INSTALLATION AND OPERATION MANUAL
SEA TEL MODEL TAC-92C/M
TRACKING ANTENNA CONTROLLERS

This manual applies to the following software versions:

TAC-92 C/M	Version 2.73 or later
2494 PCU	Version 2.50 or later
3294 PCU	Version 1.30 or later
2095 PCU	Version 3.00 or later

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1. DESCRIPTION AND TECHNICAL DATA

This manual describes the Sea Tel Model TAC-92C and TAC-92M shipboard Tracking Antenna Control Unit and provides installation and operating instructions. The TAC-92C and TAC-92M are serial interface versions of Sea Tel's proven line of TAC-92 Antenna controllers that are used to control antenna pedestals which utilize a pedestal mounted control unit for improved antenna stabilization.

1.1. CHARACTERISTICS

The TAC-92C Antenna Control Unit (ACU) communicates via an RS422 serial data link with the Pedestal Control Unit (PCU) located at the antenna. For unlimited azimuth pedestals, the RS422 link is coupled to the PCU via RF multiplexers. The Pedestal Control Unit stabilizes the antenna against the ship's roll, pitch, and turning motions. The TAC-92C ACU is the operator interface to the PCU and provides the user with a choice of positioning commands to point the antenna, search commands to find the satellite signal and tracking functions to maintain optimum pointing. The TAC-92C can incorporate a variety of signal strength receivers for tracking purposes.

1.2. TAC-92C FUNCTIONAL DESCRIPTION

The TAC-92C is housed in a standard 19-inch rack mount enclosure. The front panel contains a row of function keys used to select the desired information to be displayed and an array of numeric data entry keys for changing parameters or commanding the antenna functions. Data is displayed on a bright 40 character Vacuum Fluorescent display making it easy to read in all ambient light conditions. The TAC-92C can be mounted on chassis slides allowing easy access to all internal electronics. All external connections are brought out through three D-Subminiature connectors mounted on the rear panel. Flexible ribbon cable extends these connections to a terminal-mounting strip mounted on the rear of the rack enclosure separating the ship wiring from the Antenna Control Unit.

The TAC-92C allows the use an internal flux gate compass, external flux gate compass or a shipboard gyrocompass as the long-term azimuth reference. The TAC-92C will accept an NMEA 0183, Step- by-step or 1:1, 36:1, 90:1 or 360:1 Synchro gyro interface.

The TAC-92C automatically calculates the Elevation, Azimuth and Polarization pointing angles (POLANG) based on the ships Latitude, Longitude and the desired Satellite Longitude position. A programmable pattern search will automatically scan the area for a desired satellite if no signal is found. These two features make locating a new satellite very easy.

A serial communications Monitor and Control (M&C) interface allows external control of the TAC-92C from a PC, ASCII terminal, or telephone modem. This interface can also be used to update the ships Latitude and Longitude information from a GPS or LORAN system or update heading from a flux gate or gyro using the NMEA interface standard.

The TAC-92C will accept signal level information for tracking purposes from one of three internal receiver options or an external receiver. The standard internal receiver is a dual input full coverage wide band video receiver for tracking video transponders in all TVRO and most data applications. Two narrow band beacon-tracking receivers are available with either 70 MHz or L-BAND inputs to allow tracking on a satellite beacon or narrow band data carrier.

1.3. TAC-92C TECHNICAL SPECIFICATIONS

1.3.1. General

Physical Dimensions:	3.5 x 19" x 14"
Mounting:	2 Unit high Rackmount
Input Voltage:	110/220 VAC, 50/60 Hz
Power Requirements:	100-Watts maximum
Fuses:	2 Amp 110v input, both lines fused
	1 Amp 220v input, both lines fused

1.3.2. Front Panel

Keyboard: 4 Mode Select Keys	
	14 Numeric Input Keys
	2 Up/Down Keys
	2 Auxiliary Keys
	1 Reset Key
AlphaNumeric Display:	40 Character (2x20)
	Vacuum Fluorescent Alpha Numeric
Status Indicator Display:	4 LED enunciators

1.3.3. Rear Panel

Controls:	Power On/Off
	Voltage Select
Connectors:	
External AGC	37 pin female D-Subminiature
Gyro Compass input	25 pin female D-Subminiature
RS-232/422 M&C	9 pin male D-Subminiature
RS-422 PCU interface	9 pin male D-Subminiature
RF Tracking Input	Type F female L Band input
	BNC 70 MHz input
AC Input Power	IEC type receptacle

1.3.4. RF Tracking Input

Wide band TVRO receiver:

Frequency Range:	950 - 2050 MHz
Detection Bandwidth:	16 MHz
Input Level:	-65 to -20 dBm
LNB switching:	13/18 volt band select switching

Narrow Band SCPC receiver:

Frequency Range:	950 - 1750 MHz	(L band SCPC)
	60 - 80 MHz	(70 MHz SCPC)
	110 - 170	(140 MHz SCPC)
Detection Bandwidth:	30 kHz	
Input Level:	-90 to –30 dBm	

1.3.5. RS-232 Monitor and Control Interface

Communications Parameters:	4800/9600 Baud, 8, N, 1
Device Type:	DTE
Interface Protocol:	RS-232 or RS-422
Interface Connector:	DE9P (J11)

1.3.6. NMEA Interface

Communications Parameters:	4800 Baud, 8, N, 1
Interface Protocol:	Optically isolated RS-422
Interface Connector:	DE9P (J11 or J13)
NMEA GPS Sentence:	GPGLL, LCGLL
NMEA Heading Sentence:	HCHDM, HEHDT

1.3.7. External AGC Input

Voltage Level:	0-5 volts DC
Impedance:	1 meg ohms

1.3.8. Terminal Mounting Strip

Synchro Interface:	5 screw terminal connections
SBS Interface:	4 screw terminal connections
External AGC:	2 screw terminal connections
NMEA GPS:	4 Screw terminal connections

1.3.9. Environmental Conditions

The following requirements apply to equipment installed in weather protected locations.

Temperature	0 to 40 degrees C
Humidity	Up to 100% @ 40 degrees C Non-condensing

2. INSTALLATION

The following instructions describe the installation procedures for the TAC-92C Tracking Antenna Controller. The installation of the TAC-92C is outlined in the Pedestal Installation and Operation manual and may already have been performed.

2.1. TERMINAL MOUNTING STRIP CONNECTIONS

1. Connect the 25-pin ribbon cable from the Terminal Mounting Strip to J3 on the TAC-92C.

2. Connect the 9-pin ribbon cable or round NMEA serial cable from the Terminal Mounting Strip to J13 (if exists) or J11 on the TAC-92C.

3. If a two wire External AGC cable is attached to the Terminal Mounting Strip, connect the 37-pin connector to J2 on the TAC-92C.

2.2. PEDESTAL INTERFACE CONNECTIONS

Connect the 9-pin D Sub connector on the Serial Control Cable, to J1 on the rear of the TAC-92C. The other end of the serial control cable is routed to the antenna pedestal or base multiplexer.

2.3. SHIPS GYRO COMPASS CONNECTIONS

Connect the ship's gyrocompass or gyro compass repeater output to the Terminal Mounting Strip. Use TB3 for a Step-by- Step gyro compass and match the connections to A, B, C and COM with the gyro compass output. Use TB1 for a Synchro gyrocompass and match the connections to R1, R2, S1, S2 and S3 with the gyro compass output. Refer to Appendix A if interface problems arise.

2.4. AGC TRACKING CONNECTIONS

When using the internal receiver, connect the appropriate RF or IF cable from a splitter or directional coupler to IN A or IN B on the rear panel of the TAC-92C. Refer to the system block diagram in the pedestal Installation and Operation manual.

For external AGC, connect a cable between the AGC or TM output of the master receiver or modem and the terminals labeled X1, X2 on TB2 of the Terminal Mounting Strip or to the two wire cable leading from J2. Connect the negative lead to X2 or the Brown wire.

2.5. NMEA CONNECTIONS

The NMEA port allows automatic Latitude, Longitude and heading updates from a GPS receiver or gyrocompass. For GPS input, connect the 4 wires from the GPS receiver to connector J13 or J11 on the back of the TAC-92C as shown in drawing 112791. For heading input, connect pins 1 & 2 only (RX+, RX-) to the gyrocompass. To enable the interface, select the system TYPE parameter under the MODE/SETUP display and verify that type 8 or a combination that includes 8 is selected.

NOTE: The TAC-92C is available with one or two NMEA/M&C ports installed at J13 and J11. If two ports are installed, use J13 for the NMEA input. If two NMEA inputs are used (heading and GPS) use J13 for the heading input. If only one port is installed, then only M&C or NMEA GPS functions are available and only one at a time.

2.6. MONITOR and CONTROL CONNECTIONS

The Monitor and Control port allows external control from a modem, ASCII terminal or PC. Sea Tel supplies a windows based antenna control program called PCDAC which allows choosing satellites and tracking functions from a pull down menu, simultaneous display of all antenna functions and dialog box control of tracking and searching functions. Contact a Sea Tel sales representative for details on obtaining a copy.

The TAC-92C is wired as a DTE device for direct connection to a modem. For connection to another DTE device such as a terminal or PC, a null modem cable as shown in drawing 110762 is required. Connect the null modem cable between J11 on the back of the TAC-92C and the ASCII terminal or PC serial interface port. Set the terminal or PC to 4800 baud, 8 bits, no parity (9600 baud operation is available on the Aux Serial Board only by installing a jumper at D1). Enable the interface by selecting the system TYPE parameter under the MODE/SETUP display and verify that type 8 or a combination that includes 8 is selected. See DWG 114493 in Section 4.5 for details on the serial commands available.

NOTE: The TAC-92C is available with one or two NMEA/M&C ports installed at J13 and J11. If two ports are installed, use J13 for the NMEA input. If two NMEA inputs are used (heading and GPS) use J13 for the heading input. If only one port is installed, then only M&C or NMEA GPS functions are available and only one at a time.

2.7. SYSTEM CHECK-OUT

The following procedures provide instructions for performing pre-operational checkout of the system.

2.7.1. ACU / ANTENNA SYSTEM CHECKOUT

1. Turn on the main power switch at the rear panel.

2. Press RESET on the ACU front panel to initialize the system. Verify the display shows "SEA TEL INC - MASTER" and the ACU software version number. Wait 6 seconds for the display to change to "SEA TEL INC - REMOTE" and the PCU software version number. If the display shows "REMOTE NOT RESPONDING" Refer to Appendix A in Section 4.

3. Press the ANTENNA key twice to select the AZIMUTH entry display. Press the Up and Down keys and observe that the azimuth display changes in the correct response to the keys.

2.7.2. SET CONFIGURATION PARAMETERS

1. Press the MODE key several times until the GYRO TYPE display appears. If MODE will not advance beyond the REMOTE AUX display, key in 7979 and press ENTER. At the GYRO TYPE display, key in the appropriate Gyro Compass interface type indicated below and press ENTER:

0	for NO Gyro connection (Internal Flux Gate or NMEA)
2	for Step-By-Step gyro
360	for 360:1 Synchro with SBS Converter
362	for 360:1 Synchro with S/D Converter
90	for 90:1 Synchro with S/D Converter
36	for 36:1 Synchro with S/D Converter
1	for 1:1 Synchro with S/D Converter

2. Press the ENTER key again to select the POLANG TYPE. Key in the appropriate Polang type indicated below:

0	for no polang
9	for 24v manual polang with numeric display
72	for 24v auto polang with numeric display
64	for 24v auto polang with HORZ/VERT display
68	for Lin/Circ feed with auto polang
80	for 5v auto polang with HORZ/VERT display
112	for 5v auto polang with numeric display

3. Press ENTER several more times to select "SAVE NEW PARAMETERS" display. Press UP arrow then ENTER to save the new parameters. NOTE: if the parameters are not saved, they will be lost when the TAC-92C is RESET or turned off.

4. Press the SHIP key 4 times to select the HEADING entry display. Enter the correct ships heading reported by the bridge by pressing the appropriate keys on the numeric entry pad. Press ENTER to save this data.

5. Observe that the heading display changes in the correct direction as the ship turns. If the heading display changes incorrectly or the red ERROR LED illuminates on the front panel, check the configuration parameters below and refer to Appendix B.

2.7.3. NMEA GPS CHECKOUT

1. When a NMEA GPS receiver or gyrocompass is connected to J13 or J11, the NMEA LED on the AUX SERIAL PORT ADAPTOR (ASPA) PC board will illuminate each time a NMEA message is received. The GLL LED will illuminate each time a xxGLL, xxHDT or xxHDM message is received. Observe the NMEA and GLL LED's and confirm they are flashing about once every 2 seconds (when the system is first powered up, the GLL LED may not appear for several minutes while the GPS receiver is acquiring the necessary satellite signals).

2. If the GLL LED is illuminated constantly, this indicates the message in not being transferred to the TAC-92C board because the system type does not include the 8 setting.

2.7.4. AUXILIARY SERIAL PORT CHECKOUT

When a remote computer or terminal is connected to J11, the DISK LED will illuminate steady when a message is being received and will extinguish when the message is transferred to the TAC-92. To test this connection, set the remote terminal to 4800,N,8,1 and send an "A". The DISK LED should illuminate. Send a Carriage Return ($0D), the DISK LED should extinguish. Send a "V", the TAC-92 should respond with the ACU version number.

A list of the commands available through the serial port is shown in DWG 114493 in Section 5.

3. OPERATION

3.1. NORMAL SYSTEM OPERATION

Normal operation of the system from a cold start involves the following steps:

1. Turn on the AC Power switches for the ACU and the Radio packages. Press the RESET button on the ACU front panel to initialize the system and show the current Master Unit version number.

   Wait 1-2 minutes for the antenna to initialize. After initialization the display will show the Remote Unit version number.

2. Press SHIP to select the ship's position displays. Press SHIP again to select the LAT entry mode. Key in the ships Latitude to the nearest degree. Pressing the decimal key can enter tenths of a degree. Use the NS/EW key to set the correct hemisphere. Press ENTER to save the entry.

   Press ENTER again to select the LON entry mode. Key in the ships Longitude. Press ENTER to save the entry.

   Press ENTER again to select the HDG entry mode. Key in the ships heading if using an SBS or 36:1, 90:1 or 360:1 synchro gyro interface. Do not enter a ships heading for systems using 1:1 synchro, NMEA heading or flux gate reference.

3. Press SAT twice to select the Satellite entry mode. Key in the desired satellite longitude and press ENTER. The ACU will automatically calculate the correct elevation and azimuth pointing angles and move the antenna to the appropriate position.

4. Tune the internal or external receiver to the appropriate frequency to receive the satellite signal.

5. <u>If no signal is found:</u>
   Select the SEARCHING function under the MODE/CONTROL display. Use the UP key to turn SEARCHING on. The ACU will automatically set the AGC threshold and move the antenna in a spiral pattern. The search movement will stop when the ACU receives a signal above the threshold and automatically begin tracking. If AUTO THRESHOLD is disabled, you will need to manually set the threshold under the SAT display before beginning the search operation.

6. When a satellite signal is found:
   Manually peak the signal by selecting the AZ and EL functions under the ANTENNA display and adjusting the antenna position for peak signal strength using the up/down keys.

7. Adjust the antenna polarization by selecting the POL function under the ANTENNA display. Select the orientation (HORZ, LHCP, VERT, RHCP) by pressing the NS/EW key. Polang adjustment is automatic on most system configurations. Refer to Section 3.6 for a detailed description of polarization setup, adjustment and operations.

8. If AUTO THRESHOLD is not used, drive the antenna up or down in elevation until the AGC reading is at a minimum. Set the AGC threshold between the minimum and maximum values. Drive the antenna back in elevation to receive a strong signal.

9. For automatic peaking and tracking of the satellite, turn TRACKING on by pressing the AUX1 key or by selecting the TRACKING function under the MODE display and pressing the UP key. The TRACKING LED should be on and the signal should quickly reach a peak value. See section 3.3 for a detailed description of the tracking functions available.

   Operation from this point on is automatic and will continue unattended until:

   A. AC power to the system is interrupted, or
   B. The satellite signal is blocked by a structure on the ship, or
   C. The ship sails into an area of insufficient satellite signal level.

3.2. KEYBOARD ENTRY

The keyboard entry and operation is very simple and straightforward. Pressing any of the 4 function keys located below the VF display, enables the display of all the information associated with that function. Pressing the ENTER Key or the function key again, enables the first display to be modified. This is called the entry mode. Subsequent depressions of the ENTER key or function key again cycle the selected display for modification. A selected display can be overwritten by pressing the desired number keys or it can be incremented and decremented with the up/down keys. Pressing the decimal point allows fractional entries to be made. Pressing C clears the display to correct errors. When satisfied with the entry, press ENTER again to save the information and proceed to the next function.

3.3. STATUS LEDS

There are 4 status indicator LEDs on the front panel. They give the operator a continuous display of the major operating sates of the TAC-92C Tracking Antenna Controller. The function of each LED is described below.

3.3.1. TRACKING LED

The Tracking LED illuminates when the TRACKING mode is enabled and the received AGC level is above the THRESHOLD setting. The tracking LED will flash if TRACKING is enabled and the AGC level is below threshold. The tracking LED will extinguish and tracking will be suspended if the system goes into SEARCH, automatic UNWRAP or any antenna movement commands are issued. Tracking can be turned ON and OFF with the AUX1 key.

3.3.2. SEARCHING LED

The Searching LED performs two functions. If illuminated steady, it indicates that the ACU is performing a systematic pattern search for a satellite signal. If the LED is flashing, it indicates that the ACU is moving the antenna to a predetermined position and all tracking operations will be suspended until the new position is achieved.

3.3.3. UNWRAP LED (limited azimuth systems only)

The UNWRAP LED is illuminated and the cable unwrap function initiated, for limited azimuth systems only, whenever the antenna moves within 5 degrees of either end stop (90 and 630 degrees relative). Cable UNWRAP suspends any tracking operations, flashes the SEARCHING led and targets the antenna plus or minus 360 degrees from its current position. Any ship movements during the unwrap process are monitored and used to correct the final target position of the antenna.

3.3.4. ERROR LED

The ERROR LED is illuminated and will remain illuminated whenever an error is detected. Select ERROR in the MODE/STATUS display to view the error condition. Press UP arrow in this display to clear the error and the LED.

Refer to Section 3.8.4 for a description of the error codes.

3.4. TRACKING OPERATION

There are two modes of tracking (Step Track and Conscan) and four sources of AGC tracking information available (EXT RCVR, INA, INB and IF). Each system is described below:

3.4.1. STEP TRACK OPERATION

Step track keeps the antenna peaked at the optimum position by making small trial movements of the antenna and optimizing the received signal level. The size of the trial steps is adjusted with the EL STEP SIZE and AZ STEP SIZE parameters under the MODE/SETUP display. The recommended STEP SIZE setting for step track is 1/4 the antenna 1 dB beam width. The signal level is integrated at each new position for the time specified by the STEP INTEGRAL parameter. Units are in cycle updates of 1/40 second. A setting of 0 disables Step Track and enables Conscan. The TRACKING parameter must be set to ON to enable Step Track operation. The AUX1 key allows you to toggle tracking ON and OFF from any mode. The AZ and EL STEP SIZE parameters can be set by the Xnnn and Ynnn commands from the M&C control port.

3.4.2. CONSCAN OPERATION

Conscan tracking requires the internal Conscan Tracking Controller option and a special feed assembly. Conscan determines the optimum antenna pointing by slightly mispointing the antenna with a rotating lens or eccentric feed element and monitoring the resulting signal level variation. Movement commands are calculated based on the phase of the signal strength variations relative to the feed disturbance. The STEP INTEGRAL parameter must be set to 0 and the TRACKING function must be set to ON to enable Conscan operation.

3.4.3. CONSCAN SENSITIVITY ADJUSTMENT

The tracking sensitivity for the AZ and EL axes are set by the AZ STEP SIZE and EL STEP SIZE parameters under the MODE/SETUP display. Increasing the STEP SIZE number by one reduces the system sensitivity by a factor of 2. Default settings for Ku band are 3-AZ, 3-EL. Default settings for C band are 0-AZ, 1- EL. To change the STEP SIZE parameter, you must enter the desired setting twice within 3 seconds. The AZ and EL STEP SIZE sensitivities can also be set by the Xnnn and Ynnn commands from the M&C control port.

3.4.4. AGC INPUT SELECTION

There are four choices of AGC tracking information: External Receiver, VIDEO RF Input A (H/C), VIDEO RF Input B (V/Ku), and Narrow Band IF (SCPC). The selection is made by pressing the NS/EW key when the SAT/RCVR mode is selected for entry.

EXTERNAL AGC SETTINGS

There are no adjustments for external AGC inputs. The allowable input voltage range is 0 to 5 volts with increasing voltage corresponding to increasing signal strength.

VIDEO RF RECEIVER TUNING

The Video RF inputs (Input A and Input B) can be tuned to channel numbers or specific L, C or Ku band frequencies by selecting the SAT/RCVR display for entry. Entries from 1 to 24 select C band channels. Entries from 950-2000, 3700-4200, 10750-11700 and 11700-12750 select L, C, Europe Ku and North America Ku band frequencies in MHz respectively. Channel selection or fine-tuning in MHz increments can be done with the UP/DOWN keys.

IF RECEIVER TUNING

The Narrow Band IF or SCPC receiver is tuned to MHz and kHz by two entries. Select the SAT/RCVR mode by pressing the SAT key. Select the IF input using the NS/EW key. Key in the MHz portion and press ENTER. Press "." then key in the kHz portion and press ENTER.

For example if the desired IF frequency is 70.015 MHz, key in "70" and press "ENTER", then press ".015" and "ENTER" again. Fine-tuning may be accomplished with the UP and DOWN arrow keys. Press "." to select kHz increments for tuning, press "C" to select MHz increments for tuning.

3.4.5. C/Ku BAND SELECTION

For C and Ku band systems the preset tracking parameters for Conscan can be changed in the TRACKING window by pressing the down arrow. The display will indicate which band and tracking parameters are currently selected. For Dual C / Dual Ku band systems, both the tracking parameters and the remote C/Ku relay selection is changed by this selection.

3.5. SEARCHING OPERATION

There are two search patterns, SEARCH1 and SEARCH2 and the following searching parameters SEARCH INC, SEARCH LIMIT, SEARCH DELAY and STEP DELAY.

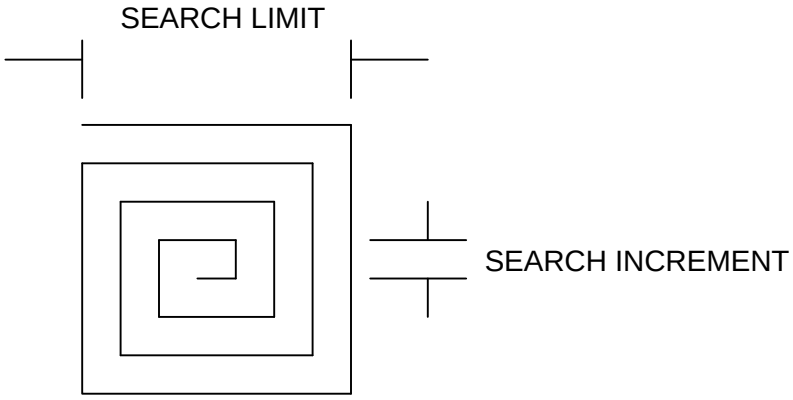
3.5.1. SEARCH 1

SEARCH1 is no longer available on later software releases.

3.5.2. SEARCH 2

SEARCH2 is a two-axis pattern consisting of alternate movements in azimuth and elevation. The size and direction of the movements are increased and reversed every other time resulting in an increasing spiral pattern as shown below.

The SEARCH2 pattern is as follows:



SEARCH2 can be initiated manually by selecting the SEARCH2 function under the MODE/CONTROL display and pressing the UP key. SEARCH2 is terminated automatically when the AGC level exceeds the threshold. Pressing AUX1 terminates SEARCH2.

3.5.3. SEARCH INCREMENT

The size of the increase in the spiral pattern is set by the SEARCH INC parameter under the MODE/SETUP display. The units are in pedestal step resolution (1/24 degree for xx96 and xx97 systems and 1/6 degree for 9695 systems). The typical SEARCH INC setting is 1/2 the antenna 3 dB Beam Width.

3.5.4. SEARCH LIMIT

The overall size of the search pattern is set by the SEARCH LIMIT parameter under the MODE/SETUP display. The units are in pedestal step resolution or 1/24 degree for xx96 and xx97 systems and 1/6 degree for 9695 systems. The typical SEARCH LIMIT setting is 2 to 4 degrees.

3.5.5. SEARCH DELAY

SEARCH2 is initiated automatically if TRACKING is enabled and the AGC signal drops below the tracing threshold (THRS) for more than a preset time. The delay time is set by the SEARCH DELAY parameter under the MODE/SETUP display. The units are in seconds. The typical SEARCH DELAY setting is 30 seconds. A setting of 0 disables the automatic search initiation.

3.5.6. AUTO THRESHOLD SETTINGS

When AUTO THRESHOLD is enabled, the TAC-92C automatically re- sets the AGC tracking threshold whenever the antenna is commanded to move to a new position by a numeric keyboard entry (SAT, EL, AZ commands). The new AGC threshold is set to the average signal level input (approximate background noise level) plus the AUTO THRES offset. The AUTO THRES parameter is adjusted under the MODE/SETUP display and should be set to approximately 1/3 the ON satellite to OFF satellite signal level difference. This will usually be around 100 counts (3 dB) for a typical antenna configuration. A setting of 0 disables the AUTO THRESHOLD feature. To quickly re- evaluate the tracking threshold with AUTO THRESHOLD enabled; move the antenna a few degrees up in elevation so there is no signal. Now key in the original elevation setting. This will force the TAC-92C to re-set the tracking threshold as it moves the antenna back to the satellite signal position.

3.5.7. STEP DELAY

The speed of antenna movements during search operations is adjusted with the STEP DELAY parameter under the MODE/SETUP display. The STEP DELAY is the time the TAC-92C waits between sending incremental movement commands to the PCU. Larger numbers result in slower antenna movements through the search pattern. The units are in cycle updates of 1/40 second. The settings is 2 for all 94 and 95 series pedestals. No other settings should be used.

3.6. AUTO POLARIZATION OPERATION

A feature of the TAC-92C is auto polarization adjustment. The TAC-92C automatically calculates the required polarization angle for the feed every 2 seconds based on ship's Latitude, Longitude and the Satellite Longitude. If the feed is not properly oriented, the TAC-92C will send a command to the PCU to adjust the feed. The system will function with 24V DC motor driven feeds, 5V servo drive probes and combination Linear / Circular (HCDC) feeds. The following section describes the alignment and operation of various feed types.

3.6.1. 24V DC POLANG ALIGNMENT

1. Select the POL TYPE parameter under the MODE/SETUP display and change the POL type setting to 9 (8+1). Press ANTENNA key 3 times to select the POL display. Rotate the feed using the UP and DOWN keys so that the feed is in the CENTER of its range and the ports are aligned Horizontal and Vertical. This is the Center Reference position.

2. Verify the POL display reads 120 +/-10. Adjust the potentiometer on the feed if necessary to bring this reading into spec (2.5v for xx96/xx97 systems). Note the display reading as the Center Reference value.

3. Rotate the feed CW 90 degrees viewed looking towards the satellite (CCW looking into the dish) by pressing the UP key. The display reading must have INCREASED. Record the change in the POL display reading from the Center Reference value. The change must be 60 or 90. If it is any other value, there is a problem with the polang potentiometer scale settings and should be corrected for proper operation.

4. Rotate the feed CCW 180 degrees or as far as it will travel, viewed looking towards the satellite (CW looking into the dish). If the feed allows full 180-degree rotation, the POL display will show 60 or 90 counts below the center reference value. Enter this value as the POL OFFSET parameter and the value recorded in step 3 as the POL SCALE parameter under the MODE/SETUP window.

NOTE:	If the feed does not allow a full 180 degree rotation to the CCW position, (CW looking into the dish), move the feed as far as it will go and readjust the polang potentiometer setting so the POL display shows 30-32. Move the feed to the center position and note the new reading. Calculate the POL OFFSET as the Center minus POLSCALE value and enter in the TAC-92C parameter list.

5. Align the feed for optimum polarization with the UP/DOWN keys and note the POL display. Select the POL TYPE parameter again and change the POL TYPE to 72 (64+8) to enable auto pol. If the POL position is not optimum using auto pol, trim the POL position up or down by adjusting the POL OFFSET parameter.

3.6.2. 5V SERVO POLANG ALIGNMENT

1. Select the POL TYPE parameter under the MODE/SETUP display and change the POL type setting to 48 (16+32). Press ANTENNA key 3 times to select the POL display. Rotate the feed probe using numeric entries in the range of 75 to 100 so that the probe is aligned with the horizontal metal patches in the feed. Note the POL display reading as the CCW value.

2. Rotate the probe CW 90 degrees and align with the vertical metal patches (use numeric entries around 180 to accomplish this). Note the POL display reading as the CENTER value.

3. Enter the CCW value in the 5V OFFSET parameter and the difference of CENTER-CCW value in the 5V SCALE parameter under the MODE/SETUP display.

4. Verify probe operation by setting the POL TYPE parameter to 4 then select the POL display in the ANTENNA window and cycle the NS/EW key. The probe should move from the horizontal alignment position to 45, 90 and 135 degrees clockwise then return.

5. For linear receive only feeds that do not have a 24 Volt DC Motor attached, enter the CCW and CENTER-CCW values in the POL OFFSET and POL SCALE parameters also. Select the POL TYPE parameter and change the POL TYPE to 112 (64+32+16) to enable auto pol with a numeric display. Select the POL display in the ANTENNA window. Use the NS/EW key to toggle receive polarity. If the POL position is not optimum using auto pol, trim the POL position up or down by adjusting the POL OFFSET parameter. Change the POL type to 80 (64+16) for normal operation.

3.6.3. LINEAR / CIRCULAR (HCDC) POLANG ALIGNMENT

1. Perform steps 1-4 of the 24V Polang Alignment.

2. Position the Ku Band LNB at 2 o'clock (facing the feed). Perform steps 1-4 of the 5V Servo Polang Alignment.

Select the POL TYPE parameter and change the POL TYPE to 68 (64+4), set the TX POLARITY to 0. Select the POL display in the ANTENNA window. Use the NS/EW key to change feed polarity (HORZ, LHCP, VERT, RHCP) as required.

4. Select POL TYPE 13 (8+4+1) to manually adjust and monitor POL position. Select POL TYPE 72 (64+8+4) to enable auto polarization. If the POL position is not optimum using auto pol, trim the POL position up or down by adjusting the POL OFFSET parameter. Change the POL TYPE to 68 (64+4) for normal operation.

3.6.4. TX POLARITY SETUP

To prevent inadvertent switching of the transmit polarity, the user can lock out NS/EW toggle feature and force the transmit polarity to be fixed horizontal or vertical with the TX POLARITY parameter under the MODE/SETUP display. With the feed in the center of its polarization adjustment range, observe the transmit port polarity (vector across the short dimension of the transmit wave-guide).

If the transmit polarity in the center of the travel range is vertical, use the following entries:

2 Vertical Transmit Polarity
4 Horizontal Transmit Polarity

If the Transmit polarity in the center of the travel range is horizontal, use the following entries:

2 Horizontal Transmit Polarity
4 Vertical Transmit Polarity

3.7. RADIATION HAZZARD and BLOCKAGE MAPPING

TAC-92C can be programmed with ship relative azimuth limits to enhance operation where there are radiation hazards or known blockage regions. Tracking and auto search are suspended when the antenna is pointed within this region to speed signal re-acquisition when the ship turns and the antenna comes out of signal blockage. The TAC-92C provides a contact closure to ground on the AUX SW terminal (J2-11) when the antenna is pointed within the blockage region to provide switching information to a multiple antenna arbitrator or to automatically suppress RF transmission to reduce radiation hazards. The contact closure is a transistor switch with a current sinking capability of 200 mA and is activated when the antenna is in the blockage region, or the system is searching, targeting or unwrapping. The lower and upper limits are user programmable and stored in NVRAM within the TAC-92C parameter list.

Programming instructions:

1. Determine the Relative AZ limits that cause signal blockage or a radiation hazard by monitoring the REL display readings or by graphing the expected blockage pattern. The Relative angles are with respect to the Pedestal reference, which is normally pointed at the bow (360). In a dual cable-wrap antenna system, one of the antennas may be pointed aft so its relative limits will be with respect to aft. The relative angles must be in the range of 0 to 360 degrees.

2. Convert the relative readings to limit values by multiplying by 10. Enter the lower and upper limits (CW reference) in the TAC-92C by selecting the AZ LIMIT1 and AZ LIMIT2 parameters under the MODE display. If the MODE display will not advance beyond the REMOTE AUX display, enter 7979 and press ENTER. Enter the beginning of the blockage region as AZ LIMIT 1 and the end of the region (clockwise direction) as AZ LIMIT 2.

EXAMPLE:
A drill ship has two antennas mounted in the front of the ship with a derrick blocking the antenna's view to the rear. The Port antenna is mounted referenced to the bow and is blocked from 160 to 175 degrees. The Starboard antenna is mounted reference to the stern and is blocked from 355 to 15 degrees relative to the stern.

The limits for the port antenna are:	The limits for the starboard antenna are:
AZ LIMIT 1 = 160 x 10 = 1600	AZ LIMIT 1 = 355 x 10 = 3550
AZ LIMIT 2 = 175 x 10 = 1750	AZ LIMIT 2 = 15 x 10 = 0150

Note: The AZ LIMITS of the starboard antenna are entered as 355 to 15 degrees. This defines a blockage zone of 20 degrees. If the limits were entered as 15 to 355 degrees, the blockage zone would be 340 degrees.

3.8. FUNCTION SUMMARY

The following tables are a comprehensive summary of the information displayed in each of the four function modes.

3.8.1. SHIP DISPLAYS

LAT	Ships Latitude. Displayed in whole degrees. Can be entered to tenths of a degree. Used to calculate elevation and azimuth from satellite position. Can be updated automatically with the addition of a NMEA interface.
LON	Ships Longitude. Displayed in whole degrees. Can be entered to tenths of a degree. Used to calculate elevation and azimuth from satellite position. Can be updated automatically with the addition of a NMEA interface.
HDG	Ships Heading. Updated automatically from the gyro compass interface or pedestal Flux gate compass. Used for azimuth stabilization and to calculate antenna position.

3.8.2. SATELLITE DISPLAYS

SAT	Satellite longitude. Displayed in whole degrees. Can be entered to tenths of a degree. Used to calculate antenna elevation, azimuth and polang pointing angles. Tracking threshold is re-set and the antenna is moved automatically when entry is changed.
THRS	Signal level threshold. SEARCH2 is started automatically when signal is below threshold for SEARCH DELAY period. SEARCH1 and SEARCH2 are terminated automatically when signal level exceeds threshold. System type 16 disables tracking when the signal level is below threshold.
RCVR	Receiver tuning or selection. NS/EW Entry selects one of 4 AGC sources. Numeric entry selects channel number or tuning frequency in MHz.
AGC	Signal AGC level. Diagnostic display of signal level. Range is 0-4095 for 0-5v input. Cannot be selected for entry.

3.8.3. ANTENNA DISPLAYS

AZ — True azimuth position. Displayed in tenths of a degree. Display is sum of ships heading and antenna relative position reduced to 0-360 degrees. Position can be incremented or decremented with UP/DOWN keys. Can be targeted to an absolute or relative position by numeric entry. NS/EW key selects relative target mode. Searching light flashes when targeting. Display can be corrected up or down with AZTRIM entry under MODE/SETUP display.

EL — Elevation position. Displayed in tenths of a degree. Position can be incremented and decremented with up/down keys. Can be targeted to an absolute position by numeric entry. Searching light flashes when targeting. Display can be corrected up or down with ELTRIM entry under MODE/SETUP display.

REL — Antenna position relative to the bow of the ship. Displayed to tenths of a degree. Range of display is 90-630, with 360 indicating antenna is pointed at the bow. Used to indicate when the antenna is near an unwrap point and if the antenna is pointing at any large structures on the ship. Diagnostic display only, cannot be selected for entry.

POL — Polang (Polarization Angle) Position. Appears in place of REL display in entry mode. NS/EW key selects HORZ, LHCP, VERT, RHCP preset or calculated probe/feed positions. UP/DOWN keys adjust Polarization angle clockwise or counter- clockwise for fine-tuning. Display is numeric value of polang position or ALPHA display of HORZ, LHCP, VERT, RHCP polarization.

AGC — Signal AGC level. Provided as a diagnostic display for manually peaking AZ, EL or POL for best signal level. Cannot be selected for entry.

3.8.4. MODE DISPLAYS

The mode displays are separated into 3 groups: CONTROL, STATUS and SETUP. Normally only the CONTROL and STATUS groups are available. To gain access to the SETUP displays, you must select the REMOTE AUX diagnostic display and press 7979 enter. This procedure only needs to be performed once to allow access to the SETUP displays unless power is removed or the TAC is reset.

MODE CONTROL DISPLAYS

TRACKING — Used to turn tracking mode ON and OFF and select operating bands. UP key toggles tracking state. DOWN key toggles band from C to Ku. Tracking can be turned on and off directly via the AUX1 key without selecting the MODE/CONTROL/TRACKING display.

SEARCH1 — Used to manually turn the one axis azimuth search ON and OFF. Up/down keys select searching state. SEARCH1 is automatically initiated when a new satellite longitude is entered and SEARCH1 priority is enabled. AGC above threshold automatically terminates SEARCH. AUX1 manually terminates SEARCH.

SEARCH2 — Used to manually turn two axis spiral search ON and OFF. Up/down keys select search state. SEARCH2 is automatically initiated when signal drops below threshold for SEARCH DELAY time. AGC above threshold automatically terminates SEARCH. AUX1 Manually terminates SEARCH.

MODE STATUS DISPLAYS

ERROR — Display of serial communication error count and error status code. Pressing UP clears error count, status code and Error LED. Occasional communication error counts are normal. More than 10 per minute indicate a problem that needs attention. Error status code is the sum of the following errors.

128	Satellite out of range
16	Conscan disk sensor error
8	Pedestal function error
4	Remote serial error
2	Wrong Synchro Converter type
1	Gyro Read Error

REMOTE AUX

Diagnostic display of Remote auxiliary read. Typically used for Temperature or EIRP readings.

Users are locked out of remaining displays unless access code 7979 is entered.

MODE SETUP DISPLAYS

ELTRIM	Elevation trim offset. Adjusts display to correct for antenna alignment errors or imbalances in the antenna system. Increase number to increase display.
AZTRIM	Azimuth trim offset. Used to correct for Magnetic Variation when using internal flux gate compass. Positive numbers indicate East Variation (Western US); Negative numbers indicate West Variation (Eastern US). Offsets true azimuth display to compensate for installation alignment when using external gyro reference. Does not affect REL azimuth reading. Increase number to increase display.
AUTO THRES	Sets offset of AGC tracking threshold above the average noise floor. Units are in A/D counts, approximately 30 counts/dB (default setting is 128). A setting of 0 disables auto threshold.
ELSTEPSIZE	Sets elevation step track trial steps or Conscan sensitivity. Units are in pedestal step resolution. Range is 0-255 steps. Zero steps disables elevation step track. Must be entered twice for Conscan settings.
AZ STEP SIZE	Sets azimuth step track trial steps or Conscan sensitivity. Units are in pedestal step resolution. Range is 1-255 steps. Must be entered twice for Conscan settings.
STEP INTEGRAL	Sets the integration time for each step track trial move. Units are in cycle updates (1/40 seconds). Range is 0-255 cycles. Recommended integration time is 1-5 seconds (40-200 cycles). A setting of 0 disables Step Track and enables Conscan.
SEARCH INC	Sets size of search pattern increment. Units are in pedestal step resolution (1/24 degree for xx96/97). The suggested setting is equal to 1/2 the 3dB beamwidth. Range is 0-255 steps.
SEARCH LIMIT	Sets the overall peak to peak size of the search pattern. Units are in pedestal step resolution. Range is 0-255 steps. Default setting is 100 steps or 4.2 degrees.

SEARCH DELAY Sets the time-out for automatic initiation of a search operation when the signal level drops below threshold. Units are in seconds. Range is 0-255 seconds. A setting of 0 disables automatic search initiation.

STEP DELAY Inter-step delay for search movements. Controls how fast the antenna is moved by setting the number of cycle updates between antenna steps. Heavy antenna systems need larger delays (slower movements). Each cycle update is 1/40 second. Range is 2-255.

SYSTEM TYPE Selects system options according to the following table. Add together all the desired options to determine the proper entry.

64	Enables LNB voltage output
32	Display Relative AZ during AZ entry
16	Disable Tracking below threshold
8	Enable NMEA / M&C interface
4	Auto SAT load at RESET and search failures
2	SEARCH1 priority for auto search
1	Reserved

GYRO TYPE Selects the type of gyro compass interface for ship turning compensation. 0 indicates Internal Magnetic reference. 2 indicates S-B-S gyro interface. 1 to 360 indicates a 1:1, 36:1, 90:1 or 360:1 Synchro gyro interface. 362 indicates 360:1 synchro using 12bit S/D interface.

POLANG TYPE Selects the Polang options installed according to the following table. Add together all the desired options to determine the proper POLANG TYPE entry.

128	Indicates 2 quadrant LHCP/RHCP display
64	Indicates Auto Pol Enabled
32	Indicates 5v numeric Polang display
16	Indicates 5v polang skew (not mode select)
8	Indicates remote potentiometer read
4	Indicates 4 quadrant HLVR presets
2	Reserved
1	Indicates 24v manual polang drive
0	Indicates alpha POLANG display (HORZ, LHCP.VERT, RHCP)

POL OFFSET — CCW 24V Polang pot position reference.

POL SCALE — 90 degree 24V Polang pot motion scale factor

AZ LIMIT 1 — Lower Relative AZ limit for pattern blockage mapping.

AZ LIMIT 2 — Upper Relative AZ limit for pattern blockage mapping

5V OFFSET — CCW 5v Polang servo position reference.

5V SCALE — 90 degree 5V Polang servo motion scale factor

TX Polarity — Selects TX polarity override to disable NS/EW polang selection and coordinate TX polarities.

- 0 Indicates no TX polarity override
- 2 Indicates Vertical desired TX polarity
- 4 Indicates Horizontal desired TX polarity

SAVE NEW PARAMETERS

Press UP arrow and ENTER to save any recent changes in NVRAM for permanent storage. If changes are made and not stored, they will still be effective but will be lost when power is removed or the TAC-92C is RESET. Press AUX2 and CLEAR simultaneously to access this function directly from any other mode.

3.8.5. REMOTE PCU CONTROL

These commands are accessed under the MODE menu by pressing the ENTER key several times after the SAVE PARAMETERS display.

REMOTE COMP

Press UP arrow and ENTER to initiate a remote flux gate compensation. Display will show PLEASE WAIT while operation is in progress and either COMP COMPLETE or COMP ERROR when finished.

REMOTE TILT

Allows easy access to the tilt adjustment commands. Press UP arrow and ENTER to select Tilt adjustment Test mode. Press 5 to center the tilt sensor adjustment. Press 4/6 to adjust the tilt left and right. Press 2/8 to adjust the tilt forward and back. Press DOWN arrow and ENTER to restore normal system operation.

REMOTE PARAMETERS

Allows easy access to the save remote parameters command sequence. Press UP arrow and ENTER to save the parameters in the remote PCU's NVRAM.

4. MAINTENANCE

This section describes several adjustments to the system that can be accomplished by shipboard personnel.

4.1. DEFAULT SETUP PARAMETERS - xx94 xx95

The following table shows the factory default parameters for the TAC-92C interfaced to a DBS style PCU:

PARAMETER	C BAND	Ku Step	Ku Conscan
EL TRIM	0	0	0
AZ TRIM	0	0	0
AUTO THRES	128	128	128
EL STEP SIZE	3	2	3
AZ STEP SIZE	3	2	3
STEP INTEGRAL	60	60	0
SEARCH INC	10	5	5
SEARCH LIMIT	200	100	100
SEARCH DELAY	30	30	30
STEP DELAY	2	2	2
SYSTEM TYPE	8	8	8
GYRO TYPE	1, 2, 36, 360, or 362		
POL TYPE	9, 68 or 72	9, 68 or 72	9 or 72
POL OFFSET	60/30	30	30
POL SCALE	60/90	90	90
AZ LIMIT 1	0	0	0
AZ LIMIT 2	0	0	0
5V OFFSET	0	0	0
5V SCALE	0	0	0
TX POLARITY	0/2	0/2	0/2

4.2. TROUBLE SHOOTING GUIDE

The following appendices will aid in diagnosing the most common problems found during installation or operation. Section 5 contains a complete set of schematic and assembly drawings to aid in diagnosing any type of failure.

4.2.1. TAC-92C DISPLAYS "REMOTE NOT RESPONDING"

Either the RS422 communications link with the antenna has failed or the pedestal control unit has failed. For Conscan equipped systems observe if the disk sensor light on the Conscan PC Board is flashing. A flashing light indicates the communication from the PCU to the ACU is functioning.

Verify the operation of the PCU if possible by using a handheld ASCII terminal connected to the interface cable at the pedestal multiplexer.

Verify the RS422 signal levels and connections. Refer to drawing 116040 "Unlimited Azimuth Interconnect Diagram" at the end of this manual for details on the signal levels and their flow directions.

Using a spectrum analyzer observe the 1.1 and 1.5 MHz Pedestal M&C carrier signals on the RX IF cable. Hold the TAC-92C RESET key down and observe the 1.5 MHz signal is at a steady high frequency of 1.525 MHz. Release the RESET key and the signal should occasionally be seen switching to 1.475 MHz. This indicates the Base Multiplexer is transmitting to the PCU.

4.2.2. HEADING DISPLAYS INCRORRECTLY

Ships' heading on the ACU does not follow the ship movement or does not display the same heading as the bridge. Determine the type of gyrocompass that is used on the ship then proceed to the step that lists the correct type.

1) 1:1 SYNCHRO

Note: The standard ACU is set up for either 360:1 or step-by- step. To operate with a 1:1 synchro compass requires a special order from the factory.

Observe the ship's heading display on the ACU. Compare its movement with that of the ship. If it does not move at all go to step A. If it moves but in the wrong direction (even if it does not display the correct heading) go to step B. If it moves in the correct direction but does not display the correct heading go to step C. The gyrocompass connects to the Terminal Mounting Strip on TB7- R1, R2, S1, S2 and S3.

A. The Ships Heading display does not change when the ship changes direction. Using a multimeter read between R1 and R2. It should read 115 VAC. If it does not then a fuse is blown at the gyro repeater or there is an open between the repeater and the ACU. Read between S1 and S2, S2 and S3 and finally S3 and S1. They should all read between 0 and 90 VAC. The voltage level will change as the ship turns. If one reading is very close to 0 volts wait until the ship has made a major change in heading and then check voltage again. If the reading is still very low there is a problem in the line between the gyro repeater and the ACU or a problem in the gyro repeater itself.

B. The display changes in the direction opposite of the movement of the ship. Switch the secondary leads S1 and S2. Caution: there is 90 VAC between them! Verify that when the ship changes direction the display shows change in the same direction. If the direction is correct but the heading is incorrect go to step C.

C The ship's heading display does not indicate the correct heading. If the display is off by 60, 180 or 300 degrees, this indicates that R1 and R2 are reversed. Reverse R1 and R2 and recheck the heading display. If the display is off by 120 or 240 degrees, this indicates that S1, S2 and S3 are in the right order but off by one place. Note their positions and carefully move the connections one position over (S1 to S2, S2 to S3, and S3 to S1). This action will offset the display by 120 degrees. Check if the display now reads correctly. If not move all three leads one more time in the same direction as last time. Verify that the ship's heading is correct.

2) STEP-BY-STEP

A Verify that the GYRO TYPE setting in the MODE display is set to 2 for Step-By-Step operation.

B. Observe the ERROR LED on the FRONT panel. IF it is illuminated, this indicates that an error was detected in the Step-By-Step input. Press RESET on the front panel. If the ERROR LED illuminates again, the problem is in the 4 connections to A, B, C and COMMON. Measure the voltage between COMMON and A, B, and C. Each reading should either be near zero or 35 to 70 volts. If all three are zero, check the repeater fuses. If some read negative and some read positive or if one reads an intermediate values the COMMON terminal is not properly connected.

C. If the ship's heading display is different from the actual heading, select the HDG function in the SHIP display mode by pressing the SHIP key 4 times. Key in the correct ships heading using the numeric keys and press ENTER. Note the reading. After the ship has turned more than one degree, compare the new heading with the reading on the display, if it has moved in the opposite direction then A, B and C from the gyro compass are not wired correctly. To reverse the direction of the display, reverse connections A and B. Reset the ACU, put in the correct ship's heading and verify that the display reading follows the ship's heading.

3) 360:1 Synchro

Observe the ship's heading display on the ACU. Compare its movement with that of the ship. If it does not move at all go to step A. If it moves but in the wrong direction (even if it does not display the correct heading) go to step B. If it moves in the correct direction but does not display the correct heading go to step C. The gyrocompass connects to the Terminal Mounting Strip on TB7- R1, R2, S1, S2 and S3.

A. The Ships Heading display does not change when the ship changes direction. Using a multimeter read between R1 and R2. It should read 115 VAC. If it does not then a fuse is blown at the gyro repeater or there is an open between the repeater and the ACU. Read between S1 and S2, S2 and S3 and finally S3 and S1. They should all read between 0 and 90 VAC. The voltage level will change as the ship turns. If one reading is very close to 0 volts wait until the ship has made a major change in heading and then check voltage again. If the reading is still very low there is a problem in the line between the gyro repeater and the ACU or a problem in the gyro repeater itself.

B. The display changes in the direction opposite of the movement of the ship. Switch the secondary leads S1 and S2. Caution: there is 90 VAC between them! Verify that when the ship changes direction the display shows change in the same direction. If the direction is correct but the heading is incorrect go to step C.

C. If the ship's heading is different than the bridge, select the HDG function in the SHIP display mode by pressing the SHIP key 4 times. Key in the correct heading using the numeric keys and press ENTER.

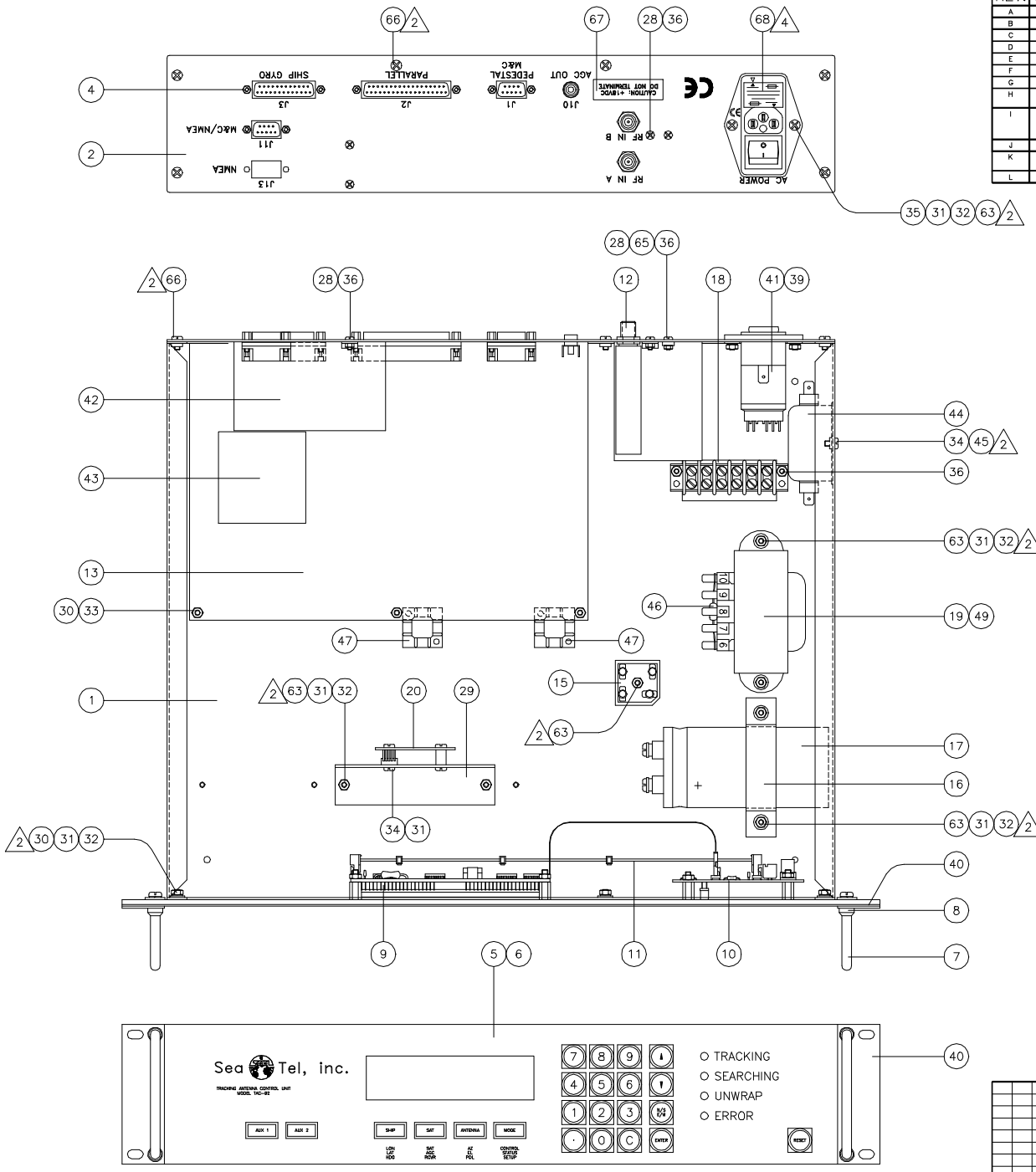
5. DRAWINGS

The drawings listed below are provided as part of this manual. Refer to the Pedestal wiring diagrams supplied with the system for details on the antenna wiring.

To view the drawings listed below from Acrobat Reader, click on the bookmark index to the left. To return to this page, use the << key from within Acrobat Reader or the BACK key if you are viewing from a web browser.

Drawing	Title
113105	TAC-92M ACU General Assembly
113106	TAC-92M Chassis Wiring Diagram
112512	Front Panel Interconnect PCB Schematic
113275	ACU PCB Assembly TAC-92
112226	TAC-92 ACU PCB Schematic
114836	12 Bit S/D Converter PCB Assembly
114648	12 Bit S/D Converter PCB Schematic
113747	Aux Serial Port Adapter PCB Assembly
113744	Aux Serial Port Adapter PCB Schematic
113037	AGC Receiver Interface PCB Assembly
113036	AGC Receiver Interface PCB Schematic
112019	70 MHz SCPC Detector PCB Assembly
112018	70 MHz SCPC Detector PCB Schematic
116676	ACU Terminal Mounting Strip Assembly
116685	ACU Terminal Mounting Strip Schematic
112791	Interface Cable Diagram GPS to ACU
116298	Interface Cable Assembly ACU to MUX
116670	RS-232 Cable Assembly
110762	RS 232 Interconnect Cable Diagram
116040	Unlimited Azimuth Interconnect Diagram
114493	TAC-92/TAC-92C User Interface Description

REV.	ECO#	DATE	DESCRIPTION	BY
A		24MAY94	ITEM 19 WS FD8-28; ADD'D ITEMS 20 & 29; DEL. TERMINAL MOUNTING STRIP.	
B		21JUN95	ITEMS 4 & 40 ADD'D.	
C		28AUG96	ADD'D LINE FILTER, AUX SERIAL. PROGRAM INFO.	
D		3APR97	ITEMS 47 & 48 ADD'D.	MAB
E		30MAY97	ITEM 46 WS P/N 110784-105.	MAB
F		3AUG97	ITEM 17 WS P/N 109356-1; ITEM 49 ADD'D.	MAB
G		16MAR98	ITEM 60 & NOTE 2 ADD'D; ITEM 2 WS P/N 112661.	MAB
H		6APR98	ITEM 39 WS P/N's 109698-1 OR 109698-4; EXPANDED ITEM 42; TACM-2XX ADD'D FOR 9695; PROG. INFO ADD'D FOR -3 & -4; ITEM 60 P/N 113910 ADD'D; NOTE 2 DLT'D.	MAB
I		17JUN98	REDRAWN IN CAD, REV. G FILED OBSOLETE: ITEM 21 WS P/N 112587; ITEM 27 WS P/N 113134-1; ITEM 28 WS P/N 110928; ITEM 43 ADD'D; ITEM 45 WS QTY. 1; ITEMS 61-66 ADD'D; SHT. 2 ADD'D; TITLE WS TAC-92M...; HARDWARE QTY's ADD'D, NOTE 2 WS DESCRIPTION OF SINGLE & DUAL AUX. SERIAL PORT OPTIONS, NOTE 3 ADD'D.	MAB
J	1663	9DEC98	ITEMS 67, 68 & NOTE 4 ADD'D.	MAB
K	1614	8JAN99	ITEM 28 WS QTY 2; ITEM 30 WS QTY 6; ITEM 31 WS QTY 14; ITEM 32 WS QTY 12; ITEM 34 WS QTY 4; ITEM 36 WS QTY 4, 6-32 x 3/8"; ITEM 45 WS P/N 114815-6; ITEM 63 WS QTY 10, ITEM 66 WS QTY 8.	RMC
L	1881	3MAR99	LM 1 OF 2 ITEM 2 REF 115692 WS 112411.	JK



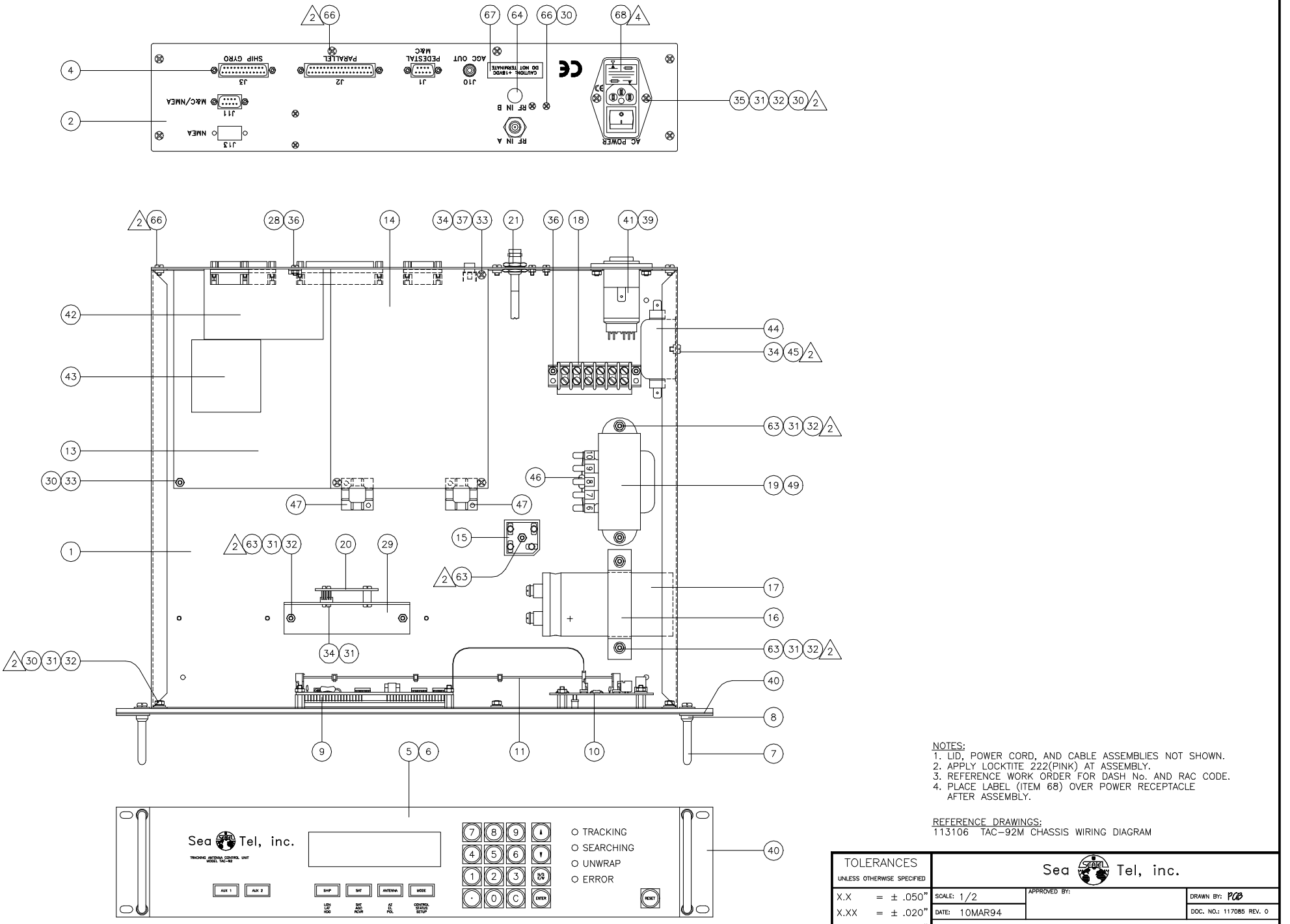
NOTES:
1. LID, POWER CORD, AND CABLE ASSEMBLIES NOT SHOWN.
2. APPLY LOCKTITE 222(PINK) AT ASSEMBLY.
3. REFERENCE WORK ORDER FOR DASH No. AND RAC CODE.
4. PLACE LABEL (ITEM 68) OVER POWER RECEPTACLE AFTER ASSEMBLY.

REFERENCE DRAWINGS:
113106 TAC-92M CHASSIS WIRING DIAGRAM

TOLERANCES UNLESS OTHERWISE SPECIFIED	Sea Tel, inc.		
X.X = ± .050"	SCALE: 1/2	APPROVED BY:	DRAWN BY: PCB
X.XX = ± .020"	DATE: 10MAR94		DOC. NO.: 117085 REV. 0
X.XXX = ± .005"	DAC-97 BELOW DECKS INTERFACE GENERAL ASSEMBLY		
ANGLES = ± 30'	-1 VIDEO DETECTOR -3 VIDEO + 2ND SERIAL	SHT. 1 OF 2	SIZE C / DRAWING NUMBER 113105-L
3rd ANGLE PROJECTION			

K	2	K	2
L	1	L	1
REV.	SHT.	REV.	LM

REV STATUS



NOTES:
1. LID, POWER CORD, AND CABLE ASSEMBLIES NOT SHOWN.
2. APPLY LOCKTITE 222(PINK) AT ASSEMBLY.
3. REFERENCE WORK ORDER FOR DASH No. AND RAC CODE.
4. PLACE LABEL (ITEM 68) OVER POWER RECEPTACLE AFTER ASSEMBLY.

REFERENCE DRAWINGS:
113106 TAC-92M CHASSIS WIRING DIAGRAM

TOLERANCES UNLESS OTHERWISE SPECIFIED	Sea Tel, inc.		
X.X = ± .050"	SCALE: 1/2	APPROVED BY:	DRAWN BY: POB
X.XX = ± .020"	DATE: 10MAR94		DOC. NO.: 117085 REV. 0
X.XXX = ± .005"	DAC-97 BELOW DECKS INTERFACE GENERAL ASSEMBLY		
ANGLES = ± 30'	-2 SCPC DETECTOR -4 SCPC + 2ND SERIAL SHT. 2	SIZE C	DRAWING NUMBER 113105-K
3rd ANGLE PROJECTION			

ITEM	QTY	SEA TEL PART NO.	DRW SZ	DESCRIPTION	VALUE	REFERENCE/NOTES
40	2	113912	A	PANEL GUARD		REF. ITEM 5
41	1	110998-2	A	IEC POWER RECEPTACLE		REF. ITEM 24
42	1	113747	A	AUX. SERIAL PORT PCB ASS'Y		-1, -2 ASS'Y, NO CONSCAN
42	2	113747	A	AUX. SERIAL PORT PCB ASS'Y		-3, -4 ASS'Y, NO CONSCAN
42	1	113888	A	AUX. SERIAL CONSCAN ASS'Y		-1, -2 ASS'Y, WITH CONSCAN
42	1	113747	A	AUX. SERIAL PORT PCB ASS'Y		-3, -4 ASS'Y, WITH CONSCAN
42	1	113888	A	AUX. SERIAL CONSCAN ASS'Y		-3, -4 ASS'Y, WITH CONSCAN
43	1	112970	A	360:1 SYNCHRO TO SBS CONV. PCB	ASS'Y	
43	1	114836	A	12 BIT S/D CONVERTER PCB ASS'Y		USED WITH S/D OPTION
44	1	114755-1	A	AC LINE FILTER		
45	2	114819-11	A	PEM NUTS	6-32	REF. ITEM 44
46	1	110783-105	A	CAPACITOR, MYLAR	1uF, 100V	
47	2	115697	A	TIE MOUNT		
48	A/R			TIE WRAP		
49	1	116132	A	TRANSFORMER ISOLATION PAD		
50	1	110792-2	A	I.C., CMOS 6805 SERIES	MC68H705C8	(REF. 113275 ASS'Y ITEM 13)
51				PROGRAM W/LATEST VERSION OF THE	FOLLOWING, INSTALL IN U16 ITEM 13	
52					TACM-3XX	FOR 9695
53					DACM-3XX	FOR XX97 & XX96 (UNLIMITED)
54						
55	1	110792-2	A	I.C., CMOS 6805 SERIES	MC68H705C8	(REF. 113747 ASS'Y ITEM 42)
56				PROGRAM W/LATEST VERSION OF THE	FOLLOWING, INSTALL IN U1 ITEM 13	
57					ASPA-2XX	FOR NMEA/M&C (J11)
58					CONS-5XX	FOR NMEA/M&C/CONSCAN (J11)
59	1	110792-2	A	I.C., CMOS 6805 SERIES	MC68H705C8	-3, -4 ASS'Y
				PROGRAM W/	NMEA-1XX	FOR 2ND NMEA (J13)
60	1	113910	A	CABLE ASSEMBLY, AUX SERIAL		-1, -2 ASS'Y
60	1	115942	A	CABLE ASSEMBLY, DUAL AUX SERIAL		-3, -4 ASS'Y
61	1	116589-1	A	RESET LINE, SINGLE		-1, -2 ASS'Y
62	1	116589-2	A	RESET LINE, DUAL		-3, -4 ASS'Y
63	9			HEX NUT, LARGE PATTERN	6-32	-2, -4 USES QTY. 8
64	1	113152-16	A	SNAP BUTTON HOLE PLUG	3/8"	USED ON -2, -4 ONLY
65	1	112707	A	INSULATING WASHER		-1, -3 ONLY
66	6			SCREW, PAN HEAD, BLACK	6-32 X 3/8"	-2, -4 USES QTY. 8
67	1	117263	A	LABEL, CAUTION, DO NOT TERMINATE		
68	1	117151	A	LABEL, VOLTAGE CAUTION		
69						
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DAC-97 BELOW DECKS INTERFACE GEN. ASS'Y SHT. 2 DRAWING NUMBER 113105-K

ITEM	QTY	SEA TEL PART NO.	DRW SZ	DESCRIPTION	VALUE	REFERENCE/NOTES
1	1	112412	C	CHASSIS PAN MACHINING		
2	1	115709	C	ACU REAR PANEL LETTERING		REF. 115692 MACHINING
3	1	108675	B	LID MACHINING		
4	8	110941-1	A	JACK SCEW SET, RS-232		-3, -4 USES QTY. 10
5	1	112922	C	FRONT PANEL ASSEMBLY		
6	1	111829	C	FRONT PANEL FABRICATION		REF. ITEM 5
7	2	108839	A	HANDLE		REF. ITEM 5
8	4	108838	A	FERRULE		REF. ITEM 5
9	1	112373	A	DISPLAY MODULE		REF. ITEM 5
10	1	112514	B	INTERCONNECT PCB ASS'Y		REF. ITEM 5
11	1	112921	A	CABLE ASS'Y, INTERCONNECT		REF. ITEM 5
12	1	113037	B	AGC RECEIVER I/F PCB ASSEMBLY		USED ON -1, -3 ONLY
13	1	113275	B	TAC-92M/C ACU PCB ASSEMBLY		SEE ITEM 50 FOR PROG. INFO
14	1	112019-1	B	70 MHz SCPC PCB ASSEMBLY		USED ON -2, -4 ONLY
15	1	109341	A	BRIDGE RECTIFIER		
16	1	109360-1	A	CAPACITOR MOUNTING CLAMP		
17	1	109356-3	A	CAPACITOR	20,000 uF, 50V	
18	1	108845	A	SCREW TYPE TERMINAL		
19	1	109734-35	A	POWER TRANSFORMER	FD8-36	
20	1	112646	A	DC-DC CONVERTER PCB ASSEMBLY		
21	1	112587-15	A	CABLE ASSEMBLY, BNC TO RCA		USED ON -2, -4 ONLY
22	1	115300	A	CABLE ASSEMBLY, SCPC INTERFACE		USED ON -2, -4 ONLY
23	1	113133-1	A	CABLE ASS'Y, AC POWER		
24	1	114820	A	CABLE ASS'Y, LINE PWR IN, FILTERED		
25	1	113039	A	CABLE ASSEMBLY, AGC RECEIVER		USED ON -1, -3 ONLY
26	1	112918	A	CABLE ASSEMBLY, RIBBON		
27	1	113134-3	A	CABLE ASSEMBLY, POWER		
28	4			SCREW, PAN HEAD	4-40 X 1/4"	
29	1	113274	A	HEAT SINK BRACKET		
30	19			HEX, NUT, SMALL PATTERN	6-32	
31	17			WASHER, FLAT	#6	
32	16			WASHER, LOCK	#6	
33	3	111672-36	A	STANDOFF, HEX, THREADED	6-32 X 1/2"	
34	2			SCREW, PAN HEAD	6-32 X 1/4"	-2,-4 USES QTY. 5
35	2			SCREW, FLAT HEAD, BLACK	6-32 X 1/2"	
36	6			HEX, NUT	4-40	
37	3	111672-40	A	STANDOFF, HEX, THREADED	6-32 X 1"	USED ON -2, -4 ONLY
38	1	108929-2 109752-3	A A	110V POWER CORD 220V POWER CORD		
39	2	109699-2 109698-5	A A	FUSE SLOW BLOW FUSE SLOW BLOW	2 AMP 1 AMP	USED W/110 POWER CORD USED W/220 POWER CORD

-1 VIDEO DETECTOR
-2 SCPC DETECTOR
-3 VIDEO + 2ND SERIAL
-4 SCPC + 2ND SERIAL

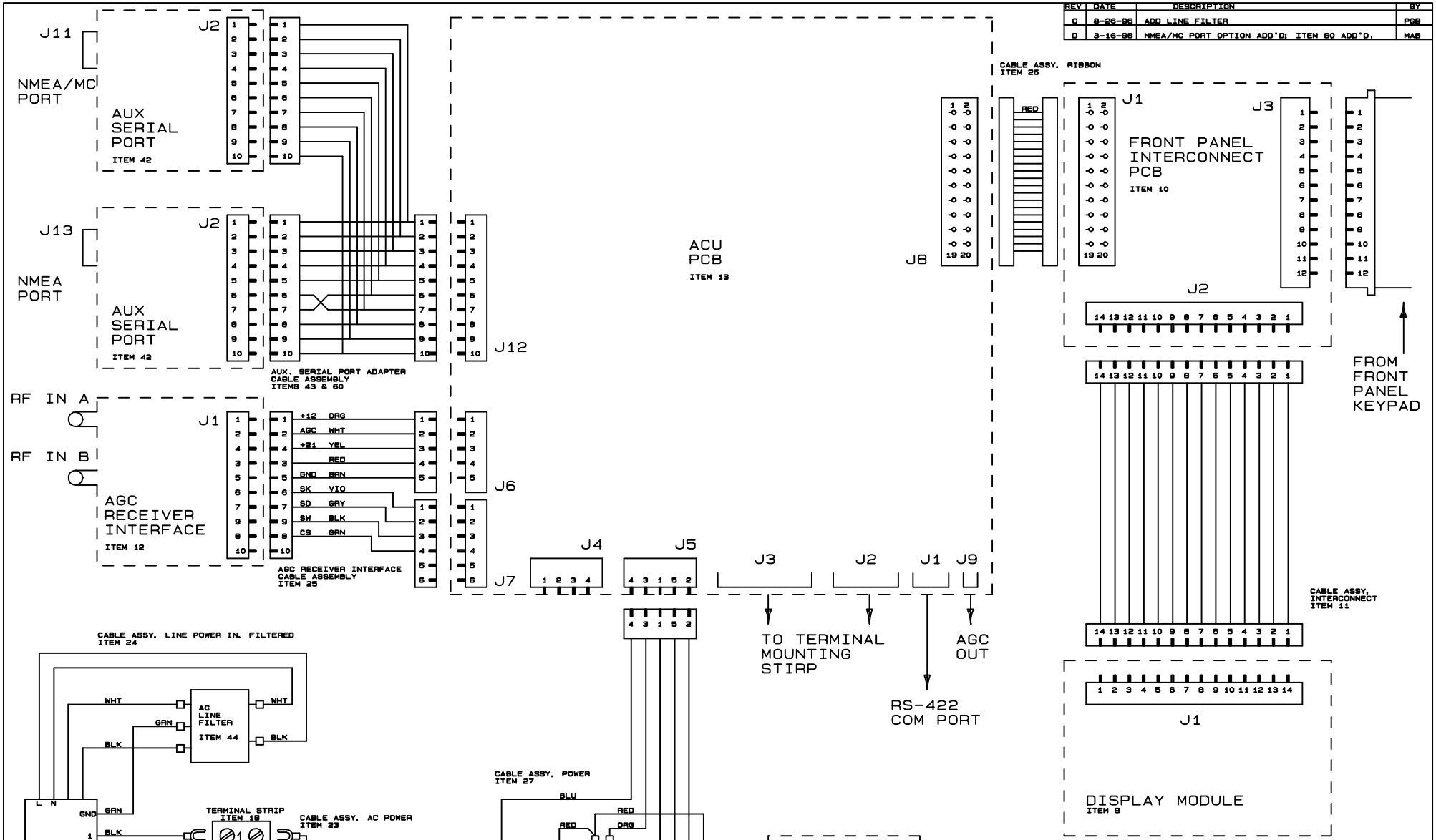
Sea Tel, inc.

SCALE: N/A | APPROVED BY: | DRAWN BY: JHD
DATE: 10MAR94 | REVISED: RMC

DAC-97 BELOW DECKS INTERFACE GENERAL ASSEMBLY

SHT. 1 OF 2 DRAWING NUMBER 113105-L

REV	DATE	DESCRIPTION	BY
C	8-26-96	ADD LINE FILTER	PGB
D	3-16-98	NMEA/MC PORT OPTION ADD'D; ITEM 60 ADD'D.	MAB



REFERENCE DRAWINGS:

113105 TAC 92M GENERAL ASSEMBLY

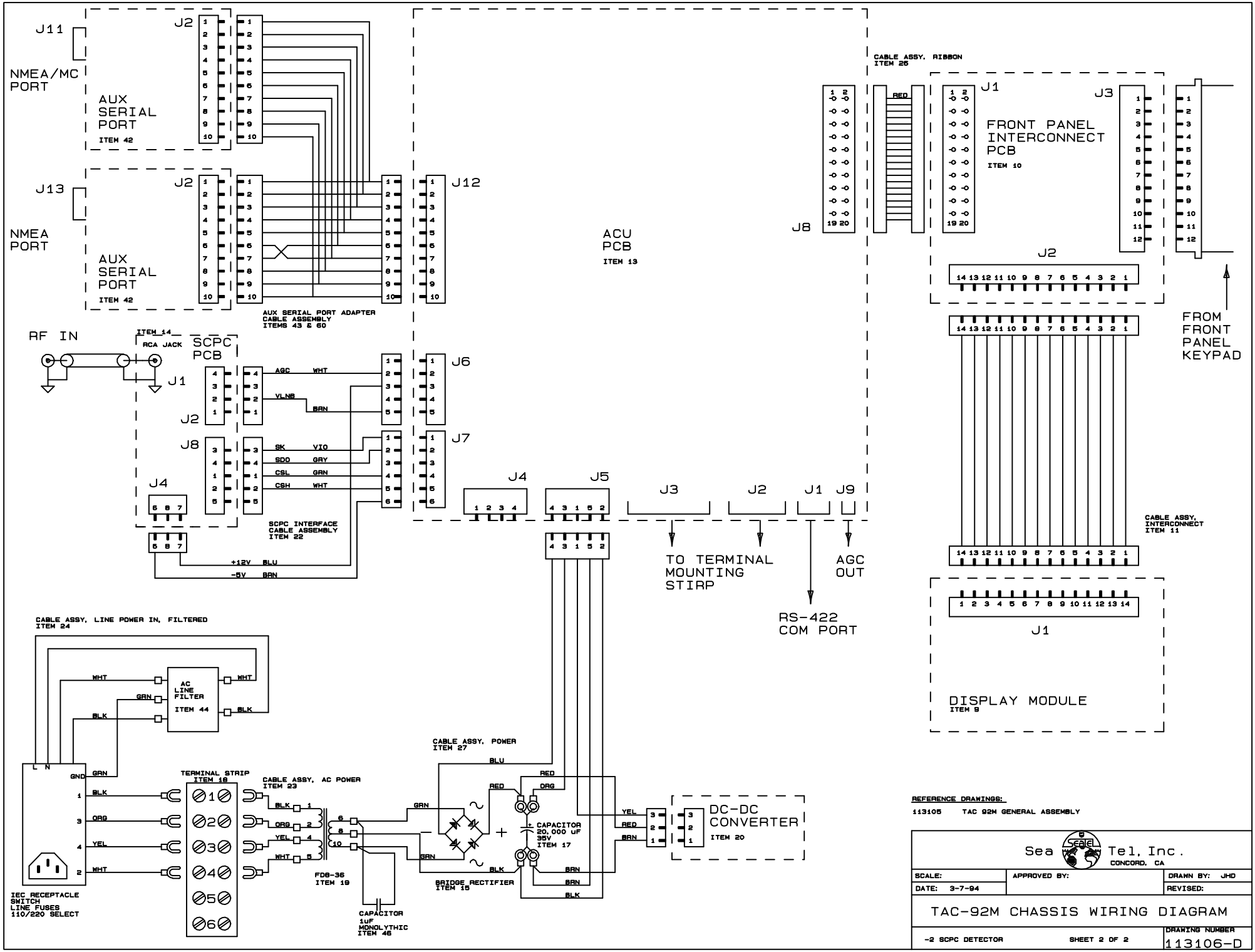
Sea Tel, Inc.
CONCORD, CA

SCALE:	APPROVED BY:	DRAWN BY: JHD
DATE: 3-7-94		REVISED:

TAC-92M CHASSIS WIRING DIAGRAM

-1 VIDEO DETECTOR SHEET 1 OF 2

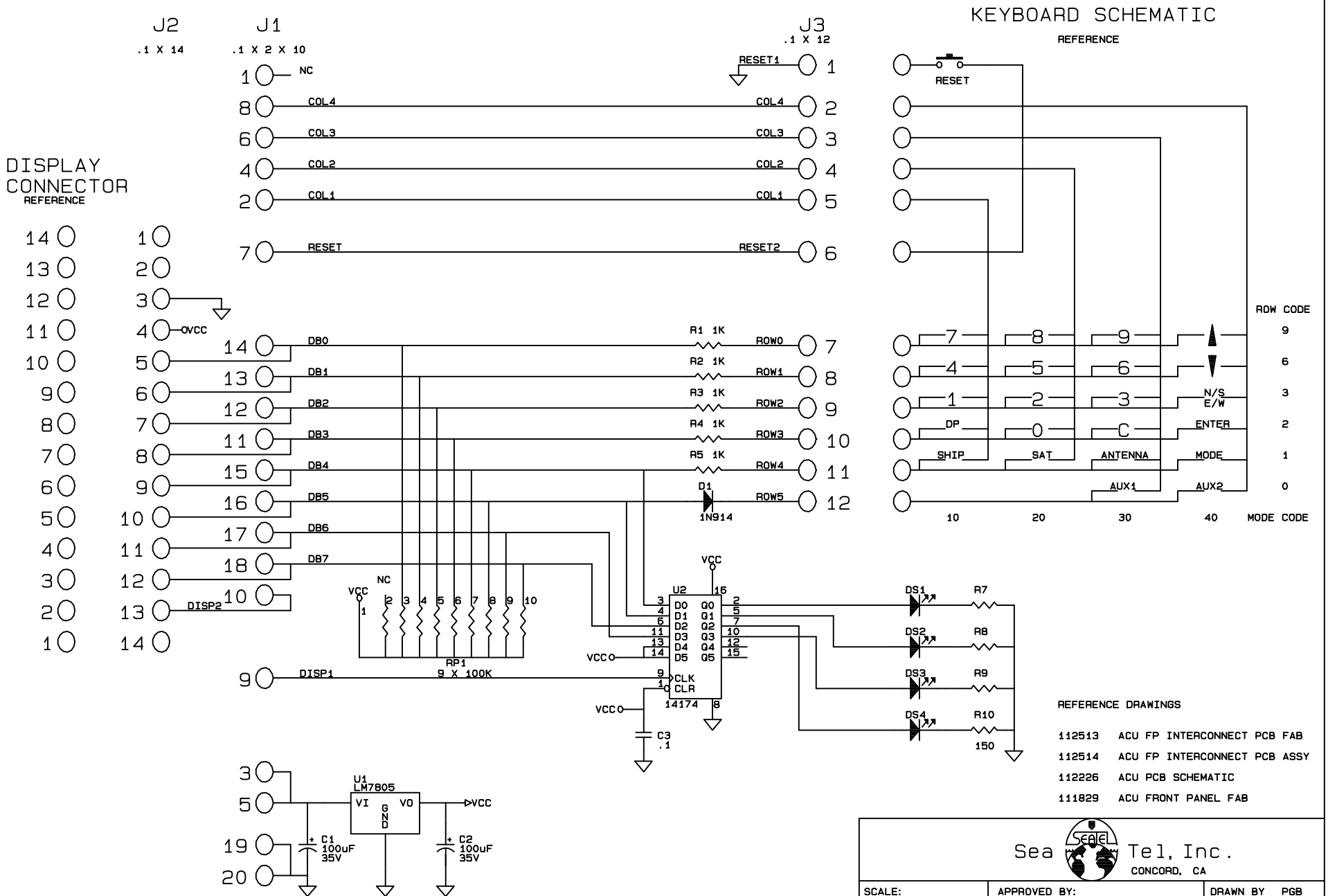
DRAWING NUMBER 113106-D



REFERENCE DRAWINGS:

113105 TAC 92M GENERAL ASSEMBLY

Sea Tel, Inc. CONCORD, CA		
SCALE:	APPROVED BY:	DRAWN BY: JHD
DATE: 3-7-94		REVISED:
TAC-92M CHASSIS WIRING DIAGRAM		
-2 SCPC DETECTOR	SHEET 2 OF 2	DRAWING NUMBER 113106-D



REFERENCE DRAWINGS

112513	ACU FP INTERCONNECT PCB FAB
112514	ACU FP INTERCONNECT PCB ASSY
112226	ACU PCB SCHEMATIC
111829	ACU FRONT PANEL FAB

REV	DATE	DESCRIPTION	APVL
C	4-1-94	CHG R6 TO D1	
B	12-21-93	CHG C1, RP1, J2 PIN NUMBERS	
A	5-18-93	UPDATE REFERENCES	

Sea Tel, Inc.
CONCORD, CA

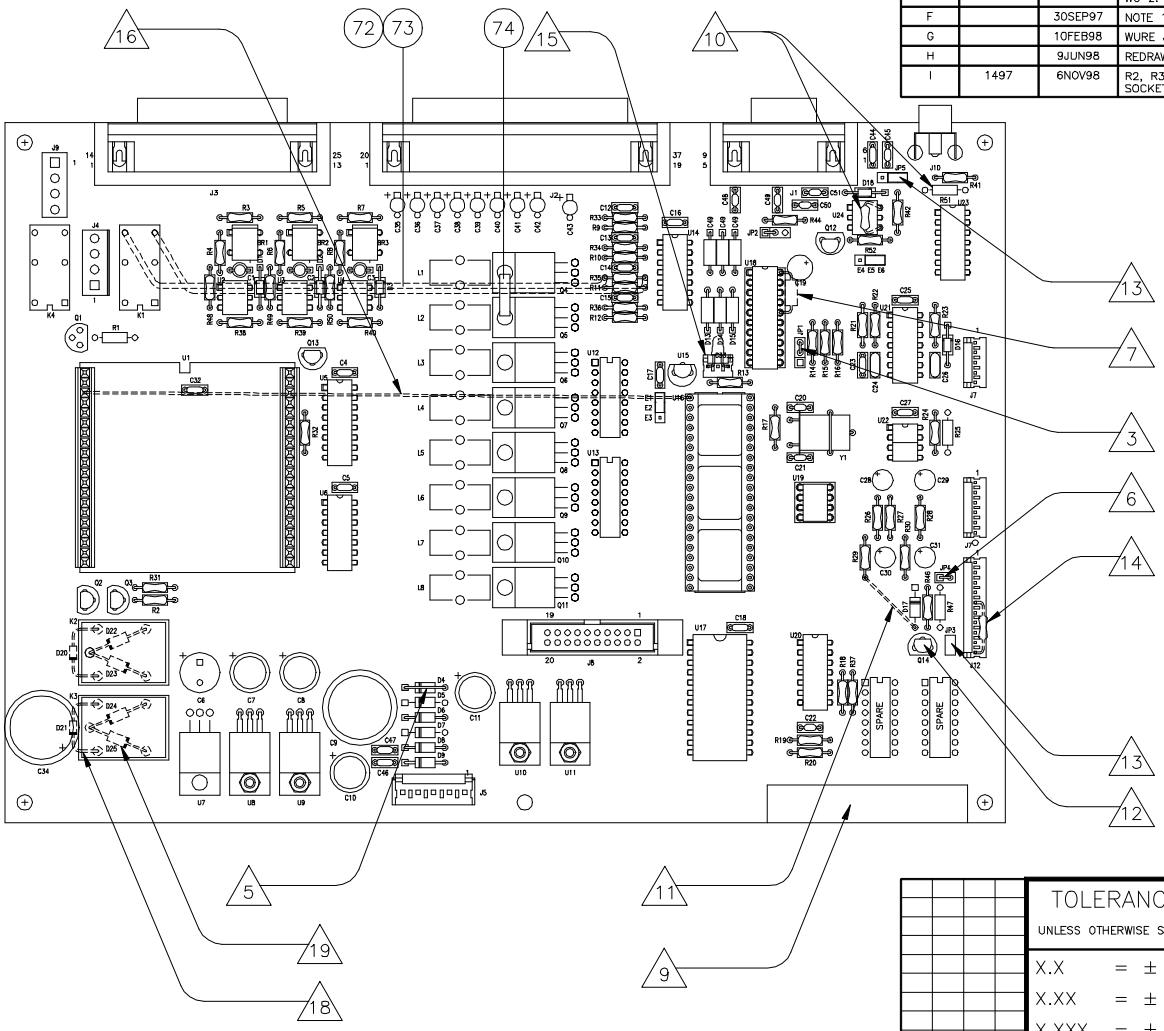
SCALE:	APPROVED BY:	DRAWN BY PGB
DATE: 3-29-93		REVISED

ACU FRONT PANEL INTERCONNECT SCHEMATIC

SHEET 1 OF 1

DRAWING NUMBER 112512-C

REV.	ECO#	DATE	DESCRIPTION	BY
A		13OCT94	PARTS NOT USED BY TAC-92C REMOVED FROM LM.	JHD
B		21DEC94	QTY. ITEM 2 WS 1; QTY. ITEM 21 WS 2; P/N 111461-2 QTY. 1 DLT'D; ADD'D ITEM 62; QTY. ITEM 59, 65, 66 WS 1 EACH.	MP
C		6NOV96	USE REV. F ARTWORK; CHG U24 TO OPTO ISOLATOR; ADD'D C48-51, R51, R52; DEL R43, R45; DEL J1 JUMPERS.	MAB
D		4FEB97	ADD'D NOTE 10; CHG'D NOTE 9; C32 WS LOADED.	MAB
E		24FEB97	Q14 & R46 LOADED; NOTE 9 WS REV. D; NOTES 11-14 ADD'D; R53 ADD'D; ITEMS 37 & 57 ADD'D; ITEM 65 QTY. WS 2.	MAB
F		30SEP97	NOTE 15 & ITEM 62 ADD'D; NOTE 2 WS REV. F ARTWORK.	MAB
G		10FEB98	WURE JUMPER ADD'D FROM U16-1 TO U1-3.	MAB
H		9JUN98	REDRAWN IN CAD; ITEM 59 WS AT J11; ITEMS 72, 73, 74 & NOTE 17 ADD'D; DAC-97 ADD'D; TAC-92M DLT'D.	MAB
I	1497	6NOV98	R2, R31, R32, C4, C32, C34, D20-D25, Q2, Q3, Q13, K2, K3 & U5 LOADED AND ADD'D TO LM; NOTES 18, 19 & U18 SOCKET ADD'D.	MAB



NOTES:
1. REFER TO LM 113275.
2. USE REV. G ARTWORK.
3. INSTALL WIRE JUMPER FROM JP1-2 TO JP1-3.
4. INSTALL WIRE JUMPER FROM JP2-1 TO JP2-2.
5. INSTALL WIRE JUMPER AT D4.
6. INSTALL WIRE JUMPER FROM JP4-1 TO JP4-2.
7. INSTALL D19 FROM U18-16 TO U18-20, SOLDER SIDE.
8. FOLLOWING PARTS NOT LOADED:
   J4, J9, K1, K4
   Q1, Q4-Q11
   R1, R47, R25
   C6, C35-C43
   D5, D7, D17
   U7, U12, U13
   L1-L8
9. MARK BOARD WITH ASS'Y No. 113275 REV. I AFTER ASS'Y.
10. REMOVE R51 AT U23; INSTALL R51 FROM U24-4 TO U24-6, SOLDER SIDE.
11. INSTALL WIRE JUMPER D17 ANODE TO R29, SOLDER SIDE. (D17 UNLOADED).
12. INSTALL Q14 REVERSED FROM ARTWORK OUTLINE.
13. INSTALL 2-POS. JUMPER (ITEM 65) FROM JP3-1 TO JP3-2 FOR DAC-97. INSTALL 2-POS. JUMPER FROM JP5-2 TO JP5-3 FOR TAC-92C.
14. INSTALL R53 FROM J12-5 TO J12-10, SOLDER SIDE.
15. INSTALL 3-PIN HEADER (ITEM 62) AT C33 LOCATION (REMOVE PIN 2), PIN 1 TO C33+. INSTALL C33 ON SOLDER SIDE (+ TO R13).
16. INSTALL WIRE JUMPER FROM U16-1 TO U1-3, SOLDER SIDE.
17. INSTALL TWISTED PAIR WIRE JUMPER FROM U16-1 TO U1-3, SOLDER SIDE. INSTALL TWISTED PAIR WIRE JUMPERS FROM R35 GND TO J3-3 AT K1(BLK) SOLDER SIDE, AND FROM R35 TO J3-1 AT K1(BLUE) SOLDER SIDE. FASTEN WITH A CABLE TIE (ITEM 74) BETWEEN Q4 & Q5.
18. INSTALL D20-D21, SOLDER SIDE. ANODE TO UBB AS SHOWN.
19. INSTALL D22-D25, SOLDER SIDE. ANODE AS SHOWN.

REFERENCE DRAWINGS:
112226 ACU PCB SCHEMATIC
112227 ACU PCB FABRICATION

REV.	SHT.	REV.	LM
I	1	I	1
		I	2

REV. STATUS

TOLERANCES
UNLESS OTHERWISE SPECIFIED
X.X = ± .050"
X.XX = ± .020"
X.XXX = ± .005"
ANGLES = ± 30'

3rd ANGLE PROJECTION

Sea Tel, inc.

SCALE: NONE
APPROVED BY:
DRAWN BY: JHD
DATE: 1SEP94
REVISED:

ACU PCB ASSEMBLY

TAC-92C/DAC-97 SHT. 1 OF 1

SIZE B

DRAWING NUMBER 113275-I

ITEM	QTY	SEA TEL PART NO.	DRW SZ	DESCRIPTION	VALUE	REFERENCE/NOTES
40	1	110782-11	A	I.C. CD4000 SERIES	CD4011	U6
41	2	110782-69	A	I.C. CD4000 SERIES	CD4069	U20,U23
42	1	109078-4	A	LOW POWER QUAD OP AMP	MC34074P	U14
43	1	110788-15	A	I.C. 4500 SERIES	CD4515BE	U17 CD4515BCN MC14515B
44	1	110791-1	A	I.C. A/D CONVERTER	LTC1290	U18
45	1	110792-2	A	I.C. CMOS 6805 SERIES	68HC705C8P	U16
46	1	110793-1	A	I.C. NVRAM	X2444P	U19
47	1	112129-1	A	I.C. DUAL OP AMP	LM 358 ND	U22
48	1	112592-2	A	I.C. DUAL TIMER	LM 556 CN	U21
49	1	110782-174	A	I.C. 4500 SERIES	CD40174BE	U5
50	1	112970	B	360:1 SYNCHRO PCB ASSEMBLY		U1 (STD) -1 ASSEMBLY
51	1	114836	B	12-BIT S/D CONV. PCB ASS'Y		U1 (OPTION) -2 ASSEMBLY
52	1	112593-9	A	RELAY, PC MOUNT	SPST	K2,K3
53	1	110935-15	A	CONNECTOR, D-SUB., PC MOUNT	DB9P	J1
54	1	110935-20	A	CONNECTOR, D-SUB., PC MOUNT	DB25S	J3
55	1	110935-22	A	CONNECTOR, D-SUB., PC MOUNT	DB37S	J2
56	1	110794-5	A	HEADER, .156 SPACING, FRICT. LOCK	5 POS.	J5
57	1	111461-5	A	HEADER, .100 SPACING, FRICT. LOCK	5 POS.	J6
58	1	111461-6	A	HEADER, .100 SPACING, FRICT. LOCK	6 POS.	J7
59	1	111461-10	A	HEADER, .100 SPACING, FRICT. LOCK	10 POS.	J12
60	1	110923-20	A	HEADER, STRIP, DUAL	20 POS.	J8
61	1	112131-5	A	RCA JACK, PC MOUNT	90 DEGREE	J10
62	1	111461-3	A	HEADER, .100 SPACING, FRICT. LOCK	3 POS.	JP6
63	1	109735-2	A	HEADER, .100 SPACING	2 POS.	JP3
64	3	109735-3	A	HEADER, .100 SPACING	3 POS.	E1-E2-E3, E4-E5-E6, JP5
65	3	110924-1	A	JUMPER, .100 CLOSED		E1 TO E2, E5 TO E6, JP3-1 TO JP3-2
66	1			WIRE JUMPER	.1 INCH	JP1-2 TO JP1-3, JP2-1 TO JP2-2, JP4-1 TO JP4-2
67	1			WIRE JUMPER	.4 INCH	D4
68	4			SCREW, PH PHD	6-32 x 3/8"	U8,U9,U10,U11
69	4			NUT, HX, SMALL PATTERN	6-32, S.S.	U8,U9,U10,U11
70	1	109097-5	A	I.C. SOCKET	20-PIN	U18
71	1			WIRE JUMPER		U16-1 TO U1-3
72	1	113343-7	A	WIRE JUMPER	22 AWG, BLU	R35 TO K1-1
73	1	113343-7	A	WIRE JUMPER	22 AWG, BLK	R35 GND TO K1-4
74	1			CABLE TIE		
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DRAWING NUMBER 113275-1

ITEM	QTY	SEA TEL PART NO.	DRW SZ	DESCRIPTION	VALUE	REFERENCE/NOTES
1	1	112227	B	ACU PCB FABRICATION		
2	3	109089-41	A	RESISTOR, 1/4 WATT, 5%	100 OHM	R41,R42,R44
3	1	109089-45	A	RESISTOR, 1/4 WATT, 5%	150 OHM	R52
4	2	109089-65	A	RESISTOR, 1/4 WATT, 5%	1K	R14,R21
5	3	109089-72	A	RESISTOR, 1/4 WATT, 5%	2K	R48,R49,R50
6	7	109089-81	A	RESISTOR, 1/4 WATT, 5%	4.7K	R2,R4,R6,R8,R20,R31,R32
7	14	109089-89	A	RESISTOR, 1/4 WATT, 5%	10K	R3,R5,R7,R15,R16,R18,R46 R19,R24,R26,R28,R29,R30,R53
8	2	109089-96	A	RESISTOR, 1/4 WATT, 5%	20K	R13,R27
9	4	109089-100	A	RESISTOR, 1/4 WATT, 5%	30K	R9,R10,R11,R12
10	1	109089-102	A	RESISTOR, 1/4 WATT, 5%	36K	R23
11	5	109089-113	A	RESISTOR, 1/4 WATT, 5%	100K	R37,R38,R39,R40,R51
12	1	109089-120	A	RESISTOR, 1/4 WATT, 5%	200K	R22
13	5	109089-137	A	RESISTOR, 1/4 WATT, 5%	1 MEG	R17,R33,R34,R35,R36
14						
15	7	110784-39	A	CAPACITOR, MONOLYTHIC	39pF	C20,C21,C45, C48,C49,C50,C51 (SUBST. 110784-27)
16	1	110784-103	A	CAPACITOR, MONOLYTHIC	.01uF	C22
17	16	110784-104	A	CAPACITOR, MONOLYTHIC	.1uF	C4,C5,C12,C13,C14,C15,C16,C17,C18,C23, C25,C27,C32,C44,C46,C47
18	2	110783-104	A	CAPACITOR, MYLAR	.1uF	C24,C26
19	4	109093-7	A	CAPACITOR, TANTALUM	1.0uF, 35V	C1,C2,C3,C33
20	4	109736-4	A	CAPACITOR, ELECTROLYTIC	10uF	C28,C29,C30,C31
21	1	109736-5	A	CAPACITOR, ELECTROLYTIC	47uF	C19
22	4	109736-6	A	CAPACITOR, ELECTROLYTIC	100uF	C7,C8,C10,C11
23	2	109736-12	A	CAPACITOR, ELECTROLYTIC	2200uF, 35V	C9,C34
24	7	109087	A	DIODE, SWITCHING	1N914	D1,D2,D3,D16,D18,D20,D21
25	7	109107-2	A	DIODE, RECTIFIER	1N4001	D6,D8,D9,D22,D23,D24,D25
26	7	110863-2	A	DIODE, SCHOTTKY BARRIER	1N5817	D10,D11,D12,D13,D14,D15,D19
27	3	109721-2	A	BRIDGE RECTIFIER	DB-102	BR1,BR2,BR3
28	1	110865-6	A	TRANSISTOR, PNP	2N3906	Q12
29	2	109099-2	A	STRIP LINE SIP SOCKET	20 POS.	U1
30	1	109097-9	A	I.C. SOCKET	40-PIN	U16
31	1	109097-1	A	I.C. SOCKET	8-PIN	U19
32	1	109088-1	A	QUARTZ CRYSTAL	4.00 MHz	Y1
33	1	109105-2	A	OPTO ISOLATOR	4N35	U24
34	3	109105-1	A	OPTO ISOLATOR	4N33	U2,U3,U4
35	2	109086-8	A	I.C. VOLTAGE REGULATOR	LM7805	U10,U11
36	1	109086-11	A	I.C. VOLTAGE REGULATOR	LM7812	U8
37	4	110790-4	A	TRANSISTOR, NPN	2N3904	Q2,Q3,Q13,Q14
38	1	109086-30	A	I.C. VOLTAGE REGULATOR	LM7912	U9
39	1	110864-1	A	I.C. UNDERVOLTAGE SENSOR	MC34064	U15

-1 360:1

-2 S/D CONVERTER

Sea Tel, inc.

SCALE: N/A

APPROVED BY:

DRAWN BY: JHD

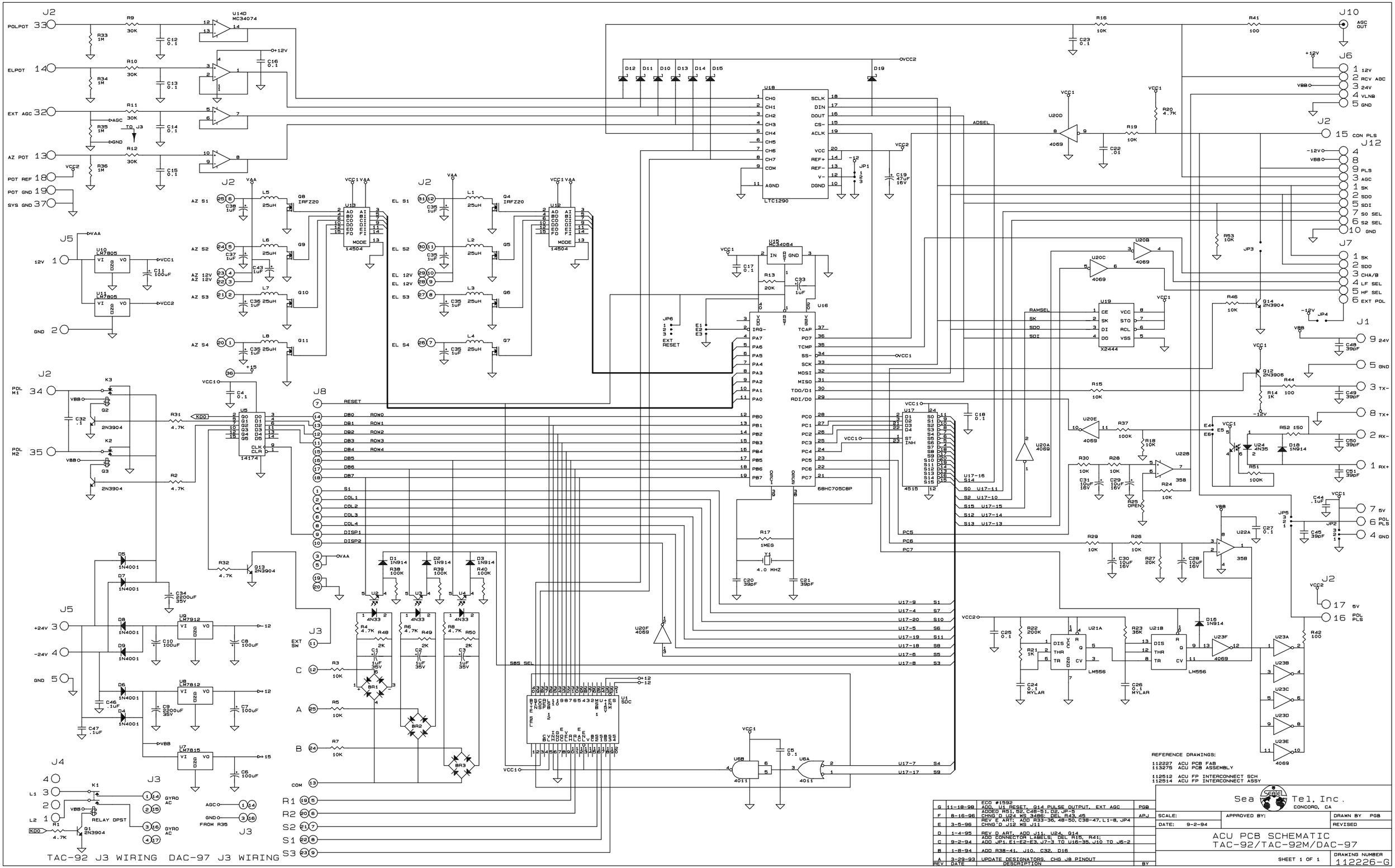
DATE: 1SEP94

REVISED:

ACU PCB ASSEMBLY

TAC-92C/DAC-97

DRAWING NUMBER 113275-1



REFERENCE DRAWINGS:

112227 ACU PCB FAB
113275 ACU PCB ASSEMBLY

112512 ACU FP INTERCONNECT SCH
112514 ACU FP INTERCONNECT ASSY

REV	DATE	DESCRIPTION	BY
G	11-10-98	ECO #1592 ADD, U1 RESET, Q14 PULSE OUTPUT, EXT AGC	PGB
F	8-16-96	ADDED R51,52, C48-51, D2, JP-5 CHNG D U24 NS 3486. DEL R43,45	APJ
E	3-5-96	REV E ART: ADD R33-36, 48-50, C38-47, L1-8, JP4 CHNG'D J12 NS J11	
D	1-4-95	REV D ART, ADD J11, U24, Q14	
C	9-2-94	ADD CONNECTOR LABELS; DEL R15, R41; ADD JP1 E1-E2-E3, J7-3 TO U16-35, J10 TO J6-2	
B	1-8-94	ADD R38-41, J10, C32, D16	
A	3-29-93	UPDATE DESIGNATORS, CHG JB PINOUT	

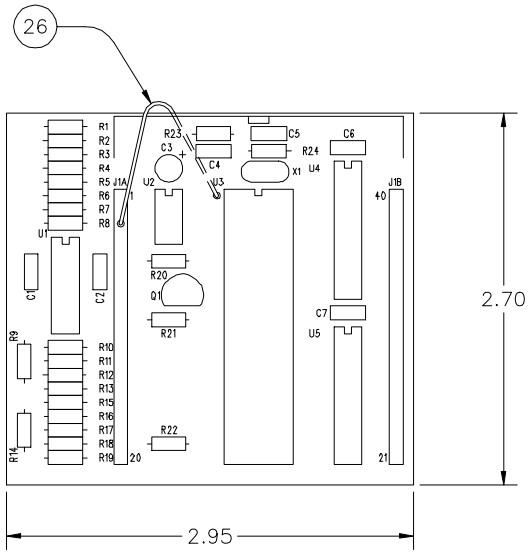
Sea Tel, Inc.
CONCORD, CA

SCALE:
APPROVED BY:
DRAWN BY PGB
DATE: 9-2-94
REVISED

ACU PCB SCHEMATIC
TAC-92/TAC-92M/DAC-97

SHEET 1 OF 1
DRAWING NUMBER 112226-G

REV.	DATE	DESCRIPTION	BY
A	10FEB98	JUMPER WIRE ADD'D.	MAB



REFERENCE DOCUMENTS

114648 12-BIT S/D CONVERTER SCHEMATIC
114690 12-BIT S/D CONVERTER PCB FABRICATION
114690 ARTWORK DRAWINGS: DRILL MASTER
SOLDER MASK – COMPONENT SIDE
SOLDER MASK – CIRCUIT SIDE
COMPONENT SIDE LAYER
CIRCUIT SIDE LAYER
SILKSCREEN – COMPONENT SIDE

TOLERANCES UNLESS OTHERWISE SPECIFIED	Sea Tel, inc.		
X.X = ± .050"	SCALE: FULL	APPROVED BY:	DRAWN BY: APJ
X.XX = ± .020"	DATE: 5APR96		REVISED:
X.XXX = ± .005"	12-BIT S/D CONVERTER PCB ASSEMBLY		
ANGLES = ± 30'		SIZE	DRAWING NUMBER
3rd ANGLE PROJECTION	SHT. 1 OF 1	B	114836-A

ITEM	QTY	SEA TEL PART NO.	DRW SZ	DESCRIPTION	VALUE	REFERENCE/NOTES
1	1	114690	B	12 BIT CONVERTER PCB FAB		
2						
3	4	109737-193	A	RESISTOR 1/8 WATT 1%	1.00K	R3, 4, 5, 6
4	2	109737-289	A	RESISTOR 1/8 WATT 1%	10.0K	R1, 2
5	2	109737-297	A	RESISTOR 1/8 WATT 1%	12.1K	R8, 9
6	4	109737-320	A	RESISTOR 1/8 WATT 1%	21.0K	R7, 12, 13, 14
7	8	109737-481	A	RESISTOR 1/8 WATT 1%	1.00M	R10, 11, 15, 16, 17, 18, 19, 22
8						
9	1	109089-81	A	RESISTOR 1/4 WATT 5%	4.7K	R20
10	2	109089-89	A	RESISTOR 1/4 WATT 5%	10K	R21, 23
11	1	109089-137	A	RESISTOR 1/4 WATT 5%	1 MEG	R24
12						
13	6	110784-104	A	CAPACITOR MONOLYTHIC	0.1 uF	C1, 2, 4, 5, 6, 7
14	1	109736-5	A	CAPACITOR ELECTROLYTIC	47uF	C3
15						
16	1	110790-4	A	TRANSISTOR NPN	2N3904	Q1
17	1	112576-1	A	CERAMIC RESONATOR, 4MHz	PX400	X1
18	1	109078-3	A	IC QUAD OP AMP	LF 444	U1
19	1	110791-2	A	IC 12-BIT A/D CONVERTER	LTC1291	U2
20	1	109097-9	A	IC SOCKET	40 PIN	U3
21	1	110792-2	A	IC CMOS MICROCONTROLLER	MC68HC705C8P	U3 INSERT AFTER ASSEMBLY
22	2	110862-573	A	IC, 8 BIT LATCH	74HC573	U4, U5
23						
24	2	109295-2	A	ADAPTOR SINGLE IN LINE	20 PIN	J1, J2
25						
26	1			KYNAR JUMPER WIRE		J1A-3 (COMP. SIDE) TO U3-1 (SOLDER SIDE)
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						

Sea Tel, Inc.
CONCORD, CA

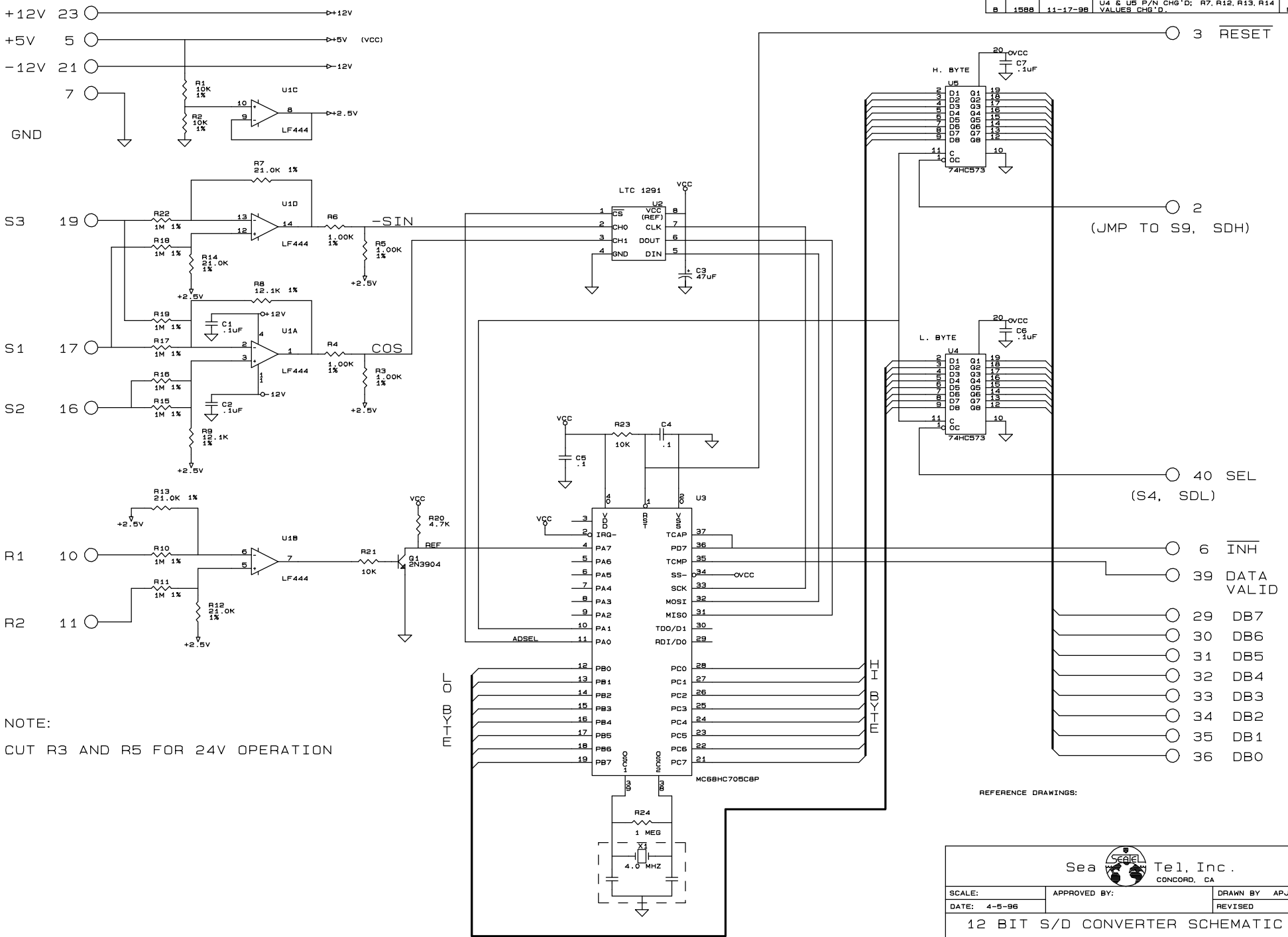
SCALE:	APPROVED BY:	DRAWN BY: APJ
DATE: 4-5-96		REVISED BY:

12 BIT S/D CONVERTER PCB ASSY

SHEET 1 OF 1

DRAWING NUMBER
114836-A

REV	ECO#	DATE	DESCRIPTION	BY
A		5-18-98	ADD RESET CONNECTION	
B	1588	11-17-98	U4 & U5 P/N CHG'D; R7, R12, R13, R14 VALUES CHG'D.	MF



NOTE:

CUT R3 AND R5 FOR 24V OPERATION

REFERENCE DRAWINGS:

Sea Tel, Inc.
CONCORD, CA

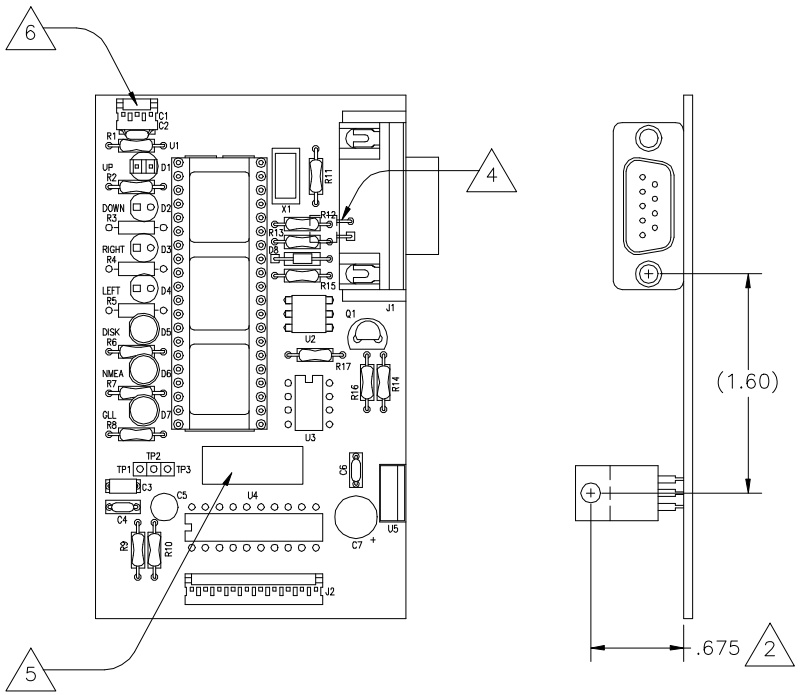
SCALE:	APPROVED BY:	DRAWN BY APJ
DATE: 4-5-96		REVISED

12 BIT S/D CONVERTER SCHEMATIC

SHEET 1 OF 1

DRAWING NUMBER 114648-B

REV.	DATE	DESCRIPTION	BY
A	22MAR95	ADD'D NOTES 2–4.	
B	31MAR95	.675 WS .625.	
C	5MAY95	CHG'D FOR REV. B ARTWORK.	
D	10MAY96	ADD'D R2, CAP AT J1–1 TO J1–2, NOTE 4, CHG'D U2 FROM 4N33, NOTE 3.	APJ
E	30MAY97	R13 WS 470 OHM; NOTE 5 ADD'D.	MAB
F	30SEP97	NOTE 6 & ITEM 32 ADD'D.	MAB



NOTES:

1. USE REV. B ARTWORK, REFER TO LM–113747.
2. INSTALL MOUNTING HOLE OF U5 .675 INCHES FROM TOP SURFACE OF PC BOARD AS SHWON.
3. FOLLOWING PARTS NOT LOADED:

   D1–D4, R3–5
   U3, U4

4. PLACE .01uF CAP FROM J1–1 TO J1–2, SOLDER SIDE.
5. MARK BOARD WITH ASSEMBLY NUMBER 113747 REV. F. AFTER ASSEMBLY.
6. INSTALL 3–PIN HEADER (ITEM 32) AT C1 LOCATION (REMOVE PIN 2). PIN 1 TO R1/U1. INSTALL C1 ON SOLDER SIDE.

REFERENCE DRAWINGS:

113744 PCB SCHEMATIC
113746 PCB FABRICATION
113888 INTERNAL CONSCAN PCB ASSEMBLY

TOLERANCES UNLESS OTHERWISE SPECIFIED	Sea Tel, inc.		
X.X = ± .050"	SCALE: NONE	APPROVED BY:	DRAWN BY: PAB
X.XX = ± .020"	DATE: 9MAR95		REVISED:
X.XXX = ± .005"	AUX SERIAL PORT ADAPTER PCB ASSEMBLY		
ANGLES = ± 30'	TAC–92	SHT. 1 OF 1	SIZE B / DRAWING NUMBER 113747–F
3rd ANGLE PROJECTION			

ITEM	QTY	SEA TEL PART NO.	DRW SZ	DESCRIPTION	VALUE	REFERENCE/NOTES
1	1	113746	B	AUX SERIAL PCB FAB		
2	1	109089-41	A	RESISTOR, 1/4 WATT 5%	100 OHM	R14
3	1	109089-52	A	RESISTOR, 1/4 WATT 5%	300 OHM	R13
4	4	109089-57	A	RESISTOR, 1/4 WATT 5%	470 OHM	R2, R6, R7, R8
5	4	109089-65	A	RESISTOR, 1/4 WATT 5%	1K	R10, R12, R16, R17
6	3	109089-89	A	RESISTOR, 1/4 WATT 5%	10K	R1, R9, R15
7	1	109089-137	A	RESISTOR, 1/4 WATT 5%	1 MEG	R11
8						
9	2	110784-103	A	CAPACITOR, MONOLYTHIC	.01 uF	C3 (J1-1 TO J1-2)
10	4	110784-104	A	CAPACITOR, MONOLYTHIC	.1 uF	C1, C2, C4, C6
11	1	109736-4	A	CAPACITOR, ELECTROLYTIC	10 uf	C5
12	1	109736-6	A	CAPACITOR, ELECTROLYTIC	100 uF	C7
13						
14	1	109087	A	DIODE, SWITCHING	1N914	D8
15	3	108837-4	A	DIODE LED	RED	D5, D6, D7
16	0	108837-3	A	DIODE LED	GREEN	D1, D2, D3, D4
17						
18	1	110865-6	A	TRANSISTOR, PNP	2N3906	Q1
19	1	109097-9	A	I.C. SOCKET	40 PIN	U1
20	1	112576-1	A	CERAMIC RESONATOR	4.00 MHZ	X1
21						
22	1	110792-2	A	I.C. CMOS 6805	68HC705C8P	U1
23	1	109105-2	A	I.C. OPTO ISOLATOR	4N35	U2
24	1	109086-8	A	I.C. VOLTAGE REGULATOR	LM7805	U5
25						
26						
27						
28	1	110935-15	A	CONNECTOR, D-SUB, PC MNT	DE-9P	J1
29	1	111461-10	A	HEADER .100 FRICT. LOCK	10 PIN	J2
30						
31	1	109735-2	A	HEADER .100 SPACING	2 POSITION	D1
32	1	111461-3	A	HEADER .100 FRICT. LOCK	3 POSITION	JP3
33						
34						
35						
36						
37						
38						
39						

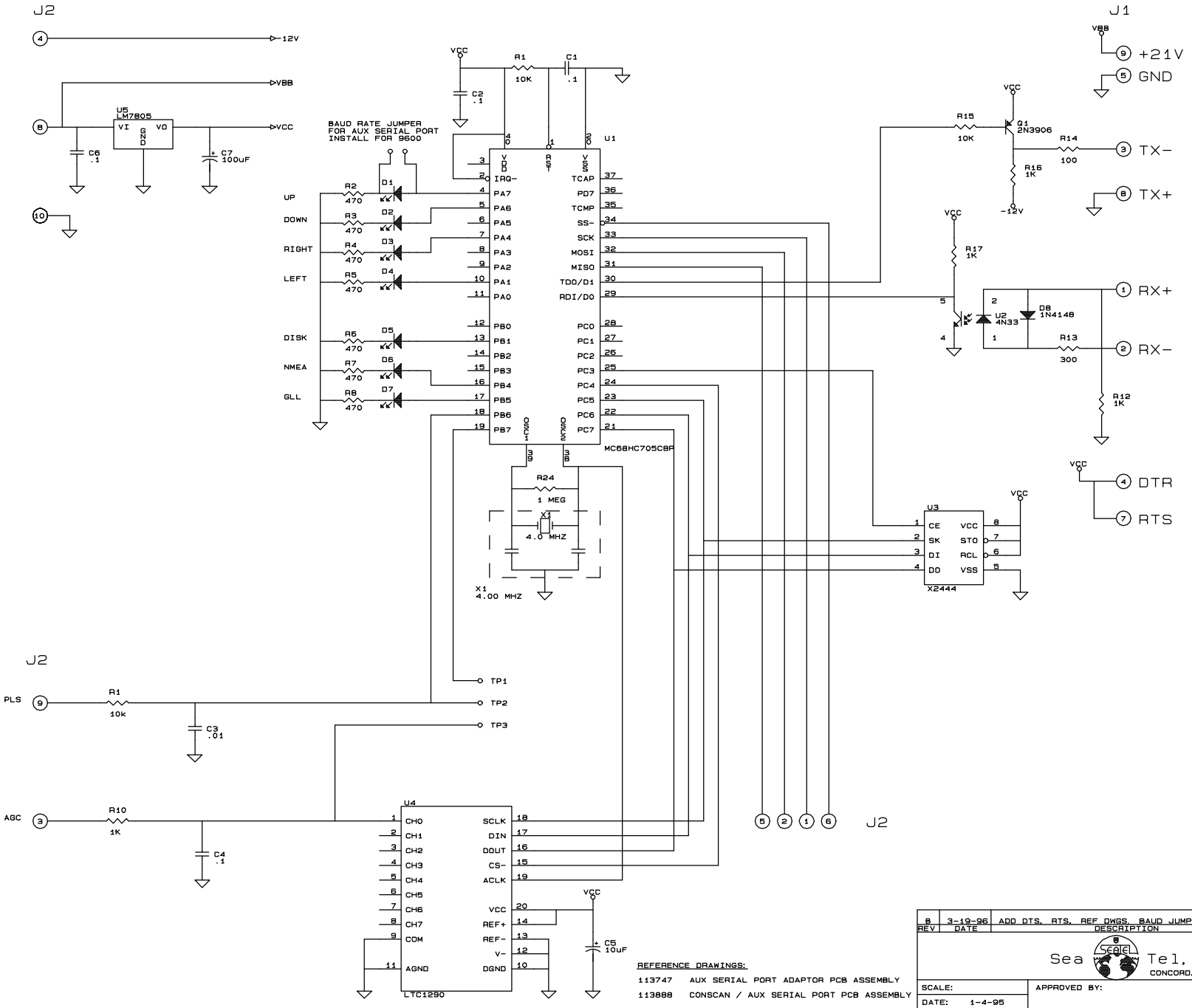
Sea Tel, Inc.
CONCORD, CA

SCALE:	APPROVED BY:	DRAWN BY: PGB
DATE: 3-9-95		REVISED:

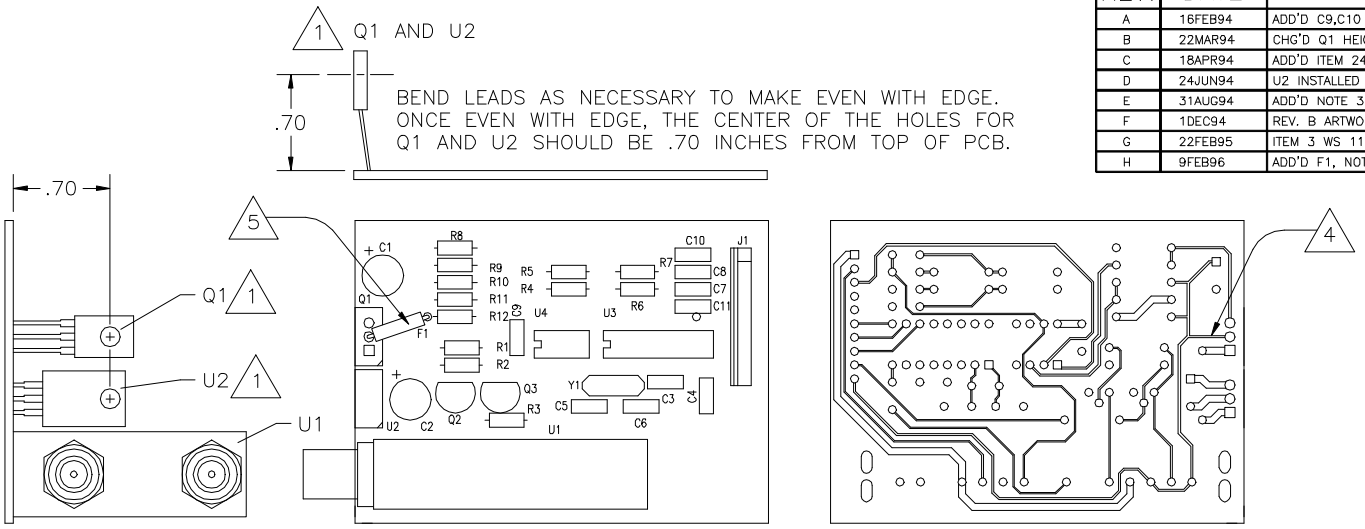
AUX SERIAL PORT ADAPTER PCB ASSEMBLY

SHEET 1 OF 1

DRAWING NUMBER
113747-F

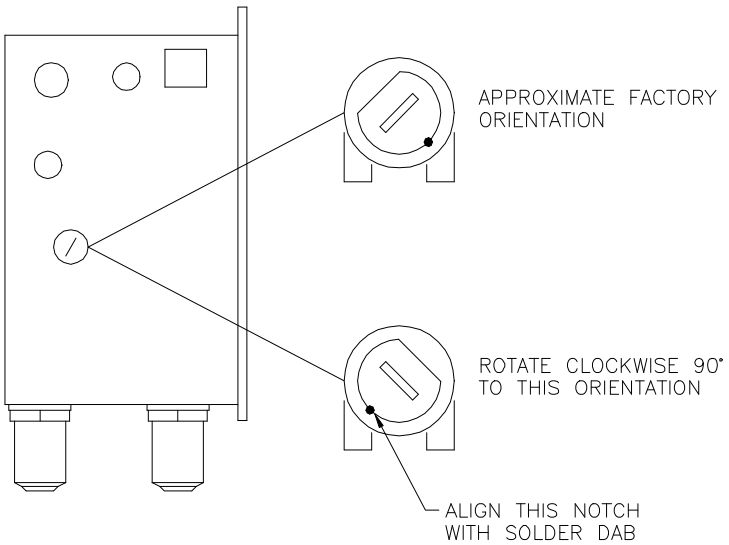

J2
J1
12V
VBB
VCC
U5
LM7805
VI
VO
GND
C6
.1
C7
100uF
BAUD RATE JUMPER
FOR AUX SERIAL PORT
INSTALL FOR 9600
R1
10K
C1
.1
C2
.1
U1
IRQ-
PA7
PA6
PA5
PA4
PA3
PA2
PA1
PA0
PB0
PB1
PB2
PB3
PB4
PB5
PB6
PB7
TCAP
PD7
TCMP
SS-
SCK
MOSI
MISO
TDO/D1
RDI/D0
PC0
PC1
PC2
PC3
PC4
PC5
PC6
PC7
MC68HC705C8P
UP
DOWN
RIGHT
LEFT
DISK
NMEA
GLL
R2
R3
R4
R5
R6
R7
R8
470
D1
D2
D3
D4
D5
D6
D7
R24
1 MEG
X1
4.0 MHZ
X1
4.00 MHZ
+21V
GND
TX-
TX+
RX+
RX-
DTR
RTS
R15
10K
Q1
2N3906
R14
100
R16
1K
-12V
R17
1K
U2
4N33
D8
1N4148
R13
300
R12
1K
U3
CE
SK
DI
DO
VCC
STO
RCL
VSS
X2444
TP1
TP2
TP3
PLS
R1
10k
C3
.01
AGC
R10
1K
C4
.1
U4
CH0
CH1
CH2
CH3
CH4
CH5
CH6
CH7
COM
AGND
SCLK
DIN
DOUT
CS-
ACLK
VCC
REF+
REF-
V-
DGND
LTC1290
C5
10uF
REFERENCE DRAWINGS:
113747 AUX SERIAL PORT ADAPTOR PCB ASSEMBLY
113888 CONSCAN / AUX SERIAL PORT PCB ASSEMBLY
REV
DATE
DESCRIPTION
APVL
B
3-19-96
ADD DTS, RTS, REF DWGS, BAUD JUMPER, CHG TITLE
Sea Tel, Inc.
CONCORD, CA
SCALE:
APPROVED BY:
DRAWN BY PGB
DATE: 1-4-95
REVISED
CONSCAN / AUX SERIAL PORT
PCB SCHEMATIC
TAC-92, TAC-92M, TAC-92C
SHEET 1 OF 1
DRAWING NUMBER
113744-B

REV.	DATE	DESCRIPTION	BY
A	16FEB94	ADD'D C9,C10 & ITEM 25.	
B	22MAR94	CHG'D Q1 HEIGHT, CORRECTED AND ADD'D NOTES.	
C	18APR94	ADD'D ITEM 24.	
D	24JUN94	U2 INSTALLED UPRIGHT; COMPONENT LOCATIONS CHG'D PER REV. A ARTWORK.	
E	31AUG94	ADD'D NOTE 3.	JHD
F	1DEC94	REV. B ARTWORK; DELETE NOTE 3 FOR REV. B.	PGB
G	22FEB95	ITEM 3 WS 110872-3, ITEM 8 WS 109088-1.	MP
H	9FEB96	ADD'D F1, NOTES 4 & 5, DELETED NOTE 3.	APJ



SOLDER SIDE

IN-HOUSE ADJUSTMENT:



AGC POT ADJUSTMENT

NOTES

1. INSTALL Q1 AND U2 AS SHOWN, .70 INCHES FROM TOP OF PCB AND EVEN WITH EDGE OF PCB. IF INSTALLED IN HOUSE, ALIGN U2 AND Q1 HOLES WITH CORRESPONDING HOLES IN REAR PANEL.
2. IN HOUSE ADJUSTMENT-ADJUST AGC POT AS SHOWN.
3. NOT APPLICABLE.
4. CUT TRACE FROM Q1 PIN 2 TO R12 AS SHOWN.
5. ADD F1(PTC FUSE) FROM Q1-2 TO R12 AS SHOWN.

REFERENCE DOCUMENTS

113036 AGC RECEIVER INTERFACE PCB SCHEMATIC
113038 AGC RECEIVER INTERFACE PCB FABRICATION
113039 AGC RECEIVER INTERFACE CABLE ASSEMBLY

TOLERANCES			
UNLESS OTHERWISE SPECIFIED			
X.X	=	± .050"	
X.XX	=	± .020"	
X.XXX	=	± .005"	
ANGLES	=	± 30'	
3rd ANGLE PROJECTION			

Sea Tel, inc.

SCALE: FULL	APPROVED BY:	DRAWN BY: JHD
DATE: 7FEB94		REVISED:

AGC RECEIVER INTERFACE PCB ASSEMBLY

SHT. 1 OF 1	SIZE	DRAWING NUMBER
	B	113037-H

ITEM	QTY	SEA TEL PART NO.	DRW SZ	DESCRIPTION	VALUE	REFERENCE/NOTES
1	1	113038	B	AGC RECEIVER PCB FAB		
2						
3	1	110872-4	A	SIGNAL STRENGTH RECEIVER	BSFE77G10	U1
4	1	109086-8	A	REGULATOR, +5 VOLT	LM7805	U2
5	1	112128-2	A	IC, PLL CONTROLLER	MC145157P2	U3
6	1	112129-1	A	IC, DUAL OP AMP	LM358	U4 SUB: 112129-7 MC34072P
7						
8	1	109088-5	A	QUARTZ CRYSTAL	8.00 MHZ	Y1
9	1	113024	A	CRYSTAL INSULATOR		Y1
10	1	110790-210	A	TRANSISTOR, PNP	MJE 210	Q1 ; -2 QTY = 0
11	2	110865-06	A	TRANSISTOR, PNP	2N3906	Q2, Q3
12						
13	1	109089-53	A	RESISTOR, 1/4W, 5%	330	R8
14	1	109089-61	A	RESISTOR, 1/4W, 5%	680	R9
15	1	109089-72	A	RESISTOR, 1/4W, 5%	2K	R12
16	1	109089-77	A	RESISTOR, 1/4W, 5%	3.3K	R11
17	4	109089-89	A	RESISTOR, 1/4W, 5%	10K	R1, R2, R3, R10
18	2	109089-113	A	RESISTOR, 1/4W, 5%	100K	R4, R5
19	2	109089-105	A	RESISTOR, 1/4W, 5%	47K	R6, R7
20						
21	1	110784-22	A	CAPACITOR, MONOLYTHIC	22pF	C5
22	1	110784-101	A	CAPACITOR, MONOLYTHIC	100pF	C6
23	3	110784-103	A	CAPACITOR, MONOLYTHIC	.01uF	C4, C10, C11
24	4	110784-104	A	CAPACITOR, MONOLYTHIC	.1uF	C3, C7, C8, C9
25	2	109736-6	A	CAPACITOR, ELECTROLYTIC	100uF	C1, C2
26						
27	1	111461-10	A	HEADER POST, F LOCK	10 POSITION	J1 (.1" SPACING)
28						
29	1	111866-2	A	PTC RESETTABLE FUSE	12V, 5 OHMS	F1
30						
31						
32						
33						
34						
35						
36						
37						
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39						

-1 STANDARD
-2 TAC 92C

Sea Tel, Inc.
CONCORD, CA

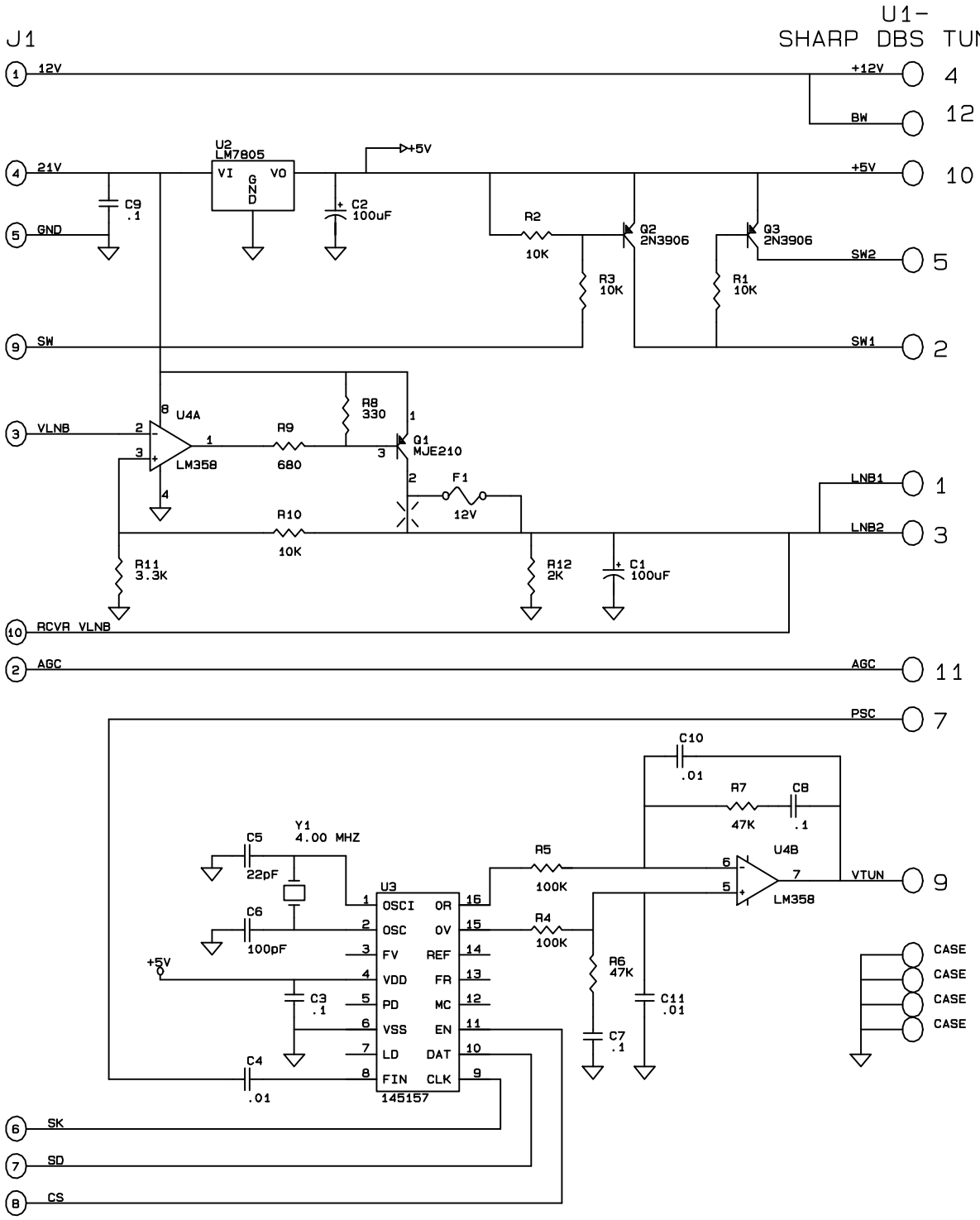
SCALE:	APPROVED BY:	DRAWN BY: JHD
DATE: 2-7-94		REVISED BY: APJ

AGC RECEIVER INTERFACE PCB ASSEMBLY

SHEET 1 OF 1

DRAWING NUMBER
113037-H

REV	DATE	DESCRIPTION	APVL
A	6-2-94	CORRECTED LABELS FOR Q2, Q3, C10, C11 CHG'D Q1, C1, C2; ADDED U4A, R8-R12	
B	10-17-94	REV B ARTWORK SWITCHED Q2, Q3, U1-2, U1-5	
C	3-13-96	ADDED F1; DEL TRACE FROM Q1-2 TO R12	APJ



REFERENCE DOCUMENTS

113037 AGC RECEIVER INTERFACE PCB ASSEMBLY

113038 AGC RECEIVER INTERFACE PCB FABRICATION

Sea Tel, Inc.
CONCORD, CA

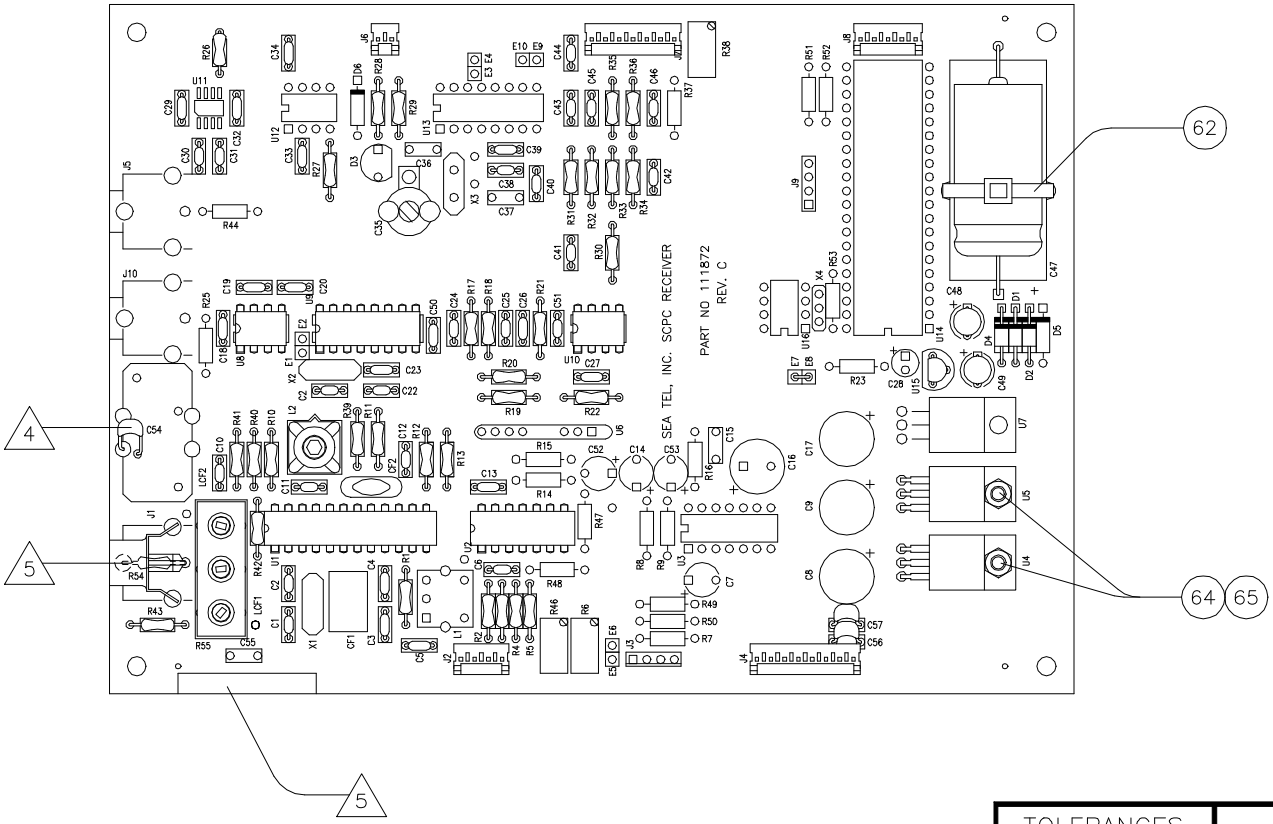
SCALE:	APPROVED BY:	DRAWN BY	PGB
DATE: 1/30/94		REVISED	APJ

AGC RECEIVER INTERFACE PCB SCHEMATIC

SHEET 1 OF 1

DRAWING NUMBER 113036-C

REV.	DATE	DESCRIPTION	BY
B	18NOV92	CHG'D FOR REV. A PCB.	
C	20APR93	SHT. 2 ADD'D.	
D	22OCT93	CHG'D FOR REV. B PCB; SHT. 3 ADD'D.	
E		LM CHG'D TO REV. E; LM & ASS'Y MADE CONCURRENT WITH REV. F.	
F	2MAY94	ADD'D R54; CHG'D R43, R46; C54 LOADED FOR −1, −2, −3.	
G	12MAY97	R13 WS 560K; R55 ADD'D; C38 WS 22pF; C24, C25 WERE .1uF.	MAB
H	18JUL97	REDRAWN IN CAD USING REV. C ARTWORK; U11 WS UPB 581.	MAB
I	13APR98	ITEM 4 −1 ASS'Y ADD'D; ITEM 6 −1 ASS'Y ADD'D; ITEM 34 −3 ASS'Y P/N WS 112121−4A; SHT. 3 NOTE 6 ADD'D; ITEM 14 R40 −1, −2 ASS'Y ADD'D; R56 ADD'D FOR −3 ASS'Y.	MAB
J	24AUG98	E.C.O. #1340; ITEM 34 P/N's 112121−6 & 112121−13 ADD'D; ITEM 49 ADD'D; ITEM 50 WS QTY. 1.	MAB



NOTES:
1. USE REV. C PCB FABRICATION.
2. REFER TO LM 112019 FOR COMPONENT DETAILS.
3. PARTS NOT LOADED;
   R7,8,9,14,15,16,23,25,37,44,45,47−53,55
   C7,14,15,16,28,35,36,37,52,53,55
   L1
   LCF2
   D3,D5,D6
   X3,X4
   U3,6,7,11,12,13,14,16
   J3,5,9,10
   E1−2,3−4,5−6,9−10
4. C54 IS INSTALLED AT LCF2, COMPONENT SIDE, AS SHOWN.
5. INSTALL R54 FROM J1 CENTER TO GROUND, SOLDER SIDE.
6. MARK BOARD WITH 112019−1 REV. I.

REFERENCE DRAWINGS:
111872 SCPC RECEIVER PCB FABRICATION
112018 70 MHz SCPC RSS DETECTOR PCB SCHEMATIC

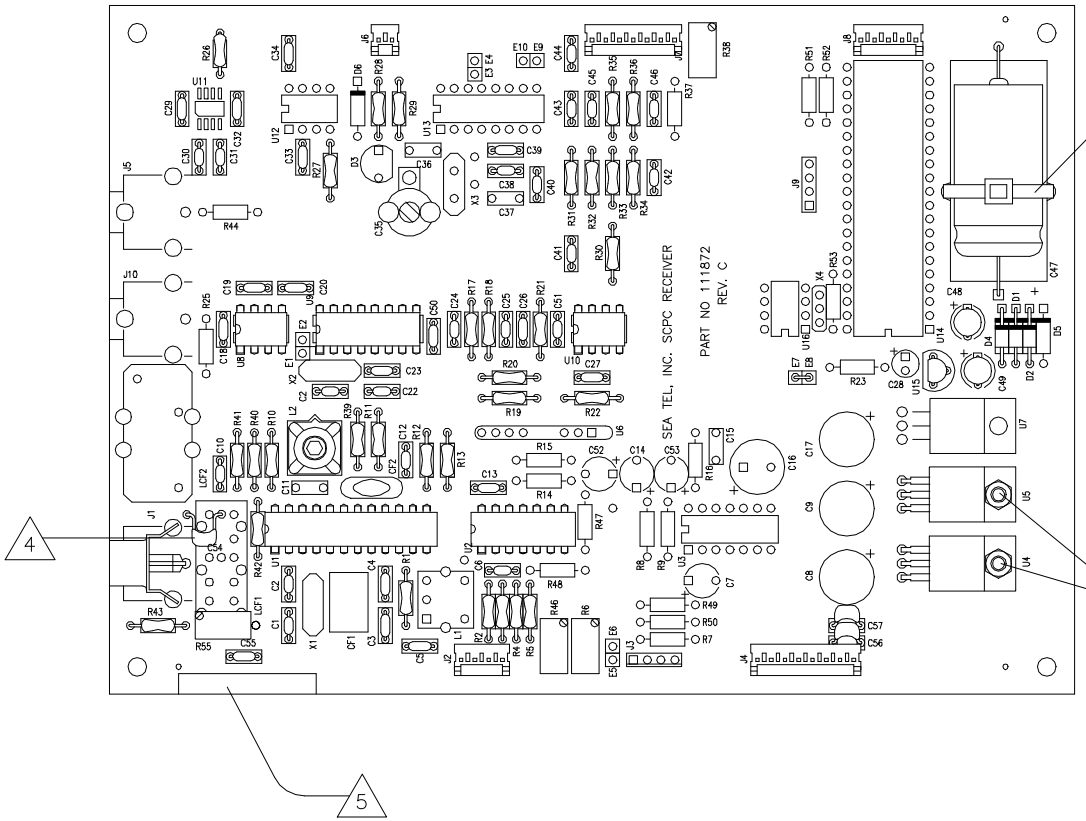
TOLERANCES			
UNLESS OTHERWISE SPECIFIED			
X.X	= ± .050"		
X.XX	= ± .020"		
X.XXX	= ± .005"		
ANGLES	= ± 30'		
3rd ANGLE PROJECTION			

Sea Tel, inc.

SCALE: FULL	APPROVED BY:	DRAWN BY: MAB
DATE: 18JUL97		REVISED:

70 MHz SCPC RSS DETECTOR PCB ASS'Y

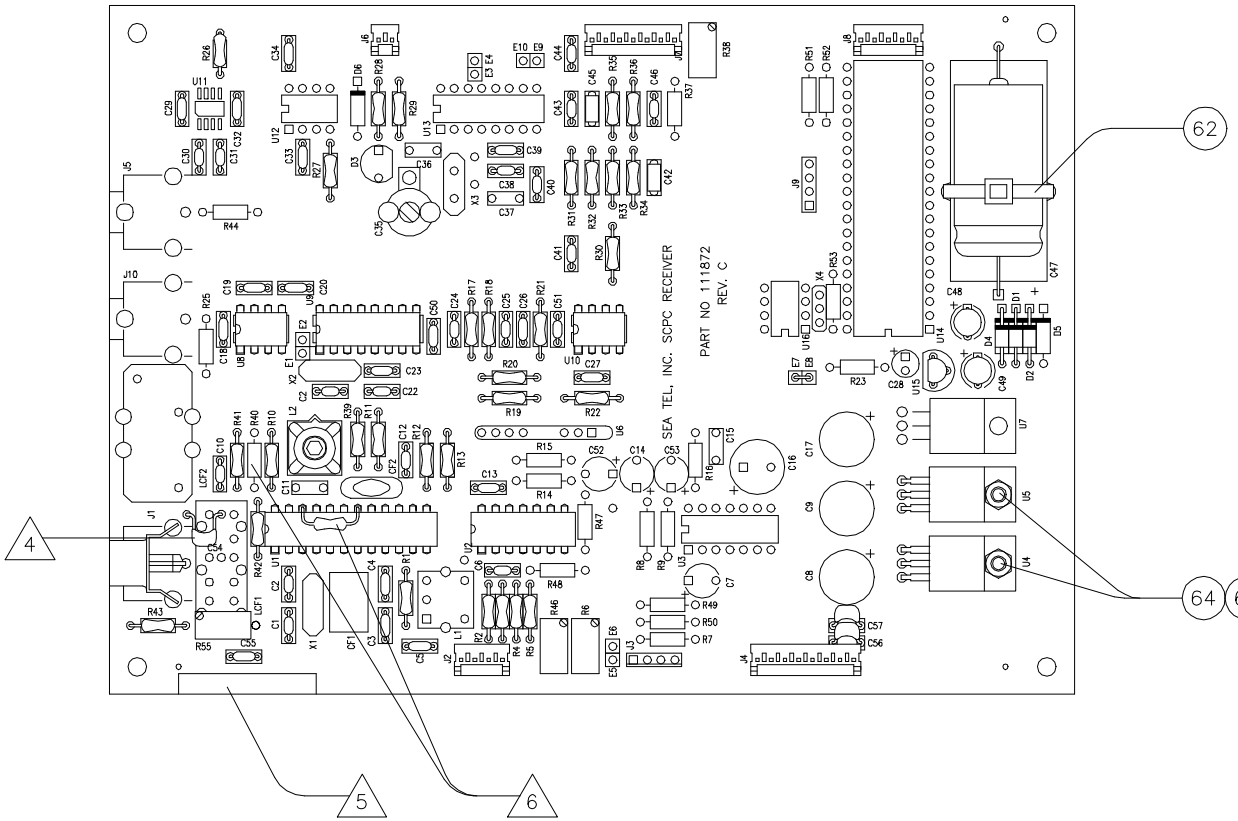
−1, 70MHz IF	SHT. 1 OF 3	SIZE	DRAWING NUMBER
		B	112019−J



NOTES:
1. USE REV. C PCB FABRICATION.
2. REFER TO LM 112019 FOR COMPONENT DETAILS.
3. PARTS NOT LOADED;
   R7,8,9,14,15,16,23,37,44,45,47–53
   C7,11,14,15,16,28,35,36,37,52,53
   L1
   LCF1,LCF2
   D3,D5,D6
   X3,X4
   U3,6,7,11,12,13,14,16
   J3,5,9,10
   E1–2,3–4,5–6,9–10
4. C54 IS INSTALLED AT LCF1, COMPONENT SIDE, AS SHOWN.
5. MARK BOARD WITH 112019–3 REV. I.

REFERENCE DRAWINGS:
111872 SCPC RECEIVER PCB FABRICATION
112018 70 MHz SCPC RSS DETECTOR PCB SCHEMATIC

TOLERANCES UNLESS OTHERWISE SPECIFIED	Sea Tel, inc.		
X.X = ± .050"	SCALE: FULL	APPROVED BY:	DRAWN BY: MAB
X.XX = ± .020"	DATE: 18JUL97		REVISED:
X.XXX = ± .005"	70 MHz SCPC RSS DETECTOR PCB ASS'Y		
ANGLES = ± 30'			
3rd ANGLE PROJECTION	–2, 70 MHz WIDE	SHT. 2	SIZE B / DRAWING NUMBER 112019–J



NOTES:
1. USE REV. C PCB FABRICATION.
2. REFER TO LM 112019 FOR COMPONENT DETAILS.
3. PARTS NOT LOADED;
   R7,8,9,14,15,16,23,37,44,45,47–53
   C7,11,14,15,16,28,35,36,37,52,53
   L1
   LCF1,LCF2
   D3,D5,D6
   X3,X4
   U3,6,7,11,12,13,14,16
   J3,5,9,10
   E1–2,3–4,5–6,9–10
4. C54 IS INSTALLED AT LCF1, COMPONENT SIDE, AS SHOWN.
5. MARK BOARD WITH 112019–3 REV. I.
6. REMOVE R40; ADD R56 FROM U1–22 TO U1–18, SOLDER SIDE.

REFERENCE DRAWINGS:
111872 SCPC RECEIVER PCB FABRICATION
112018 70 MHz SCPC RSS DETECTOR PCB SCHEMATIC

TOLERANCES UNLESS OTHERWISE SPECIFIED	Sea Tel, inc.		
X.X = ± .050"	SCALE: FULL	APPROVED BY:	DRAWN BY: MAB
X.XX = ± .020"	DATE: 18JUL97		REVISED:
X.XXX = ± .005"	70 MHz SCPC RSS DETECTOR PCB ASS'Y		
ANGLES = ± 30'	–3, 140MHz IF	SHT. 3	SIZE B / DRAWING NUMBER 112019–J
3rd ANGLE PROJECTION			

ITEM	QTY	SEA TEL PART NO.	DRW SZ	DESCRIPTION	VALUE	REFERENCE/NOTES
38	1	109088-4	A	CRYSTAL	10.245 MHz	X1
39	1	109088-1	A	CRYSTAL	4.000 MHz	X2
40	1	112126-1	A	I.C., FM RECEIVER	MC3362P	U1
41	1	109078-1	A	I.C., QUAD OP AMP	LM324	U2
42	1	109086-8	A	I.C., VOLTAGE REGULATOR	LM7805	U4
43	1	109086-11	A	I.C., VOLTAGE REGULATOR	LM7812	U5
44	1	112127-1	A	I.C., 20/21 PRESCALLER	MC12019P	U8
45	1	112128-1	A	I.C., PLL CONTROLLER	MC125158P	U9
46	1	112129-4	A	I.C., DUAL OP AMP	MC 34082P	U10
47	1	109086-15	A	I.C., VOLTAGE REGULATOR	LM79L05	U15
48						
49	2	113024	A	CRYSTAL INSULATOR TAB		
50	0	112130-1	A	PTC CRYSTAL HEATER		HT1
51	1	112122-1	A	455 KHz CERAMIC FILTER	CFW 455B	CF1
52	1	112122-12	A	10.7 MHz CERAMIC FILTER	SFE 10.7	CF2
53						
54						
55	1	11213105	A	RCA JACK, PC MOUNT	90 DEGREE	J1
56	1	111461-4	A	.100 CONNECTOR	4 POS.	J2
57	1	1111461-8	A	.100 CONNECTOR	8 POS.	J4
58	1	111461-2	A	.100 CONNECTOR	2 POS.	J6
59	1	111461-7	A	.100 CONNECTOR	7 POS.	J7
60	1	111461-5	A	.100 CONNECTOR	5 POS.	J8
61						
62	1			CABLE TIE		C47
63						
64	2			SCREW, PAN HEAD	6-32 X 3/8", S.S.	U4,U5
65	2			NUT, HX	6-32, S.S.	U4,U5
66						
67						
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83						

DRAWING NUMBER 112019-J

ITEM	QTY	SEA TEL PART NO.	DRW SZ	DESCRIPTION	VALUE	REFERENCE/NOTES
1	1	111872	B	SCPC RECEIVER PCB FAB		
2	1		A	WIRE JUMPER	.1 INCH	E7-E8
3	1	109089-17	A	RESISTOR, 1/4 WATT, 5%	10 OHM	R42 -2,-3 ASS'Y
4	1	109089-34	A	RESISTOR, 1/4 WATT, 5%	51 OHM	R54 -1 ASS'Y
5	1	109089-34	A	RESISTOR, 1/4 WATT, 5%	51 OHM	R43 -2,-3 ASS'Y
6	1	109089-41	A	RESISTOR, 1/4 WATT, 5%	100 OHM	R42 -1 ASS'Y
7	1	109089-41	A	RESISTOR, 1/4 WATT, 5%	100 OHM	R31
8	1	109089-61	A	RESISTOR, 1/4 WATT, 5%	680 OHM	R43 -1 ASS'Y
9	10	109089-65	A	RESISTOR, 1/4 WATT, 5%	1K	R2,R3,R11,R26,R30,R32,R33,R34,R35,R36
10	1	109089-73	A	RESISTOR, 1/4 WATT, 5%	2.2K	R27
11	11	109089-89	A	RESISTOR, 1/4 WATT, 5%	10K	R12,R17,R18,R19,R20,R21,R22,R28,R39,R41,R56
12	1	109089-91	A	RESISTOR, 1/4 WATT, 5%	12K	R1
13	1	109089-99	A	RESISTOR, 1/4 WATT, 5%	27K	R10
14	2	109089-113	A	RESISTOR, 1/4 WATT, 5%	100K	R13,R40 R40 USED ON -1,-2 ASS'Y
15	1	109089-128	A	RESISTOR, 1/4 WATT, 5%	430K	R5
16	1	109089-131	A	RESISTOR, 1/4 WATT, 5%	560K	R4
17	1	109089-137	A	RESISTOR, 1/4 WATT, 5%	1MEG	R29
18	2	112480-203	A	15 TURN POTENTIOMETER	20K	R6,R38
19	1	112480-504	A	15 TURN POTENTIOMETER	500K	R46
20	1	112480-101	A	15 TURN POTENTIOMETER	100 OHM	R55 -2,-3 ASS'Y
21	1	110784-10	A	CAPACITOR, MONOLYTHIC	10 pF	C11 -1 ASS'Y ONLY
22	1	110784-15	A	CAPACITOR, MONOLYTHIC	15 pF	C21
23	1	110784-22	A	CAPACITOR, MONOLYTHIC	22 pF	C2
24	5	110784-101	A	CAPACITOR, MONOLYTHIC	100 pF	C1,C22,C30,C31,C38
25	8	110784-102	A	CAPACITOR, MONOLYTHIC	.001uF	C19,C20,C29,C32,C33,C34,C50,C54
26	1	110784-102	A	CAPACITOR, MONOLYTHIC	.001uF	C55 -2,-3 ASS'Y ONLY
27	2	110784-222	A	CAPACITOR, MONOLYTHIC	2200 pF	C42,C45
28	11	110784-103	A	CAPACITOR, MONOLYTHIC	.01uF	C6,C10,C12,C40,C41,C43,C24,C25,C44,C46,C51
29	11	110784-104	A	CAPACITOR, MONOLYTHIC	.1uF	C3,C4,C13,C18,C23,C26,C27,C39,C56,C57,C5
30	2	109736-4	A	CAPACITOR, ELECTROLYTIC	10uF	C48,C49
31	3	109736-6	A	CAPACITOR, ELECTROLYTIC	100uF	C8,C9,C17
32	1	109736-32	A	CAPACITOR, ELECTROLYTIC	2200uF, 35V	C47
33						
34	1	112121-4	A	INDUCTOR, MOLDED RF COLIS	.19uH	L2, -1 ASS'Y
34	1	112121-6	A	INDUCTOR, MOLDED RF COILS	.31uH	L2, -2 ASS'Y
34	1	112121-13	A	INDUCTOR, MOLDED RF COILS	.11uH	L2, -3 ASS'Y
35	1	112119-1	A	LC BANDPASS FILTER	70 MHz	LCF1 -1 ASS'Y ONLY
36						
37	3	109107-2	A	DIODE, RECTIFIER	1N4001	D1,D2,D4

-1 70 MHz
-2 70 MHz WIDE TUNING
-3 140 MHz

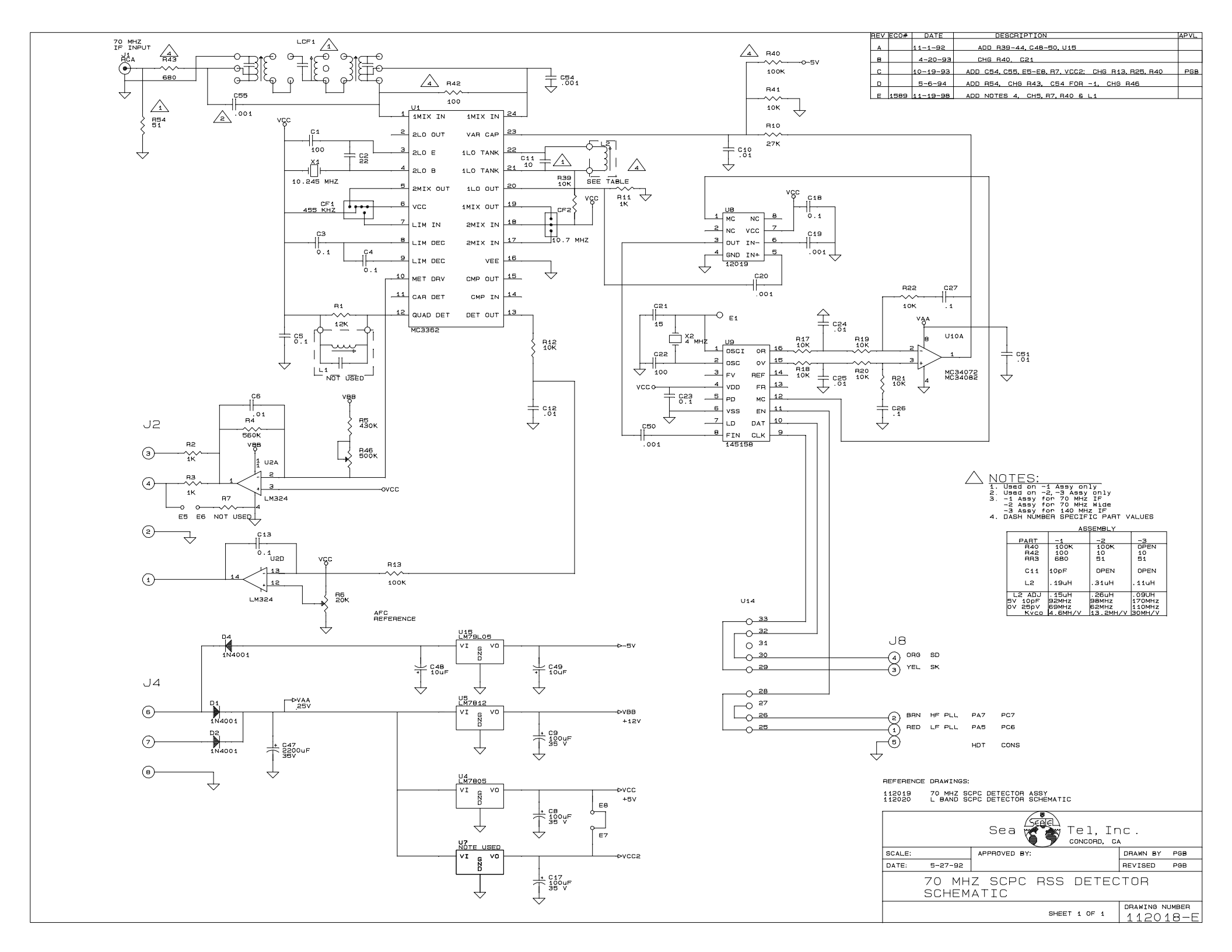
Sea Tel, inc.

SCALE: N/A | APPROVED BY: | DRAWN BY: PCB

DATE: 27MAY92 | REVISED:

70 MHz SCPC RSS DETECTOR PCB ASS'Y

DRAWING NUMBER 112019-J



REV	ECO#	DATE	DESCRIPTION	APVL
A		11-1-92	ADD R39-44, C48-50, U15	
B		4-20-93	CHG R40, C21	
C		10-19-93	ADD C54, C55, E5-E8, R7, VCC2; CHG R13, R25, R40	PGB
D		5-6-94	ADD R54, CHG R43, C54 FOR -1, CHG R46	
E	1589	11-19-98	ADD NOTES 4, CH5, R7, R40 & L1	

NOTES:

1. Used on -1 Assy only
2. Used on -2, -3 Assy only
3. -1 Assy for 70 MHz IF
   -2 Assy for 70 MHz Wide
   -3 Assy for 140 MHz IF
4. DASH NUMBER SPECIFIC PART VALUES

ASSEMBLY

PART	-1	-2	-3
R40	100K	100K	OPEN
R42	100	10	10
RR3	680	51	51
C11	10pF	OPEN	OPEN
L2	.19uH	.31uH	.11uH
L2 ADJ	.15uH	.26uH	.09UH
5V 10pF	92MHz	98MHz	170MHz
0V 25pV	69MHz	62MHz	110MHz
Kvco	4.6MH/V	13.2MH/V	30MH/V

REFERENCE DRAWINGS:

112019 70 MHZ SCPC DETECTOR ASSY
112020 L BAND SCPC DETECTOR SCHEMATIC

Sea Tel, Inc.
CONCORD, CA

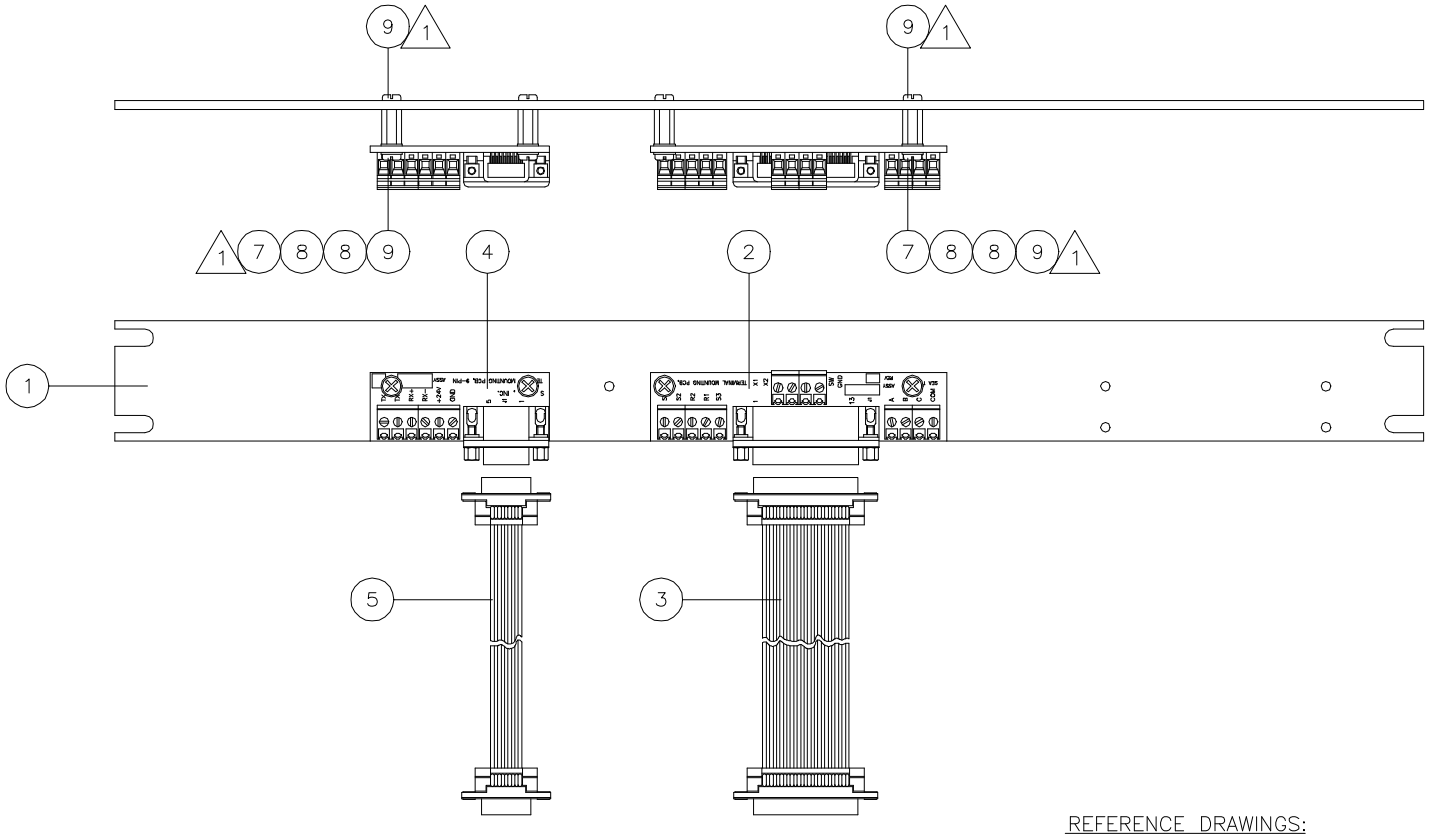
SCALE:	APPROVED BY:	DRAWN BY	PGB
DATE: 5-27-92		REVISED	PGB

70 MHZ SCPC RSS DETECTOR SCHEMATIC

SHEET 1 OF 1

DRAWING NUMBER 112018-E

REV.	DATE	DESCRIPTION	BY
A	7MAY98	ITEM 4 WS P/N 108308-10, QTY. 1; ITEM 5 WS P/N 108429-1, QTY. 2; ITEMS 6, 10 & 11 DLT'D; ITEM 6 ITEM 6 WS P/N 115957, QTY. 1; ITEM 10 WS SCREW, PH RD HD, 6-32 X 7/8", S.S., QTY. 3; ITEM 11 WS NUT, HX, 6-32, S.S., QTY. 3; ITEM 7 WS QTY. 2; ITEM 8 WS QTY. 4; ITEM 9 WS QTY. 4.	MAB



REFERENCE DRAWINGS:
112940 TERMINAL MOUNTING STRIP ASS'Y

NOTES:
1. APPLY LOCKTITE 222(PINK) AT ASSEMBLY.

ITEM	QTY	SEA TEL PART NO.	DRW SZ	DESCRIPTION	VALUE	REFERENCE/NOTES
1	1	112657	B	TERMINAL MOUNTING STRIP MACH.		
2	1	116529	A	TERMINAL MOUNTING PCB ASS'Y	25-PIN	
3	1	112936	A	CABLE ASS'Y, 25-PIN, D-SUB., M-F	36" LONG	
4	1	116527	A	TERMINAL MOUNTING PCB ASS'Y	9-PIN	
5	1	116669	A	CABLE ASS'Y, 9-PIN, D-SUB., M-F	36" LONG	
6						
7	4	111672-36	A	THREADED SPACER, HEX		6-32 X 1/2" LONG
8	8	109154-4	A	SPACER		.312 O.D." x .156" I.D. x .031" THK
9	8			SCREW, PH RD HD		6-32 X 3/8", S.S.
10						
11						

TOLERANCES
UNLESS OTHERWISE SPECIFIED

X.X = ± .050"
X.XX = ± .020"
X.XXX = ± .005"
ANGLES = ± 30'

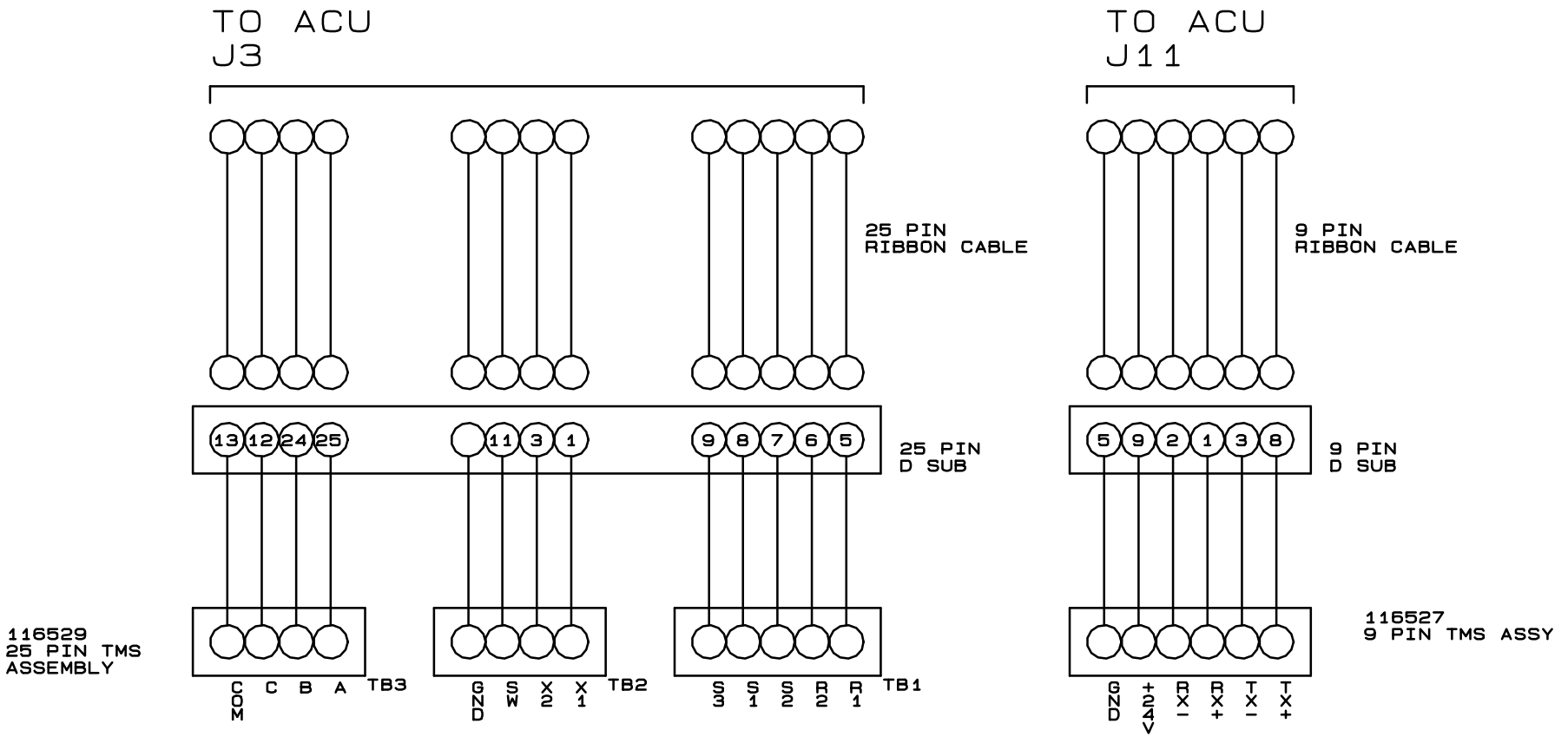
3rd ANGLE PROJECTION

Sea Tel, inc.

SCALE: 1/2 | APPROVED BY: | DRAWN BY: MAB
DATE: 6MAY98 | REVISED:

TERMINAL MOUNTING STRIP ASSEMBLY

MODEL: XX96, XX97 SHT. 1 OF 1 | SIZE B | DRAWING NUMBER 116676-A



Sea Tel, Inc.
CONCORD, CA

SCALE:	APPROVED BY:	DRAWN BY PGB
DATE: 5-11-98		REVISED

ACU TERMINAL MOUNTING STRIP SCHEMATIC

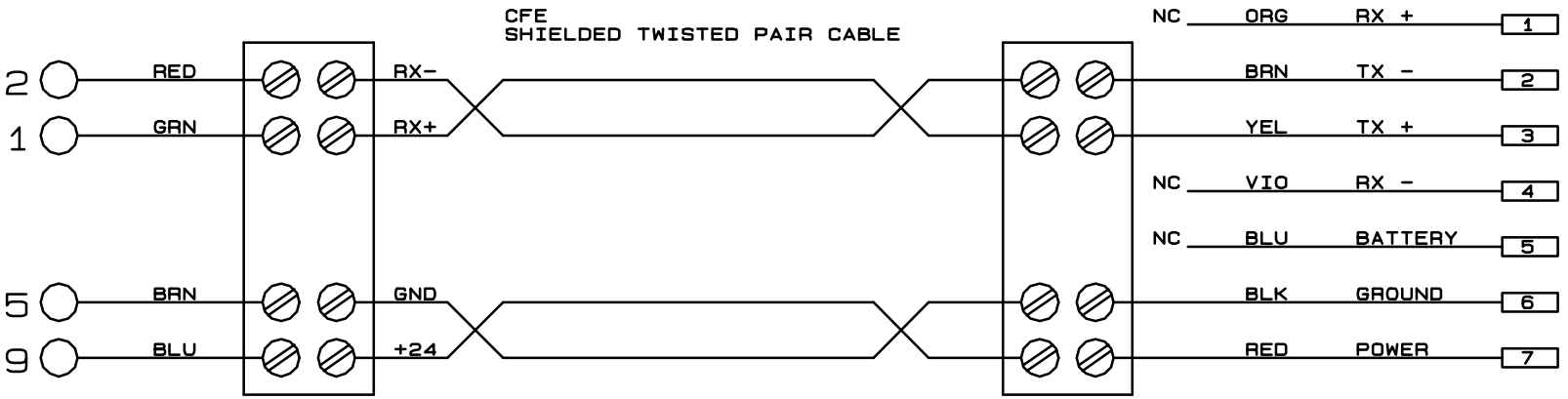
SHEET 1 OF 1

DRAWING NUMBER
116685-0

REV	DATE	DESCRIPTION	APVL
A	3-21-96	ADD TERMINAL BLOCK CONNECTIONS	
B	11-20-97	ADD RADOME BLOCK, REVISE J11 COLORS	
C	5-11-98	ADD 9 PIN TMS REFERENCE	

TO TAC-92 OR
DAC-97
J11

ACUTIS 6
CONNECTOR



TERMINAL BLOCK OR
9 PIN TERMINAL MOUNTING STRIP

LOCATED ON TAC-92 / DAC-97
TERMAINL MOUNTING STRIP

TERMINAL BLOCK
LOCATED IN RADOME

REFERENCE DRAWINGS:

114791 ACU TO BCU CONTROL CABLE DIAGRAM

Sea Tel, Inc.
CONCORD, CA

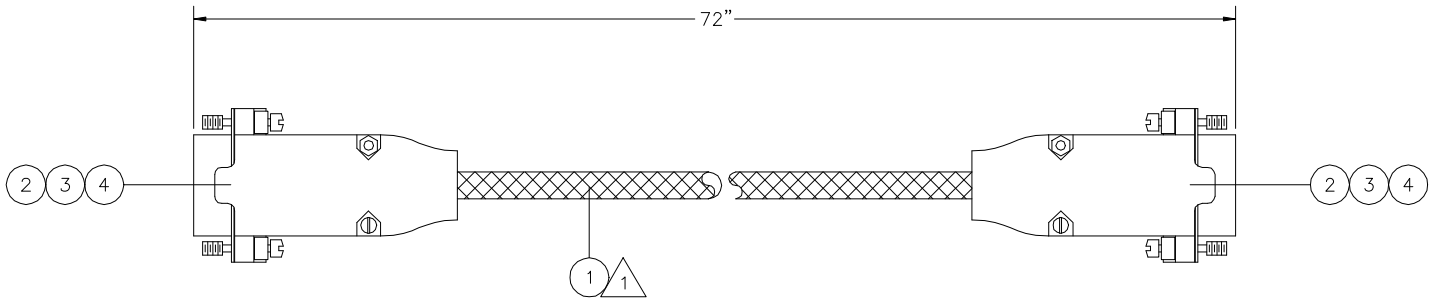
SCALE:	APPROVED BY:	DRAWN BY PGB
DATE: 9-7-93		REVISED

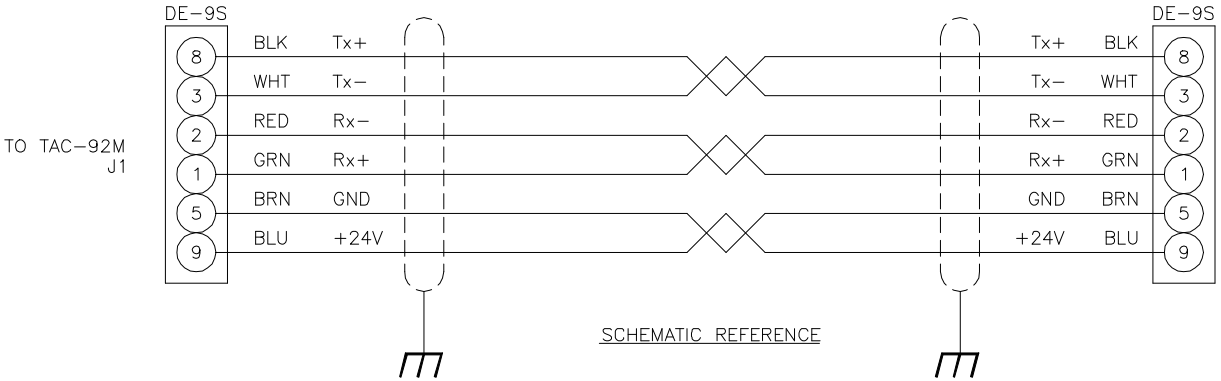
INTERFACE CABLE DIAGRAM
GPS TO ACU

XX96, XX97 SHEET 1 OF 1

DRAWING NUMBER
112791-C

REV.	ECO#	DATE	DESCRIPTION	BY
A		1-30-98	ITEM 3 MFG. WS DIGIKEY, P/N: 909Z-ND.	MAB
B		4-14-98	SHT. 3, DASH 3 ADD'D.	MAB
C	1863	3-12-99	SHT. 2: RS-232 REFERENCE ADD'D.	MAB





SCHEMATIC REFERENCE

NOTES:
1. SOLDER SHIELD TO CONNECTOR HOUSING (ITEM 2), BOTH SIDES.

REFERENCE DRAWINGS:
113275 ACU PCB ASSEMBLY
113105 TAC-92M BELOW DECKS INTERFACE GEN. ASS'Y

ITEM	QTY	SEA TEL PART NO.	DRW SZ	DESCRIPTION	VALUE	REFERENCE/NOTES
1	1			SHIELDED CABLE		CONSOLIDATED P/N: E140356
2	2	110935-36	A	DE-9S CONNECTOR HOUSING		AMP #205203-1
3	2	112570-11	A	BACKSHELL, DE, DIE CAST		AMP #748676-1
4	12	112267-13	A	DB CRIMP & SNAP SOCKETS	24-20 AWG	AMP #66504-9

B	3		
D	2		
C	1		
REV.	SHT.	REV.	LM
REV. STATUS			

TOLERANCES
UNLESS OTHERWISE SPECIFIED
X.X = ± .050"
X.XX = ± .020"
X.XXX = ± .005"
ANGLES = ± 30'
3rd ANGLE PROJECTION

STATUS:
Sea Tel, inc.
SCALE: NONE
APPROVED BY:
DRAWN BY: MAB
DATE: 12-11-97
DOC. NO.: 117084 REV. A
TITLE: INTERFACE CABLE ASS'Y, ACU TO MUX, -1
MODEL: DAC-97
SHEET: 1 OF 3
SIZE: B
DRAWING NUMBER: 116298-C

REV.	ECO#	DATE	DESCRIPTION	BY
A		1-30-98	ITEM 3 MFG. WS DIGIKEY, P/N: 909Z-ND.	MAB
B		3-3-98	DIM. 16" WS 8"	MAB
C		4-13-98	ITEM 1 WS QTY. 3; ITEM 5 WS QTY. 3; NOTES 2 & 3, FIG. A, ITEMS 5, 6 & 7 ADD'D.	MAB
D	1863	3-12-99	RS-232 REFERENCE ADD'D.	MAB

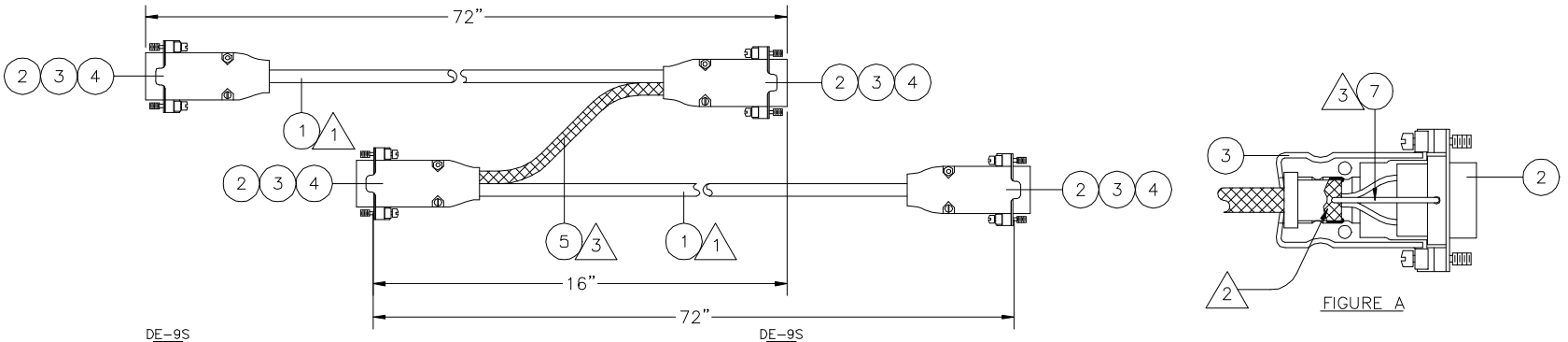
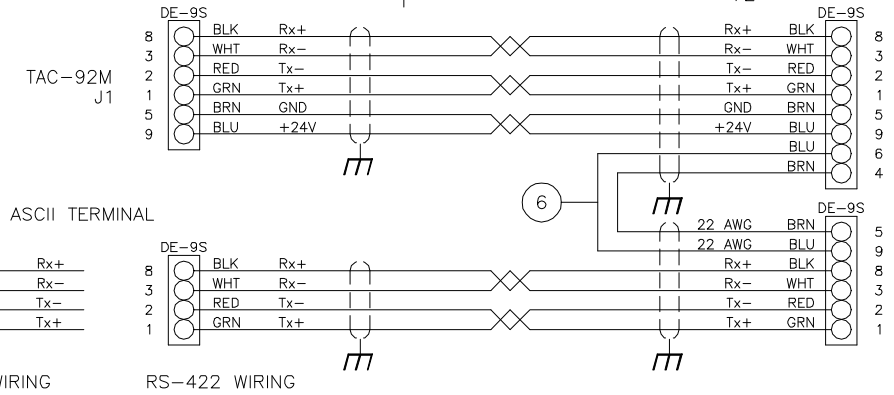


FIGURE A



NOTES:
1. SOLDER SHIELD TO CONNECTOR HOUSING (ITEM 2), BOTH SIDES.
2. FOLD BRAID BACK OVER GROMMET AS SHOWN IN FIG. A.
3. SOLDER DRAIN WIRE FROM BRAID TO CONNECTOR HOUSING (ITEM 2), BOTH SIDES.

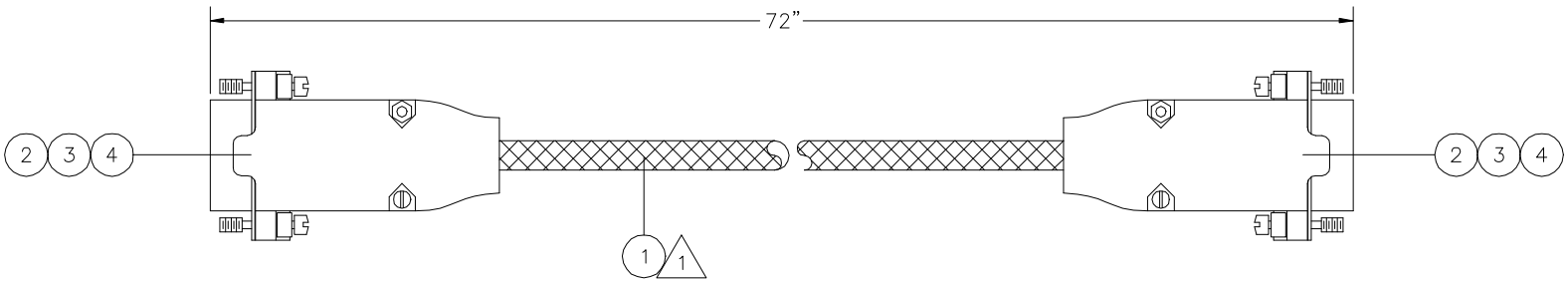
REFERENCE DRAWINGS:
113275 ACU PCB ASSEMBLY
113105 TAC-92M BELOW DECKS INTERFACE GEN. ASS'Y

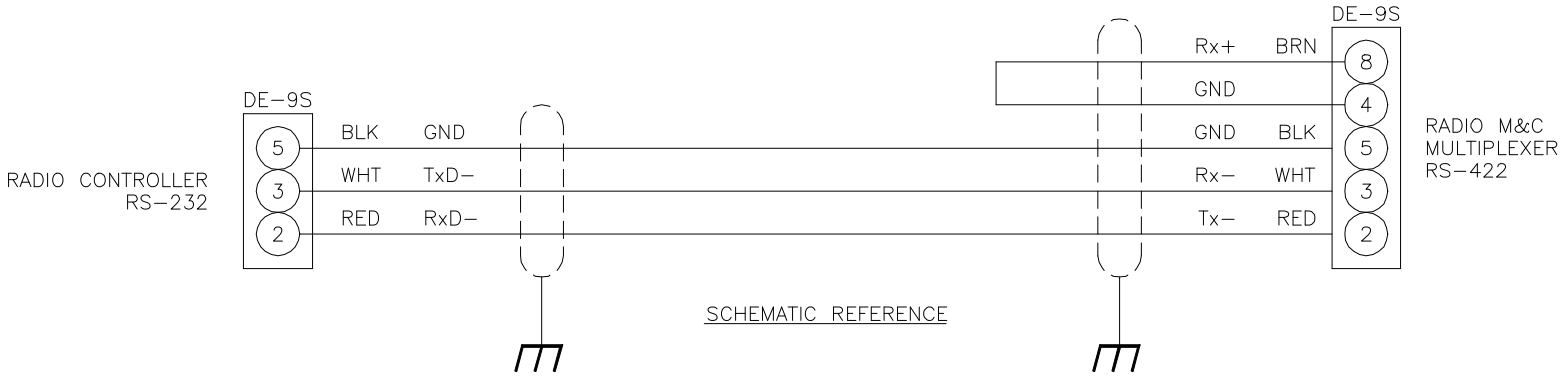
ITEM	QTY	SEA TEL PART NO.	DRW SZ	DESCRIPTION	VALUE	REFERENCE/NOTES
1	2			SHIELDED CABLE		CONSOLIDATED P/N: E140356
2	4	110935-36	A	DE-9S CONNECTOR HOUSING		AMP #205203-1
3	4	112570-11	A	BACKSHELL, DE, DIE CAST		AMP #748676-1
4	24	112267-13	A	DB CRIMP & SNAP SOCKETS	24-20 AWG	AMP #66504-9
5	1	112942-2	A	TINNED COPPER BRAID	3/16"	LENGTH AS SPECIFIED
6	2	113343-7	A	HOOKUP WIRE, GEN. PURPOSE	22 AWG	COLOR/LENGTH AS SPECIFIED
7	2	113343-7	A	HOOKUP WIRE, GEN. PURPOSE	22 AWG	COLOR: GRN, LENGTH: 1-1/2"

TOLERANCES
UNLESS OTHERWISE SPECIFIED
X.X = ± .050"
X.XX = ± .020"
X.XXX = ± .005"
ANGLES = ± 30'
3rd ANGLE PROJECTION

STATUS:
Sea Tel, inc.
SCALE: NONE
APPROVED BY:
DRAWN BY: MAB
DATE: 12-11-97
DOC. NO.: 117084 REV. A
TITLE: INTERFACE CABLE ASS'Y, ACU TO MUX, -2
MODEL: DAC-97 MULTI-MODEM
SHEET: 2 OF 3
SIZE: B
DRAWING NUMBER: 116298-D

ITEM	QTY	SEA TEL PART NO.	DRW SZ	DESCRIPTION	VALUE	REFERENCE/NOTES
1	1			SHIELDED CABLE		CONSOLIDATED P/N: E140356
2	2	110935-36	A	DE-9S CONNECTOR HOUSING		AMP #205203-1
3	2	112570-11	A	BACKSHELL, DE, DIE CAST		AMP #748676-1
4	8	112267-13	A	DB CRIMP & SNAP SOCKETS	24-20 AWG	AMP #66504-9



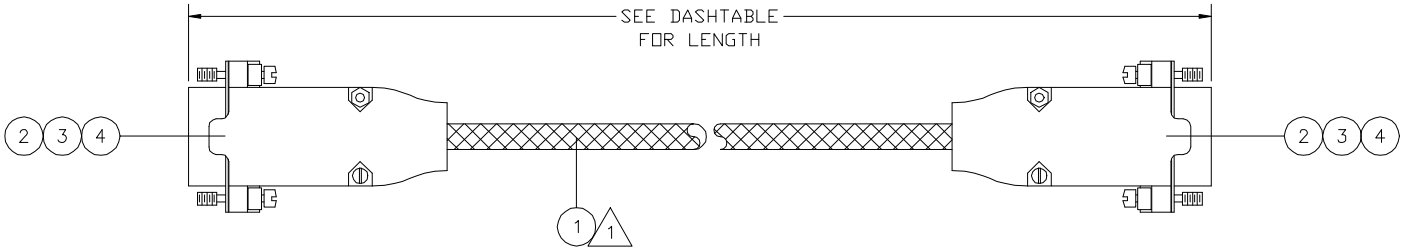


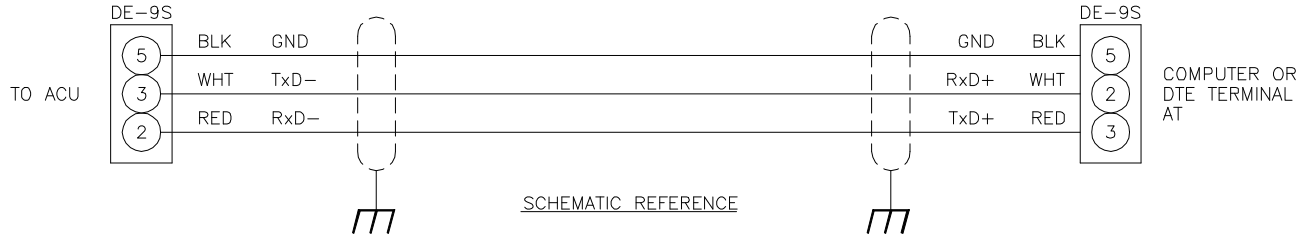
NOTES:
1. SOLDER SHIELD TO CONNECTOR HOUSING (ITEM 2), BOTH SIDES.

REFERENCE DRAWINGS:
113275 ACU PCB ASSEMBLY
113105 TAC-92M BELOW DECKS INTERFACE GEN. ASS'Y

TOLERANCES UNLESS OTHERWISE SPECIFIED	Sea Tel, inc.		
X.X = ± .050"	SCALE: NONE	APPROVED BY:	DRAWN BY: MAB
X.XX = ± .020"	DATE: 14APR98		REVISED:
X.XXX = ± .005"	INTERFACE CABLE ASS'Y, ACU TO MUX, -3		
ANGLES = ± 30'			
3rd ANGLE PROJECTION	DAC-97	SHT. 3	SIZE B / DRAWING NUMBER 116298-B

REV.	ECO#	DATE	DESCRIPTION	BY
0		5-6-98		MAB
A	1854	3-11-99	ADDED DASHTABLE	JT





ITEM	QTY	SEA TEL PART NO.	DRW SZ	DESCRIPTION	VALUE	REFERENCE/NOTES
1	1			SHIELDED CABLE		CONSOLIDATED P/N: E140356
						SUBST. BELDEN 9502, OR 9302
2	2	110935-36	A	DE-9S CONNECTOR HOUSING		AMP #205203-1
3	2	112570-11	A	BACKSHELL, DE, DIE CAST		AMP #748676-1
4	6	112267-13	A	DB CRIMP & SNAP SOCKETS	24-20 AWG	AMP #66504-9

DASH	LENGTH
-1	25'
-2	12'
-3	6'

NOTES:
1. SOLDER SHIELD TO CONNECTOR HOUSING (ITEM 2), BOTH SIDES.

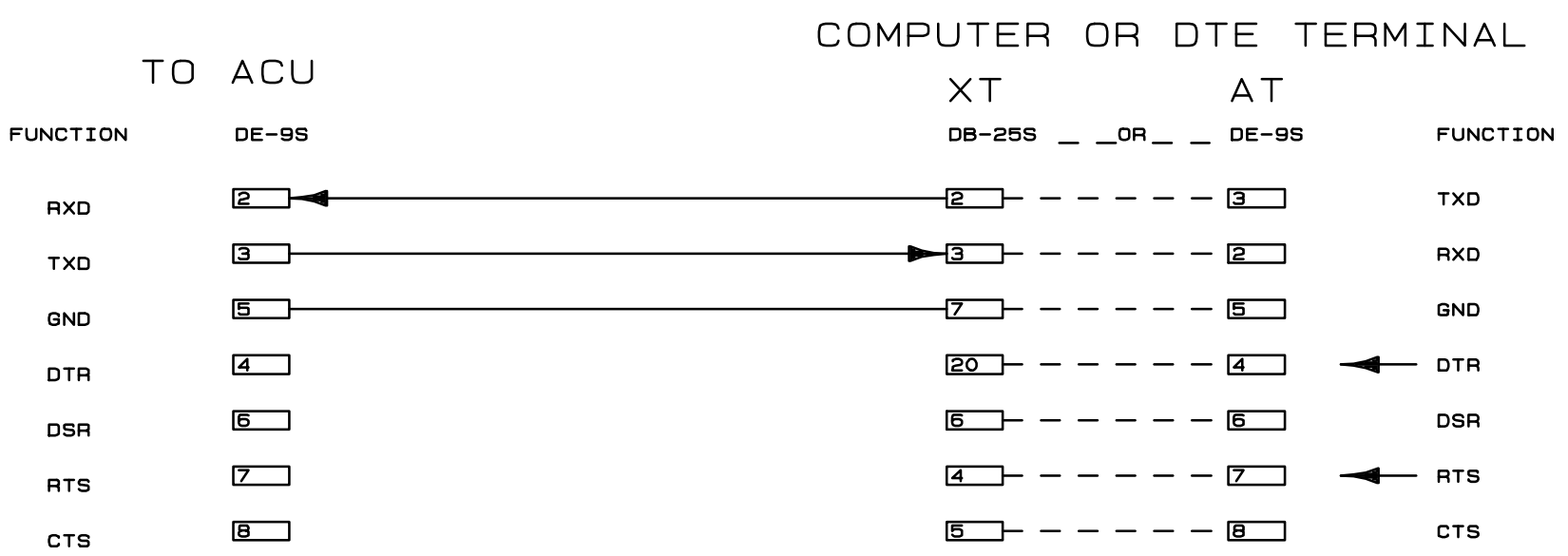
REV.	SHT.	REV.	LM
A	1		

REV. STATUS

TOLERANCES
UNLESS OTHERWISE SPECIFIED
X.X = ± .050"
X.XX = ± .020"
X.XXX = ± .005"
ANGLES = ± 30'
3rd ANGLE PROJECTION

STATUS:
Sea Tel, inc.
SCALE: NONE
APPROVED BY:
DRAWN BY: MAB
DATE: 5MAY98
DOC. NO.: 117084 REV. A
TITLE: RS-232 CABLE ASSEMBLY
MODEL: TAC-92 TO PC
SHEET: 1OF1
SIZE: B
DRAWING NUMBER: 116670 -A

REV	DATE	DESCRIPTION	APVL
A	8-15-90	RS-232 HARDWARE HANDSHAKE ADDED	
B	10-28-93	CHG D-SUB DESIGNATORS	
C	8-22-96	ADD'D SHT 2 25 PIN ACU	



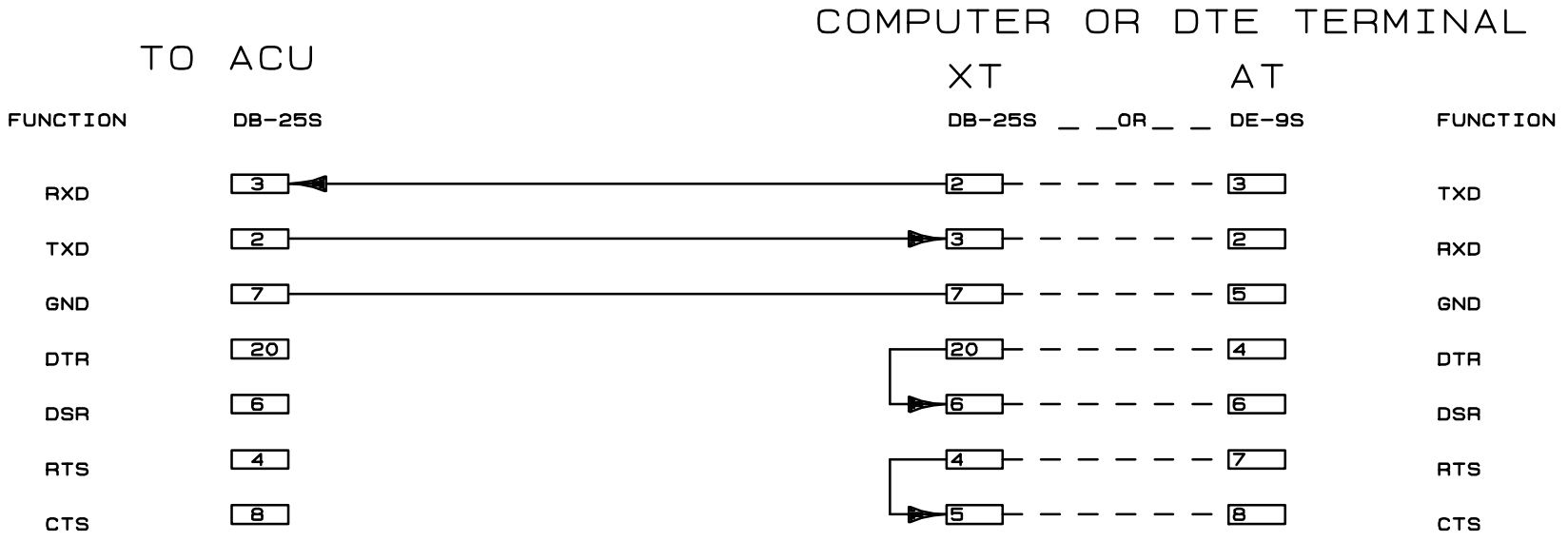
SUGESTED CABLE INTERFACE
FROM ACU TO IBM PC OR EQUIV

Sea Tel, Inc.
CONCORD, CA

SCALE:	APPROVED BY:	DRAWN BY PGB
DATE: 5-15-90		REVISED

RS-232 CABLE DIAGRAM

MPC-1, TAC-92	SHEET 1 OF 2	DRAWING NUMBER 110762-C



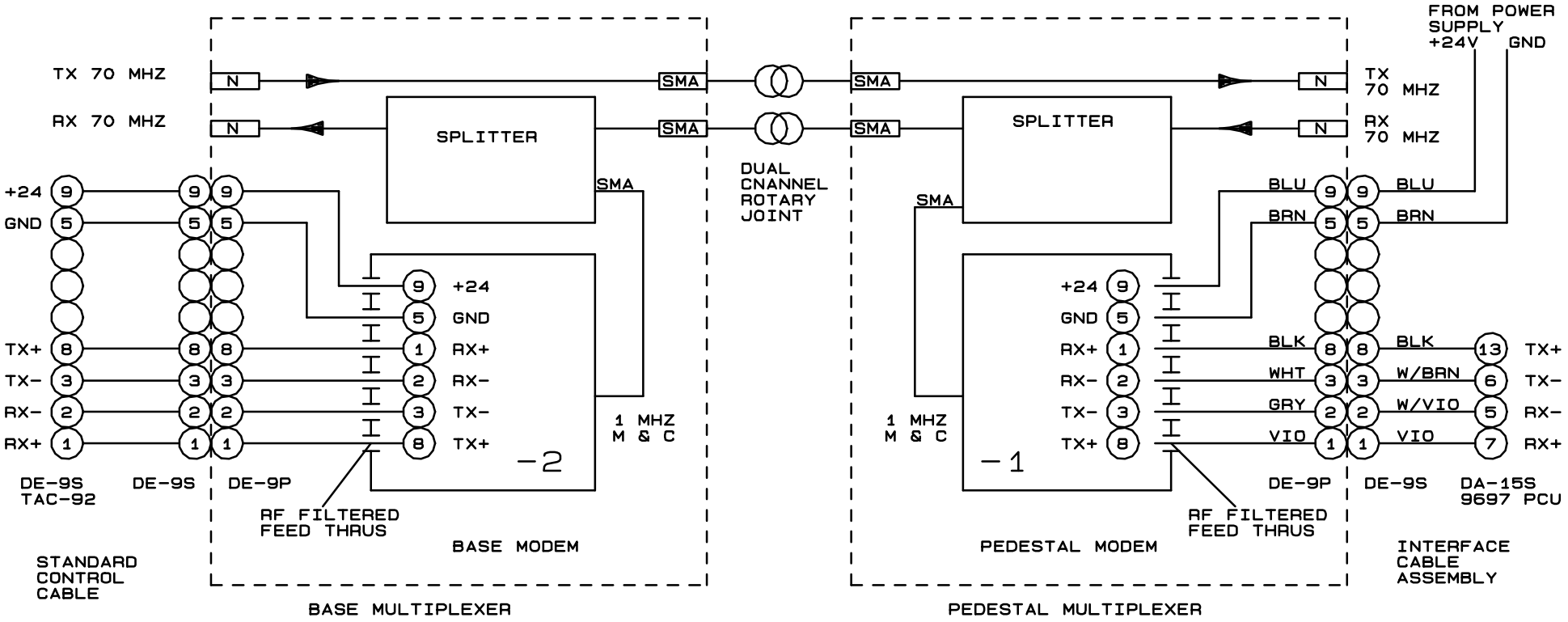
SUGESTED CABLE INTERFACE
FROM ACU TO IBM PC OR EQUIV

Sea Tel, Inc.
CONCORD, CA

SCALE:	APPROVED BY:	DRAWN BY PGB
DATE: 5-15-90		REVISED

RS-232 CABLE DIAGRAM

HDT-91, STR-95	SHEET 2 OF 2	DRAWING NUMBER 110762-C



Sea Tel, Inc.
CONCORD, CA

SCALE:	APPROVED BY:	DRAWN BY PGB
DATE: 7-28-97		REVISED

UNLIMITED AZIMUTH INTERCONNECT CABLE DIAGRAM

xx96, xx97 SHEET 1 OF 1 DRAWING NUMBER 116040-0

1.0 COMMAND SUMMARY (2nd Serial port commands)

CONTROL CODES:	FUNCTION	
6	Azimuth CW one step	(Not available in 3.00)
4	Azimuth CCW one step	"
8	Elevation UP one step	"
2	Elevation DOWN one step	"
Aaaaa{}	Move AZ to aaa.a deg. true or magnetic	
Baaaa{}	Set ships heading to aaa.a degrees	
cnnnn{}	Set MHz/CHA tuning to nnnn MHz	
dnnnn{}	Set KHz/CHB tuning to nnnn KHz/MHz	
C	Tracking (Step Track / Conscan) ON	
D	Tracking (Step Track / Conscan) OFF	
Eeeee{}	Move EL to eee.e degrees	
gnnn{}	Set 24v polang position to nnn	
hnnn{}	Set 5v PWM polang position to nnnn	
Jrrrr{}	Move azimuth to ship relative position	
Nnnn{}	Set step track integral	(0-255)
nnnnn{}	Set remote “N” parameters to Nnnnn	
Onnn{}	Output data to EME equipment	
R	Begin Spiral search	
s	Advance AGC input selection (Ext, ChA, CHB, IF)	
Taaaa{}	Move to satellite at aaa.a degrees	
U	Force cable unwrap	
W	Write parameters to NV RAM	
Xnnn{}	Set azimuth step track / conscan sensitivity to nnn steps	(0-255)
Ynnn{}	Set elevation step track / conscan sensitivity to nnn steps	(0-255)
$mmmmm{}	NMEA Latitude / Longitude input (GPGLL format)	
^nnnn{}	Send remote Utility command ^nnnn to PCU	
esc	Cancel Pending Command	
!	Enable NVRAM writes	

MONITOR CODES	FUNCTION	TAC RESPONSE
H	Relative Az,Ship Heading	RrrrrHaaaa CR,LF,>
M	Tracking Parameter Dump	Xnnn Ynnn Nnnn CR,LF,>
P	Az/EL Position	EeeeeAaaaa CR,LF,>
S	TAC Status	Snn CR,LF,>
V	Software Version	TAC-92C VER N.NN CR,LF,>
q	Read Tuning Frequencies	Qnnnn nnnn s CR,LF,>
u	Read Temperature, polang	GnnnnUuuuu CR,LF,>
%	Read Signal Strength	Lnnnn CR,LF,>
@	Report Lat / Lon Position	NeeeeWaaaa CR, LF, >
&	Read/Clear Error Status	NOT IMPLEMENTED
?a{}	Remote Monitor Request	remote response to “a” CR

ABBREVIATIONS:

eeee	=	Elevation angle 0000 to 0900.
aaaa	=	True/Magnetic Azimuth 0000 to 3599 range
rrrr	=	Relative azimuth 0950 to 6250 range
x	=	ASCII hex I/O data
nnnn	=	ASCII decimal number (0000-9999)
nnn	=	ASCII decimal number 0 to 255
uuu	=	ASCII decimal number 0 to 999
nn	=	System Status two ASCII words defined below:
e	=	Error status
{}	=	Carriage return

2.0 CONTROL CODE DETAILS

For the following descriptions, one step equals 1/24 degree for standard pedestal.

6,4	Azimuth CW,CCW one step. TAC Response: None
8,2	Elevation UP/DOWN one step. TAC Response: None
Aaaaa{}	Move AZ to aaa.a degrees magnetic. May cause antenna to move more than 180 degrees if shorter path will place antenna within 90 degrees of an end stop. TAC Response: CR,LF,">" when command is accepted.
Baaaa{}	Set ships compass heading to aaa.a degrees. Sets Heading Valid flag (Bit 3, word 2). Resets calculated azimuth position (P command) to ships heading + azimuth relative position modulo 360.0 degrees. The ships heading is automatically updated by the gyro compass inputs to the ACU. Not valid for 1:1 gyro compass interface. TAC Response: CR,LF,">" when command is accepted.
C	Step track ON. Sets Steptrack ON status flag (bit 3 word 1). Enables step track movements synchronized with "L" signal strength updates. Default state OFF. TAC Response: None.
D	Step track OFF. Clears Steptrack ON status flag (bit 3 word 1). Disables tracking. TAC Response: None.
cnnnn{}	Sets CHA tuning for IN A receiver or MHz tuning for IF receiver to nnnn MHz. TAC Response: CR,LF,">" when command is accepted.
dnnnn{}	Sets CHB tuning for IN B receiver to nnnn MHz or KHz tuning for IF receiver to nnn KHz. TAC Response: CR,LF,">" when command is accepted.
Eeeee{}	Move EL to eee.e degrees. TAC Response: CR,LF,">" when command is accepted.
gnnn{}	Set 24v Polang position to nnn. For 24v polang systems 30 to 210 corresponds to approximately -90 to +90 degrees from vertical. For flip antenna systems, 000 corresponds to the flat plate array, 128 corresponds to the horn antenna. TAC Response: CR,LF,> when command is accepted.
hnnn{}	Set 5v PWM Polang position to nnn. For 5v polang systems 50 to 200 corresponds to a probe angle of approximately -90 to +90 degrees from vertical. TAC Response: CR,FL,> when command is accepted.
Jrrrr{}	Move azimuth to ship relative position. Azimuth stabilization, Unwrap and and Tracking mode remain active after a J command. TAC Response: CR,LF,">" when command is accepted.

Nnnn{}	Set number of signal strength updates to accumulate for each trial step for step track operation. "N" should be set for a 2-6 second step track interval. Allowable range is 0 to 255. A setting of 0 disables step track and enables Conscan. TAC Response: CR,LF,">" when command is accepted.
nnnnn{}	Sets Remote PCU parameters to Nnnnn. Used to set pedestal system type, adjust individual axis gains and set reference offsets. TAC Response: CR,LF,">" when command is accepted.
Onnn{}	Output data to EME equipment. Changes logic state of output lines DO0-DO3. Data is sent as ASCII hexadecimal. Allowable range of nnn "0" to "7" TAC Response: CR,LF,">" when command is accepted.
R	Starts two axis spiral search pattern for satellite (SEARCH2). Sets Searching status flag (bit 0, word 2) and Steptrack ON status flag (bit 3 word 1). Search pattern size and increment is pre-set by the TAC-92 Setup parameters. Search is terminated by signal level above threshold, end of search pattern or a new Az or EL position command. If no signal is found then antenna is returned to its original azimuth and elevation position. TAC Response: None
s	Advance AGC input selection by one. Selection of External, RF in A, RF in B or IF receivers corresponds to an "s" value of 0, 1, 2 or 3 respectively. The current "s" value is reported by the "q" Monitor Code. TAC Response: none
W	Write all setup parameters to NV RAM. TAC Response: None
Xnnn{}	Set azimuth step track size or conscan sensitivity to nnn steps. Allowable range is 0 to 255. The maximum conscan sensitivity setting is 0. Increasing the conscan setting by one decreases the system sensitivity by a factor of 2. TAC Response: CR,LF,">" when command is accepted.
Ynnn{}	Set elevation step track size or conscan sensitivity to nnn steps. Allowable range is 0 - 255 steps. Setting "Y" to zero disables elevation step track doubling the speed of the azimuth step track. See Xnnn setting for conscan information. TAC Response: CR,LF,">" when command is accepted.
$mmmmm{}	NMEA Latitude / Longitude input. Sentence format as follows: GPGLL,YYYY.YY,N,XXXXX.XX,W (,UTC optional) YYYY.YY = Latitude in Degrees, Minutes, Decimal minutesN = North, S = South Latitude XXXXX.XX = Longitude in Degrees, Minutes, Dec Minutes E = East, W = West Longitude

3.0 MONITOR CODE DETAILS

H Relative AZ / Ships Heading position report. Reports simultaneous value of Antenna Relative position and Ships heading position in tenths of degrees. Relative azimuth range is 0950 to 6250. Ships heading range is 0000 3599.
TAC Response: "RrrrrHaaaa",CR,LF,">"

M Not implemented in this version.
Parameter Dump. Response is one line of ASCII characters representing the X,Y and N step track parameters.
TAC Response: "Xnnn Ynnn Nnnn",CR,LF,">"

P Az/EL Position. Response is one line of ASCII characters representing the antenna elevation and true azimuth position in tenths of a degree. Elevation range is 0000 to 0900. Azimuth range is 0000 to 3599.
TAC Response: "EeeeeAaaaa",CR,LF,">"

S TAC Status. Response is two ASCII characters representing the system status according to the following table. This command can be issued at any time and is not locked out by pending I/O commands.
TAC Response: "Snn",CR,LF,">" nn Status Words:

WORD1	WORD 2
Bit 0 = Remote Alarm Bit 0	Bit 0 = Searching
Bit 1 = Remote Alarm Bit 1	Bit 1 = Initializing
Bit 2 = Unwrap in progress	Bit 2 = Error Detected
Bit 3 = Steptrack On	Bit 3 = Heading Valid
Bit 4 = spare	Bit 4 = Elevation targeting
Bit 5 = Auto Unwrap On	Bit 5 = Azimuth targeting
Bit 6 = 1	Bit 6 = 1
Bit 7 = 0	Bit 7 = 0

V Software Version. Response is ASCII string defining software model and version number.
TAC Response: "TAC-92 VER N.NN",CR,LF,">"

q Tuning Frequency. Response is Channel A tuning, Channel B tuning and receiver selection. For IF receiver selection, response is MHz portion , KHz portion of the tuning frequency and receiver selection. Receiver selection of External, RF in A, RF in B or IF receivers corresponds to an "s" value of 0, 1, 2 or 3 respectively.
TAC Response: "Qnnnn nnnn s",CR,LF,">"

u Polang / AUX read. Response is polang position (nnnn) and Auxiliary A/D reading (uuuu) from remote PCU. Reads polang pot for 24 volt polang systems and polang PWM output for 5v systems. For flip antenna systems, 000 indicates primary antenna, 128 indicates secondary antenna. Aux A/D reading is 0000-4095 for 0 to 5v input. If Aux Read is temperature, Degrees C = 2.0 + .032 x uuuu - 3271 / uuuu.
TAC Response: "GnnnnUuuuu",CR,LF,">"

% Signal Strength. Response is average signal strength over N sample intervals in ASCII hex characters. Allowable range of response is 0000 to FFFF.
TAC Response: "Lssss",CR,LF,">"

@ Latitude / Longitude Position Read. Reports North/South Latitude and East/West Longitude read from GPS receiver in tenths of a degree.
TAC Response: “NeeeeWaaaa”,CR,LF,”>“

?a{} Request Remote Status. Sends the “a” Status Request command to the PCU and echoes the PCU response less checksums. ?S{} gets PCU status, ?V{} gets PCU Version Number.
TAC Response “PCU status response” + CR,LF,”>”.

4.0 GENERAL NOTES

The CR,LF,">" echo indicates that the TAC has accepted a command and is ready to process the next command. Any additional commands will not be accepted until after the TAC echoes CR,LF,">".

The normal command latency for Monitor or Control commands is 25 mili Seconds.

Temperature in degrees C = 2.0 + .032 x uuuu - 3271 /uuuu.