-03) RED Q13	B	N	I	1	EA
000	SEM-0109-010	7805 VOLTAGE REG, 5V ISOL. TO-220 U39	B	N	I	1	EA
000	SEM-0153-007	LM380 AUDIO POWER AMP U33	B	N	I	I	EA
000	SOC-0002-008	IC SOCKET, 8 PIN DIP PRNT	B	N	I	I	EA
000	SOC-0002-018	IC SOCKET, 18 PIN DIP DISP	B	N	I	1	EA
000	SOC-0004-032	32 PIN SCREW MACHINE DIP SOCKET U4SOC,U5SOC	B	N	I	2	EA
000	TRA-0003-001	TRANSF, 600 OHM AUDIO T1	B	N	I	1	EA
000	CAP-0805-100	CAP, 10PF NPO C44,C45	B	N	I	2	EA
000	CAP-0805-102	CAP, .001µF 50V "A3" C43,C59,C60,C78,C79,C82,C83,C90,C92	B	N	I	9	EA
000	CAP-0805-103	CAP, .01µF C71,C64,C72,C54,C63	B	N	I	5	EA
000	CAP-0805-104	CAP, .1µF Y5V 25V C2,C3,C4,C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15,C16,C17, C38,C48,C51,C52,C66,C74,C91,C95	B	N	I	24	EA
000	CAP-0805-105	CAP, 1µF Y5V 16V C1,C29,C30,C31,C36,C39,C80,C84,C98	B	N	I	9	EA
000	CAP-0805-220	CAP,SMD,CERAMIC, 22PF 100V "J1" NPO C41	B	N	I	I	EA
000	CAP-0805-222	CAP, SMD, 2.2NF C106	B	N	I	1	EA
000	CLP-0805-270	CAP, SHD, 27PF 100V "L1" C42,C50	B	N	I	2	EA
000	CAP-0805-333	CAP, .033µF X7R C46,C55,C56,C57,C58,C65,C73,C77,C81,C85,C87,C&8, C89,C93,C97,C99	B	N	I	16	EA
000	CAP-0805-473	CAP, .047µF,X7R C18,CI9,C20,C21,C22,C23,C24,C25,C26,C27,C28,C32, C34,C37	B	N	I	14	EA
000	CAP-1014-105	CAP, TANT, 1µF/16V,CASE A C61,C62,C69,C70,C86,C107	B	N	I	6	EA
000	CAP-1014-106	CAP, TANT, 10µF/16V,CASE C C47,C53	B	N	I	2	EA
000	CAP-1015-226	CAP, TANT, 22µF/20V,CASE D C101	B	N	I	1	EA
000	CAP-1016-475	CAP, TANT, 4.7µF/25V,CASE C C94	B	N	I	1	EA
000	CAP-1031-333	CAP, .033µF 16V FILM C67,C68,C75,C76	B	N	I	4	EA
000	IND-1612-000	SM BEAD,Z @ 25MHz=30 L1,L2,L3,L4,L5	B	N	I	5	EA
LAB	LAB[R]ASSY	LABOR, ASSEMBLY	M	R	I	0.25	HR
000	PCB-7000-12	MAINBOARD, SEACALL	B	N	I	1	EA
000	RES-0805-022	RES SMD 2.2 OHM 1/10W 5% R89	B	N	I	1	EA
000	RES-0805-101	RES SMD 100 OHM 1/10W 5% R92,R104,R105,R106,R107	B	N	I	5	EA
000	RES-0805-102	RES SMD 1K OHK 1/10W 5% R23,R91,R93,R97,R98	B	N	I	5	EA
000	RES-0805-103	RES SMD 10K OHM 1/10W 5% R1,R2,R3,R4,R5,R6,R7,R8,R9,R10,R14,R15,R24,R27,R29,R31,R 34,R36,R38,R40,R58,R64,R67,R73,R76,R77,R81,R82,R83,R86,R 96,R100,R110,R111	B	N	I	34	EA
000	RES-0905-104	RES SMD 100K OHM 1/10W 5% R13,R43,R47,R51,R55,R78,R85,R87,R88,R94	B	N	I	10	EA
000	RES-0805-105	RES SMD 1MEG OHM 1/10W 5% R46,R54	B	N	I	2	EA
000	RES-0805-123	RES,SMD,12K OHM,1/10W,5% R49	B	N	I	1	EA
000	RES-0805-152	RES SMD 1.5K OHM I/10W 5% R84	B	N	I	1	EA
000	RES-0805-153	RES SMD 15K OHM 1/10W 5% R57,R60,R61,R71,R79	B	N	I	5	EA
000	RES-0805-154	RES SMD 150K OHM 1/10W 5% R48,R56	B	N	I	2	EA
000	RES-0805-183	RES,SMD,18K OHM,1/10W,5% R20	B	N	I	1	EA
000	RES-0805-202	RES,SMD,2K OHM,1/10W,5% R28,R39,R41,R63,R66,R72,R75,R80,R103	B	N	I	9	EA
000	RES-0805-222	RES SMD 2.2K OHM 1/10W 5% R16	B	N	I	1	EA
000	RES-0805-223	RES SMD 22K OHM 1/10W 5% R11,R17,R18,R30,R32,R33,R35,R37	B	N	I	8	EA
000	RES-0805-243	RES,SMD,24K OMM 1/10W,5% R69	B	N	I	1	EA
000	RES-0805-333	RES,SMD,33K OHM,1/10W,5% R19,R21	B	N	I	2	EA
000	RES-0805-471	RES SMD 470 OMM 1/10W 5% R44,R52,R101,R102	B	N	I	4	EA
000	RES-0805-472	RES SMD 4.7K OHM 1/10W 5% R12,R45,R53,R112	B	N	I	4	EA
000	RES-0805-473	RES SMD 47K OHM 111OW 5% R22,R59,R65,R68,R74,R108,R109	B	N	I	7	EA

Figure 5.5.3 PC Assembly Main Board 1A1, page 1 of 6.

SEQN	COMPONENT	DESCRIPTION	MB	CT	QT	QUANTITY	UM
000	RES-0805-474	RES,SMD,470K OHM,1/10W,5% R42,R50,R62,R70,R95,R113	B	N	I	6	EA
000	RES-0805-822	RES SMD 8.2K OHM 1/10W 5% R99	B	N	I	1	EA
000	RES-1004-103	RES NETWORK 10K X 15 BUSS 2% RN1	B	N	I	1	EA
000	RES-1206-100	RES SMD 10 OHM 1/4W 5% R25	B	N	I	1	EA
000	RES-1206-270	RES SMD 27 OHM 1/4W 5% R26	B	N	I	1	EA
000	RES-2512-100	RES SMD 10 OHM 1W 5% R90	B	N	I	1	EA
000	SEM-1003-001	BAV74 DL SW, CC3, SOT23, CR12,CR13,CR14,CR16,CR17	B	N	I	5	EA
000	SEM-1003-004	MMBD7000L DL SW, A1, SOT- CR5,CR6,CR7,CR8,CR9,CR10,CR11,CR15,CR18,CR20	B	N	I	10	EA
000	SEM-1003-006	CMP2836, DUAL DIODE,COM ANODE CR2,CR4	B	N	I	2	EA
000	SEM-1005-003	CMPSH-3C DL HC,CC3,100MA CR3	B	N	I	1	EA
000	SEM-1008-082	MMBZ5237B,8.2ZD,A1,SOT23 CR1	B	N	I	1	EA
000	SEM-1012-004	DIODE,SCHOTTKY,3A,60V,SMC CASE CR19	B	N	I	1	EA
000	SEM-1015-000	MC74HC00AD, QUAD 2 INP NA U25,U26	B	N	I	2	EA
000	SEM-1015-002	MC74HC02AD, QUAD 2 INP NO U28	B	N	I	1	EA
000	SEM-1015-004	MC74HCO4AD, HEX INV, SO-1 U11	B	N	I	1	EA
000	SEM-1015-030	GATE, 8 INPUT NAND, 74HC30 U16	B	N	I	1	EA
000	SEM-1015-074	74HC74, DUAL F/F, SO-14 U24	B	N	I	1	EA
000	SEM-1015-132	74HC132, QUAD SCHMITT NAN U12,U17,U27	B	N	I	3	EA
000	SEM-1015-147	74HC147D DEC TO BCD ENCODER U14,U15	B	N	I	2	EA
000	SEM-1015-191	74HC191D 4-BIT UP/DN COUNTER U20,U21,U22,U23	B	N	I	4	EA
000	SEM-1015-374	74HC374 OCTAL 3-STATE D F/F U10,U13	B	N	I	2	EA
000	SEM-1015-390	74HC390, DUAL DECIMAL CNT U18,U19	B	N	I	2	EA
000	SEM-1015-393	74HC393D BINARY RIPPLE CNTR U3	B	N	I	1	EA
000	SEM-1017-002	75176, RS-485 DIFF BUS XC U37	B	N	I	1	EA
000	SEM-1022-008	LM324M, QUAD OPAMP, SO-14 U31	B	N	I	1	EA
000	SEM-1024-022	TL7705 RESET GEN/SUPPLY SUPERVISOR U2	B	N	I	1	EA
000	SEM-1025-001	32K X 8 CMOS STATIC RAM U6,U7	B	N	I	2	EA
000	SEM-1025-002	8K X 8 CMOS EEPROM U8	B	N	I	1	EA
000	SEM-1026-007	MC68306FC16A 16BIT MCU "A" ONLY U1	B	N	I	1	EA
000	SEM-1027-005	XR2211 FSK DEMOD/TONE DEC U29,U30	B	N	I	2	EA
000	SEM-1030-001	LM555CM,TIMER SO-8 U34,U38	B	N	I	2	EA
000	SEN-1030-002	LM556CM DUAL TIMER SO14 U32	B	N	I	1	EA
000	SEM-1032-001	DS1283S WATCHDOG TIMEKEEPER CMOS U9	B	N	I	1	EA
000	SEM-1041-001	2222, NPN GP TRANS , 1B/1 SOT-23 Q2,Q5,Q6,Q8,Q9,Q10,Q11,Q12	B	N	I	8	EA
000	SEM-1044-002	PZT2907A, GP PNP BIP SOT-223 Q3,Q4	B	N	I	2	EA
000	SEM-1051-001	2N7002, N-CH MOSFET, 702 SOT-23 Q1,Q7	B	N	I	2	EA
000	SEM-1179-001	PC353T, OPTO-ISOLATOR U35,U36	B	N	I	2	EA

Figure 5.5.3 PC Assembly Main Board 1A1, page 2 of 6.

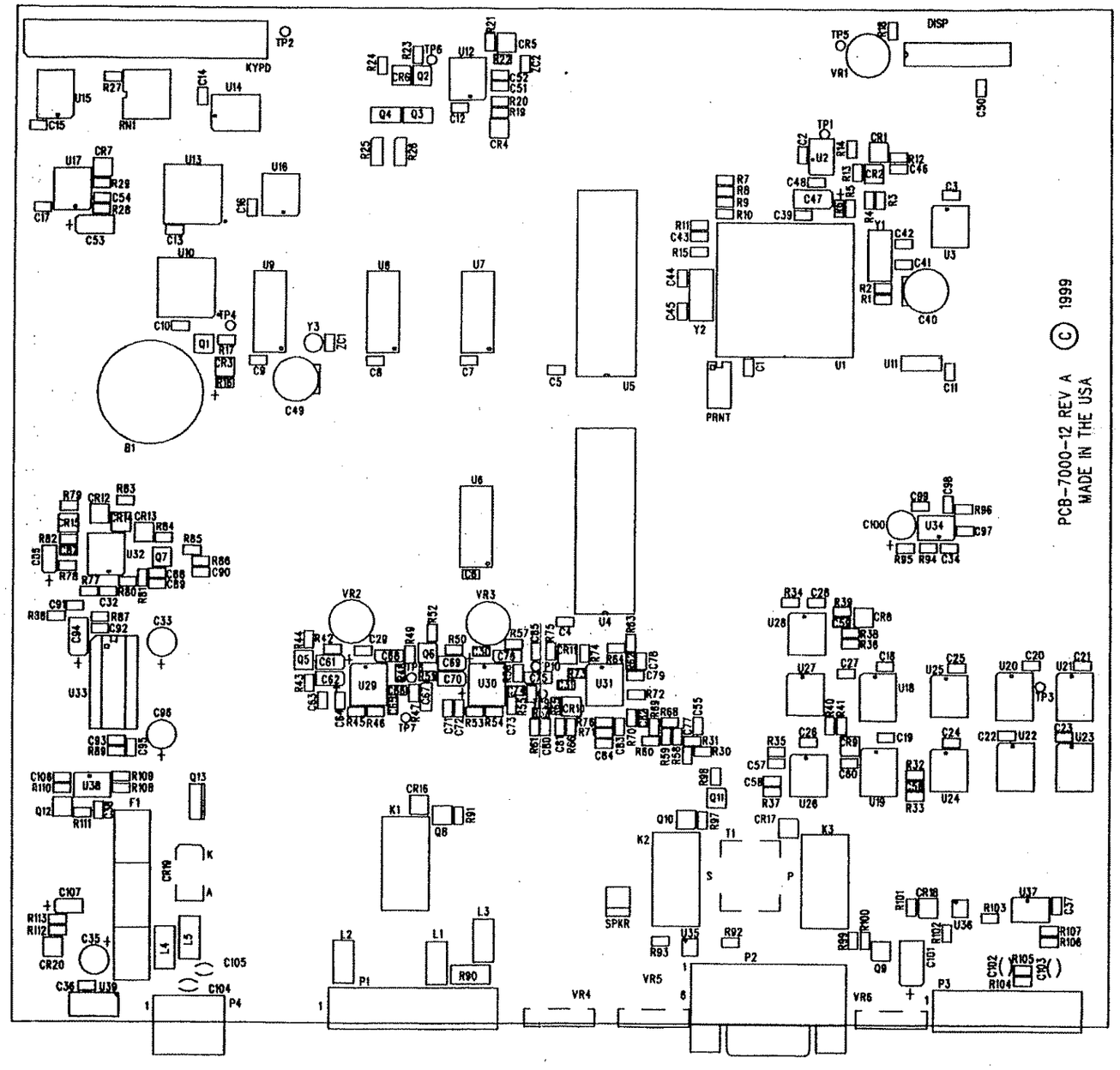


Figure 5.5.3 PC Assembly Main Board 1A1, page 3 of 6.

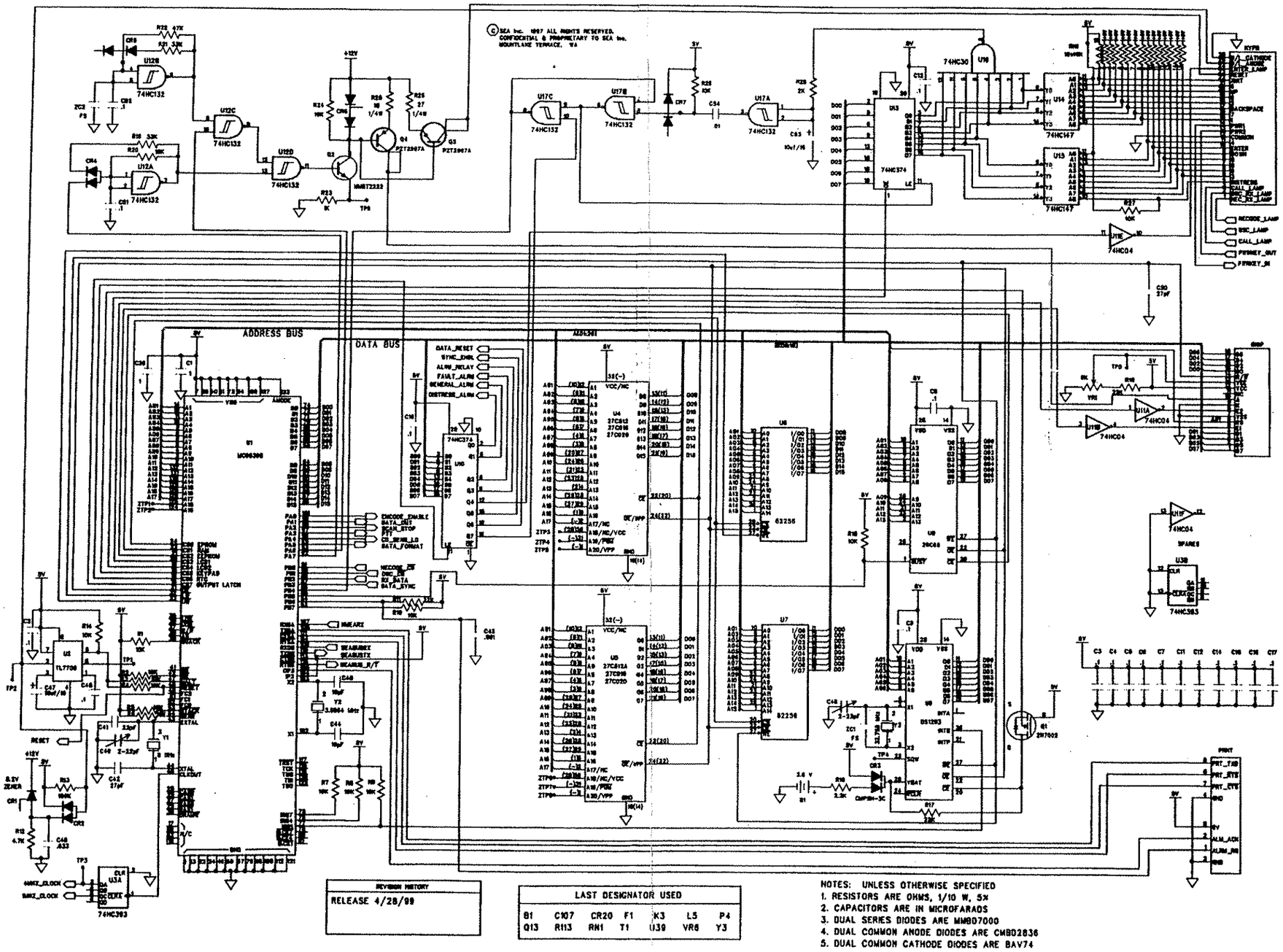


Figure 5.5.3 PC Assembly Main Board 1A1, page 4 of 6

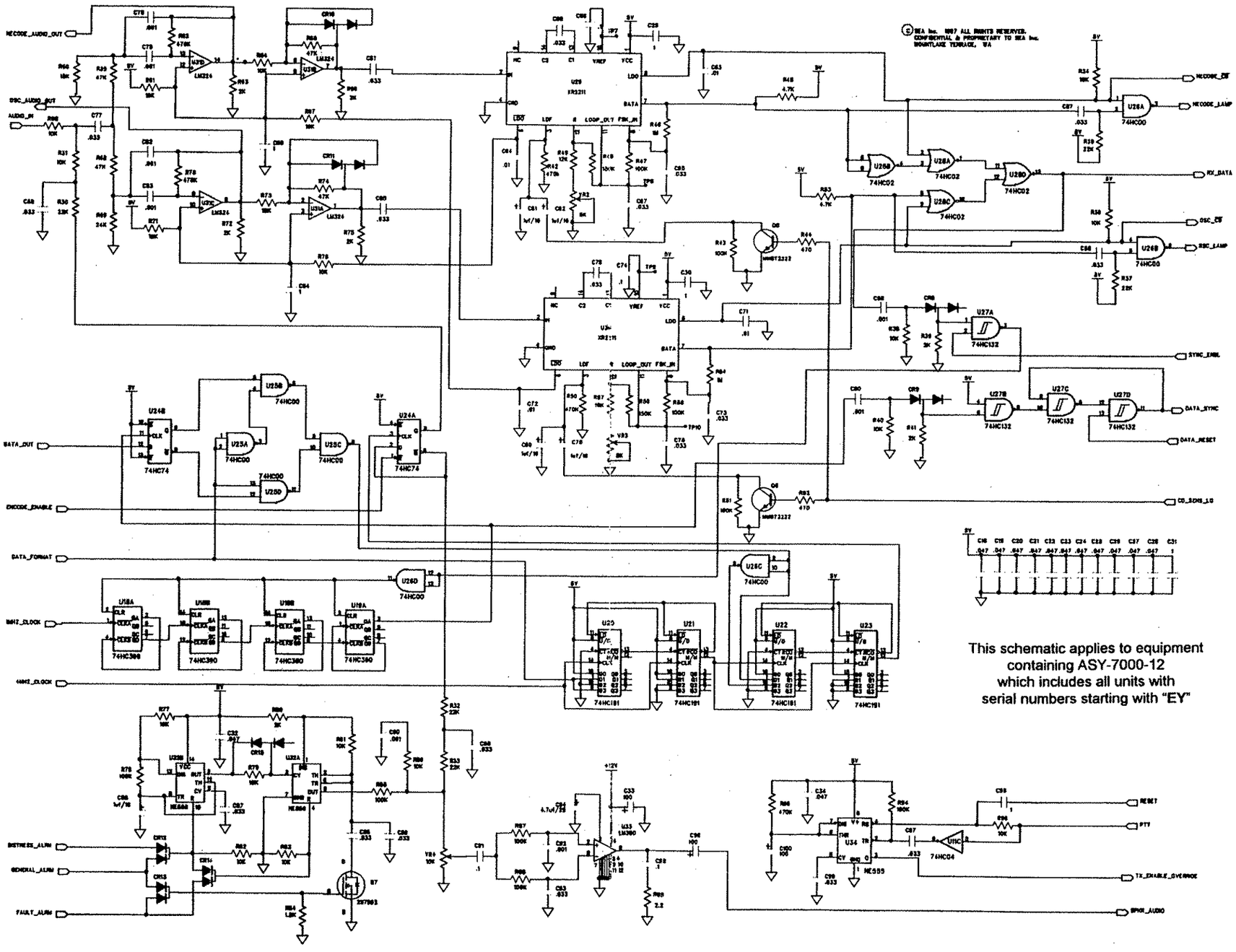


Figure 5.5.3 PC Assembly Main Board 1A1, page 5 of 6.

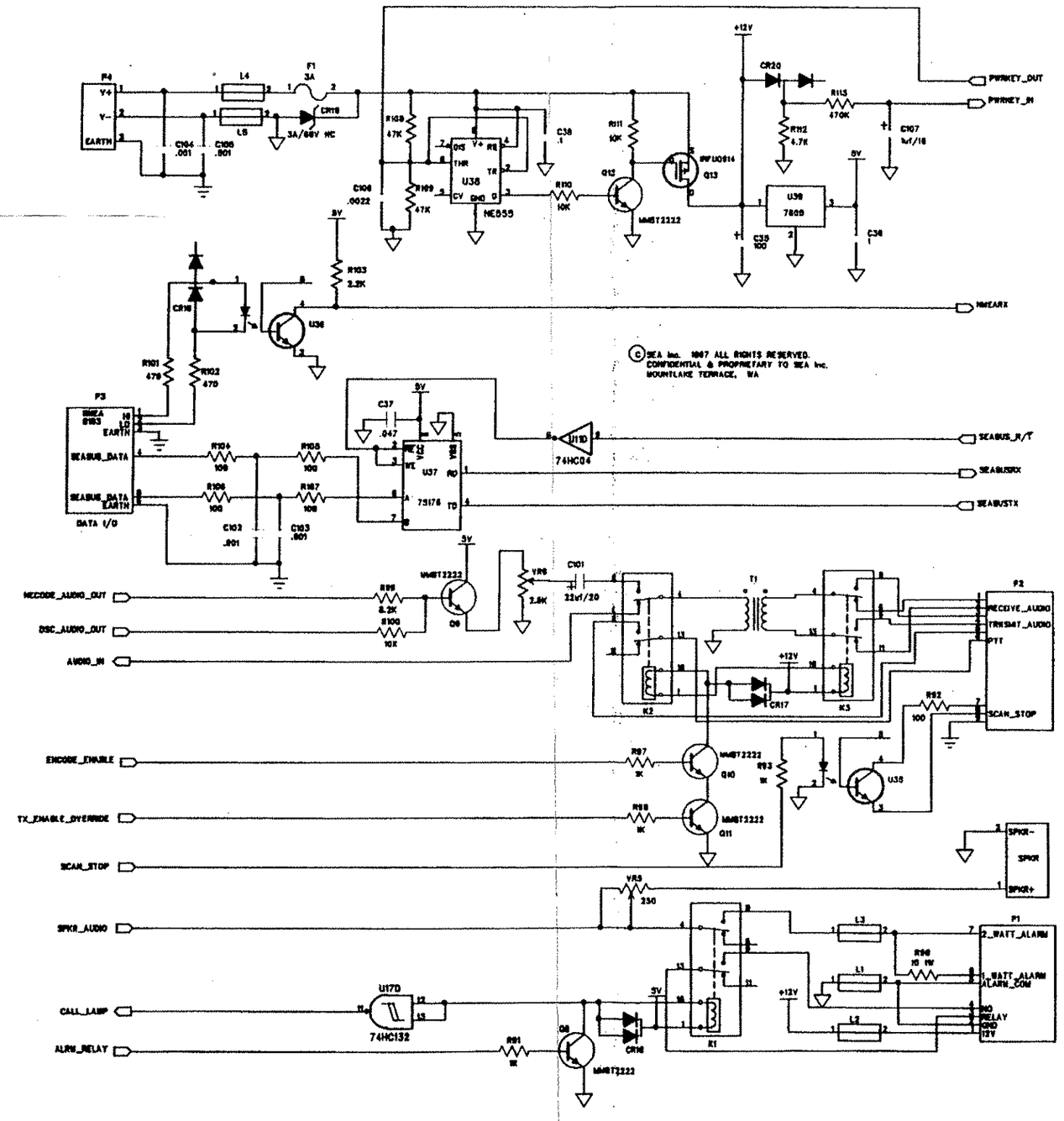


Figure 5.5.3 PC Assembly Main Board 1A1, page 6 of 6.

ENGINEERING CHANGE NOTICE

Title	Drawing	Old Rev	New Rev	Number	8108-0083
COVER, TOP	8108611601	A	B	Date	10/4/00
	Assemblies Affected	Old Rev	New Rev	Revision	
				Revision Date	
				Originator	GB
Model MD-2700				Sheet 1 of 1	

ENGINEERING CHANGES:

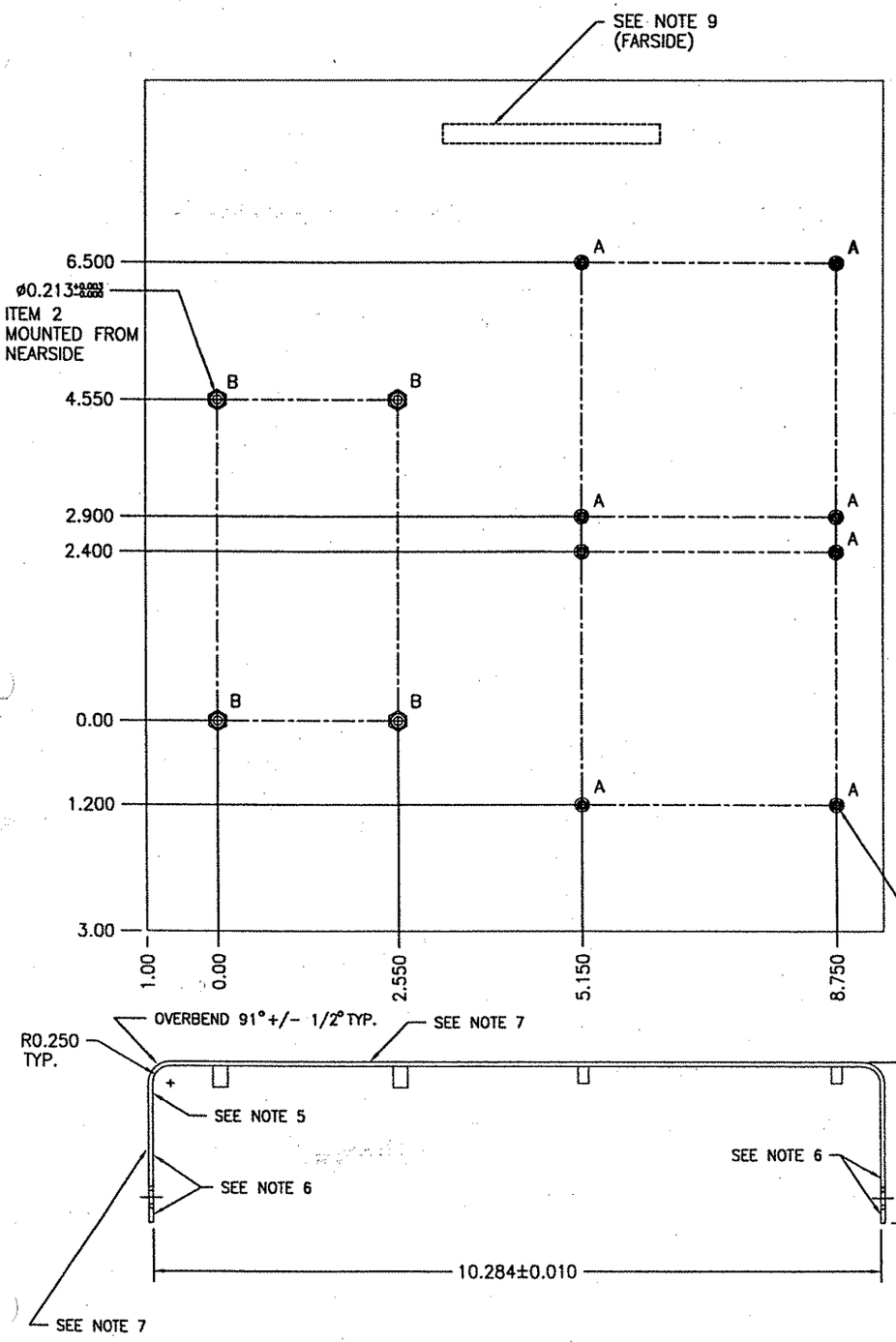
ADD 8 STUDS TO THE COVER TO PROVIDE MOUNTING POINTS FOR THE SERIAL EXPANSION BOARD AND THE EMBEDDED CONTROLLER.

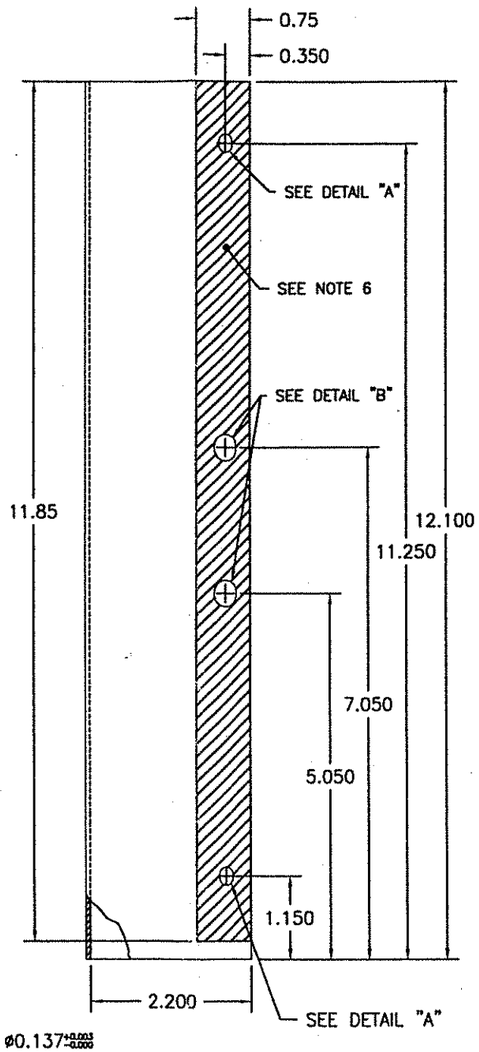
ADD 4 STANDOFFS TO THE COVER TO PROVIDE MOUNTING POINTS FOR THE AC POWER SUPPLY.

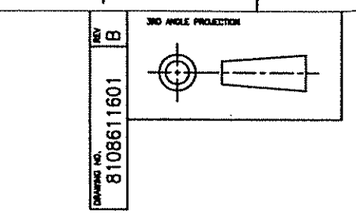
RELEASED

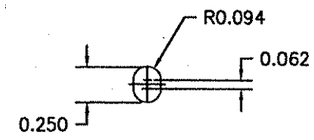
OCT 11 2000

PARTS DISPOSITION		DOCUMENTATION AFFECTED BY THIS CHANGE ACTION	Status	Responsibility	APPROVALS	Date
Parts - On Order	N.A.	ENG. DWG/SPECS	REVISION COMPLETED	GB	PROJECT MGR.	10/4/00
Parts - In Stock	NOTED ABOVE	Bill Of Material			ENG. MGR.	10/6/00
In Process Assy's	N.A.	Technical Manuals			PROD. MGR.	10/9/00
Completed Assy's	N.A.	Service Bulletin			PRODUCT SERVICES MGR.	10/09/00
Completed Products	N.A.	Master Parts List			Q.A. MGR.	10/9/00
Returned Equipment	N.A.	Production Drawing			CORPORATE OFFICER	10/10/00
		Buy Card				
		Production Control				
		Configuration Control				
		FAA Notification				

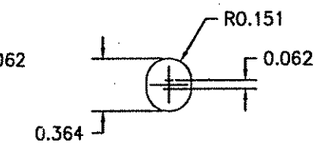








DETAIL "A"
4 PLCS
(SCALE 2X)



DETAIL "B"
4 PLCS
(SCALE 2X)

NOTES: (UNLESS OTHERWISE SPECIFIED)
1. MATERIAL: 0.062 THK. ALUM., 5052-H32
2. FINISH: CLEAR IRIDITE PER SUNAIR ESP 74-03
3. REMOVE ALL BURRS AND BREAK SHARP EDGES. ALL OUTSIDE SURFACES TO BE FREE OF SCRATCHES, BLEMISHES, MACHINE PROCESS, ETC..
4. PART TO MATE WITH SUNAIR 8108611709, COVER, BOTTOM.
5. DO NOT PAINT THIS SURFACE; MINIMUM OVERSPRAY PERMISSIBLE.
6. MASK INSIDE SURFACE A SHOWN. DO NOT PAINT. NO OVERSPRAY PERMISSIBLE.
7. PAINT OUTSIDE SURFACES WITH S/W #F62BY10 POLANE "T" DULL BLACK, FINE TEXTURE PER APPROVED SUNAIR TEXTURE SPEC.
8. ALL LINEAR DIMENSIONS ARE SHOWN PRIOR TO OVERBED.
9. METAL OR ETCHING INK STAMP SUNAIR PART NUMBER WITH REV. LETTER AND VENDOR I.D. APPROX. WHERE INDICATED ON SURFACE INDICATED.

REV	DESCRIPTION	DATE
01	RELEASE TO PROTOTYPE	
A	+/-.010 WAS +.010/-.000	02/98
B	ADDED STANDOFF'S ON TOP	07/00

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OCT 11 2000

ITEM	REQD	PART NO.	DESCRIPTION
2	4	BSOS-6440-10	STANDOFF CAPTIVE PEM
1	8	FHS-632-4	STANDOFF CAPTIVE PEM

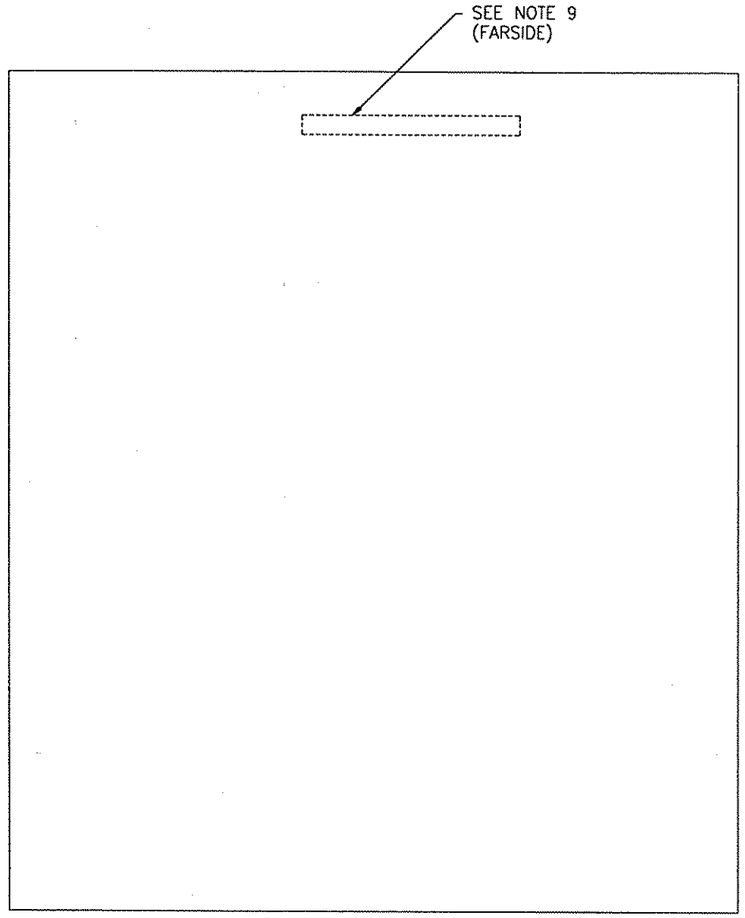
MATERIAL:		DRAWN BY	DESIGNED BY
		CHECKED BY	APPROVED BY
ALL DIMENSIONS ARE IN INCHES. TOLERANCE UNLESS SPECIFIED			
ONE PLACE DECIMAL X.X ± 0.03		TOOL ENG N/A	MD DES N/A
TWO PLACE DECIMAL X.XX ± 0.01		SCALE	SHEET NO. 1=1
THREE PLACE DECIMAL X.XXX ± 0.005			
NEXT ASSEMBLY	ANGULAR DIMENSION X° ± 1°		

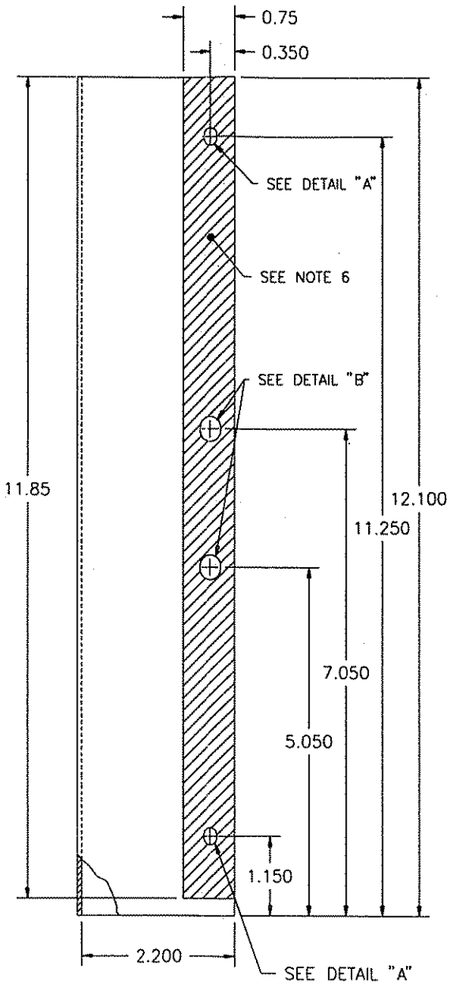
COMPUTER FILE
M114B.DWG

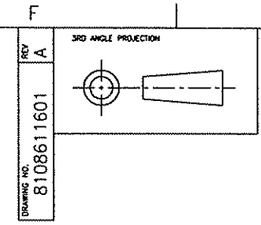
sunair electronics, inc.

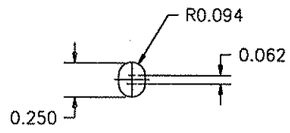
DRAWING DESCRIPTION
COVER, TOP

DRAWING NO.
8108611601

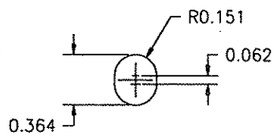








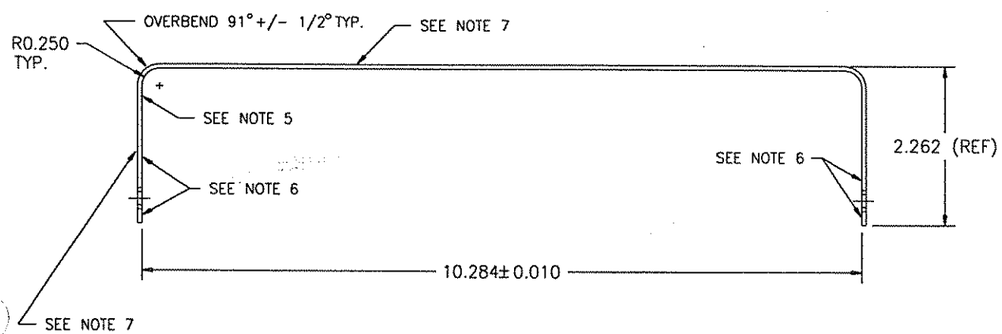
DETAIL "A"
4 PLCS
(SCALE 2X)



DETAIL "B"
4 PLCS
(SCALE 2X)

NOTES: (UNLESS OTHERWISE SPECIFIED)
1. MATERIAL: 0.062 THK. ALUM., 5052-H32
2. FINISH: CLEAR IRIDITE PER SUNAIR ESP 74-03
3. REMOVE ALL BURRS AND BREAK SHARP EDGES. ALL OUTSIDE SURFACES TO BE FREE OF SCRATCHES, BLEMISHES, MACHINE PROCESS, ETC..
4. PART TO MATE WITH SUNAIR 8108611709, COVER, BOTTOM.
5. DO NOT PAINT THIS SURFACE; MINIMUM OVERSPRAY PERMISSIBLE.
6. MASK INSIDE SURFACE A SHOWN. DO NOT PAINT. NO OVERSPRAY PERMISSIBLE.
7. PAINT OUTSIDE SURFACES WITH S/W #F62BY10 POLANE "T" DULL BLACK, FINE TEXTURE PER APPROVED SUNAIR TEXTURE SPEC.
8. ALL LINEAR DIMENSIONS ARE SHOWN PRIOR TO OVERBED.
9. METAL OR ETCHING INK STAMP SUNAIR PART NUMBER WITH REV. LETTER AND VENDOR I.D. APPROX. WHERE INDICATED ON SURFACE INDICATED.

REV	DESCRIPTION	DATE
01	RELEASE TO PROTOTYPE	
A	+/-.010 WAS +.010/-.000	02/98



OCT 1 1 2000

RELEASED

COMPUTER FILE
M114A.DWG

ITEM	REQD	PART NO.	DESCRIPTION

MATERIAL:		DRAWN BY	DESIGNED BY
		CHECKED BY	APPROVED BY
ALL DIMENSIONS ARE IN INCHES. TOLERANCE UNLESS SPECIFIED			
ONE PLACE DECIMAL X.X ± 0.03		TOOL ENG	IND DES
TWO PLACE DECIMAL X.XX ± 0.01		N/A	N/A
THREE PLACE DECIMAL X.XXX ± 0.005		SCALE	SHEET NO. 1=1
NEXT ASSEMBLY	ANGULAR DIMENSION ° ± 1°		

sunair electronics, inc.

DRAWING DESCRIPTION
COVER, TOP

DRAWING NO.
8108611601