ESCORT 100/200
ESCORT 100T/200T

SERVICE MANUAL

Medical Data Electronics • 12720 Wentworth Street • Arleta, California 91331-4329
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NOVEMBER, 1993

REVISION K

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WARRANTY

ESCORT is warranted against defects in materials and workmanship for the period of 12 months from the date of shipment to original purchaser. Batteries, cables, cuffs, and sensors are warranted 3 months from date of shipment. Warranty is valid only to the original buyer. Defective equipment should be returned freight prepaid. Equipment returned with defective parts and assemblies will be either replaced or repaired. This warranty is not applicable if repair has been attempted or if the instrument has been damaged due to operation outside the environmental and power specifications for the product, or due to improper handling or use.

If any default develops, notify Medical Data Electronics, giving full details of the difficulty, including the model and serial number of the device. On receipt of the shipping instructions, forward the device prepaid, and repairs will be made at the factory. If requested, an estimate will be made before work begins, provided the device is not covered by warranty.

The foregoing warranty is in lieu of all other warranties expressed or implied, including but not limited to any implied warranty or merchantability, fitness or adequacy for any particular purpose or use. Medical Data Electronics shall not be liable for any special, incidental or consequential damages.

Factory Service is available by obtaining an RMA number from the MDE Service Department. Please have model number and serial number ready when calling.

WARNING!

To avoid personal injury, the user should not perform any servicing unless qualified to do so.

TABLE OF CONTENTS

TELEMETRY

ESCORT HARDWIRE SPECIFICATIONS

DISPLAY

Size: 5" (12.7cm) diagonal
Type: CRT non-fade, P31 phosphor
Number of Traces: 2
Trace Length: 3.2 sec at 25 mm/sec
6.4 sec in cascade

FRONT PANEL KEY FUNCTIONS

Freeze 1, Freeze 2, Record 1, Record 2, Alarm Suspend, Record Stop, Page Home, Next Page, Softkeys (4)

ECG

Range: 10 to 300 BPM
Accuracy: ± 2% or ± 2 BPM
Sweep Speed: 12.5, 25, 50 mm/sec selectable
High Limit Range: 50 to 250 BPM
Low Limit Range: 20 to 150 BPM
Limit Resolution: 5 BPM
Asystole Alarm: R to R interval greater than 6 seconds
Bandwidth: 0.5 to 40 Hz (monitor)
0.05 to 100 Hz (diagnostic)
R-wave Indicator: Flashing heart
Leads: Full 5 lead selectable - or fixed 3 lead
Sensitivity: .12 to 3 cm/mV selectable (12 levels)
Pacer Rejection: 0.2 to 2 msec; 2 to 700 mV
Defib Tolerance: 400 joule with 25 ohm series lead impedance
Connector: Standard AAMI 6 pin MS
Isolation: Full electrical isolation
Overload Recovery: Less than 2 sec excluding electrode polarization
Electrosurgical Suppression: Standard
Configuration: Neonatal/Adult softkey

RESPIRATION

Range: 4 to 200 BPM
Accuracy: ± 2% or 2 BPM
Lead: RA to LA
Inspiration Indicator: Flashing lungs
Sensitivity: .19 to 3 ohms selectable
Alarm: High and low rate, apnea delay selectable, 10, 15, 20, 30, 40 sec
Sweep Speed: 1.56, 6.25, 12.5, 25 mm/sec selectable
CVA Rejection: Rejects most cardiovascular coincidence
Configuration: Neonatal/Adult softkey

PRESSURE

Range: -40 to 300 mmHg
Accuracy: ± 1% or ± 1mmHg
Parameter Display: SYS, DIAS, and MEAN
Alarm Parameter: SYS, DIAS, or MEAN
Limit Range: 5 to 250 mmHg
Limit Resolution: 5 mmHg
Sweep Speed: 12.5, 25, 50 mm/sec selectable
Display Scale: 30, 60, 120, 240 mmHg selectable
Cursor Bar: Selectable levels, 1 mmHg steps
Input Connector: Standard 6 pin MS
Display: Pulse or scaled waveform, selectable
Heart Rate Source: ECG or BP
Sensitivity: 5 uV/V/mmHg, softkey gain adjust
Zero Range: ± 100 mmHg, auto zero
Calibration: 100/50 mmHg squarewave
Isolation: Full electrical isolation
Auto Transducer Detect

MODULAR BATTERIES (Option)

Capacity: 2.0 to 2.5 hours
(3 battery packs)
Charge Time: Internal charger: 16 hrs
Opt. external charger: 2.7 hrs per battery pack
Type: 12V, 2AH sealed lead acid rechargeable

RECORDER

Print Method: Thermal array
Channels: Single or dual
Resolution: 8 dots/mm vertical
32 dots/mm horizontal
Paper: 40mm grid; 50mm paper width
Speed: 6.25 to 50 mm/sec;
1mm/min Trend
Manual Record Duration: 16 sec
Memory: 12 sec
Annotation: Time, date, all parameter values, scales, source, speed

TEMPERATURE

Range: 0 to 50 degrees C
Accuracy: ±0.2 degrees C
Probe: YSI 700
Units: Degrees C or Degrees F selectable
Channels: Two
Connector: 1/4 inch stereo phone jack
Isolation: Full electrical isolation

TREND

Parameters: HR, BP, RR, TEMP

Time: 24 hours
CRG Mode: Compressed resp waveform displayed and recorded with HR trend

PHYSICAL

Size: 6-7/8" (H) x 7-7/8" (W) x 9" (D)
7-7/8" (H) x 7-7/8" (W) x 10" (D) with battery
Weight: 10.5 pounds
12.5 pounds with recorder
18.5 pounds with recorder and battery
Environment: 5 to 40 Degrees C;
0 to 90% humidity
AC Main: 115 or 230 V ac ± 10%,
60 or 50 Hz ± 5%
Power: 40 watts
External DC In: 10 to 24 V dc, 3A max.
Designed to meet UL544 Requirements

ESCORT HARDWIRE SPECIFICATIONS (Continued)

NIBP (Option)

Measurement Method: Oscillometric
Measurement Range: Systolic 60-270mmHg
Diastolic 40-250mmHg
Pulse Rate 20-250 BPM
Measurement Time: 30 to 40 seconds typical
Modes: Manual-initiated via START key
Automatic-STAT, 1, 2, 3, 4, 5, 10, 15, 30, 45, 60 minute selections
Auto Zero: Prior to each reading
Cuff Inflation: 170mmHg on first inflation
Systolic + 30mmHg on subsequent inflations
Cuff Deflation: 8mmHg steps
Alarms: Systolic, Diastolic, or Mean selectable in 5mmHg increments
Electronic Accuracy: ±3mmHg or ±2% reading
System Accuracy: ±5mmHg mean error with ±8mmHg SD
Hose: Dual lumen
Cuff/Hose Connectors: Standard screw fittings
Cuff Sizes: Pediatric, Adult, Large Adult, Adult Thigh

SaO2 (Option)

Display: % SaO2, Plethysmographic Waveform, Pulse Rate, Pulse Amplitude Bar, Alarm & Status Messages
SaO2 Range: 0-100%
SaO2 Accuracy:

Adult	70 - 100%	±2 digits
Adult	50 - 69%	±3 digits
Neonatal	70 - 94%	±3 digits

Pulse Rate Range: 35 - 250 beats/minute
Pulse Rate Accuracy: ±3 beats/minute
Alarm Limit Range: High 70 - 100%
Low 50 - 100%
Operating Modes: NORM = 5-7 seconds
FAST = 2-3 seconds
SLOW = 10- 15 seconds
Calibration: Automatic

NELLCOR MODULE
U.S. PATENT

4,621,643 4,700,708
4,802,486 4,770,179

Specifications subject to change without notice.

SYSTEM OVERVIEW

CHAPTER 2

2.0.0 SYSTEM OVERVIEW

The ESCORT hardwire is a two trace portable patient monitor that can be configured at the factory for a multiple of different uses depending on the requirements of the customer. All ESCORTS are configured for ECG. With the addition of another processor board and enhanced software, temperatures, pressures, and respiration can also be included depending on the model. The configuration for the monitor is held in the CPU EPROM.

The ESCORT has a minimum of three PCBA's and a maximum of five PCBA's. These include: CPU Board, ECG Board, Temperature-Pressure Board, Battery Charger Board and Switching Power Supply Board.

The CPU Board handles the various processing tasks for the monitor as well as interfacing between the signal processor boards (ECG and Temp-Press) and the CRT display and recorder. Keyboard decoding is located on the CPU Board, as are the High Level Outputs. The HL outputs are available at the auxiliary connector on the rear panel.

ECG, temperature, respiration and pressure signals are input to the processor boards via the connector plate on the right side of the monitor. These inputs are isolated from line current by the use of opto-couplers. The signals that are input are filtered and then converted from an analog to a digital format. Further processing and calculating will be done before the data is sent to the CPU Board through the edge connector. The CPU will then process the data and convert the digital information to analog X, Y, and Z-axis drive signals to be sent to the CRT. Data is also sent to the recorder. Filament voltage to the CRT is also from the CPU board.

The Battery Charger Board provides charging current to the batteries in two separate modes. When the unit is not being used for monitoring, the batteries are charged at the maximum current rate. If the unit is in service, the batteries are charged at minimum current to reduce total power consumption.

The Switching Power Supply provides necessary operating voltages by any one of three methods: an AC outlet, internal battery power, and an auxiliary DC power source. Battery level indication is measured on the Switching Power Supply Board.

2.1.0 ESCORT RS-232 Communication Protocol

ESCORT 100/200, 100T/200T monitors include an RS-232 interface for data acquisition by the user's Clinical Information System. Virtually all information displayed on the ESCORT monitor is available for serial transmission, including parameter values, alarm status, leads status, remote status and waveform information. The Clinical Information System used should have an unused serial port that operates under the EIA (Electronics Industry Association) RS-232C standard. This protocol is only valid for main software versions 7.6 and higher. The software version may be obtained by calling up the TEST page of the ESCORT monitor. Refer to the ESCORT 100/200, 100T/200T Operator's Manual for instructions.

WARNING!

Do not attempt accessing RS-232 information unless you are familiar with UART (Universal Asynchronous Receiver and Transmitter) operation and setup. Only qualified and experienced technicians or programmers should attempt using the following protocol. The user will be required to develop program code to access and display the acquired data.

UART configuration for serial communications is 9600 baud, one (1) start bit, eight (8) data bits, two (2) stop bits, and no parity. In its default condition, ESCORT monitors transmit two packets of information: a parameter packet followed by an ECG waveform packet.

A parameter packet is illustrated below. Parameter sequence and identification are outlined in Table 1. The tabular references located above some of the blocks in the figure below will point toward additional information. All checksums are modulo 256 over the indicated ranges.

	Table 2	Table 3	.....	Table 3			Table 4			
2 byte ID ESC,P	3 byte parameter #0	3 byte parameter #1	*parameters #2 thru #11*	3 byte parameter #12	1 byte HR limit HIGH	1 byte HR limit LOW	1 byte Remote Status	1 byte Spare	1 byte Spare	1 byte CHECK SUM

Parameter Packet: The two byte ID is generated by the ESCORT monitor, see Table 5 for details

The three byte parameter blocks (referenced #0 through #12 above) are broken down as follows:

2 byte Data (0-500)	1 byte ECG Status

3 Byte - Parameter #0 (ECG)

The *first two bytes* contain the value of the parameter measured (in this case, ECG) within a range of zero to five hundred (0 -500). Data is transmitted LSB, MSB.
The *third byte* contains ECG status information as described in Table 2.

2 byte Data (0-500)	1 byte Status

3 Byte - Parameters #1 through #12

The *first two bytes* contain the value of the parameter measured within a range of zero to five hundred (0 -500). Data is transmitted LSB, MSB.
The *third byte* contains parameter status information as described in Table 3.

1 byte HR limit HIGH

1 Byte - Number representing heart rate HIGH alarm limit

1 byte HR limit LOW

1 Byte - Number representing heart rate LOW alarm limit

1 byte Remote Status

1 Byte - Remote Status (See Table 4)

The ECG waveform packet immediately follows the parameter packet. It is identified by its three byte ID (ESC, W, <Waveform No.>) followed by a length byte. The length byte represents the number of bytes that include waveform data. Waveform resolution is limited to 00h - FEh (254 decimal). FFh (255d) sets a pacer flag which may be used for pacer detection (only sent when PACER ON is selected, and the ECG software version is 7.11 or later).

Telemetry ECG was first supported with main software version 7.12. Support for sending a lead-fail message when telemetry is in squelch was first available with main software version 7.13.

Transmitted waveform information varies in ESCORT monitors configured for 110V/60Hz and 220V/50Hz. Please note caption information in the following waveform packet descriptions to determine the anticipated waveform information for your ESCORT monitor.

3 byte ID ESC, W, <Waveform No.>	1 byte length (bytes)	approx. 160ms of data sent at a sample rate of 120Hz; length is specified by length byte	1 byte CHECK SUM

Waveform packet information for 110V/60Hz ESCORT monitors ONLY

3 byte ID ESC, W, <Waveform No.>	1 byte length (bytes)	approx. 200ms of data sent at a sample rate of 100Hz; length is specified by length byte	1 byte CHECK SUM

Waveform packet information for 220V/50Hz ESCORT monitors ONLY

As previously stated, the ESCORT monitor transmits two packets of information: a parameter packet and an ECG waveform packet. The Clinical Information System may request an additional waveform by issuing the following command:

ESC, R, <Waveform No.>

The ESCORT monitor will respond by sending the additional waveform packet in the previously described format (i.e., ESC, W, <Waveform No.>). Only one additional waveform may be acquired at a time. *IMPORTANT - Remember differences in transmission information for 110V/60Hz and 220V/50Hz!*

The additional waveform packet will be sent in sequence after the ECG waveform packet. A review of the overall sequence would be:

PARAMETER - ECG WAVEFORM - ADDITIONAL WAVEFORM

It is particularly important that special attention is applied when counting the number of bytes received and to properly use the waveform length byte to locate the appropriate waveform data. To change to a different *additional* waveform or to simply stop the acquisition of the current waveform, the selection in use must be turned off. This is accomplished by issuing the following command:

ESC, R, O

Note: The ECG waveform packet always follows the Parameter packet by default and may not be turned off.

Wiring information may be found in Figure 1, located at the end of this section.

Parameter	Order	Waveform Number
ECG	0	0
RESP	1	1
BP1 systolic	2	2
BP1 diastolic	3	
BP1 mean	4	
BP2 systolic	5	5
BP2 diastolic	6	
BP2 mean	7	
NIBP systolic	8	not available
NIBP diastolic	9	not available
NIBP mean	10	not available
SaO_2	11	11
TEMP	12	not available

Table 1
Order of parameters within packet

Note: TEMP (Temperature) is transmitted as an integer value with a range between 200 and 500 (Base 10). Each integer represents one tenth degree Celsius (0.1° C). This translates to an actual temp range transmitted that is between 20 and 50 degrees Celsius (20° C — 50° C).

ECG Status	Bit Position	Description
ECG Lead Loose (no connection)	0	leads not connected or loose
HR Alarm ON	1	an alarm is set for ECG
HR "IN ALARM"	2	a heart rate limit has been violated
HR Source Not ECG	3	heart rate is set for another source
Telemetry in Squelch (lead-fail)	4	send lead-fail message when telemetry is in squelch

Table 2
ECG Status (Bit Value: 1 = true, 0 = false)

Parameter Status	ASCII Value	Hex Value	Description
Connected and Alarms On	N	4Eh	Parameter is installed, connected and alarm is enabled
Connected and Alarms Off	F	46h	Parameter is installed, connected and alarm is disabled
Connected in Alarm	A	41h	Parameter is installed, connected, and in alarm condition
Disconnected	D	44h	Parameter is installed but not connected
Not Available	V	56h	Parameter is not installed
Not Zeroed	Z	5Ah	BP1 or BP2 have not been zeroed

Table 3
Parameter Status (ECG, see Table 2)

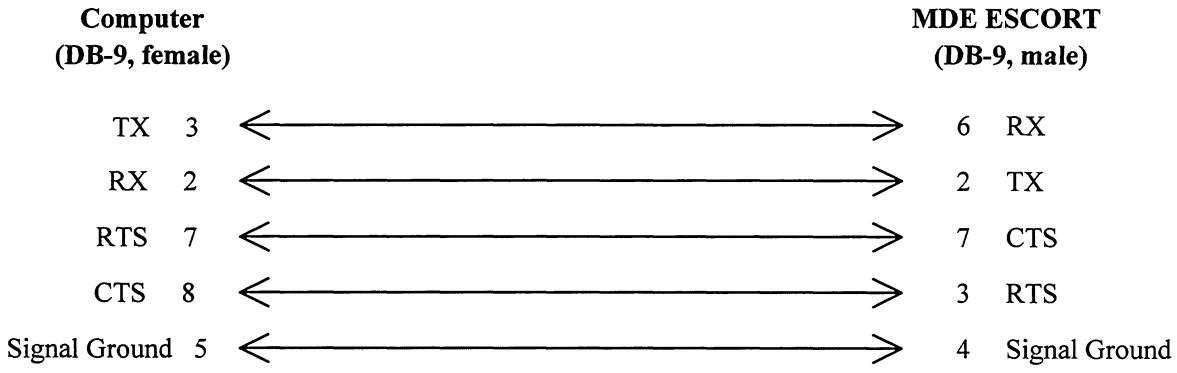
Remote ESCORT Status	Hex Value	Description
Null Status	00h	No activity
Low Battery	10h	Battery Voltage is Low
ESCORT Alarm Suspend	70h	Alarm Suspend Activated

Table 4
Remote Status

Note: In the event that a low battery condition occurs coincident with an alarm suspend, the ESCORT monitor will prioritize the event. Priority will be given to the low battery signal and ESCORT will transmit 10h.

Action	Identification Commands (ASCII)	Identification Commands (HEX)	Source
Parameter Packet Transmission	ESC , P	1B, 50	ESCORT
Waveform Packet Transmission	ESC , W , <Waveform No.> (See Table 1)	1B, 57, <Waveform No.> (See Table 1)	ESCORT
Request by User's computer for additional waveform	ESC, R , <Waveform No.> (See Table 1)	1B, 52, <Waveform No.> (See Table 1)	Clinical Information System
Turn off transmission of all waveforms except ECG	ESC, R, O	1B, 52, 4F	Clinical Information System

Table 5
Packet Identification Codes



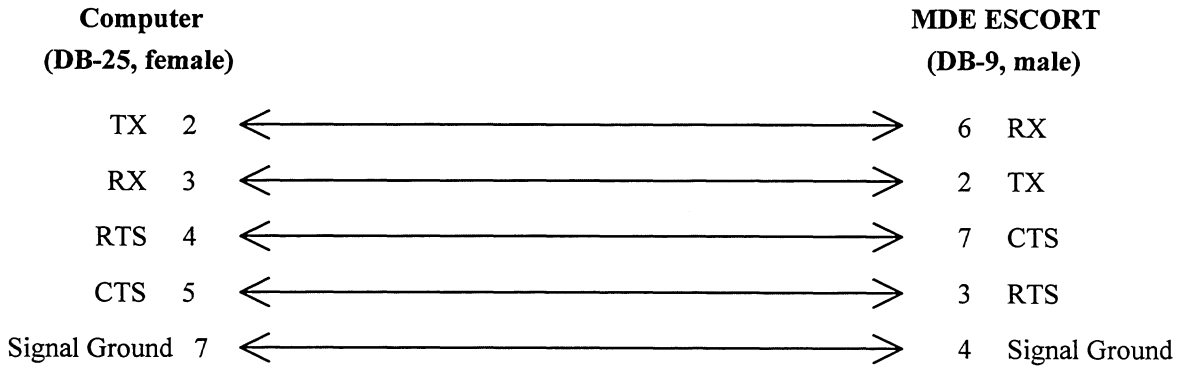
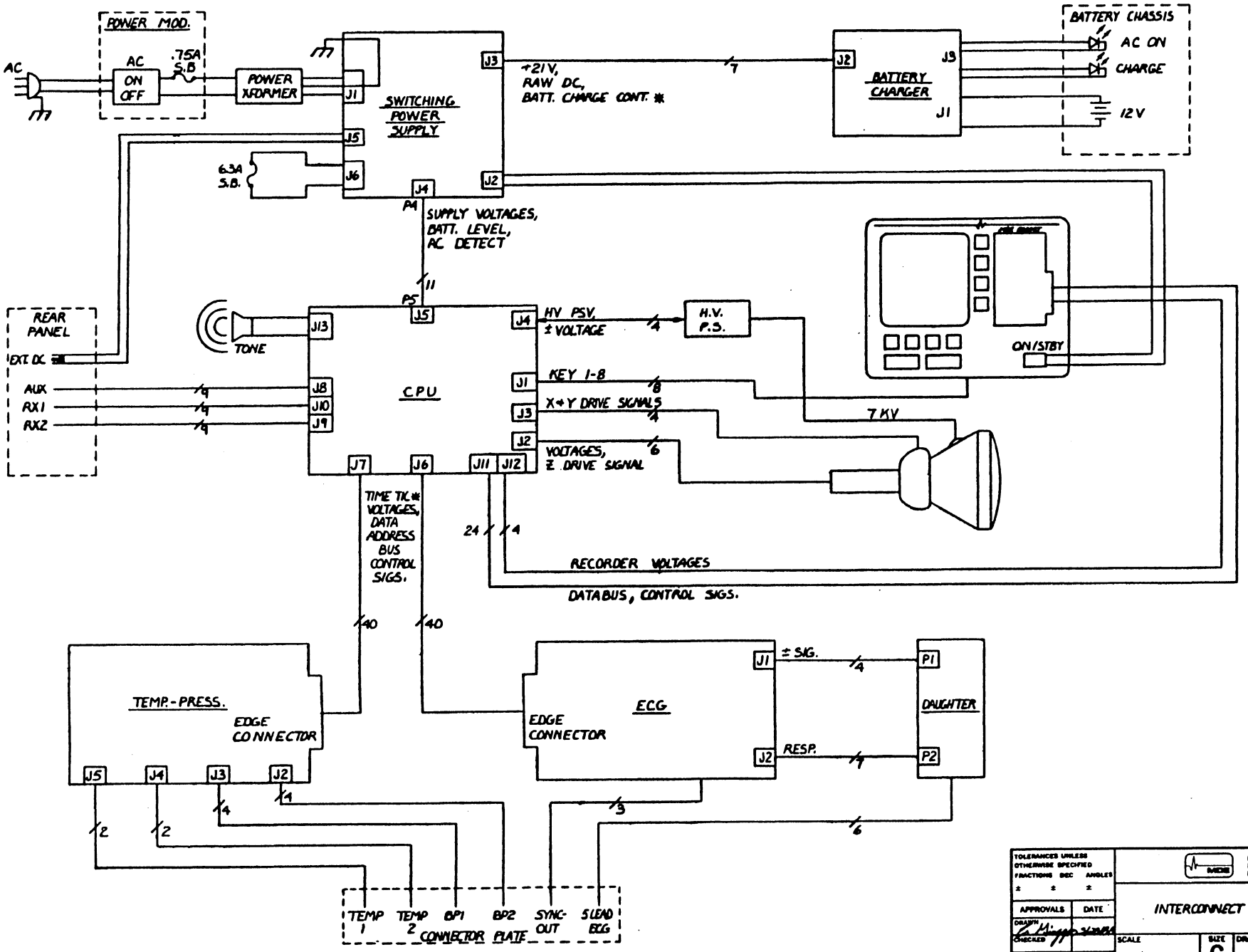


Figure 1
RS-232 Wiring Diagrams

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

INTERCONNECT DIAGRAM



TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	±

APPROVALS	DATE
DRAWN	
CHECKED	

MEDICAL DATA ELECTRONICS

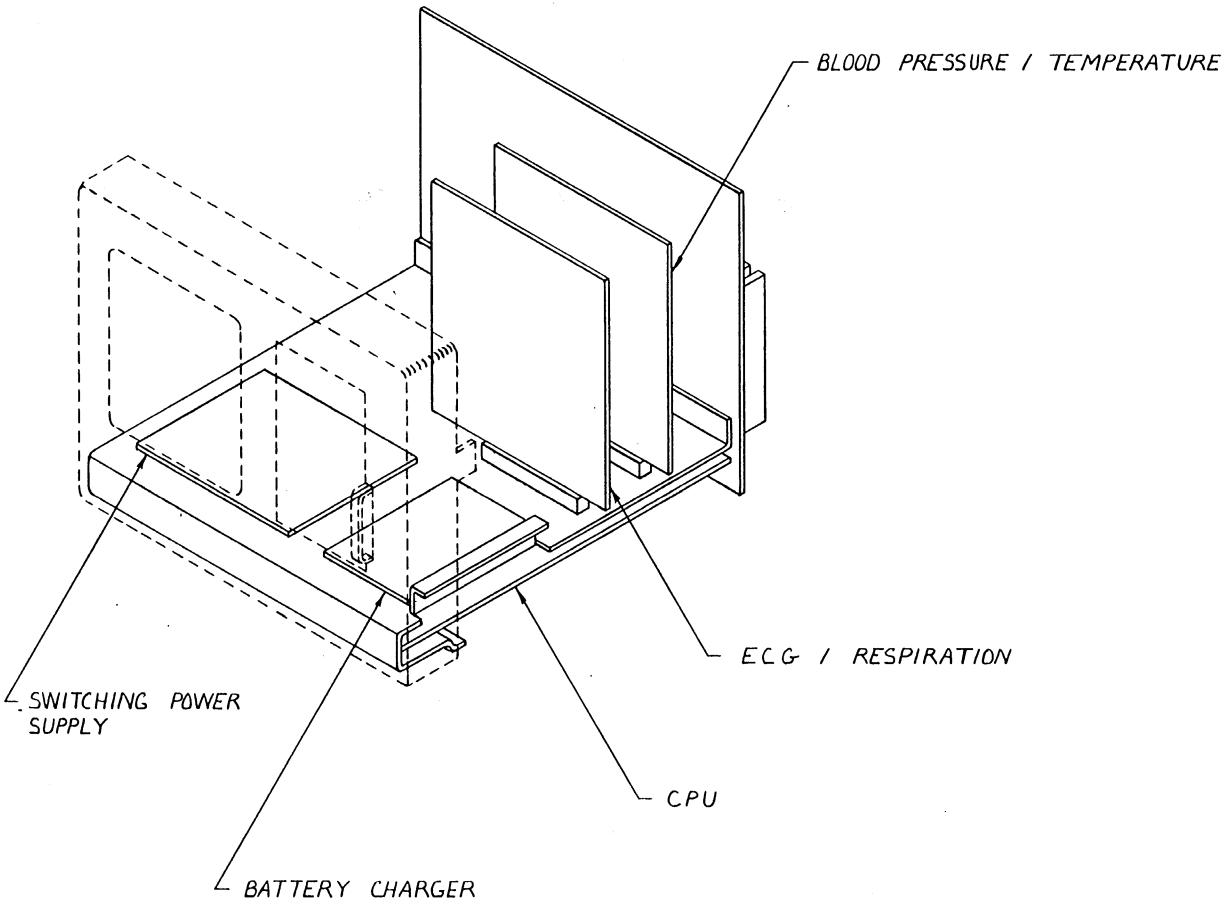
INTERCONNECT DIAGRAM

SCALE | SIZE C | DRAWING NO.

DO NOT SCALE DRAWING | SHEET 1 OF 1

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

BOARD LOCATION



TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±		MDE MEDICAL DATA ELECTRONICS
APPROVALS	DATE	BOARD LOCATION
DRAWN T. Dupuis	4-26-88	
CHECKED		SCALE 1/2 · SIZE C · DRAWING NO.
		DO NOT SCALE DRAWING · SHEET 1 OF 1

CPU BOARD

CHAPTER 3

3.0.0 CPU BOARD

3.1.0 OVERVIEW

The CPU Board controls all the functions of the **ESCORT.** It generates timing signals and holds the monitor configuration in the EPROM. It stores the softkey setup in the RAM, and retains it with a battery backup. A peripheral I/O chip decodes, generates and receives essential signals,and a keyboard encoder identifies and debounces key depressions. The microprocessor controls the CRT deflection on an interrupt level. The interrupts are a separate software loop in real time used to control the CRT beam. A longer loop will take care of CPU computing, softkeys, alarms and recorder.

3.2.0 MICROPROCESSOR

The microprocessor chip used on the CPU board is a Hitachi 64180. It is an 8-bit high integration CMOS chip with internal memory management, DMA control and a Z80 type CPU. It has 18 address lines that can access 512K memory or I/O. Basic timing for the processor is derived from X1, a 16 MHz crystal input to pins 2 and 3. The processor divides this signal internally by 2 for an 8mHz timing output at pin 64. Pins 34-41 are on the data bus and pins 13-30 are on the address bus. WAIT * signal at pin 4 is to introduce bus cycle waits as needed by the Dual Port RAM. Pins 47 and 54 are used for DMA Requests. The Recorder Busy (REC. BUSY) input at pin 11 will let the CPU know if the recorder's buffer is full. Pin 8 is a non-maskable interrupt; U40 will detect a DC low condition by the voltage divider, R51 and R52. If a DC low condition exists, U40 pin 3 will go low, causing the program to vector to an interrupt service routine that will protect RAM information from being corrupted by generating NO OPS. RESET *, pin 7, is held low by C26 slowly charging.

Memory enable * (ME*) pin 59 and Read * (RD*), Write * (WR*) pins 63 and 62 are gated together to produce the signals Memory Read * (M/R*) and Memory Write * (M/W*). These signals are used to write to and read from the ROM and RAM chips U7 and U10. The same gating logic is used to derive I/O Read * (IO/R*) and I/O Write * (IO/W*) from IOE * pin 58 and WR *, RD * pins 62 and 63. Interrupt 1 * (INT1*) pin 10 tells the Program that the CRT Beam is back at the beginning of the screen and ready for more information by the signal HORZ BK*.

3.2.1 TIMING

The 8MHz clock from pin 64 is further divided by the flip flop, U49. The 4MHz clock goes to U3 pin 2. U3 clocks U4, produces the Power Supply Synchronizing Signal (PS SYNC) at pin 15, and the timing signals C5 and C6. U4 generates timing functions for direct writing on the CRT with the signal COL.

* Denotes low active signal

3.2.2 RESET TIMER

The Reset Timer (U5) is driven by the peripheral I/O signal Horizontal Sweep 1 (HSWP1). HSWP1 toggles at approximately 5ms intervals to reset the counter. In the event that HWSP1 stops, the CPU would be in a malfunctioning state and U5 would not be reset. U5 would then count up and reset the CPU through U39 and D6. It will keep resetting the CPU until HWSP1 is generated, indicating that the CPU is now operational.

3.2.3 MEMORIES

The memory chips are U7, a 64K x 8 bit EPROM,and U10, a 32K x 8 bit static RAM. U7 is enabled by the address decoder U9 pin 4, and U10 is enabled from the address decoder via U11. U11 acts as a switch for the backup battery to the RAM. U11 monitors +5V at pin 8; if the voltage falls below critical level, U11 will inhibit the select line (CEO*) at pin 6 and switch VCC to the battery. The 2.4V nicad battery supplies enough voltage to retain RAM information, but not for operation in the event of the loss of +VCC. The battery is trickle charged through R59 and D10.

3.2.4 P I/O

U6 is a peripheral I/O chip that is enabled through U38 by IO enable (IO*) and address line A9. U6 interfaces critical system information and tasks to and from the microprocessor.

3.2.5 KEYBOARD

The keyboard encoder has a 4-line matrix of 4 rows (Y) and 4 columns (X). The columns are scanned at a rate set by C34 and C35. With a key depression, the appropriate X and Y input will go low, disabling the counter. Internal and external circuitry (C33) will debounce the key by locking out the other Y inputs, timing out, and then latching the data. Data available (KYBDDA) will also go high. U8 is enabled via U33 at pin 13 and will put data on the bus through pins 14-17.

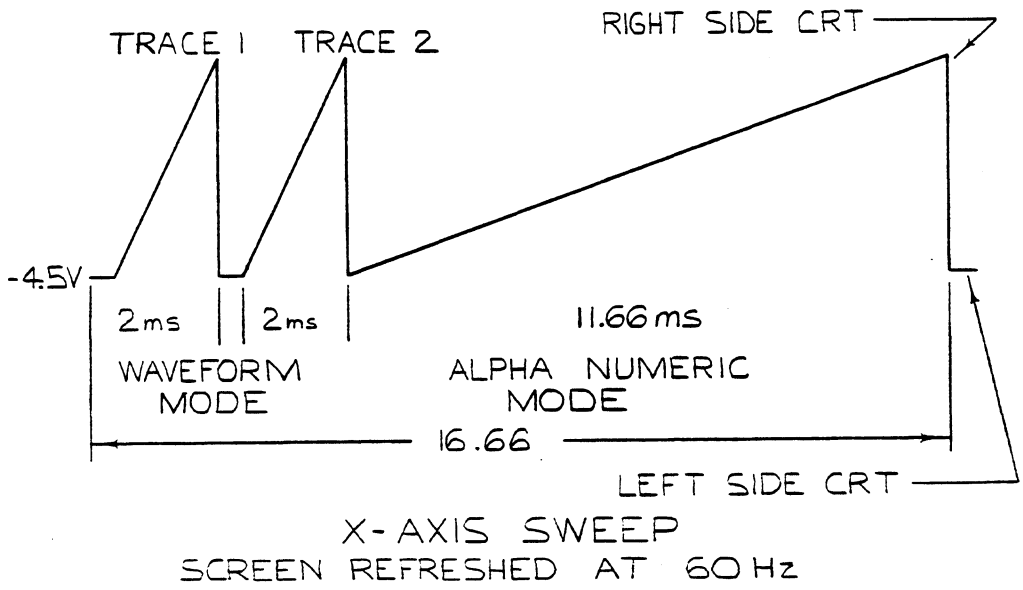
3.2.6 TIME OF DAY CLOCK

For **ESCORTS** configured with recorder, time of day circuitry will be implemented on the CPU Board. U48 is a real time clock module (RTC-72421) that has a built-in quartz oscillator, time and date function and CMOS circuitry for low power consumption. The time and date is displayed on the test page and annotated on the recorder strip.

U11 monitors +5 volts, the operating voltage for U48. If +5 volts drops below critical level, U11 will switch to the battery backup for the operating voltage. This will retain accurate time and date.

3.3.0 X-AXIS TIMING

Screen information for the **ESCORT** CRT can be separated into two major sections: (1) waveform data, to produce Trace 1 and Trace 2, and (2) alpha numeric data, for generating the rest of the screen information:



X-AXIS SWEEP
SCREEN REFRESHED AT 60 Hz

3.3.1 WAVEFORM MODE

Timing for waveform data is controlled by the signal C6. The multiplexer (U21) will select the C6 timing input at pin 14, by HSWP1 and HSWP2 signals at pins 11 and 10. U21 is strobed by U22A which will delay U21's output until there is an active clock edge. This synchronizes the counter's timing with the beginning of trace at the left side of the screen. U21 will then clock the FIFO's, U12 and U13, to shift out data, at a 4us rate. U12 and U13 provide an elastic buffer between the CPU and the CRT deflection circuitry. The FIFO's can make a DMA request (DMA REQ) by putting a high on pin 2. If the FIFO's are full, pin 2 will go low inhibiting the FIFO IN * Signal. FIFO IN * shifts in data from the bus when it goes low.

3.3.2 Y-AXIS (WF)

The Y-axis data shifted out of the FIFO's will go to the DAC, U16. The analog voltages generated by U16 are controlled by the signal DAC SIZE and R60. DAC SIZE determines the basic size of the waveform according to whether it is an ECG or respiration waveform, which will take 1/3 the screen, or full scale pressure, which will take up to 2/3's of the screen. R60 is a further adjustment of the size of either waveform. The DAC outputs, pins 2 and 4, go to the current to voltage converter, U42. At pin 3 of U42 is another adjusting potentiometer and input for the waveform. R62 adjusts the horizontal position of the waveform and the input DAC OFFSET chooses whether it is Trace 1 or Trace 2. D18 and D12 are to protect U23B against high voltage inputs. U23B will select the waveform data at pins 12, 14 and 15 by HSWP1 and HSWP2 signals. U23B's output goes to the buffer opamp U42, then becomes the Y-axis out signal YOUT. This signal goes to page 1 of 5 for further amplification.

3.3.3 X-AXIS (WF)

X-axis sweep for the waveform has its speed selected by HSWP1 and HSWP2 at U23A. For left to right speed, pin 5 of U23A is selected. For the -Grat or right to left direction, pin 2 is selected. The output at pin 3 goes to opamp U42. The selected resistor with C43 form a linear ramp generator and become the X-axis output (XOUT). U32B and surrounding components are to indicate when the trace has begun at the left side of the screen. It will wrap around to inhibit any new selection at U23A until the trace has reached the right side of the screen. U32 compares XOUT information to left and right margins set by pots R83 (right) and R80 (left). When the X-axis is in the -Grat mode a new speed is selected. This returning of the trace is seen on the screen in the full scale pressure mode only. Otherwise, it is blanked out by the signal GRATBLK* at pin 2 of U35. U35 gates waveform and alpha numeric data for the Z-axis signal (ZOUT).

3.3.4 ALPHA NUMERIC MODE

Timing for the alpha numeric data is controlled by the signal C5. U20A divides the signal COL by 2 and produces the signal RASTER (RAST). C5 together with RAST are input to U20B to produce RASTER DELAY (RASTD). These, when gated together with C5 at U35, will produce the proper alpha numeric timing input to MUX U21. HSWP1 and HSWP2 will select the alpha numeric timing input at pin 12 for the FIFO shiftout clock. The FIFO's will shift data to the parallel to serial shift registers U14 and U15. The 4MHz signal clocks the shift registers, and the shift/load input is controlled by the signal C6. U14 and U15 work in a ping-pong fashion. When U14 is shifting in data in parallel, U15 is shifting out data in serial. U36 and U35 select one output or the other from U14 and U15 according to the serial dot stream, producing the signal DOTS*. This signal goes through U46 to U35 which selects alpha numeric or waveform data for the Z-axis out (ZOUT), or dot ON/OFF information. X-axis information

for the alpha numeric mode has its speed selected by HSWP1 and HSWP2 at U23A pin 4. This gives the slower speed necessary for the alpha numeric mode.

Y-axis raster direction is controlled by the signal RASTER (RAST). U17 will select the raster up or down information to the integrator U42. HSWP1 and HSWP2 again will select the raster ramp at pin 11 of U23B and output it for the YOUT signal.

3.4.0 ANALOG VOLTAGES

Various analog voltages for the CPU Board are generated by DAC U18 and the sample and hold circuitry that includes U19. U18 is addressed as an I/O device. It takes data off the bus and decodes it for the appropriate voltage. U18 then outputs this voltage to U19 through U43. U19 selects an output by the signals DMUX1, DMUX2, DMUX3, and DMUXI. U19 will route the input at pin 3 to the selected output. The capacitors at the output pins will charge and hold the voltage. U45 and U44 are unity gain buffers. The exception to unity gain is the output at pin 5, which controls the tone generation. Its associated opamp has gain built into the circuitry. The output can be a square wave for QRS beeps, where software timing will bring the signal to ground. For alarms, the bleeder resistor R71 will taper the tone (voltage) off slowly to give a distinct sound.

The signal INTENSITY is the sample and hold voltage that controls the brightness of the waveform traces and alpha numeric rasters.

3.5.0 HIGH LEVEL OUTPUTS (AUX PORT 1 AND 2)

3.5.1 Two high level output pins are available to the user. These pins are located on the AUX connector at the rear panel. Port #1 is pin 9. Port #2 is pin 8. Pin 5 is analog ground. The following description is applicable to software versions 2.0 and higher. 9DB Low Profile connectors and housings available from AMP, Inc. Part numbers are: 207753-1 (Cord Guard), 745032-1 (Connector), and 61831-1 (Strain Relief).

3.5.2 Each port can be defined by the user under the CONFIG page of the **ESCORT** softkeys. Each key has three modes, each with a number of possibilities:

1. The WAVEFORM (WF) mode causes the port to output a waveform or parameter value. The selections are as follows:

   AUTO

   The waveform that is currently displayed on the screen is output. Port 1 reflects Trace 1. Port 2 reflects Trace 2.

   ECG

   The ECG waveform is always output. Signal level is approximately 1V/mV and rides on a 2.5V baseline level.

BP1 or BP2
The pressure waveform is always output. 0mmHg=0V, and 250mmHg=2.5V.

RESP

The respiration waveform is always output. The signal level is approximately 1V/1 ohm and rides on a 2.5V baseline level.

HR
The cardiotach information will be output and updated every 200ms. 1V = 51 beats ±1, 2V = 103 ±1

T1 or T2

The temperature values are always output. 0 degrees C=0V and 50 degrees C=5.0V.

Pleth

Pleth waveform output centered on 2.5V Level.

SAO2

Percent SaO2 output (4V = 100%)

2. The ALARM (ALM) mode can send different alarm conditions to the port. In all cases 0V=no alarm and 5V=alarm condition.

ANY	Enables on any alarm condition
FLASH	Will toggle the port on any alarm condition
ECG	Enables on ECG alarms only
BP1	Enables on BP1 alarms only
BP2	Enables on BP2 alarms only
RESP	Enables on Respiration alarms only
T1	Enables on Temperature 1 alarms only
T2	Enables on Temperature 2 alarms only
SAO2	Enables on SaO2 alarm only

3. The key mode will reflect recorder condition:

ANY	Enables when either REC1 or REC2 key has been selected
REC1	Enables only when REC1 key is selected
REC2	Enables only when REC2 key is selected

3.6.0 REGULATORS

U26 regulates +5V from the +8V input at pin 5 of J5. U27 and U28 will regulate +12V and -12V from the +15V input. These input voltages are from the Switching Power Supply Board. +12V and -12V are further regulated by U29 and U30 for the signals +REF and -REF. U31 is part of the high voltage adjustment circuit. R13 should be adjusted for an output of 8.5V at pin 1 of U31, which provides a CRT anode voltage of approx 6-7KV.

VRAW comes in on J5 pin 11, to the comparitor U4, to determine battery condition. LOW = 10.6V or Lower, MID = 10.6V to 11V, and HIGH=11V and above.

3.7.0 Z-AXIS

Z-axis signal (ZOUT) controls Q1 on and off and then is combined with Intensity (INTENS), ALPHA NUMERIC * , and 30V at Q3 for controlling and providing voltage to the cathode of the CRT. Pot R46 controls waveform intensity. Focus and overall picture brightness is adjusted by pots R49 and R50.

-15V goes through current limiter R48 to J2 pin 1, the CRT filament.

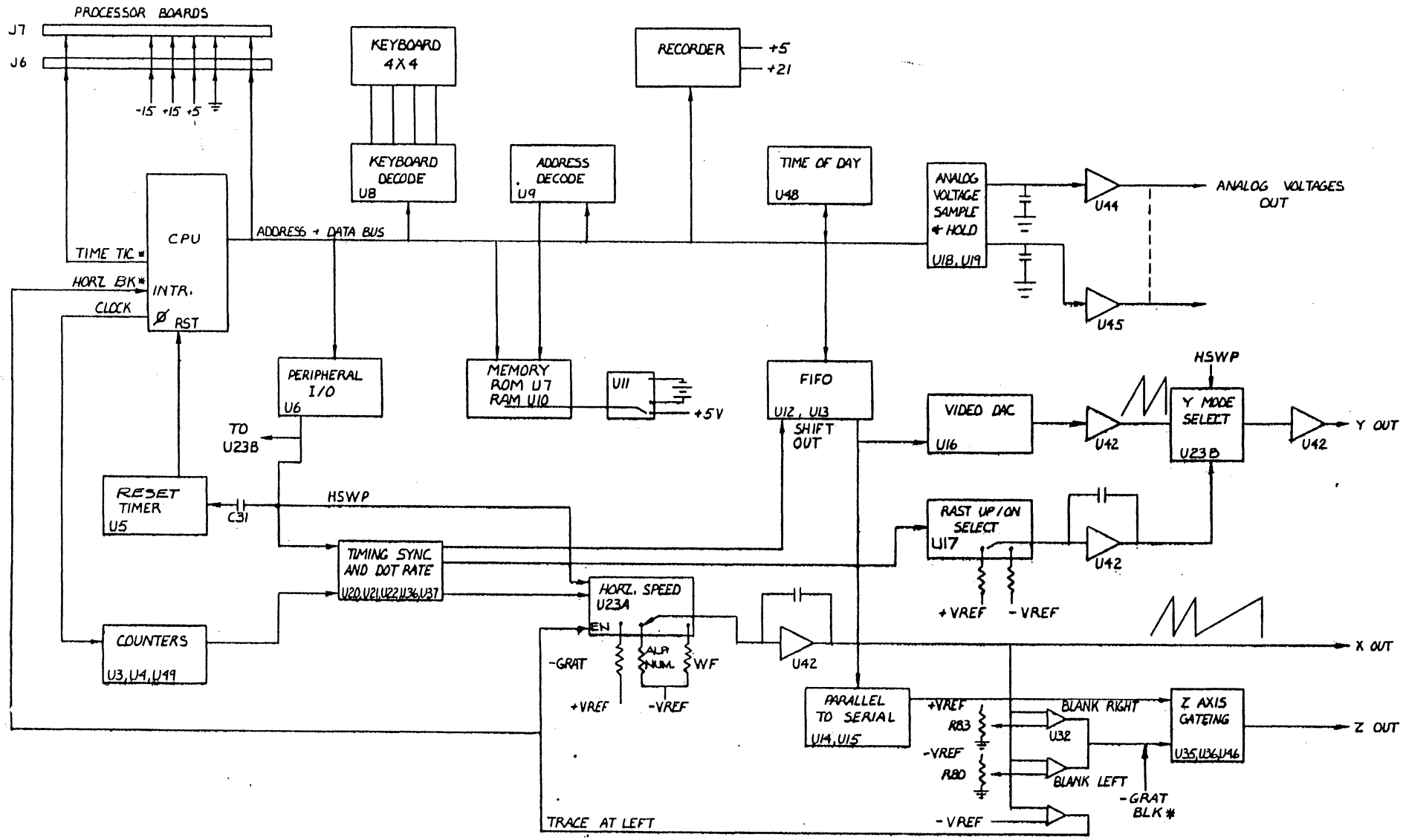
3.8.0 YOKE AMPLIFIER

X-axis deflection signal (XOUT) goes to U41 pin 13, Y-axis deflection amplifier. R27 adjusts the left to right position of the screen. R31 adjusts the horizontal size. U25 is a current amplifier for X-axis deflection signals X-YOKE 1 and X-YOKE 2.

Y-axis deflection (YOUT) goes to U41 pin 2. R15 adjusts the up and down placement of the screen, and R19 adjusts the vertical size. U24 is the current amplifier for Y-axis deflection signals Y-YOKE 1 and Y-YOKE 2.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

CPU



TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	±

APPROVALS	DATE
DRAWN	3-22-88
CHECKED	

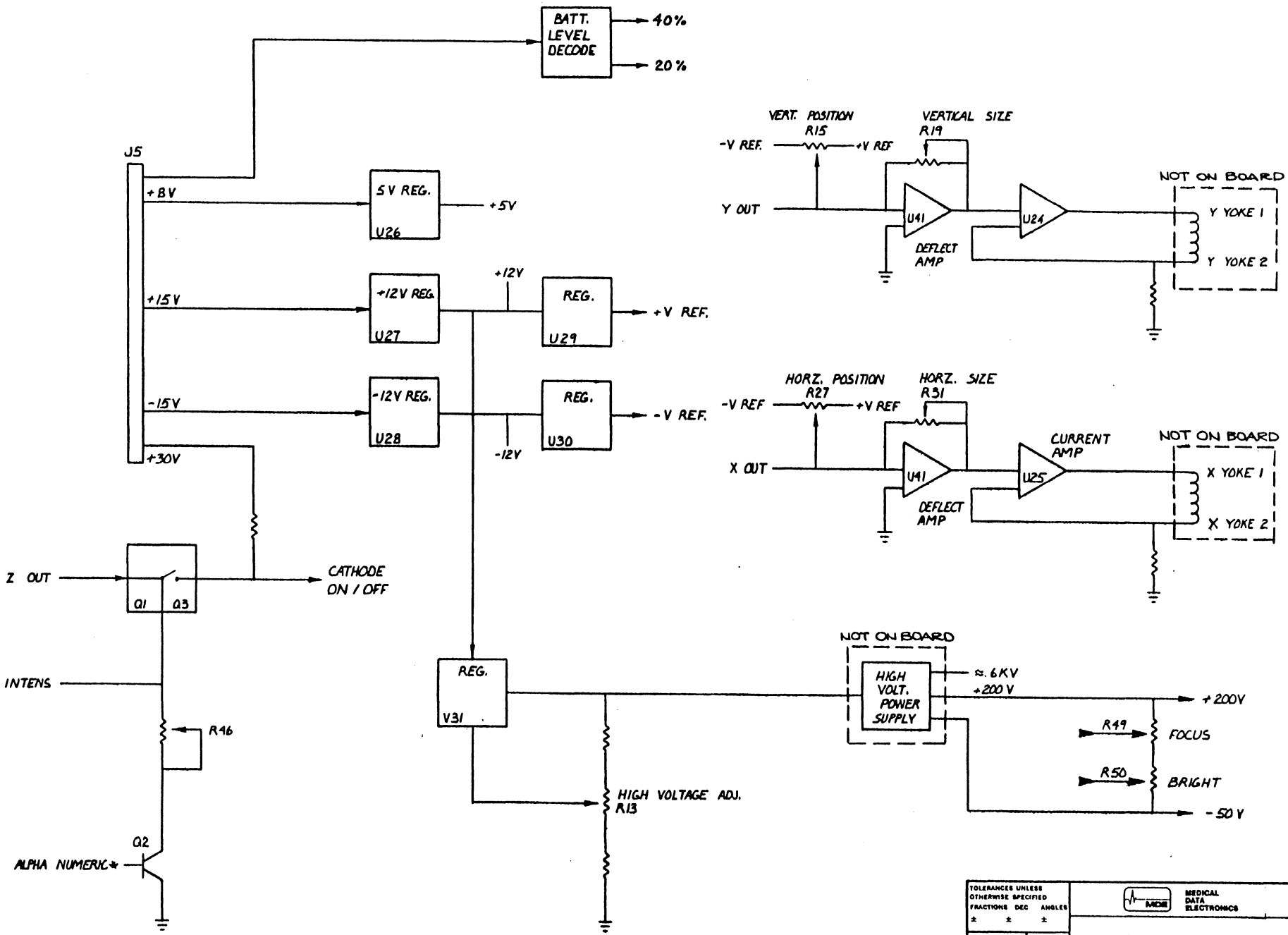
MEDICAL DATA ELECTRONICS

CPU BLOCK DIAGRAM

SCALE	SIZE	DRAWING NO.
N/A	C	

DO NOT SCALE DRAWING — SHEET 1 OF 2

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS ± DEC ± ANGLES ±		MDE MEDICAL DATA ELECTRONICS	
APPROVALS	DATE	CPU BLOCK DIAGRAM	
DRAWN E. Wagner	4-27-88		
CHECKED		SCALE	SIZE C / DRAWING NO.
		DO NOT SCALE DRAWING	SHEET 2 OF 2

3.9.0 CRT SCREEN ADJUSTMENT PROCEDURE

3.9.1 OVERVIEW

Physical adjustments for the CRT screen are located on the CPU Board. These adjustments are not normally needed and should only be done if necessary. Remove bottom cover-battery chassis. Yoke ring centering magnets should both be pointed UP. Place **ESCORT** on left side to expose CPU Board.

3.9.2 HIGH VOLTAGE

The high voltage adjustment controls all around compression of the CRT display. Place voltmeter between U31 pin 1 and ground. Adjust R13 until meter reads 8.5V.

3.9.3 INTENSITY/FOCUS

R50 controls overall brightness. Disregarding the traces at this time, adjust R50 so that the alpha numeric display is comfortable to read in normal room lighting. Then adjust R46 for trace brightness. The trace should be slightly brighter than the alpha numerics. At this point, check softkey intensity control. When intensity is at minimum, screen should still be readable. As the intensity gets brighter, the display will bloom slightly. When intensity is at maximum, the entire display should still be seen. Return intensity level to standard setting. Now adjust focus at R49 until a crisp display is achieved.

3.9.4 LEFT AND RIGHT BLANKING

To adjust left and right blanking, disconnect ECG input to **ESCORT**. Power up and wait for the apnea flag to appear in the upper right corner. Adjust left blanking at R80. Correct adjustment will just reveal softkey border on lower left side of screen. R83 adjusts right blanking. Entire apnea flag and softkey border should be revealed. If not configured with respiration, use softkey border only as a reference.

3.9.5 VERTICAL (Y)

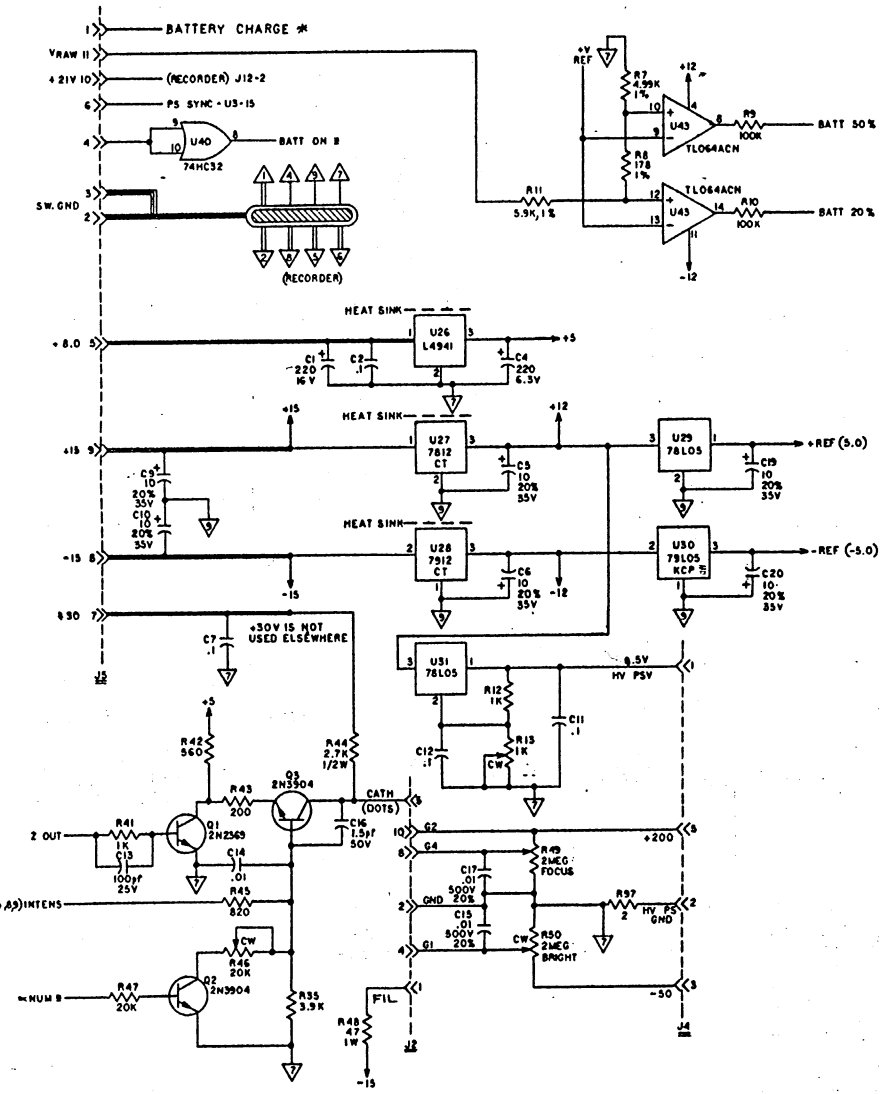
Adjust the vertical size first. The large two-digit heart rate is the top of the display and the softkey border is the bottom. Adjust R19 so that the bottom of the softkey border is approximately 1/8" from the edge of the face plate, and the top of the heart rate digits are 1/2" from the edge of the face plate. It may be necessary to adjust vertical position, R15, to attain the above.

3.9.6 HORIZONTAL (X)

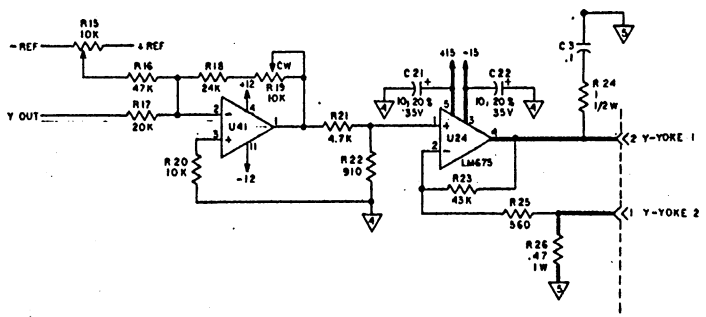
Center display on screen by adjusting R27. Horizontal size is adjusted so that softkey borders are extended to the outside edge of the display. Using softkey intensity control, set level to maximum. Check to be sure that the entire display is still visible. Return to standard setting.

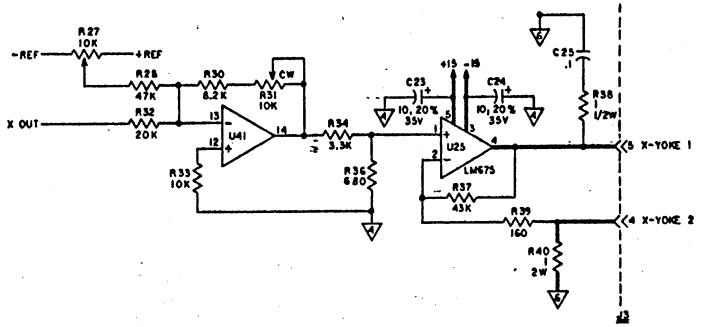
3.9.7 TRACE POSITIONING AND AMPLITUDE

If configured with Blood Pressure, use softkeys to call up blood pressure configuration on Trace 2 (BP1), complete with scales. It may be necessary to turn scales on, again with softkeys. By adjusting R60 and R62, the bottom scale line should rest just above the message line that reads "BP1 SET UP". The top scale line should be adjusted to just above the systolic/diastolic readout. This adjustment will lend the proper amplitude and positioning of the traces. If blood pressure configuration is not available use an ECG simulator to get a 1mV NSR waveform on monitor. Adjust R61 and R62 until Trace 2 has its baseline in the center of the screen. The top of the R-wave on Trace 1 should be approximately 1/4" from the bottom of Heart Rate readout.



VRAW VOLTAGE	(≤ 10.6V)	(10.6-11.0V)	(≥ 11.0V)
BATT CONDITION	LOW	MID	HIGH
~ BATT 40%	0	0	1
~ BATT 20%	0	1	1





REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
	REVISED J5 PIN OUT	11-10-87	
B	ECO 156	12-30-87	
C	ECO 161	2-1-88	
D	ECO 165	2-16-88	
E	ECO 174	3-15-88	
F	ECO 187	4-11-88	
G	ECO 190	4-14-88	
H	ECO 192	4-15-88	
J	ECO 194	4-19-88	
J	ECO 196	4-21-88	
K	ECO 207	6-4-88	
L	ECO 210	7-8-88	
M	ECO 252	7-20-88	
N	ECO 279	9-20-88	
O	ECO 281	9-21-88	
P	ECO 288	9-23-88	
Q	ECO 297	10-13-88	
R	ECO 303	10-24-88	
S	ECO 314	11-15-88	
T	ECO 360	1-23-89	
U	ECO 367	2-7-89	
V	ECO 384	2-14-89	
W	ECO 392	2-20-89	
X	ECO 465	7-17-89	
Y*	ECO 498	7-26-89	
Z	ECO 507	8-21-89	
AA	ECO 522	9-21-89	
AB	ECO 542	3-13-90	
AC	ECO 693	7-16-90	
AD	ECO 700	8-3-90	
AE*	ECO 854	2-8-91	
AG	ECO 901	4-15-91	
AH	ECO 923	5-23-91	

3-12

2. ALL CAPACITANCE IS IN MICRO FARADS, 50V ± 10%.
1. ALL RESISTANCE IS IN OHMS 1/4 WATT 2 5%.
NOTES: UNLESS OTHERWISE SPECIFIED

REV: AH

TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	±

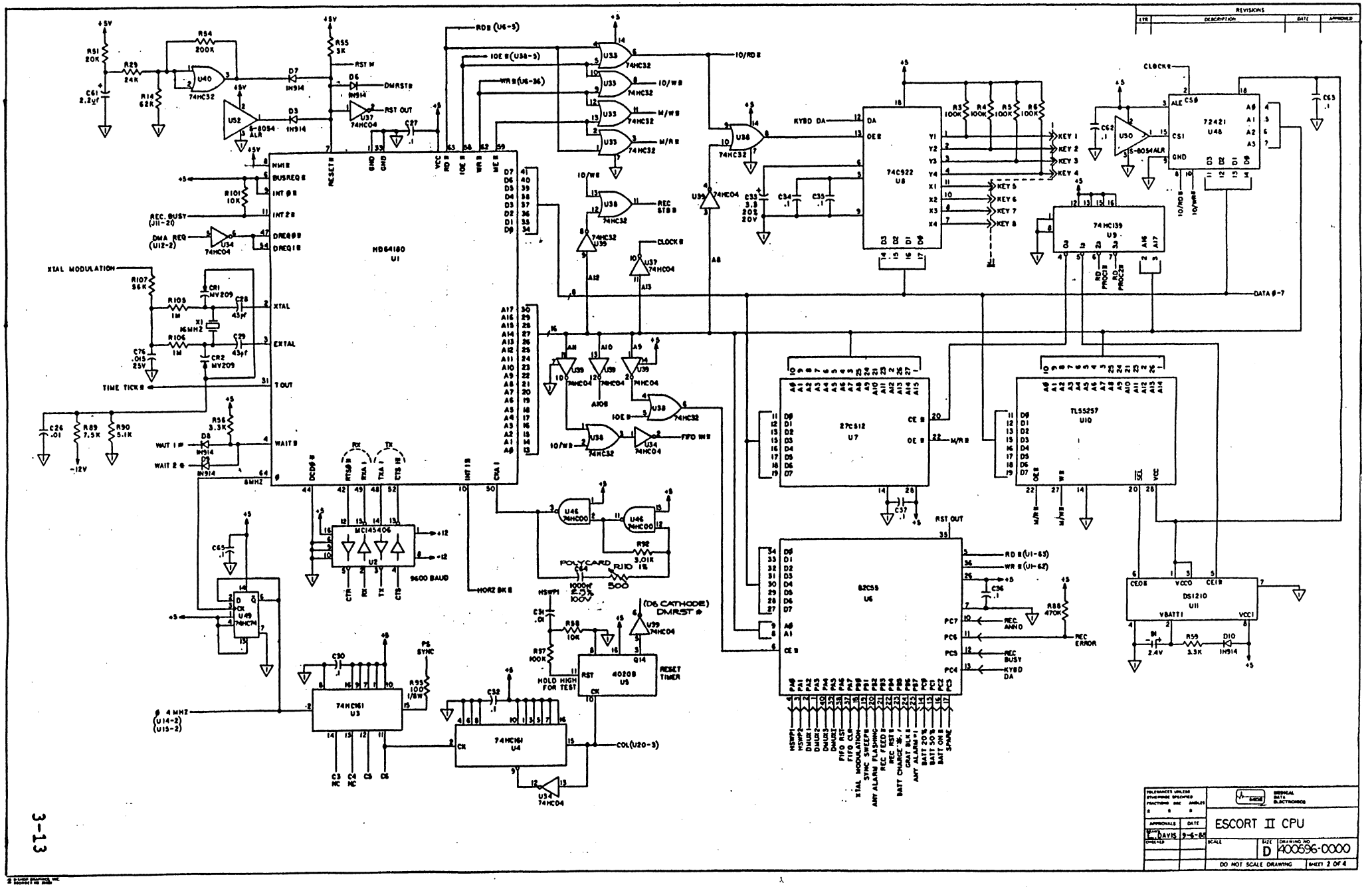
APPROVALS	DATE
DRAWN E. DAVIS	9-2-88
CHECKED	

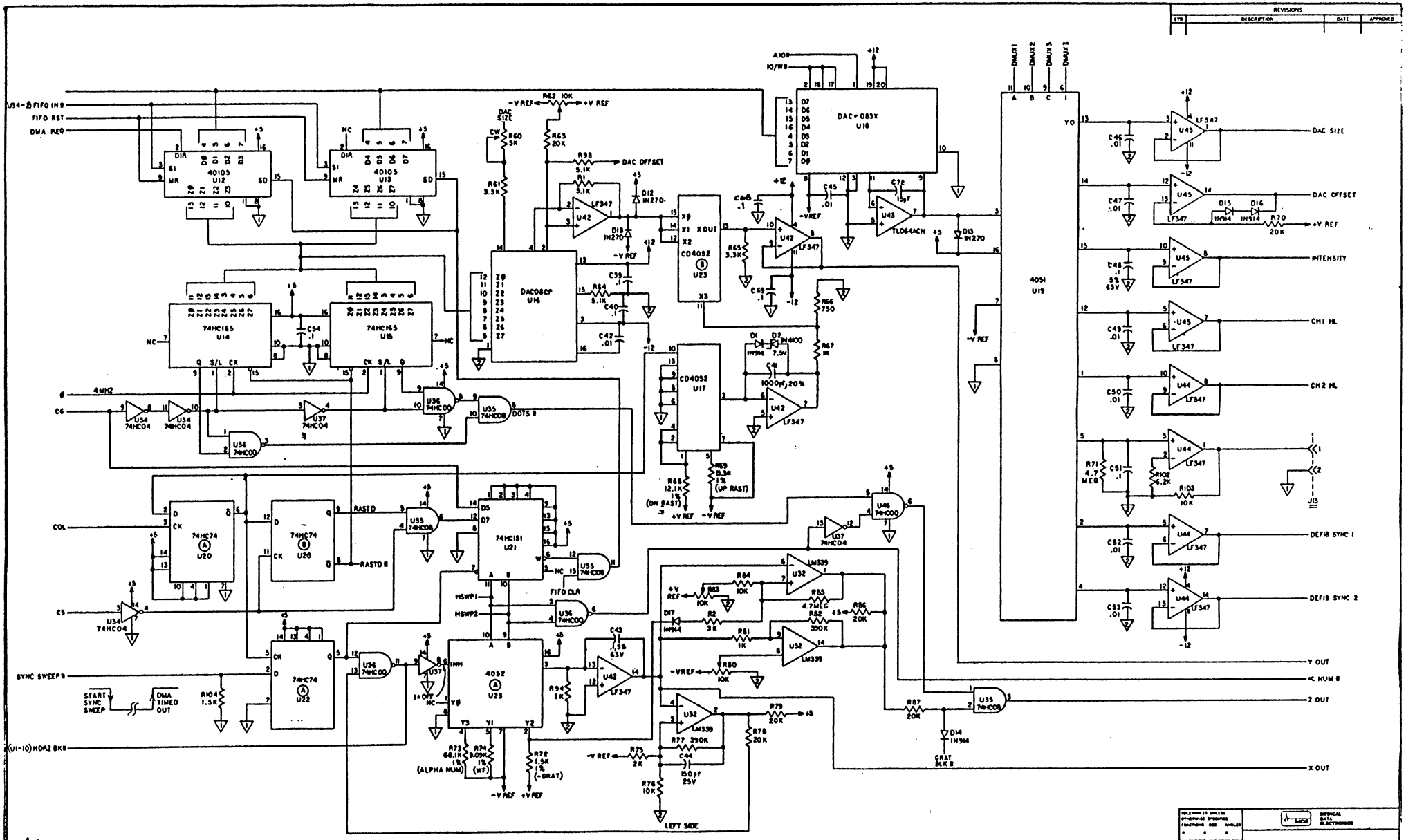
MEDICAL DATA ELECTRONICS

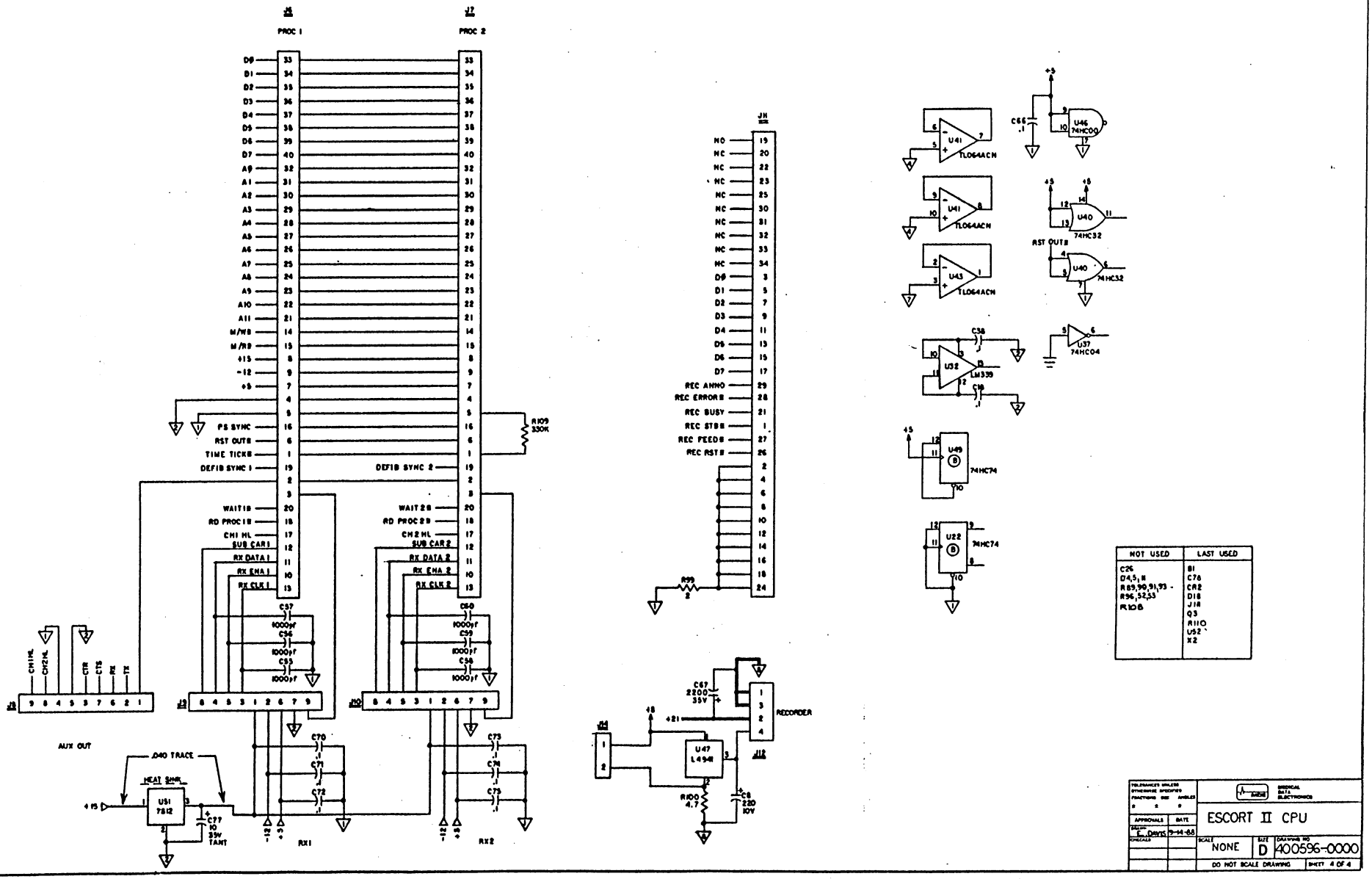
ESCORT II CPU

SCALE | SIZE D | DRAWING NO. 400596-0000

DO NOT SCALE DRAWING | SHEET 1 OF 4


ESCORT II CPU
D 400696-0000
SCALE
DO NOT SCALE DRAWING
SHEET 2 OF 4
DAVIS 9-6-88
APPROVALS
DATE
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
HD64180 U1
27C512 U7
TL55257 U10
74C922 U8
72421 U46
82C55 U6
DS1210 U11
74HC139 U9
MC145406 U2
74HC961 U3
74HC961 U4
40208 U5
S-8054 ALR U50
S-8054 ALR U52
74HC32
74HC04
74HC00
74HC74
RST OUT
DMRSTB
RESET TIMER
REC BUSY
REC ERROR
REC ANNO
KYBD DA
KEY 1
KEY 2
KEY 3
KEY 4
KEY 5
KEY 6
KEY 7
KEY 8
DATA 0-7
CLOCK 8
TIME TICK 8
XTAL MODULATION
WAIT 1 IP
WAIT 2 IP
9600 BAUD
HORZ BK IP
RD (U6-5)
WR (U6-36)
IOE (U36-5)
10/RD
10/WR
M/RD
M/WR
REC STB
FIFO WR
DMA REQ (U12-2)
REC. BUSY (J11-20)
RD PROC
WR PROC
RD (U1-63)
WR (U1-62)
(D6 CATHODE) DMRST
POLYCARD RJ10
HOLD HIGH FOR TEST
PS SYNC
Φ 4 MHZ (U14-2) (U15-2)
COL (U20-3)
VBATT
VCC
VCC1
CE0
CE1
VCCO
R51 20K
R54 200K
R55 5K
R29 24K
R16 62K
C61 2.2µf
D7 IN914
D6 IN914
D3 IN914
C27 .1
R101 10K
R107 56K
R108 1M
R106 1M
X1 16MHZ
CR1 MV209
CR2 MV209
C28 43pf
C29 43pf
C76 .015 25V
R56 3.3K
D8 IN914
D9 IN914
C26 .01
R89 7.5K
R90 5.1K
-12V
C65 .1
C30 .1
R53 100 1/8W
C32 .1
C3 NC
C4 NC
C5
C6
C34 .01
R58 10K
R57 100K
C36 .1
R88 470K
R59 3.3K
D10 IN914
1M 2.4V
R92 3.01K 1%
500
1000pf 2.5% 100V
C33 3.3 20% 20V
C34 .1
C35 .1
C37 .1
R3 100K
R4 100K
R5 100K
R6 100K
C62 .1
C63 .1
10/RD B
10/WR B
HSWP1
HSWP2
DMUX1
DMUX2
DMUX3
DMUX4
FIFO RST
FIFO CLK
XTAL MODULATION
SYNC SWEEP B
ANY ALARM FLASHING
REC FEED B
REC RST B
BATT CHARGE 36-/
CRAT BLK B
ANY ALARM
BATT 20%
BATT 50%
BATT ON B
SPARE

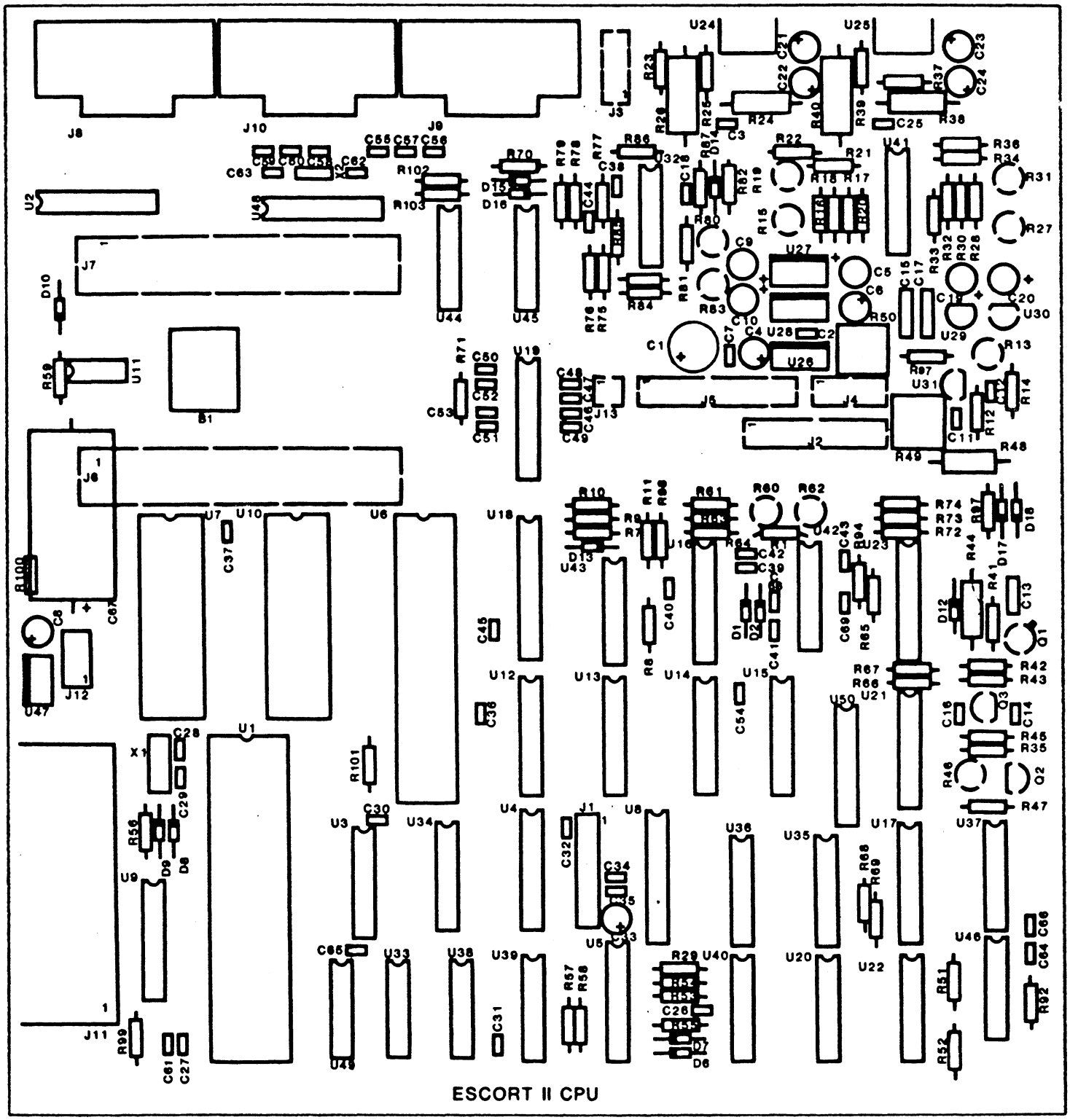

REVISIONS
ESCORT II CPU
SCALE NONE
SIZE D
DRAWING NO. 400596-0000
SHEET 3 OF 4
DO NOT SCALE DRAWING
DAC SIZE
DAC OFFSET
+V REF
INTENSITY
CH1 HL
CH2 HL
DEFIB SYNC 1
DEFIB SYNC 2
Y OUT
HC NUM B
Z OUT
X OUT
FIFO RST
DMA REQ
FIFO CLR
SYNC SWEEP B
START SYNC SWEEP
DMA TIMED OUT
LEFT SIDE
3-14



NOT USED	LAST USED
C26	B1
D4,5,11	C78
R89,90,91,93 - R96,52,53	CR2
R108	D18
	J1A
	Q3
	R110
	U52
	X2

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

APPROVALS	DATE	ESCORT II CPU
DRAWN L. Davis	9-14-88	
CHECKED		SCALE NONE · SIZE D · 400596-0000
		DO NOT SCALE DRAWING · SHEET 4 OF 4


J8
J10
J9
J5
J7
J6
J12
J11
J13
J4
J2
J1
U1
U2
U3
U4
U5
U6
U7
U8
U9
U10
U11
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U31
U33
U34
U35
U36
U37
U38
U39
U40
U41
U43
U44
U45
U46
U47
U48
U50
B1
X1
X2
ESCORT II CPU

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400596-0000	PCBA, CPU ESCORT II, E2 REV. "AH" (E923)			A				AH	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
400594-0000	*1	1	PCB, CPU ESCORT II, REV. "F" (E854)	F	R	33	1.000	EA		Yes		
352300-0102A	*1	2	CAP, 1000PF,50V,20%,RAD,MYLAR		R	22	6.000	EA	C55-60	Yes		
352300-0103A	*1	3	CAP, .01UF,50V,20%,RAD,MYLAR		R	22	6.000	EA	C31,42,45,46,47,26,	Yes		
352300-0103A	*1	4	CAP, .01UF,50V,20%,RAD,MYLAR		R	22	4.000	EA	C49,50,52,53	Yes		
352300-0104A	*1	5	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	7.000	EA	C2,3,7,11,12,18,25,	Yes		
352300-0104A	*1	6	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	3.000	EA	C27,30,32,	Yes		
352300-0104A	*1	7	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	7.000	EA	C36,37,38,39,40,62,63	Yes		
352300-0104A	*1	8	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	5.000	EA	C54,65,66,68,69,	Yes		
352300-0104A	*1	9	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	6.000	EA	C70-75	Yes		
352100-0151A	*1	10	CAP, 150PF,25V,10%,RAD,X7R		R	22	1.000	EA	C44	Yes		
352103-0103A	*1	11	CAP, .01UF,500V,20%,RAD,CER (.25 L.S.)		R	22	2.000	EA	C15,17	Yes		
352200-0227A	*1	12	CAP, 220UF,16V,RAD,ELECT, SWTCH SP TYPE,10X16MM		R	22	1.000	EA	C1	Yes		
352201-0227A	*1	14	CAP, 220UF,10V,RAD,ELECT, .248 X .433 CS		R	66	2.000	EA	C8,4	Yes		
352201-0228A	*1	15	CAP, 2200UF,35V,AX,ELECT, 16X30MM		R	66	1.000	EA	C67	Yes		
352101-0102A	*1	16	CAP,NPO DIELECTRIC, 1000PF (.001UF),5%,50V,RAD, .1		R	22	1.000	EA	C41	Yes		
352301-0104A	*1	17	CAP, .1UF,5%,MYLAR		R	66	2.000	EA	C43,48	Yes		
352401-0106A	*1	18	CAP, 10UF,35V,20%,RAD,TANT		R	11	6.000	EA	C5,6,9,10,19,20,	Yes		
352401-0106A	*1	19	CAP, 10UF,35V,20%,RAD,TANT		R	11	5.000	EA	C21,22,23,24,77	Yes		
352400-0335A	*1	20	CAP, 3.3UF,20V,20%,RAD,TANT		R	11	1.000	EA	C33	Yes		
352600-0004A	*1	21	CAP, 1.5PF,50V,+/-.5PF,RAD,NPO EDPT		R	22	1.000	EA	C16	Yes		
354000-0103A	*1	22	CONN, SGL ROW,STRT,SGL PINS,SNAP-AWAY		R	11	8.000	PIN	J1 - 1 PC OF 8 PINS	Yes		
354000-0031A	*1	23	CONN, 5-P,M,STRT LOCK,.1 CTR		R	11	2.000	EA	J3,4	Yes		
354000-0033A	*1	24	CONN, 10-PIN,M,STRT LCK,.1 CTR		R	11	1.000	EA	J2	Yes		
354000-0138A	*1	25	CONN, 2-P,M,STRT LOCK,.1 CTR,HDR		R	11	1.000	EA	J13	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
400596-0000	PCBA, CPU ESCORT II, E2 REV. "AH" (E923)			A			AH	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
354000-0140A	*1	26	CONN, 11-P,M,STRT LOCK,.1 CTR,HDR		R	11	1.000	EA	J5	Yes		
354000-0145A	*1	27	CONN, 9-P,F,DB 9,PLASTIC, R/A		R	22	3.000	EA	J8-10	Yes		
354000-0146A	*1	28	CONN, 40-PIN,CARD EDGE,.1 CTR,.437-.460 HIGH		R	22	2.000	EA	J6,7	Yes		
354000-0147A	*1	29	CONN, 34-P,M,RIBBON,R/A,SHRD HDR,.025SQ		R	11	1.000	EA	J11	Yes		
354000-0148A	*1	30	CONN, 4-P,M,STRT,.1 CTR,LOCKING RAMP		R	11	1.000	EA	J12	Yes		
356000-0001A	*1	31	XTAL, 16MHZ,QUARTZ,MICROPROCESSOR		R	11	1.000	EA	X1	Yes		
364000-0002A	*1	32	IC, DAC-083X, NOTE: X = EITHER 0, 1, OR 2.		R	22	1.000	EA	U18	Yes		
364000-0114A	*1	33	IC, TL064 ACN		R	11	2.000	EA	U41,43	Yes		
364000-0010A	*1	34	IC, LM339		R	11	1.000	EA	U32	Yes		
364000-0013A	*1	35	IC, LM675		R	22	2.000	EA	U24,25	Yes		
364000-0115A	*1	36	IC, L4941, 5V REG, TO-220, LOW DROP		R	11	2.000	EA	U26,47	Yes		
364000-0024A	*1	37	IC, 74HC00		R	11	2.000	EA	U36,46	Yes		
364000-0025A	*1	38	IC, 74HC04		R	11	3.000	EA	U34,37,39	Yes		
364000-0026A	*1	39	IC, 74HC08		R	11	1.000	EA	U35	Yes		
364000-0027A	*1	40	IC, 74HC32		R	11	3.000	EA	U33,38,40	Yes		
364000-0028A	*1	41	IC, 74HC74		R	11	3.000	EA	U20,22,49	Yes		
364000-0030A	*1	42	IC, 74HC151		R	11	1.000	EA	U21	Yes		
364000-0031A	*1	43	IC, 74HC161		R	11	2.000	EA	U3,4	Yes		
364000-0032A	*1	44	IC, 74HC165		R	11	2.000	EA	U14,15	Yes		
364000-0039A	*1	45	IC, 40105		R	11	2.000	EA	U12,13	Yes		
364000-0040A	*1	46	IC, 4051		R	11	1.000	EA	U19	Yes		
364000-0048A	*1	47	IC, DAC-08CP		R	11	1.000	EA	U16	Yes		
364000-0055A	*1	48	IC, CD4052		R	11	2.000	EA	U17,23	Yes		
364000-0062A	*1	49	IC, 74C922		R	22	1.000	EA	U8	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
400596-0000	PCBA, CPU ESCORT II, E2 REV. "AH" (E923)			A			AH	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
364000-0092A	*1	50	IC, HD 64180 RP-8 (Z180-8 MHZ)		R	11	1.000	EA	U1	Yes		
364000-0100A	*1	51	IC, MC145406		R	11	1.000	EA	U2	Yes		
364000-0101A	*1	52	IC, 82C55 **MITSUBISHI ONLY**		R	22	1.000	EA	U6	Yes		
364000-0102A	*1	53	IC, 27C512, EPROM, 200NS		R	22	1.000	EA	U7	Yes		
364000-0103A	*1	54	IC, 4020B		R	11	1.000	EA	U5	Yes		
364000-0104A	*1	55	IC, 74HC139		R	11	1.000	EA	U9	Yes		
364000-0105A	*1	56	IC, TL55257 PL12 32 X 8 RAM, STATIC		R	22	1.000	EA	U10	Yes		
364000-0106A	*1	57	IC, DS1210		R	11	1.000	EA	U11	Yes		
364000-0107A	*1	58	IC, 7812 CT		R	11	2.000	EA	U27,51	Yes		
364000-0108A	*1	59	IC, 7912 CT		R	11	1.000	EA	U28	Yes		
364000-0109A	*1	60	IC, 78L05 +5V REG. TO-92 PKG.		R	11	2.000	EA	U29,31	Yes		
364000-0110A	*1	61	IC, 79L05 ACP -5V REG.		R	11	1.000	EA	U30	Yes		
365000-0064A	*1	62	SKT, 64-PIN,.07 LEADS		R	11	1.000	EA	U1	Yes		
370100-0020A	*1	63	RES, 2,1/4W,5%,CF		R	11	2.000	EA	R97,99	Yes		
370100-0102A	*1	64	RES, 1K,1/4W,5%,CF		R	11	5.000	EA	R12,41,67,81,94	Yes		
370100-0103A	*1	65	RES, 10K,1/4W,5%,CF		R	11	3.000	EA	R20,33,58,	Yes		
370100-0103A	*1	66	RES, 10K,1/4W,5%,CF		R	11	3.000	EA	R76,84,101,	Yes		
370100-0103A	*1	67	RES, 10K,1/4W,5%,CF		R	11	1.000	EA	R103	Yes		
370100-0104A	*1	68	RES, 100K,1/4W,5%,CF		R	11	7.000	EA	R3-6,9,10,57	Yes		
370200-1332A	*1	69	RES, 13.3K,1/4W,1%,MF		R	11	1.000	EA	R69	Yes		
370100-0201A	*1	70	RES, 200,1/4W,5%,CF		R	11	1.000	EA	R43	Yes		
370100-0202A	*1	71	RES, 2K,1/4W,5%,CF		R	11	1.000	EA	R75	Yes		
370100-0203A	*1	72	RES, 20K,1/4W,5%,CF		R	11	6.000	EA	R17,32,47,51,63,70,	Yes		
370100-0203A	*1	73	RES, 20K,1/4W,5%,CF		R	11	4.000	EA	R78,79,86,87	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400596-0000	PCBA, CPU ESCORT II, E2 REV. "AH" (E923)			A				AH	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370100-0204A	*1	74	RES, 200K,1/4W,5%,CF		R	11	1.000	EA	R54	Yes		
370100-0243A	*1	75	RES, 24K,1/4W,5%,CF		R	11	2.000	EA	R18,29	Yes		
370100-0302A	*1	76	RES, 3K,1/4W,5%,CF		R	11	2.000	EA	R2,55	Yes		
370100-0332A	*1	77	RES, 3.3K,1/4W,5%,CF		R	11	5.000	EA	R34,56,59,61,65	Yes		
370100-0392A	*1	78	RES, 3.9K,1/4W,5%,CF		R	11	1.000	EA	R35	Yes		
370100-0394A	*1	79	RES, 390K,1/4W,5%,CF		R	11	2.000	EA	R77,82	Yes		
370100-0433A	*1	80	RES, 43K,1/4W,5%,CF		R	11	2.000	EA	R23,37	Yes		
370100-0047A	*1	81	RES, 4.7,1/4W,5%,CF		R	11	1.000	EA	R100	Yes		
370100-0472A	*1	82	RES, 4.7K,1/4W,5%,CF		R	11	1.000	EA	R21	Yes		
370100-0473A	*1	83	RES, 47K,1/4W,5%,CF		R	11	2.000	EA	R16,28	Yes		
370100-0475A	*1	84	RES, 4.7M,1/4W,5%,CF		R	11	2.000	EA	R71,85	Yes		
370100-0512A	*1	85	RES, 5.1K,1/4W,5%,CF		R	11	4.000	EA	R1,64,98,90	Yes		
370100-0561A	*1	86	RES, 560,1/4W,5%,CF		R	11	2.000	EA	R25,42	Yes		
370100-0681A	*1	87	RES, 680,1/4W,5%,CF		R	11	1.000	EA	R36	Yes		
370100-0751A	*1	88	RES, 750,1/4W,5%,CF		R	11	1.000	EA	R66	Yes		
370100-0821A	*1	89	RES, 820,1/4W,5%,CF		R	11	1.000	EA	R45	Yes		
370100-0822A	*1	90	RES, 8.2K,1/4W,5%,CF		R	11	1.000	EA	R30	Yes		
370200-1780A	*1	91	RES, 178,1/4W,1%,MF		R	11	1.000	EA	R8	Yes		
370102-0010A	*1	92	RES, 1,1/2W,5%,CF		R	11	2.000	EA	R24,38	Yes		
370102-0272A	*1	93	RES, 2.7K,1/2W,5%,CF		R	11	1.000	EA	R44	Yes		
370200-1212A	*1	94	RES, 12.1K,1/4W,1%,MF		R	11	1.000	EA	R68	Yes		
370200-1501A	*1	95	RES, 1.5K,1/4W,1%,MF		R	11	1.000	EA	R72	Yes		
370200-4991A	*1	96	RES, 4.99K,1/4W,1%,MF		R	11	1.000	EA	R7	Yes		
370200-5901A	*1	97	RES, 5.9K,1/4W,1%,MF		R	11	1.000	EA	R11	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400596-0000	PCBA, CPU ESCORT II, E2 REV. "AH" (E923)			A				AH	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370200-6812A	*1	98	RES, 68.1K,1/4W,1%,MF		R	11	1.000	EA	R73	Yes		
370200-9091A	*1	99	RES, 9.09K,1/4W,1%,MF		R	11	1.000	EA	R74	Yes		
370201-0470A	*1	100	RES, 47,1W,M.O.		R	11	1.000	EA	R48	Yes		
370201-4700A	*1	101	RES, 0.47,1W,M.O.		R	11	1.000	EA	R26	Yes		
370203-0010A	*1	102	RES, 1,2W,M.O.		R	11	1.000	EA	R40	Yes		
374301-0205A	*1	103	POT, 2M,TRIM,TOP ADJ,CERMET,3/8 SQR,.15LS		R	11	2.000	EA	R49,50	Yes		
374000-0103A	*1	104	POT, 10K,TRIM,TOP ADJ,OFF CTR LEADS,CERMET		R	22	4.000	EA	R15,19,27,31,	Yes		
374000-0103A	*1	105	POT, 10K,TRIM,TOP ADJ,OFF CTR LEADS,CERMET		R	22	3.000	EA	R62,80,83	Yes		
374000-0203A	*1	106	POT, 20K,TRIM,TOP ADJ,OFF CTR LEADS,CERMET		R	11	1.000	EA	R46	Yes		
374000-0502A	*1	107	POT, 5K,TRIM,TOP ADJ,OFF CTR LEADS,CERMET		R	11	1.000	EA	R60	Yes		
376000-0001A	*1	108	XSTR, 2N2369		R	11	1.000	EA	Q1	Yes		
376000-0003A	*1	109	XSTR, 2N3904		R	11	2.000	EA	Q2,3	Yes		
378000-0001A	*1	110	DIO, 1N270 T&R		R	11	3.000	EA	D12,13,18	Yes		
378000-0005A	*1	111	DIO, 1N914,SIGNAL T&R		R	11	6.000	EA	D1,6,8,9,10,3,	Yes		
378000-0005A	*1	112	DIO, 1N914,SIGNAL T&R		R	11	5.000	EA	D14,15,16,17,7(R53)	Yes		
378000-0019A	*1	113	DIO, 1N4100,7.5V,LOW NOISE, ZENER T&R		R	11	1.000	EA	D2	Yes		
384000-0036A	*1	114	BATT, 2.4V (1 PIN NEG; 2 PINS POS.)		R	11	1.000	EA	B1	Yes		
352100-0101A	*1	115	CAP, 100PF,25V,10%,RAD,NP0		R	11	1.000	EA	C13	Yes		
400595-0000	*1	116	BRKT, HTSNK, REV. B		R	22	1.000	EA		Yes		
365000-0014A	*1	117	SKT, 14-POS,DIP,TIN PLATE,L.P.		R	11	1.000	EA	U42	Yes		
365000-0016A	*1	118	SKT, 16-POS,DIP,TIN PLATE,L.P.		R	11	1.000	EA	U2	Yes		
365000-0028A	*1	121	SKT, 28-POS,DIP,TIN PLATE,L.P.		R	11	1.000	EA	U7	Yes		
365000-0040A	*1	122	SKT, 40-POS,DIP,TIN PLATE,L.P.		R	11	1.000	EA	U6	Yes		
365000-0018A	*1	123	SKT, 18-POS,DIP,TIN PLATE,L.P.		R	11	1.000	EA	U48	Yes		

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
400596-0000	PCBA, CPU ESCORT II, E2 REV. "AH" (E923)				A				AH	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370200-3011A	*1	126	RES, 3.01K,1/4W,1%,MF		R	11	1.000	EA	R92	Yes		
360500-0044A	*1	127	SPCR, #6,.25 RND X .125 LNG		R	11	4.000	EA		Yes		
370100-0622A	*1	128	RES, 6.2K,1/4W,5%,CF		R	11	1.000	EA	R102	Yes		
370100-0623A	*1	130	RES, 62K,1/4W,5%,CF		R	11	1.000	EA	FLY R14	Yes		
370100-0161A	*1	131	RES, 160,1/4W,5%,CF		R	11	1.000	EA	R39	Yes		
370100-0911A	*1	132	RES, 910,1/4W,5%,CF		R	11	1.000	EA	R22	Yes		
352401-0225A	*1	133	CAP, 2.2UF,35V,20%,TANT		R	11	1.000	EA	C61	Yes		
370100-0152A	*1	135	RES, 1.5K,1/4W,5%,CF		R	11	1.000	EA	R104	Yes		
358200-0001A	*1	136	WSHR, SHLDR		R	11	2.000	EA	TORQUE TO 4 IN/LBS.	Yes		
358200-0009A	*1	137	WSHR, #4 SPLIT LOCK		R	11	2.000	EA	HEAT SINK BRACKET	Yes		
358200-0024A	*1	138	WSHR, #4 FLT (.250 OD)		R	11	2.000	EA	HEAT SINK BRACKET	Yes		
401540-0000	*1	139	INSULATOR, E2 CPU HEATSINK REV. A (E923)		R	22	1.000	EA		Yes		
360500-0021A	*1	140	NUT, #4 HEX,SM PTRN		R	11	2.000	EA	HEAT SINK BRACKET	Yes		
370100-0474A	*1	141	RES, 470K,1/4W,5%,CF		R	11	1.000	EA	R88	Yes		
374000-0102A	*1	142	POT, 1K,TRIM,TOP ADJ,OFF CTR LEADS,CERMET		R	11	1.000	EA	R13	Yes		
364000-0173A	*1	143	IC, LF347 SCREENED FROM -0009, -0130, -0135		A	5	3.000	EA	U42,44,45	Yes		
352100-0430A	*1	144	CAP, 43PF,50V,5%,NPO		R	11	2.000	EA	C28,29	Yes		
370101-0101A	*1	145	RES, 100,1/8W,5%,CF		R	11	1.000	EA	R95	Yes		
352100-0153A	*1	146	CAP, .015UF,25V,10%,RAD,X7R		R	22	1.000	EA	C76	Yes		
378000-0014A	*1	147	DIO, MV209,VARACTOR		R	11	2.000	EA	CR1,2	Yes		
370100-0105A	*1	148	RES, 1M,1/4W,5%,CF		R	11	2.000	EA	R105,106	Yes		
370101-0563A	*1	149	RES, 56K,1/8W,5%,CF		R	11	1.000	EA	R107	Yes		
352300-0012A	*1	150	CAP, .01UF,10%,MYLAR		R	77	1.000	EA	C14	Yes		
352300-0011A	*1	151	CAP, .1UF,10%,MYLAR		R	77	3.000	EA	C34,35,51	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
400596-0000	PCBA, CPU ESCORT II, E2 REV. "AH" (E923)			A			AH	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
352600-0031A	*1	152	CAP, 1000pF,2.5%,100V,POLYCARB		R	33	1.000	EA	C64	Yes		
400806-0000	*1	153	HTSNK, EII,TO-220		R	22	4.000	EA	U26,27,28,51	Yes		
358100-0043A	*1	154	SCR, 4-40 X 3/16,PH,FLTHD,82DEG,S.S.		R	11	4.000	EA	1 PER HEAT SINK	Yes		
374000-0501A	*1	155	POT, 500,TRIM,TOP ADJ,CERMET		R	33	1.000	EA	R110	Yes		
364000-0124A	*1	156	IC, S-8054 ALR, TO 92 PKG., VOLT.DET. 4.3 TO 4.6		R	22	2.000	EA	U52,50	Yes		
400806-0000	*1	157	HTSNK, EII,TO-220		R	22	0.000	EA	USE LOCTITE	Yes		
358100-0004A	*1	158	SCR, 4-40 X 3/8,PH FLTHD, SS,100 DEG.		R	11	4.000	EA		Yes		
354000-0182A	*1	161	CONN, 2-POS, MALE		R	33	1.000	EA	J14	Yes		
370100-0752A	*1	162	RES, 7.5K,1/4W,5%,CF		R	11	1.000	EA	R89	Yes		
370100-0334A	*1	163	RES, 330K,1/4W,5%,CF		R	11	1.000	EA	R109	Yes		
364000-0123A	*1	164	IC, RTC 72421A		R	22	1.000	EA	U48	Yes		
352100-0150A	*1	165	CAP, 15PF,50V,10%,RAD,NPO EDPT		R	22	1.000	EA	C78	Yes		

Cumulative Lead Time for 400596-0000 = 99

ECG BOARD

CHAPTER 4

4.0.0 ECG BOARD

4.1.0 OVERVIEW

One of the two processor boards in the **ESCORT** is the ECG Board. The primary function of this board is to detect an ECG signal and reproduce it on the monitor screen. If the **ESCORT** is configured for Respiration, then the ECG Board will detect and reproduce a respiration waveform. Both waveforms are received in analog, and converted to a digital format to be stored in RAM. If the **ESCORT**is equipped with five lead select, the ECG Daughter Board will interpret and implement the selection.

The ECG Board also provides electrical isolation for the patient from the monitor. All signals are isolated through opto-couplers creating a barrier, separating line voltages from the patient. Necessary operating voltage for the isolated section are provided by T1 and U8 --completing the isolation barrier.

Circuits will be described in 2 major sections: the ISOLATED SECTION including Lead Select, Instrumentation amp and Notch filter, Pacer detect, ECG MUX, A to D Sampling, Iso DC Power Supply, and the Respiration circuit if included in configuration. In the NON ISOLATED section are the Digital portion and Defib Buffer.

4.2.0 ISOLATED SECTION

4.2.1 LEAD SELECT

For **ESCORTS** equipped with Lead Select and/or Respiration, an ECG Daughter Board is installed. ECG from patient leads is input to and selected on the Daughter Board. Each lead has its own defibrillator protection circuitry comprised of a current limiting resistor and two back-to-back zener diodes (for RA: R17 and D1, D2). In addition, each lead has its own electro-surgical filtering circuits consisting of a 63 mH inductor and a 2200 pF capacitor in parallel with it.

The multiple gang waffer switch (S1) selects the lead configuration to produce the signals -SIG, +SIG and ISO GRD. These signals go to the main ECG Board via J1.

4.2.2 INSTRUMENTATION AMPLIFIER/NOTCH FILTER

U1 on the ECG Mother Board is a high impedance differential amplifier. The two signals are combined and amplified with a gain of 26 at U1 pin 8. R66 is adjusted to compensate for any phase difference in the two signals; R8 will balance and offset anycommon mode on top of the ECG signal.

The Notch filter will eliminate any respiration drive signal (125HKz) that might be present on the ECG signal.

4.2.3 PACER PULSE DETECT

If Pace key is ON, the **ESCORT** will reject pacer artifact and insert a pacer flag into the ECG waveform. C10, C11, R12 and R13 form a bandpass filter which is used to recognize the pacer pulse. If a quick spike, ±150mV, occurs, U3 pin 13 or 14 will be forced to -15V for 2ms. This will inhibit U2 pin 7, effectively stripping the spike from the ECG signal. The U3 output also goes to opto coupler U7, generating the signal FLAG. When FLAG goes LOW for 5 - 15mS, a pacer spike has been detected.

The pacer detection circuit can be disabled by the user with the softkey PACE ON/OFF. The signal PACE ENABLE* goes through opto coupler U6 to U2 pin 9. U2 pin 11 will force U3 pins 9 and 10 to ground, disabling the pacer detect circuit.

4.2.4 ECG/RESPIRATION MULTIPLEXER

R16, R18, R19, C14, C13, C15, D11 and D12 all comprise another band pass filter that sets the monitor frequency response at .05Hz to 100Hz. The next section will multiplex the respiration signal (RESP) and the ECG signal according to the control signals RESP SEL and ECG SEL from the digital portion. Q1 is turned on and off by ECG SEL through opto coupler U5 pin 11. If respiration is selected, (RESP SEL high) Q2 is turned on, passing the respiration signal on to the A to D sampling circuit. For **ESCORTS** not configured with respiration, ECG only will be selected.

BASELINE RST will quickly drive the ECG signal back on the screen if the amplitude of the signal becomes too large, as in the case of replacing a loose lead.

4.2.5 A TO D SAMPLING CIRCUIT

This circuit provides analog to digital conversion for use by the digital portion of the ECG Board. An oscillator and ramp waveform create a window to sample the instantaneous analog voltage and calculate a digital data point. Reference voltages are used by the integrating A to D converter to initiate timing cycles. The ramp voltage has a rise rate of 1 volt per 60us: if the ECG signal voltage has not been reached by the ramp voltage by 900 microseconds, the digital circuitry will set the SAMPLE RST to start a new cycle.

The sampling circuit starts with the signal SAMPLE RST. When SAMPLE RST goes high, it turns on Q4, shorting U4 pin 1 to -10.5V. The voltage then starts to ramp up. When it reaches -10V, U3 pin 2 will go high, starting the count and signifying the beginning of the digital conversion. U3 pin 1 and U3 pin 2 outputs are wired OR'd together. The ramp will continue up until its voltage is equal to the signal at U3 pin 7, ECG or RESP. At that time, U3 pin 1 will pull the

outputs low, stopping the counter and completing the square wave. The higher the voltage, the longer the square wave. This signal will go to opto coupler U7, and then to the digital portion of the board.

4.2.6 RESPIRATION

In addition to lead select, respiration detection is on the Daughter Board. Respiration is detected by the impedance change that occurs with the inhalation and exhalation of air by the lungs. The signal RESP DRIVE is a 125 KHz square wave that is generated by pulse width modulator U8 through T1 on the Main Board. It gets clipped and stabilized by U8, D11, D12 and L2. U1A will amplify the square wave to approximately $\pm$7.2V. C9 and R11 couple this signal to T1. T1 will limit this signal to less than 1mA at the outputs RA and LA.

The patient is seen by T1 as a resistance load on the secondary of the transformer. As the patient breaths, the primary drive signal changes amplitude according to how much resistance it sees across the two leads. This signal is rectified and filtered by D13, C10 and R12 to a DC level. C11 will strip off the DC component, leaving only the respiration component. This signal will change very slightly (mV), reflecting the patient's breathing pattern.

U1B has a gain of 2K to amplify this respiration component and create RESP SIGNAL. If for some reason the signal is too large to be seen on the screen, RESP RESET will shorten the RC time constant by adding R10 in parallel with R14 to drive the signal back onto the screen quickly.

4.2.7 LEAD FAIL

The LEAD FAIL detect circuit is standard in all monitors shipped after July, 1989. Most of the circuitry is located on the ECG daughter board. A LEAD FAIL message will be displayed if the +SIG, the -SIG, or both leads, have been dislodged. The LEAD FAIL message will also be displayed if the base line impedance for respiration is 4K ohms or more, or if ECG impedance is greater than 3.5 meg ohms. In any of these instances, LEAD FAIL will be displayed on the parameter message line, but no recording will be generated. In addition, all alarms are inhibited at this time.

U2 pin 12 will detect an interruption of current flow on the -SIG, and U2 pin 3 will monitor +SIG. When the current loop, through ISO GROUND, is broken, as in the case of a lead off, the affected input will be pulled high through R23 or R24. U2c is looking for a differential of 160mV or more to signify the lead at -SIG is off. If both leads are off, D14 and D15 will drop approximately 3 volts, leaving 2 volts at the input of U3d.

U3d will detect if the lead is off at +SIG or if both leads are off. U3c will detect a lead off at -SIG, and U3a will detect if the respiration signal is higher than 4K ohms base line impedance. These signals are wired or'd together at this point. R33 and C15 form a 500ms RC time constant to filter ECG and artifact. U2b and U3b are

buffers for the signal LEAD FAIL. This signal goes to the ECG mother board through J2 pin 2.

At this point if LEAD FAIL is low, a lead fail condition exists. This signal will go through opto-coupler U7 where it becomes the signal FLAG. Software determines whether the FLAG is a pacer spike or a lead fail. If the signal remains low for 10 to 15ms, then it is considered a pacer spike. If FLAG remains low for more than 3 seconds, it is considered a lead fail.

4.2.8 ISOLATION POWER SUPPLY

Plus and minus voltages for the isolation section of the ECG Board are supplied by T1 and U8. PS SYNC drives the pulse width modulator U8 and synchronizes it with all other voltages in the monitor. T1 furnishes isolation to complete the isolation barrier. The 125 KHz RESP DRIVE signal is taken from pin 5 of T1. D7, D8, D9, and D10 rectify the AC, and a filtering circuit smoothes out the DC. ISO Ground, +V, and -V are obtained from this circuit.

4.3.0 NON ISOLATED SECTION

4.3.1 ECG DIGITAL

The processor chip on the ECG Board is a Z-80 type microprocessor. Y1 clocks U9 at 4MHz. I/O reads and writes (IORD, IOWR) and memory reads and writes (MRD, MWR) are decoded by U14 from the signals at pins 19-22. The ECG data address bus directs information to the EPROM, Dual Port RAM, CTC and address decoders. The microprocessor is reset by the CPU Board signal RSTOUT*. WAIT at pin 24 inserts wait cycles to the CPU from the Dual Port RAM. The interrupt on pin 16 will indicate to the microprocessor that 900 microseconds have elapsed since the start of the sampling cycle and request the processor to terminate this cycle. Pin 17 is the signal TIMETIC* which synchronizes the sampling cycle so that each TIMETIC* denotes getting and decoding one data point.

The EPROM (U10) stores software for the ECG Board and is enabled by U12 and the MRD signal.

The Dual Port RAM (U11) is a 2K x 8 bit CMOS RAM MS6132. It provides two ports with separate controls, address and I/O that permit separate access to memory reads and writes. The Dual Port RAM interfaces the CPU Board data address bus to the ECG Board.

U13 and U16 are input and output ports. U13 has two input signals, DEFIB SYNC and FLAG that, when requested, it places on the ECG data bus. U16 outputs control signals to the isolated section of the board.

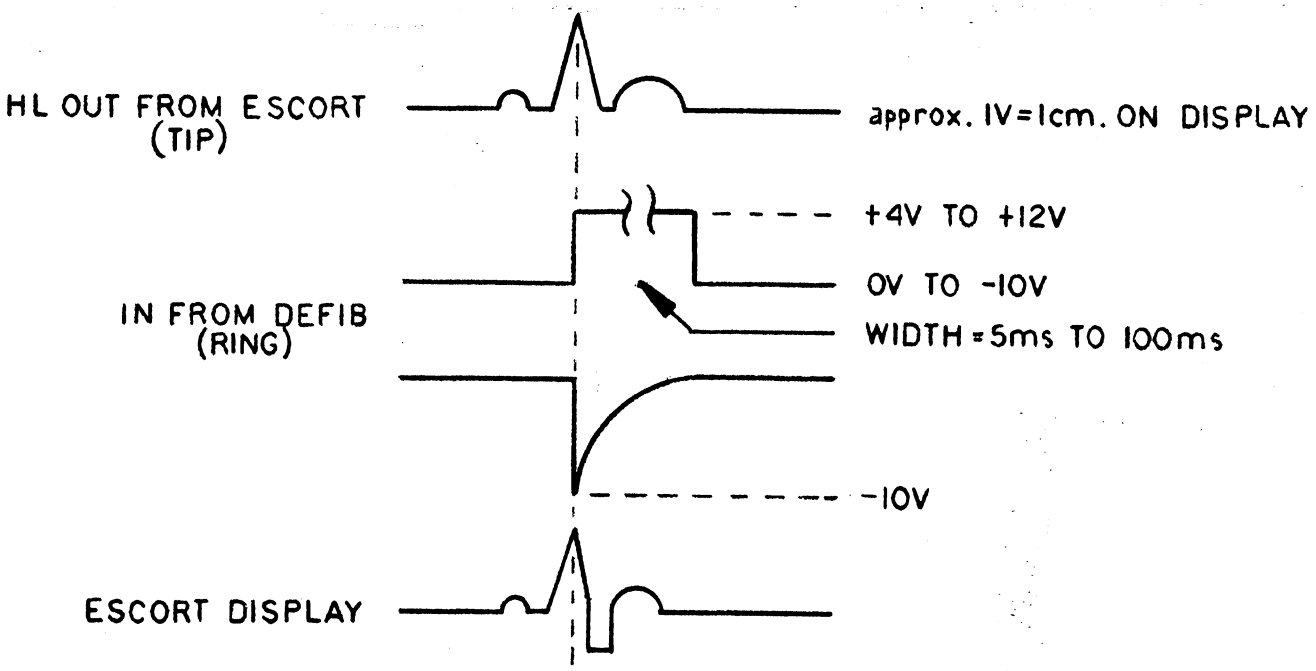
U17 is a Counter Timer Chip. It is programmable with four

independent channels for counting and timing functions. It is enabled by IOWR, IORD and A2, and it is clocked by Y1.

At SAMPLE RST the counter will start counting at the rate of 4MHz and will continue to count for 900 microseconds if it is not stopped before by the ramp voltage equaling the sample voltage in the A to D sample circuit.

4.3.2 DEFIBRILLATOR SYNC

The defibrillator sync circuit sends a high level ECG signal to the defibrillator via the stereo jack on the connector plate. The defibrillator will detect the R wave and respond with a square wave, or RC spike flag to the **ESCORT** This signal will turn Q5 on sending a low to the input port U13. The microprocessor will take this information and place a flag on the ECG waveform indicating the defibrillator sync position. Defibrillator sync requirements follow:

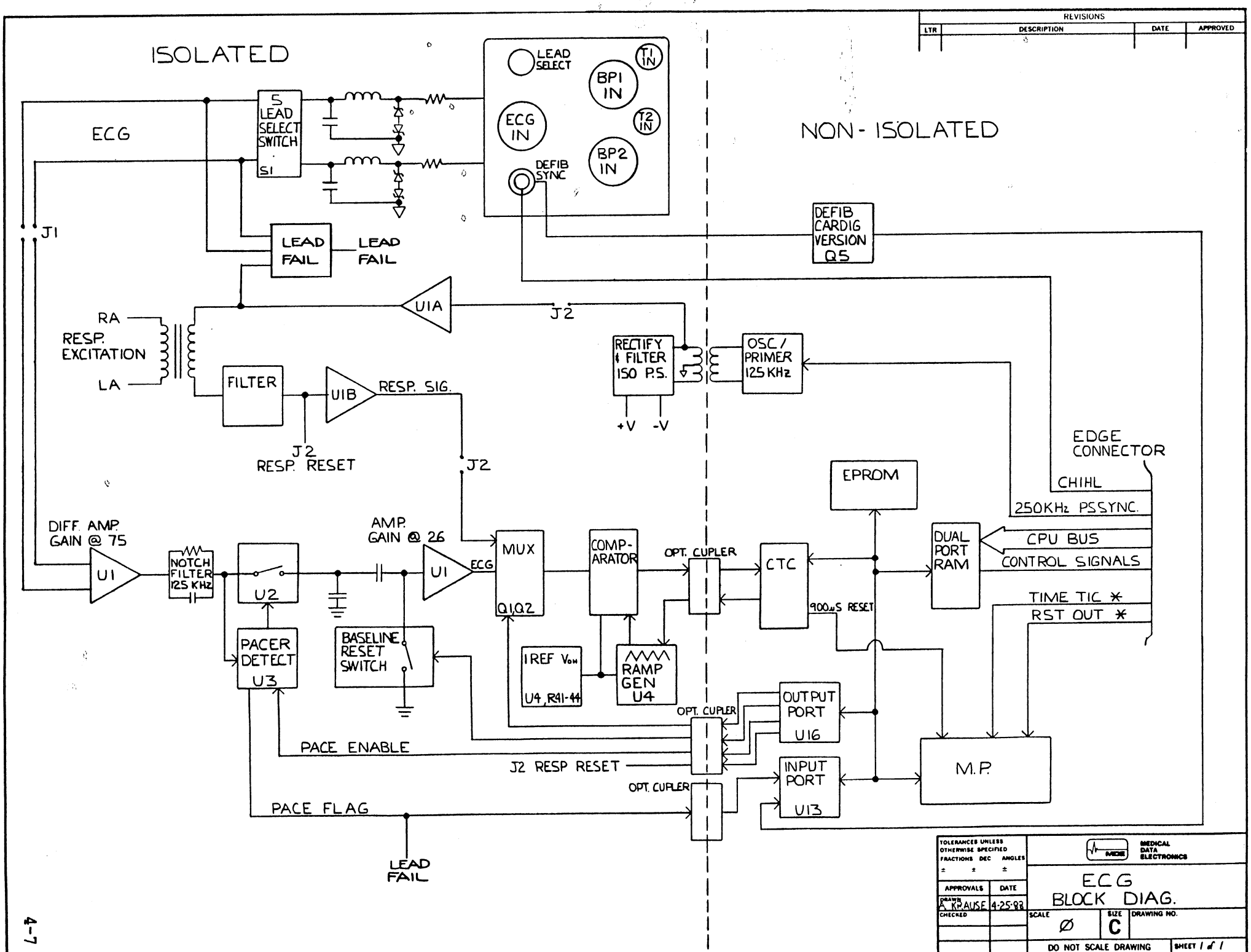


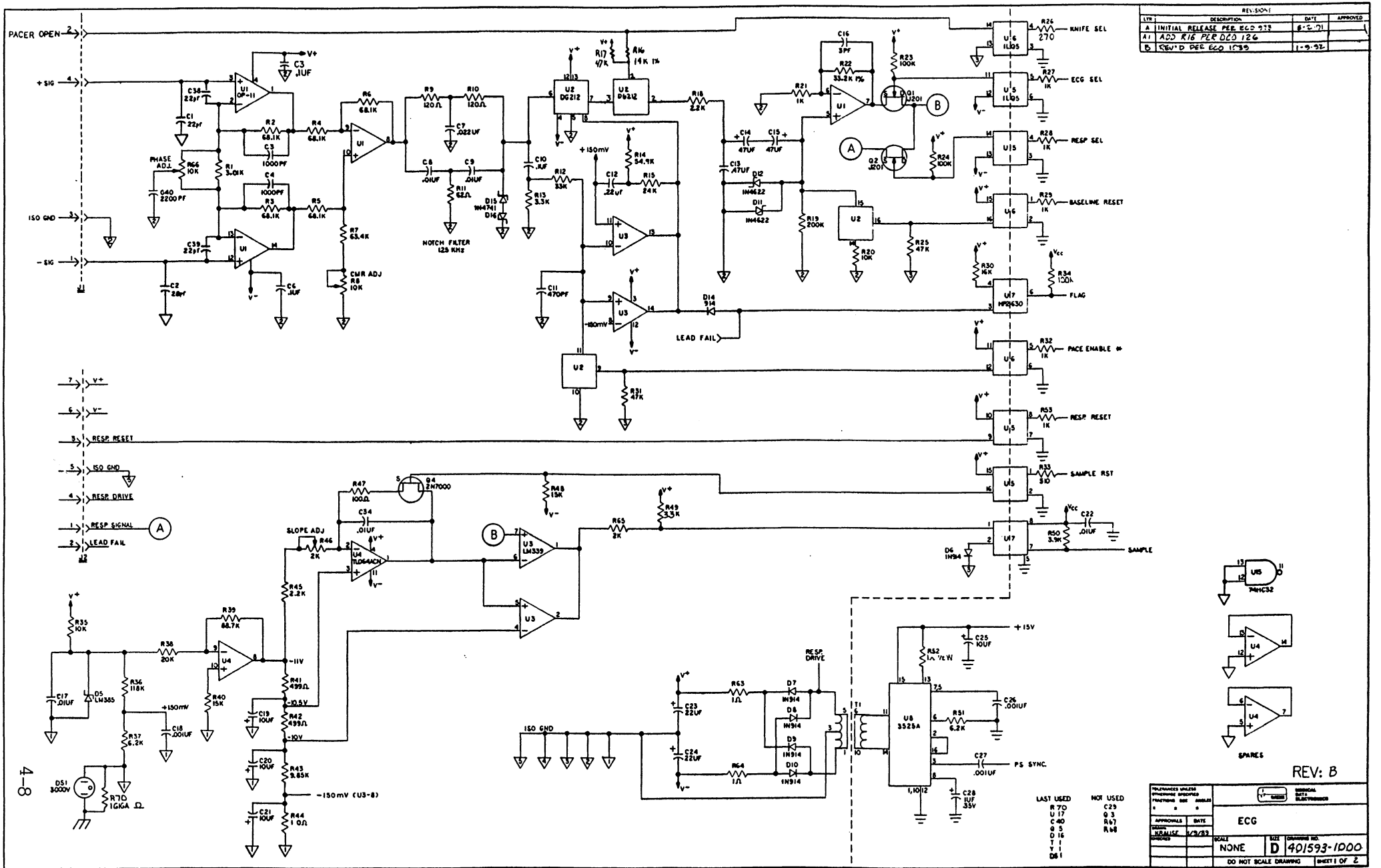
4.4.0 SOFTWARE

Software for the ECG board is stored in the EPROM, U10. Software version number can be obtained by calling up the TEST softkey page. All **ESCORTS** will feature software for ECG functions. If your monitor is configured for respiration, then the EPROM will include software for respiration tasks.

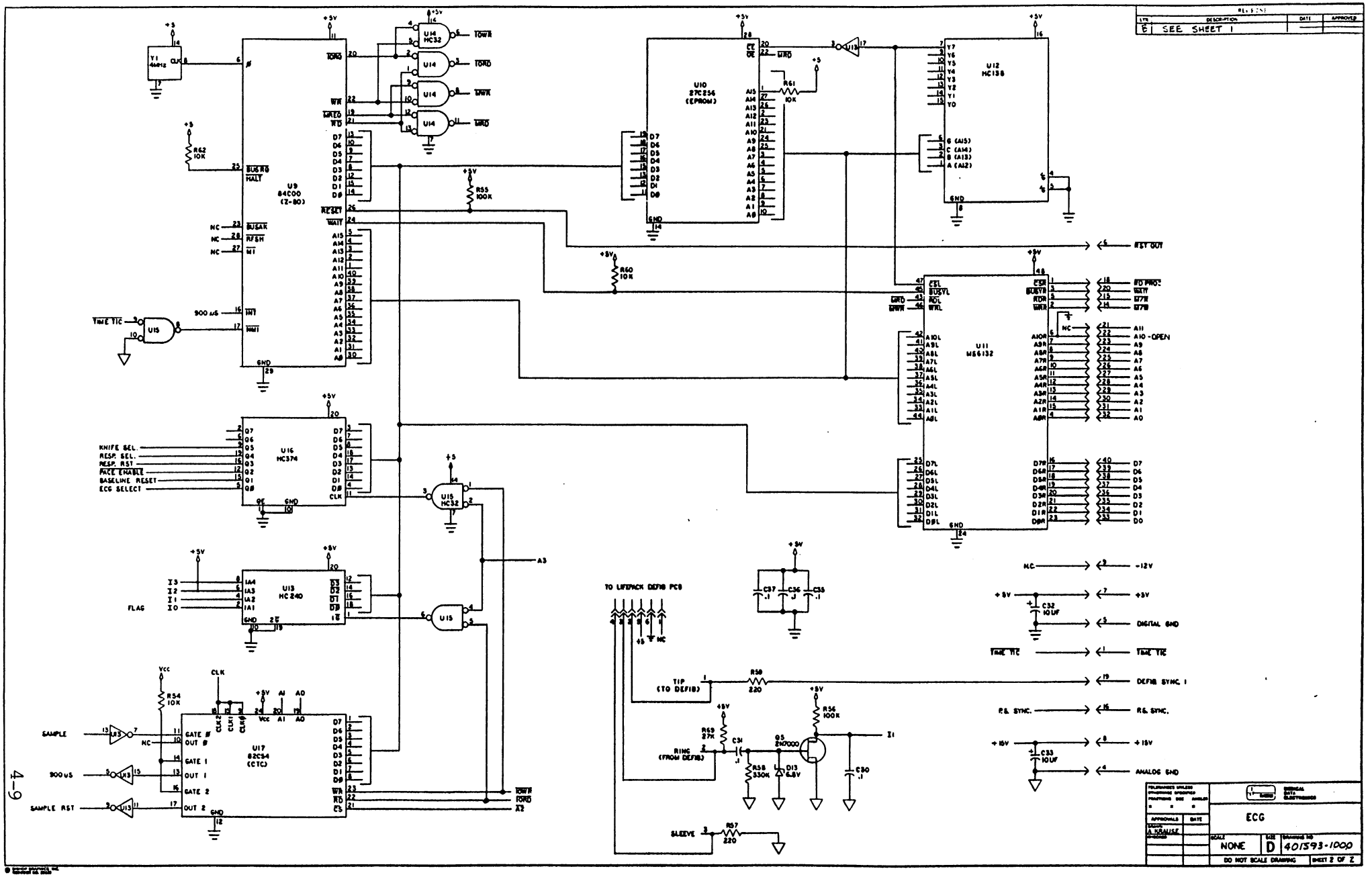
Software tasks:

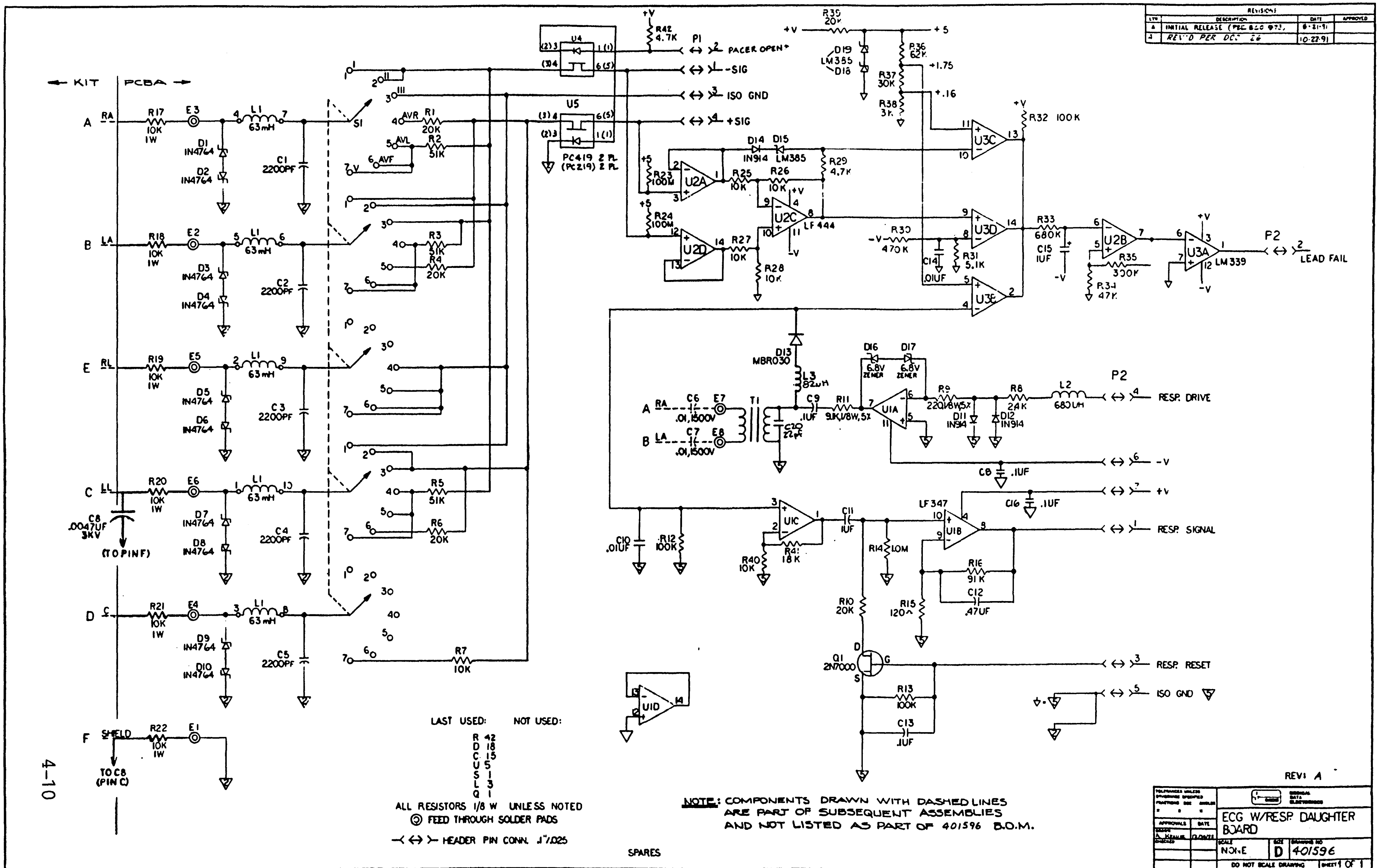
ECG	Waveform sizing and gain control
	High pass filtering
	Low pass filtering
	Line frequency notch filtering
	R-wave picking
	Baseline reset
	Heart rate counting
RESPIRATION	Waveform sizing and gain control
	High pass filtering
	Low pass filtering
	Respiraiton waveform picking
	Baseline reset
	Pneumotach tach rate
	CVA detection
	Apnea delay

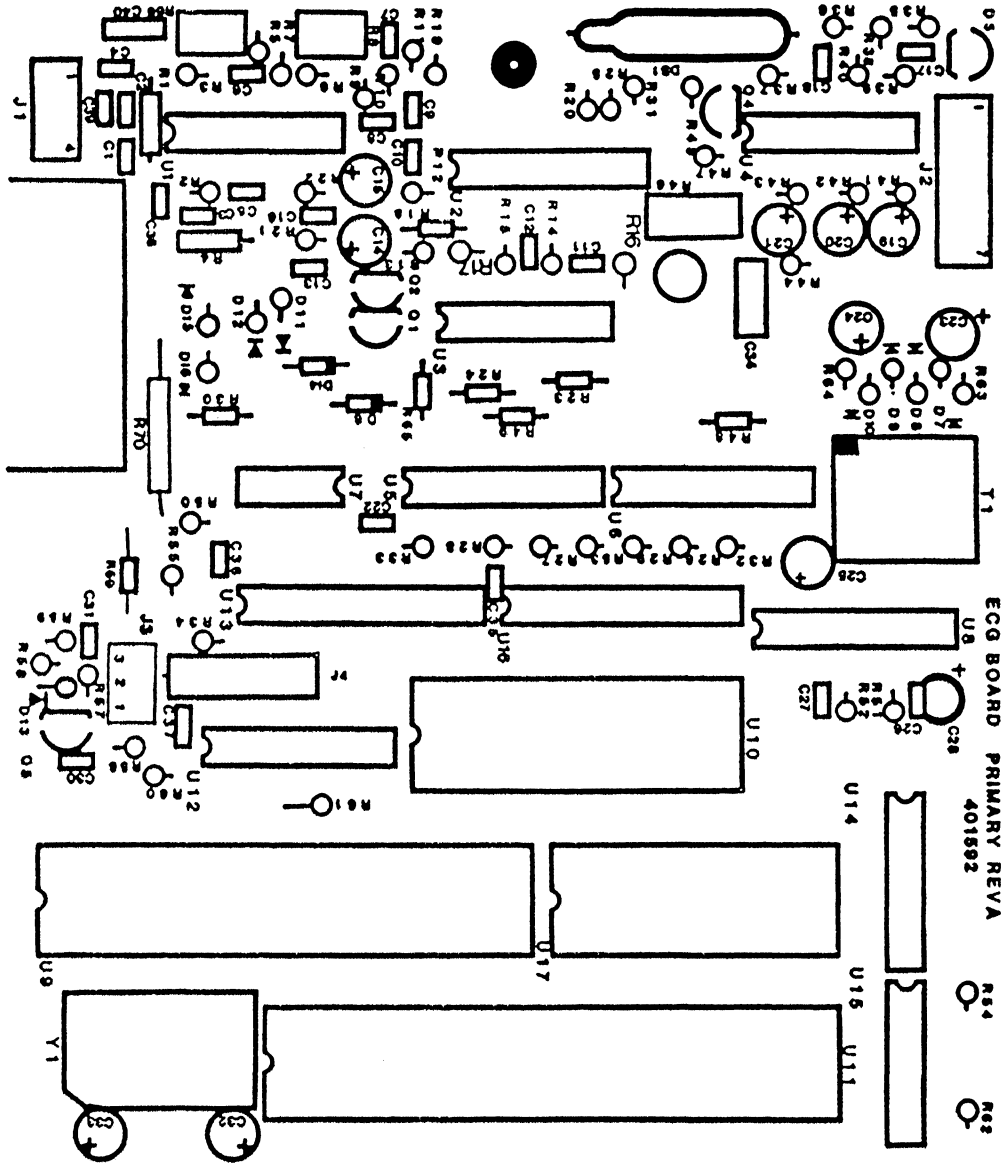

ISOLATED
NON-ISOLATED
REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
ECG
5 LEAD SELECT SWITCH
S1
LEAD SELECT
BP1 IN
T1 IN
ECG IN
T2 IN
BP2 IN
DEFIB SYNC
J1
LEAD FAIL
LEAD FAIL
DEFIB CARDIG VERSION Q5
U1A
J2
RA
RESP. EXCITATION
LA
FILTER
U1B
RESP. SIG.
J2
RESP. RESET
RECTIFY & FILTER 150 P.S.
OSC / PRIMER 125 KHz
+V
-V
EDGE CONNECTOR
EPROM
CHIHL
250KHz PSSYNC.
DIFF. AMP. GAIN @ 75
U1
NOTCH FILTER 125 KHz
U2
AMP. GAIN @ 26
U1
ECG
MUX
Q1,Q2
COMP-ARATOR
OPT. CUPLER
CTC
900μS RESET
DUAL PORT RAM
CPU BUS
CONTROL SIGNALS
TIME TIC *
RST OUT *
PACER DETECT U3
BASELINE RESET SWITCH
IREF VOW
U4, R41-44
RAMP GEN U4
OPT. CUPLER
OUTPUT PORT U16
PACE ENABLE
J2 RESP RESET
OPT. CUPLER
INPUT PORT U13
M.P.
PACE FLAG
LEAD FAIL
TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS DEC ANGLES
APPROVALS
DATE
DRAWN A KRAUSE 4-25-88
CHECKED
MEDICAL DATA ELECTRONICS
ECG BLOCK DIAG.
SCALE Ø
SIZE C
DRAWING NO.
DO NOT SCALE DRAWING
SHEET 1 of 1
4-7
BISHOP GRAPHICS, INC RECORDER NO. 20622



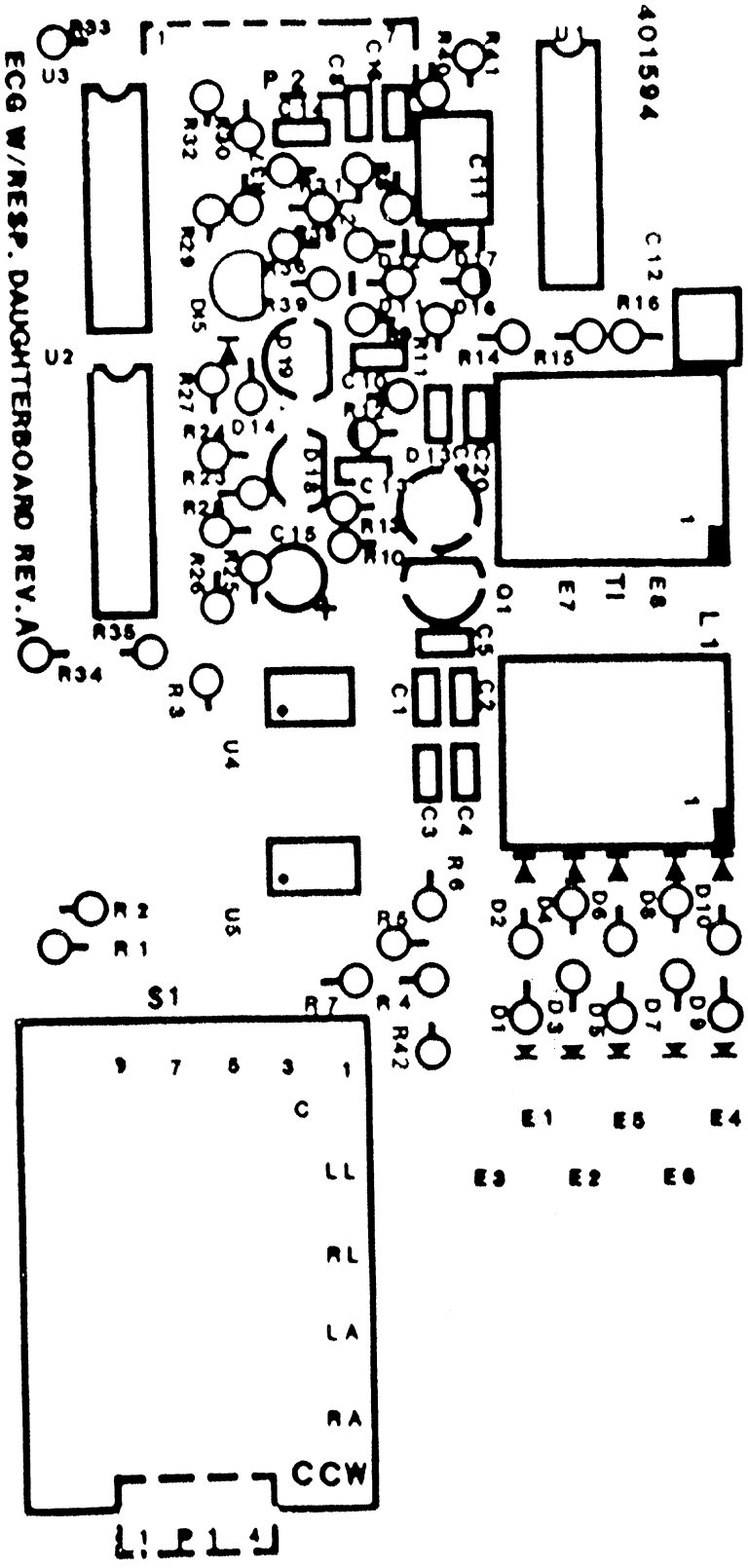
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE PER ECO 979	8-2-91	
A1	ADD R16 PER ECO 126		
B	REV'D PER ECO 1039	1-9-92	


SEE SHEET 1
U9 84C00 (Z-80)
U10 27C256 (EPROM)
U11 MS6132
U12 HC138
U13 HC240
U14 HC32
U15 HC32
U16 HC374
U17 82C54 (CTC)
Y1 4MHz
R54 10K
R55 100K
R56 100K
R57 220
R58 330K
R59 220
R60 10K
R61 10K
R62 10K
C30 .1
C32 10UF
C33 10UF
C35 .1
C36 .1
C37 .1
D13 6.8V
Q5 2N7000
TIME TIC
900 uS
SAMPLE
SAMPLE RST
KNIFE SEL.
RESP. SEL.
RESP. RST
PACE ENABLE
BASELINE RESET
ECG SELECT
FLAG
RING (FROM DEFIB)
TIP (TO DEFIB)
SLEEVE
TO LIFEPACK DEFIB PCB
RST OUT
I/O PROC.
WAIT
WR
RD
A10 - OPEN
DEFIB SYNC. 1
R & SYNC.
-12V
+5V
DIGITAL GND
ANALOG GND
ECG
NONE
D
4015593-1000
DO NOT SCALE DRAWING
SHEET 2 OF 2


KIT
PCBA
REVISIONS
A INITIAL RELEASE
REV'D PER DCC
P1
PACER OPEN*
-SIG
ISO GND
+SIG
PC419 2 PL (PC219) 2 PL
U2A
U2C
U2D
LF 444
U3C
U3D
U3E
U2B
U3A
LM 339
P2
LEAD FAIL
RESP. DRIVE
RESP. SIGNAL
RESP. RESET
ISO GND
MBR030
U1A
U1B
U1C
U1D
LF347
2N7000
LAST USED: R 42 D 18 C 15 U 5 S 1 L 3 Q 1
NOT USED:
ALL RESISTORS 1/8 W UNLESS NOTED
FEED THROUGH SOLDER PADS
HEADER PIN CONN. .1"/.025
SPARES
NOTE: COMPONENTS DRAWN WITH DASHED LINES ARE PART OF SUBSEQUENT ASSEMBLIES AND NOT LISTED AS PART OF 401596 B.O.M.
REV A
ECG W/RESP. DAUGHTER BOARD
SCALE NONE
SIZE D
DRAWING NO 401596
DO NOT SCALE DRAWING
SHEET 1 OF 1

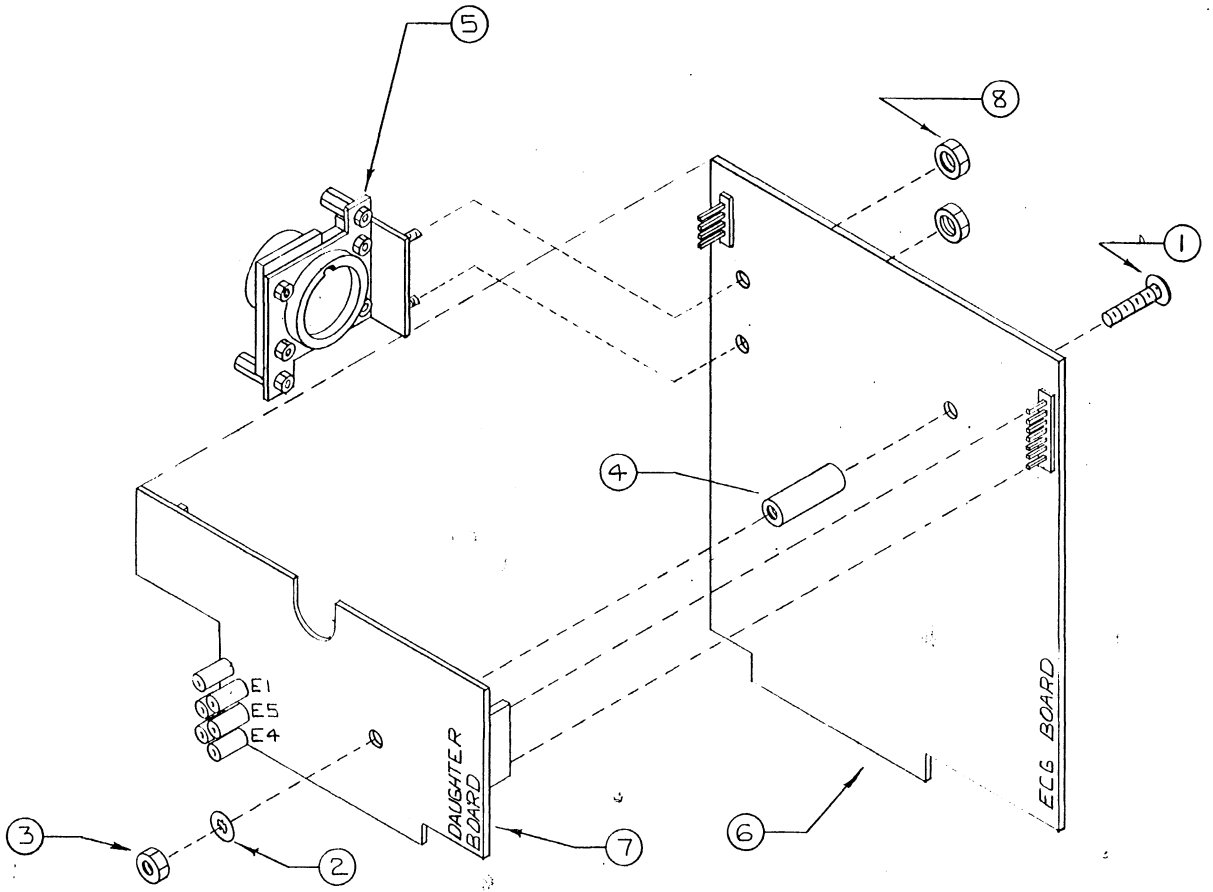


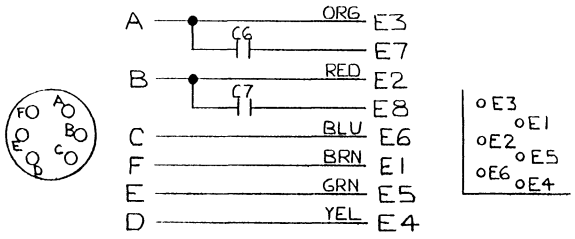
ECG BOARD



ECG W/RESP.
DAUGHTERBOARD

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	12-	





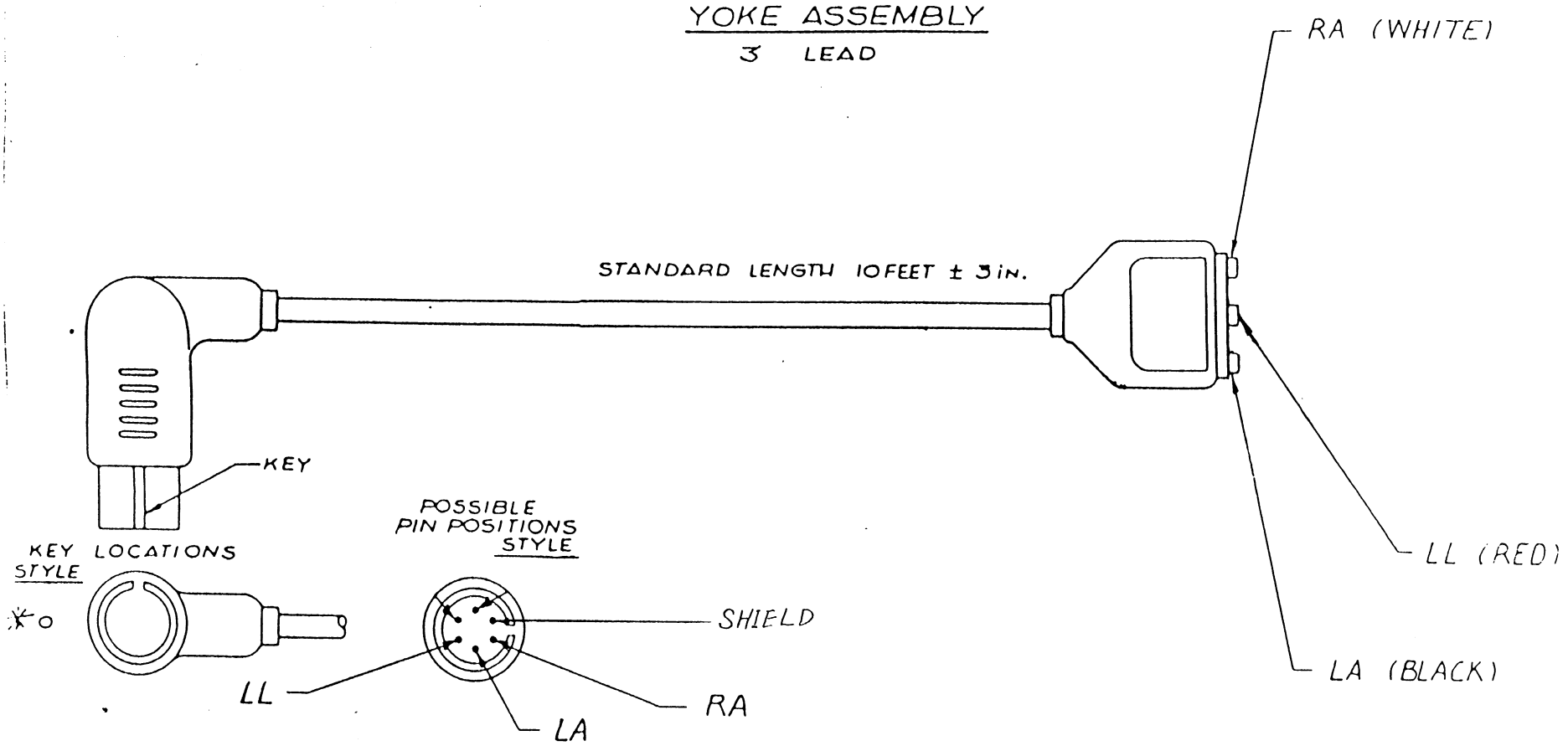
NO.	QTY.	DESCRIPTION	PART NO.
9			
8	2	4-40 LOCK NUTS	360500-0037
7	1	ECG 5 LD. DGHTR PCBA	SEE NOTE 1
6	1	ECG MOTHER BD. ASSY # 2	400608-0000
5	1	ECG BRKT ASSY.	400650-0000
4	1	# 4 ROUND ALU SPACER	360500-0035
3	1	# HEX NUT SM. PATTERN	360500-0021
2	1	# 4 STAR WASHER	358200-0007
1	1	4-40 x 3/4 PHIL1 SCREW	358100-0022

NOTES:
1. FOR 5 LD ONLY (400584) USE DGHTR BD. ASSY. 400609.
2. FOR 5 LEAD WITH RESP (400585) USE DGHTR BD. 400610.
3. C6 AND C7 USED ON 400585-0000 (RESP) ONLY.

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±		MDE MEDICAL DATA ELECTRONICS	
APPROVALS	DATE	ECG 5 LD. WITH OR WITHOUT RESP OPT. ASSY.	
DRAWN A. KRAUSE	12-22-87		
CHECKED		SCALE FULL	SIZE C
		DRAWING NO. 400584-0000 400585-0000	
		DO NOT SCALE DRAWING	SHEET 1 of 1

YOKE ASSEMBLY

3 LEAD



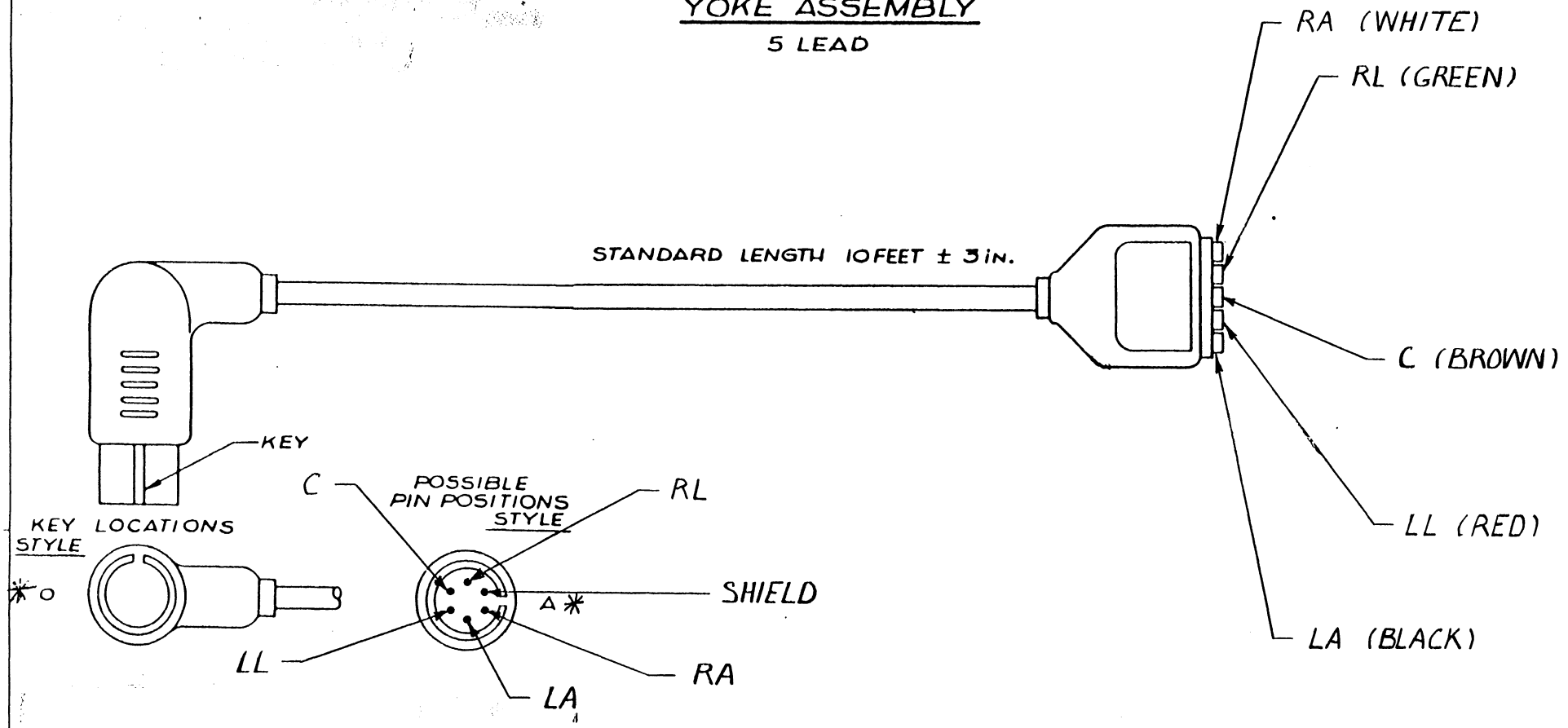
ASSEMBLY MAY BE GAS STERILIZED.
LEAD RETAINER WITH BEDSHEET CLIP IS P/N K-2148.
UNLESS OTHERWISE NOTED, STANDARD COLOR OF ASSEMBLY IS GRAY.

MOLD NO. T-102
SHEET 5 A
4-79-A

MOLD NO. T-103-5
SHEET 2
4-79-A

YOKE ASSEMBLY

5 LEAD



ASSEMBLY MAY BE GAS STERILIZED.
LEAD RETAINER WITH BEDSHEET CLIP
IS P/N K-2148.
UNLESS OTHERWISE NOTED, STANDARD
COLOR OF ASSEMBLY IS GRAY.

MOLD NO. T-102

SHEET 5A
4-79-A

MOLD NO. T-103-5

SHEET 2
4-79-A

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

RESP.CAPS	H.P.CONN.	E II DAUGHTER BD.	(REF)
	H GRN/WHT		LL
	F BROWN		C
	J BLUE		RL
X	A ORANGE		RA
X	B RED		LA
	D YELLOW		SHIELD

TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	±

APPROVALS	DATE
DRAWN E. DAVIS	10/26/88
CHECKED	

MDE MEDICAL DATA ELECTRONICS

H.P. ECG WIRING CLOVER FOR ESCORT II

SCALE	SIZE	DRAWING NO.
NONE	A	

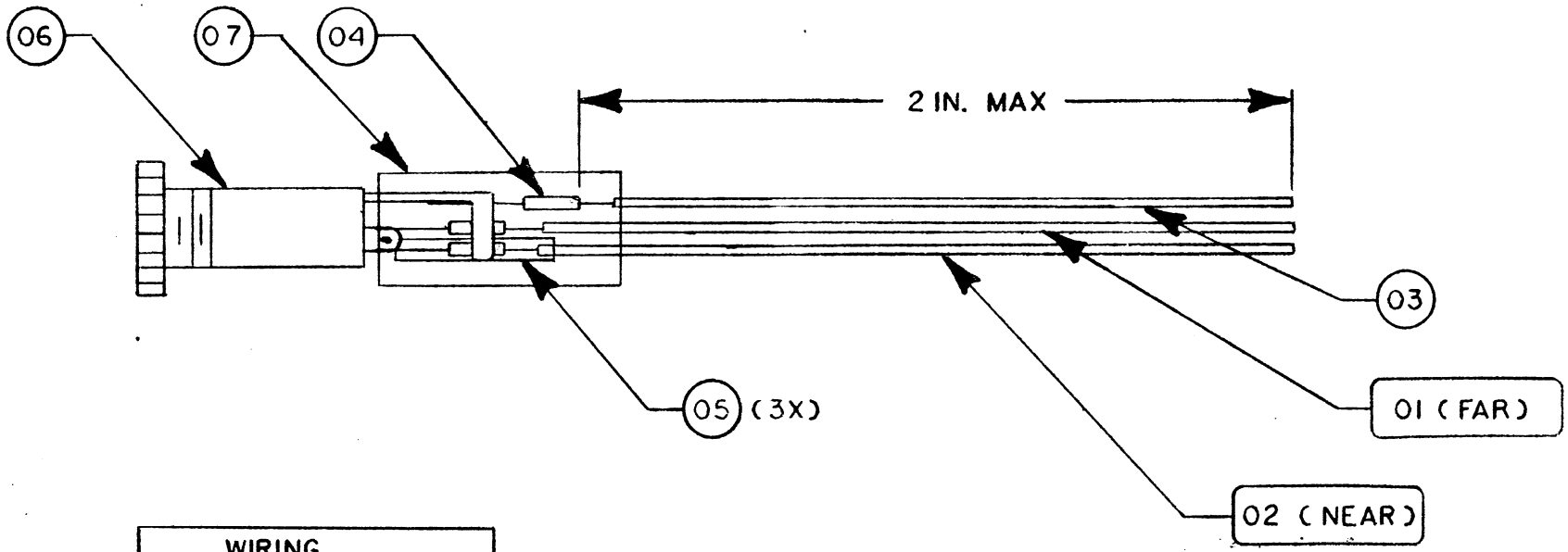
DO NOT SCALE DRAWING | SHEET 1 OF 1

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

RESPCAPS	MERLIN H.P.CONN	E II DAUGHTER BD.	(REF)
	6 GRN/WHT		LL
	5 BROWN		C
	2 BLUE		RL
X	1 ORANGE		RA
X	7 RED		LA
	C YELLOW		SHIELD

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±		MDE MEDICAL DATA ELECTRONICS	
APPROVALS	DATE	H.P. MERLIN ECG WIRING FOR ESCORT II	
DRAWN E. DAVIS	2/10/89		
CHECKED		SCALE NONE	SIZE A
		DRAWING NO.	
		DO NOT SCALE DRAWING	SHEET

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	2-10-89	
B	ECO 393 REDRAWN	2-22-89	



WIRING
PIN 1 BROWN
PIN 2 RED
PIN 3 ORANGE

4-18

REV: B

NO.	QTY.	DESCRIPTION	PART NO.
07	1	1/4" DIA. HT. SHRINK 1/2" LENGTH	385000-0005A
06	1	CONN. MINI STEREO	354000-0144A
05	3	1/16" SHRINK TUBING 1/2" LENGTH	385000-0003A
04	3	RESISTOR 1K, 1/4W, 5%	370100-0102A
03	1	WIRE ORANGE 24GA STRD. 1.5"	399100-0003A
02	1	WIRE RED 24 GA STRD. 1.5"	399100-0002A
01	1	WIRE BROWN 24 GA STRD 1.5"	399100-0001A

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ± DEC ± ANGLES ±

APPROVALS	DATE
DRAWN A. KRAUSE	2-22-89
CHECKED	

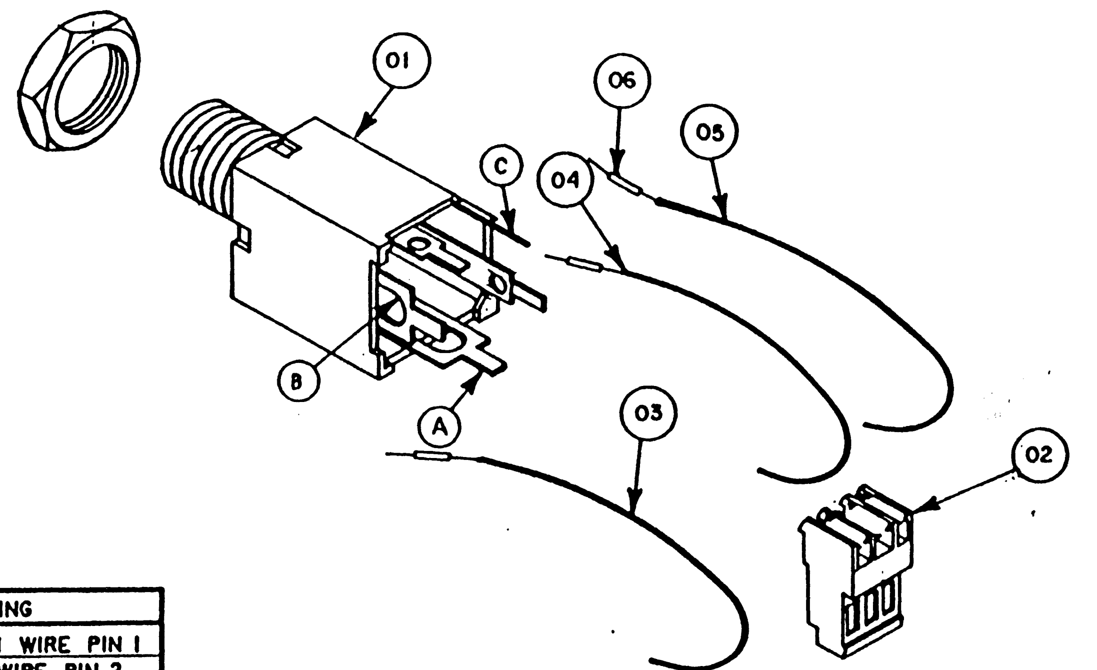
MDE MEDICAL DATA ELECTRONICS

DEFIB SYNC CONNECTOR HARNESS ASSY.

SCALE	SIZE	DRAWING NO.
2X	A	400903-0000

DO NOT SCALE DRAWING — SHEET 1 OF 1

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	11/18/88	
B	ECO 377	2/10/89	
C	ECO 391	2/21/89	



WIRING
A-RING BROWN WIRE PIN 1
B-TIP RED WIRE PIN 2
C-GND ORANGE WIRE PIN 3

REV: C

NO.	QTY.	DESCRIPTION	PART NO.
06	3	RESISTOR 1K, 1/4W, 5 %	370100-0102A
05	1	WIRE ORANGE 24GA STRD. HOOKUP PVC	399100-0003A
04	1	WIRE RED 24GA STRD. HOOKUP PVC.	399100-0002A
03	1	WIRE BROWN 24GA STRD. HOOKUP PVC.	399100-0001A
02	1	CONN, 3-P,F 24GA INS. DISP. MASS TERM.	354000-0087A
01	1	CONNECTOR, 1/4 JACK, F. (DEFIB SYNC)	354000-0179A

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±	MDE MEDICAL DATA ELECTRONICS
APPROVALS: E. DAVIS — DATE: 12/9/88	H.P. SYNC CONNECTOR HARNESS ASSEMBLY
CHECKED	SCALE 2/1 — SIZE B — DRAWING NO. 400828-0000
	DO NOT SCALE DRAWING — SHEET 1 OF 1

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
401596-0000	PCBA, ECG W/RESP 5LD DAUGHTER REV. A1 (D126)				A				A1	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401594-0000	*1	1	PCB, ECG 5LD DAUGHTER REV. A (E973)	A	R	22	1.000	EA		Yes		
354000-0142A	*1	2	CONN, 7 SKT STRP,.1 SKT SP,.335 HT		R	22	1.000	EA		Yes		
354000-0143A	*1	3	CONN, 4 SKT STRP,.1 SKT SP,.335 HT.		R	22	1.000	EA		Yes		
370101-0103A	*1	4	RES, 10K,1/8W,5%,CF		R	11	6.000	EA	R7,25,26,27,28,40	Yes		
370101-0203A	*1	5	RES, 20K,1/8W,5%,CF		R	11	5.000	EA	R1,4,6,10,39	Yes		
370101-0513A	*1	6	RES, 51K,1/8W,5%,CF		R	11	3.000	EA	R2,3,5	Yes		
370402-0103A	*1	7	RES, 10K,1/2W,5%,CC (ALL N BRDLY ONLY)*BULK ONLY*		R	22	6.000	EA	R17-22	Yes		
100000	*1	8	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	ABOVE ALL MATCHED 1%	Yes		
378000-0054A	*1	9	DIO, 1N4764,100V,ZENER		R	22	10.000	EA	D1-10	Yes		
352100-0104A	*1	10	CAP, .1UF,50V,10%,RAD,X7R		R	11	3.000	EA	C13,8,16	Yes		
380000-0017A	*1	11	SW, MINI,PCB MOUNT,5 POLE,7-POS		R	44	1.000	EA	S1	Yes		
352300-0222A	*1	12	CAP, 2200PF,50V OR 100V,1%,MYLAR,.15L.S.		R	77	5.000	EA	C1-5	Yes		
400554-0000	*1	13	IDCTR, MULTI ESCORT II, REV. 'B' **(FIFO)**		R	22	1.000	EA	L1	Yes		
360600-0016A	*1	14	LUG, 1/4,INT TOOTH,13/16 INCH LENGTH		R	11	1.000	EA		Yes		
400738-0000	*1	15	5-LEAD SHIELD, REV. 'B', GOLD IRRID.FINISH		R	22	1.000	EA		Yes		
352300-0104A	*1	16	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	1.000	EA	C9	Yes		
352300-0103A	*1	17	CAP, .01UF,50V,20%,RAD,MYLAR		R	22	2.000	EA	C10,14	Yes		
352301-0105A	*1	18	CAP, 1UF,63V,20%,MYLAR		R	66	1.000	EA	C11	Yes		
352600-0019A	*1	19	CAP, .01UF,1000V,20%,Z5U, CER DISC,.4 L.S.		R	11	2.000	EA	C6,7	Yes		
364000-0135A	*1	20	IC, LF347, SCREENED TO +/-1.5mV OFFSET & LOW NOISE		A	22	1.000	EA	U1	Yes		
370101-0121A	*1	21	RES, 120,1/8W,5%,CF		R	11	1.000	EA	R15	Yes		
370101-0104A	*1	22	RES, 100K,1/8W,5%,CF		R	11	3.000	EA	R12,13,32	Yes		
364000-0132A	*1	23	IC, LF444 NATIONAL ONLY		R	22	1.000	EA	U2	Yes		
370101-0242A	*1	24	RES, 2.4K,1/8W,5%,CF		R	11	1.000	EA	R8	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
401596-0000	PCBA, ECG W/RESP 5LD DAUGHTER REV. A1 (D126)			A			A1	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370101-0221A	*1	25	RES, 220,1/8W,5%,CF		R	11	1.000	EA	R9	Yes		
370101-0105A	*1	26	RES, 1M,1/8W,5%,CF		R	11	1.000	EA	R14	Yes		
370101-0912A	*1	27	RES, 9.1K,1/8W,5%,CF		R	11	1.000	EA	R11	Yes		
376000-0019A	*1	28	XSTR, 2N7000,FET		R	11	1.000	EA	Q1	Yes		
378000-0005A	*1	29	DIO, 1N914,SIGNAL T&R		R	11	3.000	EA	D11,12,14	Yes		
378000-0009A	*1	30	DIO, 1N754A,6.8V,ZENER T& R ***MOT ONLY***		R	11	2.000	EA	D16,17	Yes		
400553-0000	*1	31	XFMR, ESC. II RESP DRIVE REV. A **(FIFO)**		R	22	1.000	EA	T1	Yes		
352300-0474A	*1	32	CAP, .47UF, 50V,20%,RAD,M YLAR(METALLIZED POLYESTR)		R	22	1.000	EA	C12	Yes		
365000-0014A	*1	33	SKT, 14-POS,DIP,TIN PLATE ,L.P.		R	11	1.000	EA	U1	Yes		
370101-0913A	*1	34	RES, 91K,1/8W,5%,CF		R	22	1.000	EA	R16	Yes		
378000-0037A	*1	35	DIO, MBR030,SCHOTTKY RCTF R		R	11	1.000	EA	D13	Yes		
382200-0015A	*1	36	CHOKE, 680 UH		R	11	1.000	EA	L2	Yes		
384000-0047A	*1	37	BUMPERS, .125 INCH, BLACK		R	22	1.000	EA		Yes		
352400-0105A	*1	38	CAP, 1UF,50V,20%,RAD,TANT , MAX: HT. .28; O.D. .16		R	11	1.000	EA	C15	Yes		
364000-0010A	*1	39	IC, LM339		R	11	1.000	EA	U3	Yes		
378000-0034A	*1	40	DIO, LM385,ZENER (XSTR NA TIONAL ONLY)		R	11	3.000	EA	D19,18,15	Yes		
370500-0107A	*1	41	RES, 100M,1/4W,5%,M.O. (O R M.G.)		R	33	2.000	EA	R23,24	Yes		
370101-0183A	*1	42	RES, 18K,1/8W,5%,CF		R	11	1.000	EA	R41	Yes		
370101-0302A	*1	43	RES, 3K,1/8W,5%,CF		R	11	1.000	EA	R38	Yes		
370101-0303A	*1	44	RES, 30K,1/8W,5%,CF		R	11	1.000	EA	R37	Yes		
370101-0304A	*1	45	RES, 300K,1/8W,5%,CF		R	11	1.000	EA	R35	Yes		
370101-0472A	*1	46	RES, 4.7K,1/8W,5%,CF		R	11	1.000	EA	R29	Yes		
370101-0473A	*1	47	RES, 47K,1/8W,5%,CF		R	11	1.000	EA	R34	Yes		
370101-0474A	*1	48	RES, 470K,1/8W,5%,CF		R	11	1.000	EA	R30	Yes		

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
401596-0000	PCBA, ECG W/RESP 5LD DAUGHTER REV. A1 (D126)				A				A1	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370101-0512A	*1	49	RES, 5.1K,1/8W,5%,CF		R	11	1.000	EA	R31	Yes		
370101-0623A	*1	50	RES, 62K,1/8W,5%,CF		R	11	1.000	EA	R36	Yes		
370101-0684A	*1	51	RES, 680K,1/8W,5%,CF		R	11	1.000	EA	R33	Yes		
382200-0027A	*1	52	IDCTR, 82uH,SHIELDED,ISOLATED		R	22	1.000	EA	L3 IN SERIES WITH D13	Yes		
352100-0220A	*1	53	CAP, 22PF,50V,10%,RAD,NPO EDPT		R	22	1.000	EA	ACROSS PRIMARY OF T1	Yes		
352100-0220A	*1	54	CAP, 22PF,50V,10%,RAD,NPO EDPT		R	22	0.000	EA	FLY ON SOLDER SIDE	Yes		
100000	*1	55	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	FOR ASSEMBLY	Yes		
100000	*1	56	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	FOR RESISTORS CHECK	Yes		
100000	*1	57	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	BIN - FILL IF REQUIRE	Yes		
352101-0472A	*1	58	CAP, 4700PF,20%,3KV, Z5U, CERAMIC DISC (5000PF OK)		R	22	1.000	EA	C17	Yes		
364000-0175A	*1	59	IC, PC219,PHOTOCOUPLER,MINI-FLAT PKG.		R	22	2.000	EA	U4-5	Yes		
370100-0472A	*1	60	RES, 4.7K,1/4W,5%,CF		R	11	1.000	EA	R42	Yes		
900000	*1	99	ASSEMBLY LABOR & BURDEN		L	0	0.910	HR	-	Yes		

Cumulative Lead Time for 401596-0000 = 99

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
401593-0000	PCBA, ECG 5LD MOTHER REV. D (E1074)				A				D	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401592-0000	*1	1	PCB, ECG 5LD MOTHER REV. A (E973)		R	22	1.000	EA		Yes		
352300-0102A	*1	2	CAP, 1000PF,50V,20%,RAD,MYLAR		R	66	1.000	EA	C18	Yes		
352300-0103A	*1	3	CAP, .01UF,50V,20%,RAD,MYLAR		R	22	2.000	EA	C17,22	Yes		
352300-0104A	*1	4	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	6.000	EA	C5,6,30,36,37,31	Yes		
352301-0104A	*1	5	CAP, .1UF,5%,MYLAR		R	66	1.000	EA	C10	Yes		
354000-0084A	*1	6	CONN, 3-P,M,STRT LCK,.1 CTR		R	11	1.000	EA	J3	Yes		
352100-0471A	*1	7	CAP, 470PF,25V,10%,RAD,X7R		R	22	1.000	EA	C11	Yes		
352300-0007A	*1	8	CAP, .001UF,10%, MYLAR		R	66	2.000	EA	C26,27	Yes		
352100-0223A	*1	9	CAP, .022UF,50V,10%,RAD,X7R		R	22	1.000	EA	C7	Yes		
352300-0018A	*1	10	CAP, .47UF,10%,MYLAR		R	66	1.000	EA	C13	Yes		
352301-0103A	*1	11	CAP, .01UF,100V,20%,POLYCARB,.2 L.S.		R	66	1.000	EA	C34	Yes		
352401-0106A	*1	12	CAP, 10UF,35V,20%,RAD,TANT		R	11	6.000	EA	C19,20,21,25,32,33	Yes		
352400-0226A	*1	13	CAP, 22UF,25V,20%,TANT		R	11	2.000	EA	C23,24	Yes		
352401-0476A	*1	14	CAP, 47UF,10V,20%,RAD,TANT (10V ONLY)		R	11	2.000	EA	C14,15	Yes		
354000-0104A	*1	15	CONN, SGL ROW,STRT,SGL PINS,SNAP-AWAY		R	11	4.000	PIN	1 PC. OF 4 PINS	Yes		
354000-0104A	*1	16	CONN, SGL ROW,STRT,SGL PINS,SNAP-AWAY		R	11	7.000	PIN	1 PC. OF 7 PINS	Yes		
356000-0008A	*1	17	REF OSCILLATOR, 4.0MHZ,CMOS HIGH SPEED		R	22	1.000	EA	Y1	Yes		
360500-0048A	*1	18	SPCR, 1/4 X 1/4,SWAGE TYPE		R	11	1.000	EA	DO NOT ISSUE	Yes		
364000-0008A	*1	19	IC, DG212CJ		R	11	1.000	EA	U2	Yes		
364000-0114A	*1	20	IC, TL064 ACN		R	11	1.000	EA	U4	Yes		
364000-0010A	*1	21	IC, LM339		R	11	1.000	EA	U3	Yes		
364000-0027A	*1	22	IC, 74HC32		R	11	2.000	EA	U14,15	Yes		
364000-0029A	*1	23	IC, 74HC138		R	11	1.000	EA	U12	Yes		
364000-0038A	*1	24	IC, 27C256,CMOS,EPROM,200NS		R	11	1.000	EA	U10	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401593-0000	PCBA, ECG 5LD MOTHER REV. D (E1074)			A				D	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
364000-0132A	*1	25	IC, LF444 NATIONAL ONLY		R	22	1.000	EA	U1	Yes		
364000-0080A	*1	26	IC, TMPZ84C00P (Z80A, CM OS VERSION)		R	11	1.000	EA	U9	Yes		
364000-0091A	*1	27	IC, SG 3525		R	44	1.000	EA	U8	Yes		
364000-0093A	*1	28	IC, ILQ5 QUAD OPTO ISOLAT OR		R	22	2.000	EA	U5,6	Yes		
364000-0094A	*1	29	IC, HP2630, OPTO ISOLATOR		R	11	1.000	EA	U7	Yes		
364000-0095A	*1	30	IC, MS6132,DUAL PORT RAM, 8 X 2K,48-PIN (OR MS7132)		R	11	1.000	EA	U11	Yes		
364000-0096A	*1	31	IC, 74HC240		R	11	1.000	EA	U13	Yes		
364000-0097A	*1	32	IC, 74HC374		R	11	1.000	EA	U16	Yes		
364000-0098A	*1	33	IC, 82C54,CTC		R	11	1.000	EA	U17	Yes		
370100-0010A	*1	34	RES, 1,1/4W,5%,CF		R	11	2.000	EA	R63,64	Yes		
370100-0101A	*1	35	RES, 100,1/4W,5%,CF		R	11	1.000	EA	R47	Yes		
370100-0102A	*1	36	RES, 1K,1/4W,5%,CF		R	11	4.000	EA	R27-29,32	Yes		
370100-0102A	*1	37	RES, 1K,1/4W,5%,CF		R	11	1.000	EA	R53	Yes		
370100-0103A	*1	38	RES, 10K,1/4W,5%,CF		R	11	6.000	EA	R20,35,54,60-62	Yes		
370100-0104A	*1	39	RES, 100K,1/4W,5%,CF		R	11	2.000	EA	R55,56	Yes		
370100-0121A	*1	40	RES, 120,1/4W,5%,CF		R	11	2.000	EA	R9,10	Yes		
370100-0153A	*1	41	RES, 15K,1/4W,5%,CF		R	11	1.000	EA	R40	Yes		
370100-0204A	*1	43	RES, 200K,1/4W,5%,CF		R	11	1.000	EA	R19	Yes		
370100-0221A	*1	44	RES, 220,1/4W,5%,CF		R	11	2.000	EA	R57,59	Yes		
370100-0222A	*1	45	RES, 2.2K,1/4W,5%,CF		R	11	1.000	EA	R45	Yes		
370100-0334A	*1	46	RES, 330K,1/4W,5%,CF		R	11	1.000	EA	R58	Yes		
370100-0243A	*1	47	RES, 24K,1/4W,5%,CF		R	11	1.000	EA	R15	Yes		
370100-0333A	*1	48	RES, 33K,1/4W,5%,CF		R	11	1.000	EA	R12	Yes		
370100-0622A	*1	49	RES, 6.2K,1/4W,5%,CF		R	11	1.000	EA	R51	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401593-0000	PCBA, ECG 5LD MOTHER REV. D (E1074)			A				D	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370100-0473A	*1	50	RES, 47K,1/4W,5%,CF		R	11	3.000	EA	R17,25,31	Yes		
370100-0620A	*1	51	RES, 62,1/4W,5%,CF		R	11	1.000	EA	R11	Yes		
370200-6342A	*1	52	RES, 63.4K,1/4W,1%,MF		R	11	1.000	EA	R7	Yes		
370101-0153A	*1	53	RES, 15K,1/8W,5%,CF		R	11	1.000	EA	R48	Yes		
370101-0104A	*1	54	RES, 100K,1/8W,5%,CF		R	11	3.000	EA	R23,24,34	Yes		
370200-3011A	*1	55	RES, 3.01K,1/4W,1%,MF		R	11	1.000	EA	R1	Yes		
370101-0222A	*1	56	RES, 2.2K,1/8W,5%,CF		R	11	1.000	EA	R18	Yes		
370101-0332A	*1	57	RES, 3.3K,1/8W,5%,CF		R	22	1.000	EA	R49	Yes		
370200-1183A	*1	58	RES, 118K,1/4W,1%,MF		R	11	1.000	EA	R36	Yes		
370200-1210A	*1	59	RES, 121,1/4W,1%,MF		R	11	1.000	EA	R44	Yes		
370200-2002A	*1	60	RES, 20K,1/4W,1%,MF		R	11	1.000	EA	R38	Yes		
370200-3322A	*1	61	RES, 33.2K,1/4W,1%,MF		R	11	1.000	EA	R22	Yes		
370200-4990A	*1	62	RES, 499,1/4W,1%,MF		R	11	2.000	EA	R41,42	Yes		
370200-5492A	*1	63	RES, 54.9K,1/4W,1%,MF		R	11	1.000	EA	R14	Yes		
370200-6812A	*1	64	RES, 68.1K,1/4W,1%,MF		R	11	5.000	EA	R2-6	Yes		
370200-8872A	*1	65	RES, 88.7K,1/4W,1%,MF		R	11	1.000	EA	R39	Yes		
370200-9761A	*1	66	RES, 9.76K,1/4W,1%,MF		R	11	1.000	EA	R43	Yes		
374300-0202A	*1	67	POT, 2K,TRIM,SIDE ADJ,CER MET,3/8 SQR,.15LS		R	11	1.000	EA	R46	Yes		
374401-0103A	*1	68	POT, 10K,TRIMM,MULTI-TURN ,CERMET FILM (860X)		R	11	2.000	EA	R8,66	Yes		
376000-0019A	*1	69	XSTR, 2N7000,FET		R	11	2.000	EA	Q4,5	Yes		
376000-0020A	*1	70	XSTR, J201,FET		R	11	2.000	EA	Q1,2	Yes		
378000-0005A	*1	71	DIO, 1N914,SIGNAL T&R		R	11	6.000	EA	D6,7,8,9,10,14	Yes		
378000-0005A	*1	72	DIO, 1N914,SIGNAL T&R		R	11	2.000	EA	D11,12	Yes		
378000-0034A	*1	73	DIO, LM385,ZENER (XSTR NA TIONAL ONLY)		R	11	1.000	EA	D5	Yes		

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
401593-0000	PCBA, ECG 5LD MOTHER REV. D (E1074)				A				D	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
400552-0000	*1	75	ESCORT II ISO-TRANSFORMER , REV. 'A' **(FIFO)**		R	22	1.000	EA	T1	Yes		
352100-0003A	*1	76	CAP, 3.3PF,50V,+/-.5PF,RAD,NPO EDPT		R	11	1.000	EA	C16	Yes		
370100-0332A	*1	77	RES, 3.3K,1/4W,5%,CF		R	11	1.000	EA	R13	Yes		
365000-0024A	*1	82	SKT, 24-POS,DIP,TIN PLATE ,L.P.		R	11	1.000	EA		Yes		
365000-0028A	*1	83	SKT, 28-POS,DIP,TIN PLATE ,L.P.		R	11	1.000	EA		Yes		
365000-0040A	*1	84	SKT, 40-POS,DIP,TIN PLATE ,L.P.		R	11	1.000	EA		Yes		
370200-6191A	*1	86	RES, 6.19K, 1/4W 1%, MF		R	11	1.000	EA	R37	Yes		
378000-0009A	*1	87	DIO, 1N754A,6.8V,ZENER T&R ***MOT ONLY***		R	11	1.000	EA	D13	Yes		
370200-1001A	*1	88	RES, 1K,1/4W,1%,MF		R	11	1.000	EA	R21	Yes		
352300-0222A	*1	89	CAP, 2200PF,50V OR 100V,1%,MYLAR,.15L.S.		R	77	1.000	EA	C40	Yes		
370101-0163A	*1	90	RES, 16K,1/8W,5%,CF		R	11	1.000	EA	R30	Yes		
370100-0392A	*1	91	RES, 3.9K,1/4W,5%,CF		R	11	1.000	EA	R50	Yes		
370100-0271A	*1	92	RES, 270,1/4W,5%,CF		R	11	1.000	EA	R26	Yes		
370101-0202A	*1	93	RES, 2K,1/8W,5%,CF		R	11	1.000	EA	R65	Yes		
352101-0471A	*1	95	CAP, 470pF,10%,50V,RAD,NP0		R	22	2.000	EA	C3,4	Yes		
352300-0008A	*1	96	CAP, .01UF,5%,MYLAR		R	66	2.000	EA	C8,9	Yes		
352400-0105A	*1	97	CAP, 1UF,50V,20%,RAD,TANT , MAX: HT. .28; O.D. .16		R	11	1.000	EA	C28	Yes		
370102-0010A	*1	98	RES, 1,1/2W,5%,CF		R	11	1.000	EA	R52	Yes		
900000	*1	99	ASSEMBLY LABOR & BURDEN		L	0	0.990	HR		Yes		
384000-0061A	*1	100	GAS TUBE (SURGE ARRESTER)		R	33	1.000	EA	DS1	Yes		
352100-0104A	*1	101	CAP, .1UF,50V,10%,RAD,X7R		R	11	1.000	EA	C35	Yes		
352100-0220A	*1	102	CAP, 22PF,50V,10%,RAD,NPO EDPT		R	22	4.000	EA	C38,39,1,2	Yes		
352300-0015A	*1	103	CAP, .22UF,10%,MYLAR		R	66	1.000	EA	C12	Yes		
370100-0273A	*1	104	RES, 27K,1/4W,5%,CF		R	11	1.000	EA	R69	Yes		

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
401593-0000	PCBA, ECG 5LD MOTHER REV. D (E1074)				A				D	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370401-0108A	*1	105	RES, 1000M,1W,5%,2500V		R	66	1.000	EA	R70	Yes		
378000-0011A	*1	106	DIO, 1N4741A,11V,ZENER T& R ***MOTOROLA ONLY***		R	11	2.000	EA	D15,16	Yes		
365000-0148A	*1	107	SOCKET, 48 PIN DIP		R	22	1.000	EA	U11	Yes		
100000	*1	108	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	FOR ASSEMBLY	No		
100000	*1	109	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	FOR RESISTORS CHECK	No		
100000	*1	110	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	BIN - FILL IF REQUIRE	No		
370100-0511A	*1	111	RES, 510,1/4W,5%,CF		R	11	1.000	EA	R33	Yes		
370200-1402A	*1	112	RES, 14K,1/4W,1%,MF		R	11	1.000	EA	R16	No		

Cumulative Lead Time for 401593-0000 = 99

TEMPERATURE-PRESSURE BOARD

CHAPTER 5

5.0.0 TEMPERATURE-PRESSURE BOARD

5.1.0 OVERVIEW

The other processor board in the **ESCORT** is the TEMP-PRESS BOARD. Whether the monitor is configured for temperature or blood pressure, the circuitry to implement the configuration is on the TEMP-PRESS board.

The two main functions of the board are: (1) to detect temperature and display on the screen the value in degrees C or degrees F (selectable by user), and (2) to receive a signal from a pressure transducer, interpret, and reproduce the pressure waveform on the screen, while calculating the mean, systolic and diastolic values. All information is received in analog and converted to a digital format that is stored in RAM.

The TEMP-PRESS board also provides an excitation voltage of +5VDC for use by the pressure transducer.

As on the ECG Board, an ISOLATION BARRIER is also utilized to protect the patient from line current. The barrier is created by the use of opto couplers. The isolated section has its own power supply to complete the barrier.

5.2.0 ISOLATION SECTION

5.2.1 TEMPERATURE INPUTS

The temperature input connector to the **ESCORT** is a 1/4 inch stereo phone jack. 700 series temperature probes are used by the **ESCORT** Temperature is detected by measuring the resistance from the probe and interpreting that resistance to a temperature value.

The temperature inputs for T1 at J5 are protected by zener diodes D10 and D11. Capacitors C40, C41 and C44 are for noise reduction. U10 pin 14 is a constant current source of 2.5uA to the temperature probes. The resistance change that occurs in the probe parallels the temperature change. This will produce a voltage across R50 and R51. The signal HALFREF (2.5V) goes to U10 pin 12. R52 is adjusted to offset and to equal U10 pin 12, so only the difference is seen at the output. This difference is equal to the temperature. R50 and R51 will divide the signal to a level that is usable by the multiplexer, creating the signals TPOS1 and TNEG1. These signals go directly to MUX, U11 and U14.

The input circuit for T2 is functionally identical to that of T1.

5.2.2 PRESSURE INPUTS

The pressure inputs are on J3 (BP1) and J2 (BP2). The inputs are protected by zener diodes D14-D18. The +5VDC excitation goes to the transducer through pin 13 on J2 and J3. The +SIG and -SIG are filtered by LC circuits to reduce noise. L1, C19 and C20 filter BP1 and L2, C21 and C22 filter BP2. The filtered signal PPOS1, PNEG1 and PPOS2, PNEG2 also go to MUX, U11 and U14.

5.2.3 MULTIPLEXERS

U11 and U14 are 8 to 1 multiplexers that are addressed by the microprocessor. The address lines E0, E1, and E2 are used by the processor to walk through the inputs one at a time and send the appropriate signal on to the A to D circuit.

Along with temperature and pressure signals, other signals that the processor walks through at the MUX are the GROUND and the REFERENCE VOLTAGE. Information from the ground signal is used by software to determine what ground will look like when it is sent through the A to D circuit, and will use that as a zero reference. The reference voltage generated by metal film resistors R47, R48, and R49 is used by software as a calibration standard, and will adjust all other readings appropriately. R47 is adjusted for a reading of 100mmHg by the monitor when a calibrated 100mmHg is input to it.

5.2.4 ANALOG TO DIGITAL

The positive and negative signals are passed on to the differential amplifier which begins the A to D conversion. As on the ECG Board, a ramp waveform is compared to the signal input; when both are equal, the sample voltage is turned into a digital data point to be used by the digital portion of the board. Here again, reference voltages are used to initiate timing cycles. A 900us time limit is set by the CTC (U5) to retrieve and calculate one data point.

U12 is a high impedance differential amplifier that subtracts and amplifies the input signals. The output at U12 pin 7 has a gain of 770. R30 adjusts to compensate for common mode offset, and to give the circuit more precision.

SAMPLE RST is used to begin a new "fetch datapoint" cycle by driving U13 pins 8 and 11 to -11.7V. As the voltage from U12 pin 8 ramps up, the counter (U5) will start and the square wave (SAMPLE) will go high. The ramp will continue up until its voltage is equal to the signal at U13 pin 9. Since pins 13 and 14 are wired OR'ed together, U13 pin 14 will pull the outputs low, completing the square wave and stopping the counter. Q1 is used as a current source to drive the opto-coupler, U17.

5.2.5 EXCITATION VOLTAGE

The excitation voltage provided by the **ESCORT** is +5VDC. D8 and D20 are 2.5V reference diodes that put +5V at U10 pin 5. Q2 is used to give the +5V a higher current capability. VREF becomes + excitation voltage to the transducer.

5.2.6 ISOLATION POWER SUPPLY

Plus and minus voltages for the isolated section of the board are supplied by U15 and T1. PS SYNC drives the pulse width modulator, U15, and synchronizes it with all other voltage in the monitor. T1 furnishes isolation to complete the barrier. D4-D7 rectify the AC to DC; L3, L4, C9 and C10 filter out the ripple. +V is equal to +15V and -V is equal to -15V.

5.3.0 NON-ISOLATED

5.3.1 TEMP-PRESS DIGITAL

The digital portion of the TEMP-PRESS board is identical to the ECG Board.

The microprocessor chip is a Z-80 type microprocessor. Y1 clocks U1 at 4MHz. IO reads and writes (IORD, IOWR) and memory reads and writes (MRD, MWR) are decoded by U8 from the signals at pins 19-22. The TEMP-PRESS data address bus directs information to and from the EPROM, Dual Port RAM, CTC and address decoders. The microprocessor is reset by the CPU Board signal RSTOUT*. WAIT at pin 24 inserts wait cycles to the CPU from the Dual Port RAM. The interrupt on pin 16 will indicate to the microprocessor that 900 microseconds have elapsed since the start of the sampling cycle and will request the processor to terminate this cycle. Pin 17 is the signal TIMETIC* which synchronizes the sampling cycle so that each TIMETIC* denotes getting and decoding one data point.

The EPROM (U2) stores software for the TEMP-PRESS board and is enabled by U4 and the MRD signal.

The Dual Port RAM (U3) is a 2K x 8 bit CMOS RAM MS6132. It provides two ports with separate controls, address and I/O that permit separate access to memory reads and writes. The Dual Port RAM interfaces the CPU board data address bus to the TEMP-PRESS board. U3 is enabled by U4.

U6 and U7 are input and output ports. U7 outputs control signals to the isolated section of the board.

U5 is a Counter Timer Chip. It is programmable with four independent channels for counting and timing functions. It is enabled by IOWR, IORD, and A2, and it is clocked by Y1.

At SAMPLE RST the counter will start counting at the rate of 4MHz and will continue to count for 900 microseconds if it is not stopped before by the ramp voltage equaling the sample voltage in the A to D sample circuit.

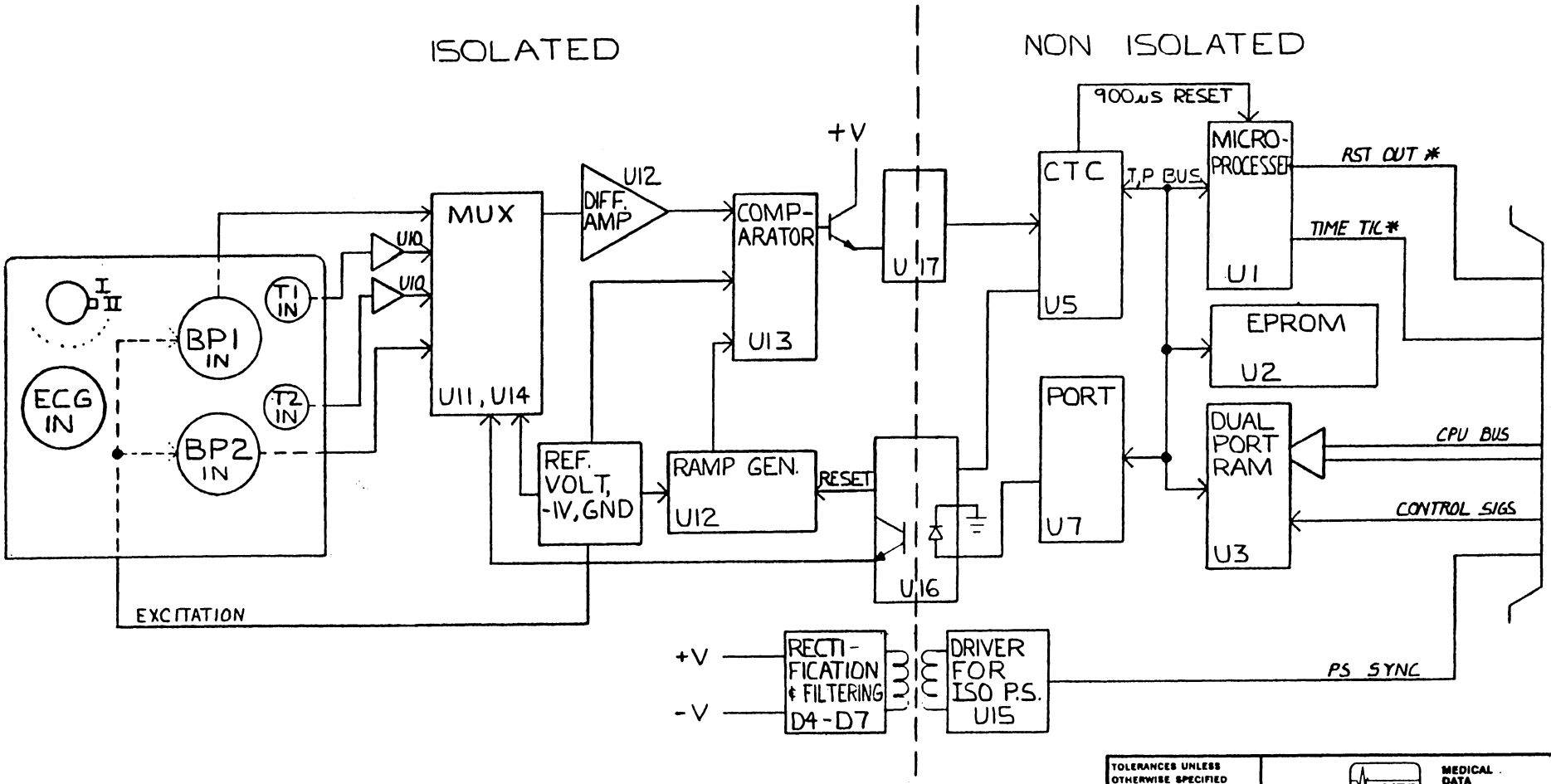
5.4.0 SOFTWARE

Software for the TEMP-PRESS board is stored in the EPROM, U2.

Software tasks:

PRESSURE WAVEFORM	Correction for gain drift and amplification offset Low Pass filter, 15Hz cutoff Correction for transducer offset Final scaling for screen
PRESSURE CALCULATIONS	Mean calculation Heart rate picking Systolic calculation Diastolic calculation
TEMPERATURE CALCULATIONS	Correction for amplification and gain drift Low pass filter Linearization Conversion to degrees F
AUTO CALIBRATION	Compute gain and offset drift correction factors

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	±

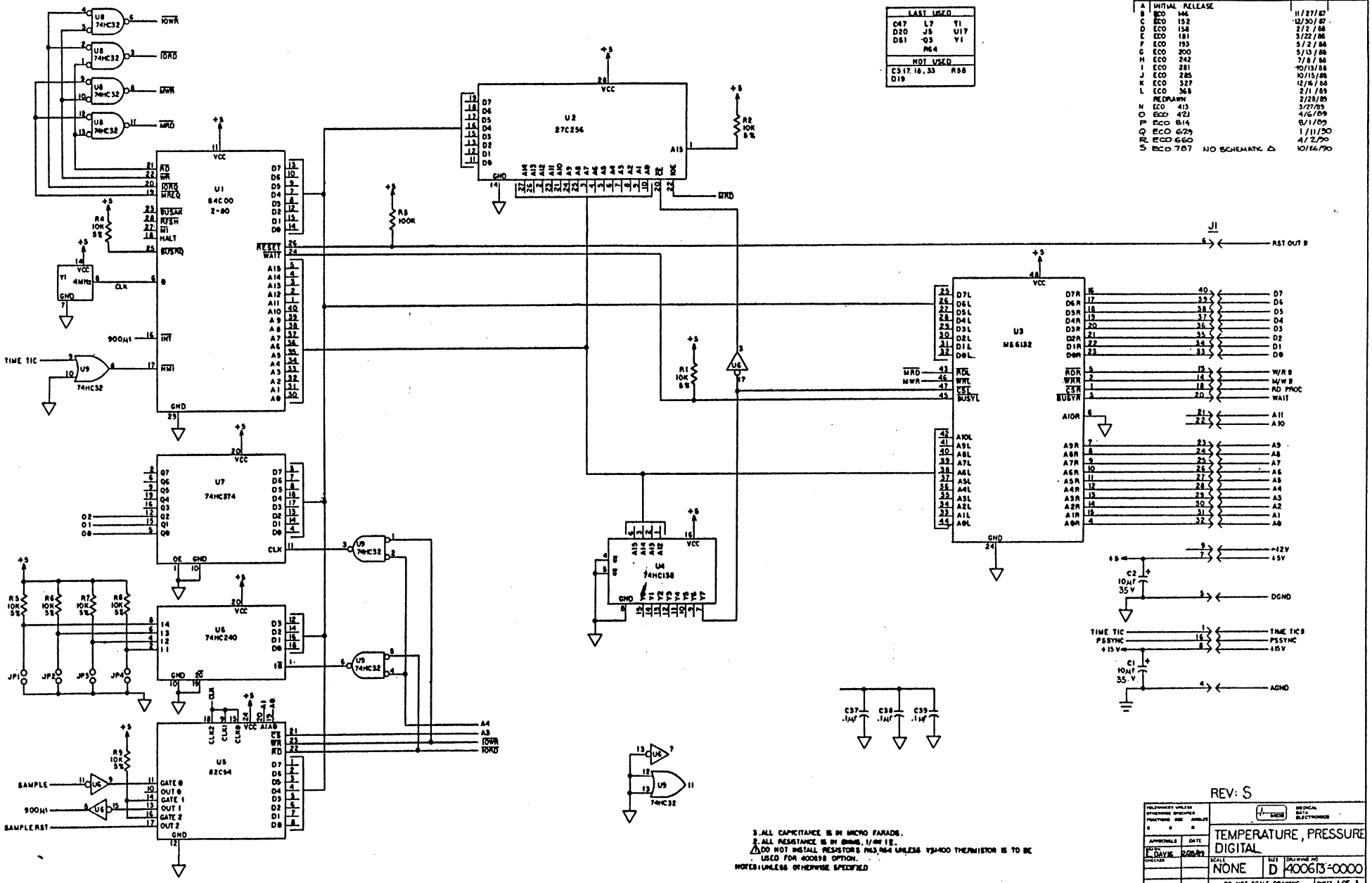
MEDICAL DATA ELECTRONICS

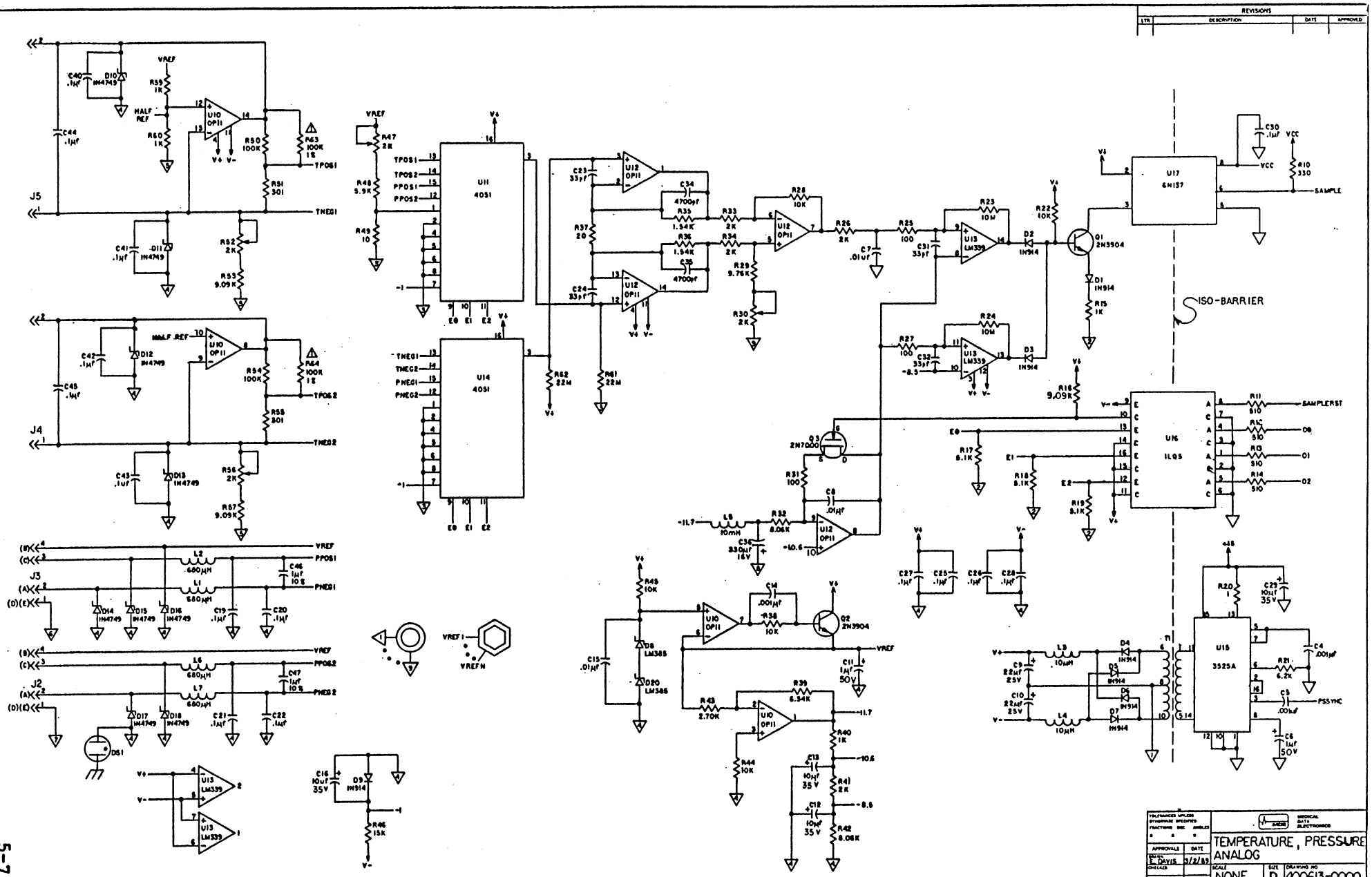
APPROVALS	DATE
DRAWN A KRAUSE	4-19-88
CHECKED	

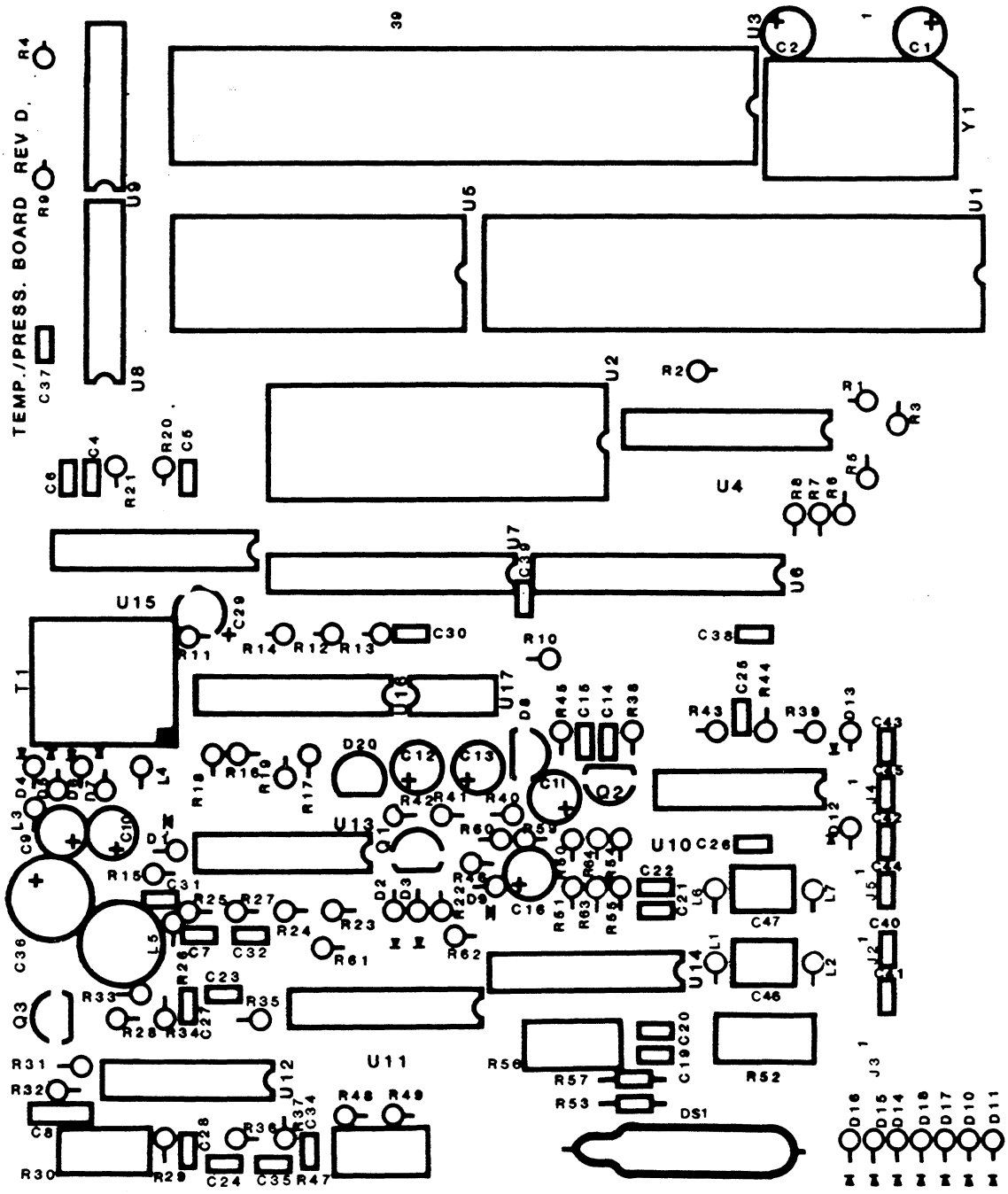
TEMP-PRES BLOCK DIAG.

SCALE	SIZE	DRAWING NO.
Ø	B	

DO NOT SCALE DRAWING — SHEET 1 of 1

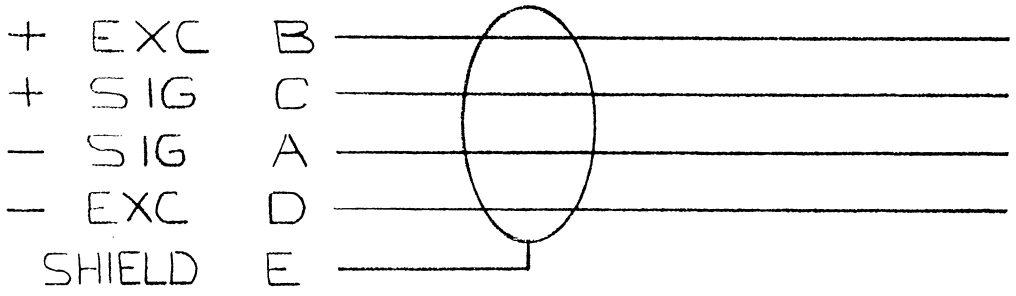

REVISIONS
LTR DESCRIPTION DATE APPROVED
A INITIAL RELEASE
B ECO 146 11/27/87
C ECO 152 12/30/87
D ECO 158 2/2/88
E ECO 181 5/22/88
F ECO 193 5/2/88
G ECO 200 5/13/88
H ECO 242 7/8/88
I ECO 281 10/13/88
J ECO 285 10/15/88
K ECO 327 12/6/88
L ECO 368 2/1/89
REDRAWN 2/28/89
N ECO 413 3/27/89
O ECO 421 4/6/89
P ECO 614 8/1/89
Q ECO 629 1/11/90
R ECO 660 4/2/90
S ECO 787 NO SCHEMATIC Δ 10/26/90
LAST USED
C47 L7 Y1
D20 J6 U17
D61 Q3 V1
R64
NOT USED
C317, 18, 33 R58
D19
U1 64C00 Z-80
U2 27C256
U3 MS6132
U4 74HC138
U5 82C54
U6 74HC240
U7 74HC374
U8 74HC32
U9 74HC32
J1
RST OUT B
D7
D6
D5
D4
D3
D2
D1
D0
W/R B
M/W B
RD PROC
WAIT
A11
A10
A9
A8
A7
A6
A5
A4
A3
A2
A1
A0
+12V
+5V
DGND
TIME TIC
PSSYNC
+15V
AGND
A4
A3
IOWR
IORD
SAMPLE
SAMPLE RST
900Hz
TIME TIC
JP1
JP2
JP3
JP4
R1 10K 5%
R2 10K 5%
R3 100K
R4 10K 5%
R5 10K 5%
R6 10K 5%
R7 10K 5%
R8 10K 5%
R9 10K 5%
Y1 4MHz
C1 10μF 35V
C2 10μF 35V
C37 .1μF
C38 .1μF
C39 .1μF
NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL CAPACITANCE IS IN MICRO FARADS.
2. ALL RESISTANCE IS IN OHMS, 1/4W 1%.
⚠ DO NOT INSTALL RESISTORS R63, R64 UNLESS V3H400 THERMISTOR IS TO BE USED FOR 400898 OPTION.
REV: S
TEMPERATURE, PRESSURE DIGITAL
SCALE NONE
SIZE D
DRAWING NO 400613-0000
DO NOT SCALE DRAWING
SHEET 1 OF 3


REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
J5
J4
J3
J2
ISO-BARRIER
SAMPLE
SAMPLERST
D0
D1
D2
PSSYNC
TEMPERATURE, PRESSURE
ANALOG
SCALE
NONE
SIZE
D
DRAWING NO
400613-0000
DO NOT SCALE DRAWING
SHEET 2 OF 3
5-7



TEMP/PRESS. BOARD

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	1-29-87	



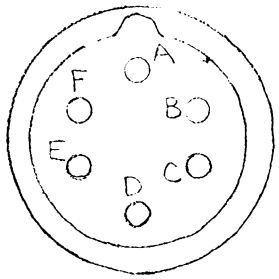
5 uV
TRANSDUCER

CABLE CONNECTOR
IS MS3106E 14S-6P

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±	MDE MEDICAL DATA ELECTRONICS
APPROVALS / DATE	PRESSURE XDUCER CABLE ESCORT 100 SERIES
DRAWN A. KRAUSE / 1-29-88	
CHECKED	SCALE Ø / SIZE A / DRAWING NO. REFERENCE ONLY
	DO NOT SCALE DRAWING / SHEET 1 of 1

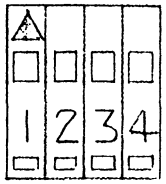
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	12-21-87	

MS 97-3102A14S-6S(639)



REAR VIEW

WIRING



VREF	B	YEL	4	VREF
+	C	ORG	3	+
—	A	RED	2	—
GND	D, E	BRN	1	GND

2.0"

TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	±

APPROVALS	DATE
DRAWN A. KRAUSE	12-21-87
CHECKED	

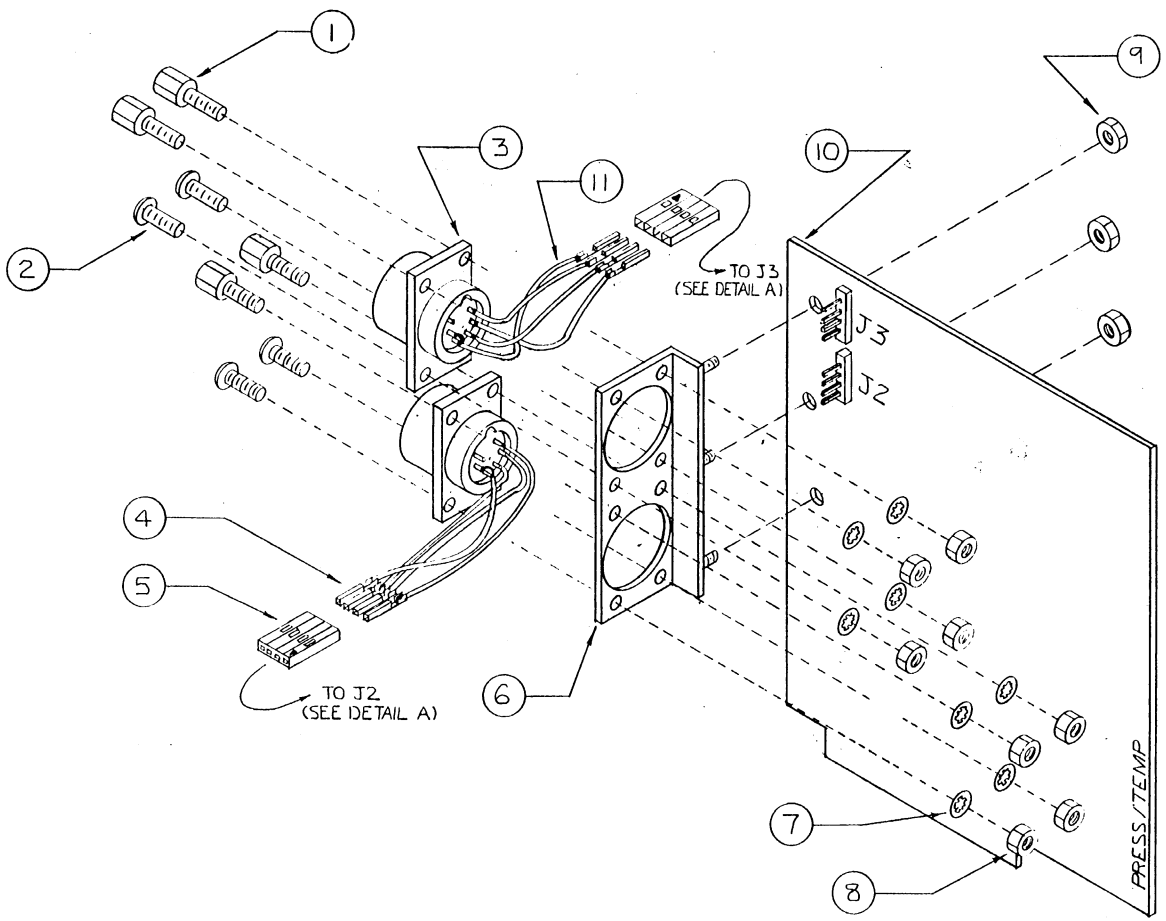
MDE MEDICAL DATA ELECTRONICS

PRESSURE CONN. HARNESS
ESCORT 100/200 SERIES

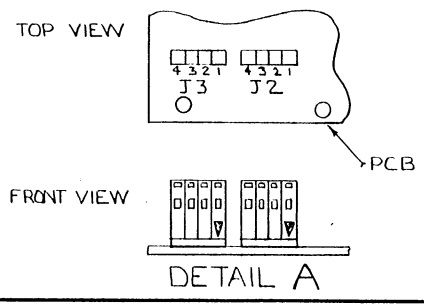
SCALE	SIZE	DRAWING NO.
∅	A	400698-0000

DO NOT SCALE DRAWING — SHEET 1 of 1

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	12-14-87	



NO.	QTY.	DESCRIPTION	PART NO.
11	2	WHITE WIRE 24 GA STRANDED	399100-0009
10	1	PRESSURE/TEMP PCBA	400613-0000
9	3	#4 LOCK NUT THIN PATTERN	360500-0043
8	8	HEX NUT 2-56	360500-0020
7	8	#2 STAR WASHER	358200-0020
6	1	PRESSURE TEMP BRKT.	400578-0000
5	2	CONN. HOUSING 4F	359000-0159
4	8	CRIMP PINS	354000-0160
3	2	PRESSURE CONNECTOR FAB.	400665-0000
2	4	SCREW 2-56 × 3/8 PHILLIP	358100-0044
1	4	STANDOFF, 2-56 X .187	360500-0020



NOTES: 1.

TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	±

APPROVALS	DATE
DRAWN KRAUSE	12-14-87
CHECKED	

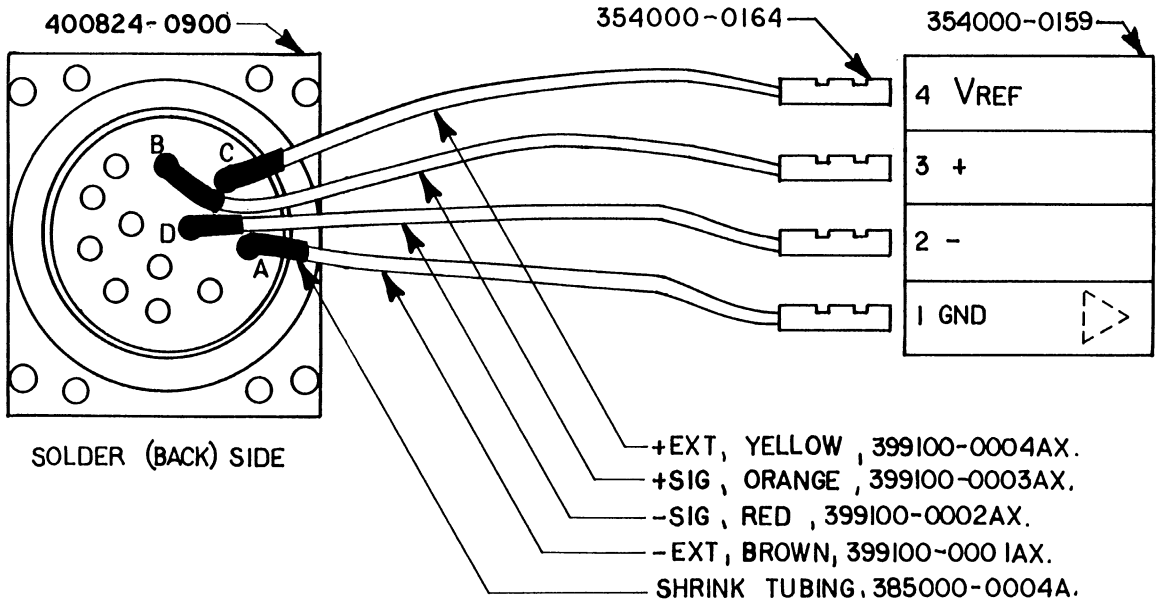
MEDICAL DATA ELECTRONICS

PRESS. &/OR TEMP. OPTION ASSY.

SCALE	SIZE	DRAWING NO.
FULL	C	400587-0000

DO NOT SCALE DRAWING — SHEET 1 of 1

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	11/18/88	



REV:A

NOTES:

2: TRIM OFF NARROW END OF PINS ON NO. 354000-0176.

1: ALL WIRE LENGTHS ARE 2.0 INCHES.

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±		MDE MEDICAL DATA ELECTRONICS	
APPROVALS	DATE	H.P. PRESSURE CONN. HARNESS ASSEMBLY	
DRAWN E. DAVIS	10/25/88		
CHECKED		SCALE NONE	SIZE B / DRAWING NO. 400819
		DO NOT SCALE DRAWING	SHEET 1 OF 1

Partial list of disposable type pressure transducer adapter cables for use with **ESCORT** 100/200.

COMPANY NAME	PART NUMBER
Cobe	CDX3 - 041709-012
Baxter Edwards	Super Cable 892019-001
Baxter Edwards (HP)	UNIFLO893208-001
SpectraMed (Gould)	TCVTK 072393-000-013
Sorenson (Abbott Critical Care)	47987-01 or 42655-04-14
Deseret	38-8505-1
Utah Medical	650-208
MEDEX	MX900-03
MECWX (Reusable Disposable)	MX800-03

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
400613-0000	PCBA, PRESS/TEMP, REV.'S' (E787) - E2/E3			A			S	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
400612-0000	*1	1	PCB, PRESSURE/TEMP., REV. G (E888)	G	R	33	1.000	EA		Yes		
352300-0012A	*1	2	CAP, .01UF,10%,MYLAR		R	77	2.000	EA	C7,15	Yes		
352301-0105A	*1	4	CAP, 1UF,63V,20%,MYLAR		R	22	2.000	EA	C46,47	Yes		
352301-0104A	*1	5	CAP, .1UF,5%,MYLAR		R	66	4.000	EA	C19-22	Yes		
352300-0017A	*1	6	CAP, .0047UF,10%,MYLAR		R	77	2.000	EA	C34,35	Yes		
352101-0330A	*1	7	CAP, 33PF,100V,5%,RAD,NPO		R	22	4.000	EA	C23,24,31,32	Yes		
352201-0337A	*1	8	CAP, 330UF,16V,ELEC,RAD		R	22	1.000	EA	C36	Yes		
352301-0103A	*1	9	CAP, .01UF,100V,20%,POLYCARB,.2 L.S.		R	66	1.000	EA	C8	Yes		
352400-0105A	*1	10	CAP, 1UF,50V,20%,RAD,TANT, MAX: HT. .28; O.D. .16		R	11	2.000	EA	C11,6	Yes		
352401-0106A	*1	11	CAP, 10UF,35V,20%,RAD,TANT		R	11	6.000	EA	C1,2,12,13,16,29	Yes		
352400-0226A	*1	12	CAP, 22UF,25V,20%,TANT		R	11	2.000	EA	C9,10	Yes		
356000-0008A	*1	14	REF OSCILLATOR, 4.0MHZ,CMOS HIGH SPEED		R	22	1.000	EA	Y1	Yes		
364000-0010A	*1	15	IC, LM339		R	11	1.000	EA	U13	Yes		
364000-0027A	*1	16	IC, 74HC32		R	11	2.000	EA	U8,9	Yes		
364000-0029A	*1	17	IC, 74HC138		R	11	1.000	EA	U4	Yes		
364000-0038A	*1	18	IC, 27C256,CMOS,EPROM,200NS		R	11	1.000	EA	U2	Yes		
364000-0040A	*1	19	IC, 4051		R	11	2.000	EA	U11,14	Yes		
364000-0065A	*1	20	IC, OP11FP,OP AMP		R	11	2.000	EA	U10,12	Yes		
364000-0080A	*1	21	IC, TMPZ84COOP (Z80A, CMOS VERSION)		R	11	1.000	EA	U1	Yes		
364000-0091A	*1	22	IC, SG 3525		R	44	1.000	EA	U15	Yes		
364000-0093A	*1	23	IC, ILQ5 QUAD OPTO ISOLATOR		R	11	1.000	EA	U16	Yes		
364000-0095A	*1	24	IC, MS6132,DUAL PORT RAM, 8 X 2K,48-PIN (OR MS7132)		R	11	1.000	EA	U3	Yes		
364000-0096A	*1	25	IC, 74HC240		R	11	1.000	EA	U6	Yes		
364000-0097A	*1	26	IC, 74HC374		R	11	1.000	EA	U7	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
400613-0000	PCBA, PRESS/TEMP, REV.'S' (E787) - E2/E3			A			S	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
364000-0098A	*1	27	IC, 82C54,CTC	R	11		1.000	EA	U5	Yes		
364000-0099A	*1	28	IC, 6N137	R	11		1.000	EA	U17	Yes		
370100-0010A	*1	29	RES, 1,1/4W,5%,CF	R	11		1.000	EA	R20	Yes		
370100-0101A	*1	30	RES, 100,1/4W,5%,CF	R	11		3.000	EA	R25,27,31	Yes		
370100-0102A	*1	31	RES, 1K,1/4W,5%,CF	R	11		1.000	EA	R15	Yes		
370100-0103A	*1	32	RES, 10K,1/4W,5%,CF	R	11		8.000	EA	R1,2,4-9	Yes		
370100-0103A	*1	33	RES, 10K,1/4W,5%,CF	R	11		3.000	EA	R22,38,45	Yes		
370100-0104A	*1	34	RES, 100K,1/4W,5%,CF	R	11		1.000	EA	R3	Yes		
370100-0106A	*1	35	RES, 10M,1/4W,5%,CF	R	11		2.000	EA	R23,24	Yes		
370100-0153A	*1	36	RES, 15K,1/4W,5%,CF	R	11		1.000	EA	R46	Yes		
370100-0202A	*1	37	RES, 2K,1/4W,5%,CF	R	11		1.000	EA	R26	Yes		
370100-0226A	*1	38	RES, 22M,1/4W,5%,CF	R	11		2.000	EA	R61,62	Yes		
370100-0622A	*1	39	RES, 6.2K,1/4W,5%,CF	R	11		1.000	EA	R21	Yes		
370100-0511A	*1	40	RES, 510,1/4W,5%,CF	R	11		4.000	EA	R11-14	Yes		
370100-0512A	*1	41	RES, 5.1K,1/4W,5%,CF	R	11		3.000	EA	R17-19	Yes		
370100-0331A	*1	42	RES, 330,1/4W,5%,CF	R	11		1.000	EA	R10	Yes		
370200-0200A	*1	43	RES, 20,1/4W,1%,MF	R	11		1.000	EA	R37	Yes		
370200-0100A	*1	44	RES, 10,1/4W,1%,MF	R	11		1.000	EA	R49	Yes		
370200-1001A	*1	45	RES, 1K,1/4W,1%,MF	R	11		3.000	EA	R40,59,60	Yes		
370200-1002A	*1	46	RES, 10K,1/4W,1%,MF	R	11		2.000	EA	R28,44	Yes		
370200-1003A	*1	47	RES, 100K,1/4W,1%,MF	R	11		2.000	EA	R50,54	Yes		
370200-1541A	*1	48	RES, 1.54K,1/4W,1%,MF	R	11		2.000	EA	R35,36	Yes		
370200-3010A	*1	49	RES, 301,1/4W,1%,MF	R	11		2.000	EA	R51,55	Yes		
370200-2001A	*1	50	RES, 2K,1/4W,1%,MF	R	11		3.000	EA	R33,34,41	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400613-0000	PCBA, PRESS/TEMP, REV.'S' (E787) - E2/E3			A				S	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370200-2701A	*1	51	RES, 2.7K,1/4W,1%,MF		R	11	1.000	EA	R43	Yes		
370200-5901A	*1	52	RES, 5.9K,1/4W,1%,MF		R	11	1.000	EA	R48	Yes		
370200-6341A	*1	53	RES, 6.34K,1/4W,1%,MF		R	11	1.000	EA	R39	Yes		
370200-8061A	*1	54	RES, 8.06K,1/4W,1%,MF (8 .05K N/A :OK PER KR)		R	11	2.000	EA	R32,42	Yes		
370200-9091A	*1	55	RES, 9.09K,1/4W,1%,MF		R	11	3.000	EA	R16,53,57	Yes		
370200-9761A	*1	56	RES, 9.76K,1/4W,1%,MF		R	11	1.000	EA	R29	Yes		
374300-0202A	*1	57	POT, 2K,TRIM,SIDE ADJ,CER MET,3/8 SQR,.15LS		R	11	4.000	EA	R30,47,52,56	Yes		
376000-0003A	*1	58	XSTR, 2N3904		R	11	2.000	EA	Q1,2	Yes		
376000-0019A	*1	59	XSTR, 2N7000,FET		R	11	1.000	EA	Q3	Yes		
378000-0005A	*1	60	DIO, 1N914,SIGNAL T&R		R	11	8.000	EA	D1-7,9	Yes		
378000-0012A	*1	61	DIO, 1N4749A,24V,ZENER T& R ***MOT ONLY***		R	11	5.000	EA	D10-14	Yes		
378000-0012A	*1	62	DIO, 1N4749A,24V,ZENER T& R ***MOT ONLY***		R	11	4.000	EA	D15-18	Yes		
378000-0034A	*1	63	DIO, LM385,ZENER (XSTR NA TIONAL ONLY)		R	11	2.000	EA	D8,20	Yes		
382200-0005A	*1	64	CHOKE, 10UH,MOLDED		R	11	2.000	EA	L3,4	Yes		
382200-0018A	*1	65	CHOKE, 10,000UH MS75089-35		R	11	1.000	EA	L5	Yes		
382200-0015A	*1	66	CHOKE, 680 UH		R	11	4.000	EA	L1,2,6,7	Yes		
352300-0007A	*1	67	CAP, .001UF,10%, MYLAR		R	66	3.000	EA	C4,5,14	Yes		
365000-0016A	*1	70	SKT, 16-POS,DIP,TIN PLATE ,L.P.		R	11	2.000	EA	U11,14	Yes		
365000-0028A	*1	73	SKT, 28-POS,DIP,TIN PLATE ,L.P.		R	11	1.000	EA	U2	Yes		
360500-0045A	*1	76	SPCR, #6 X 1.437 X 1/4,RO UND		R	22	1.000	EA		Yes		
400552-0000	*1	77	ESCORT II ISO-TRANSFORMER , REV. 'A' **(FIFO)**		R	22	1.000	EA	T1	Yes		
354000-0103A	*1	78	CONN, SGL ROW,STRT,SGL PI NS,SNAP-AWAY		R	11	8.000	PIN	2 PCS. OF 4 PINS EACH	Yes		
354000-0103A	*1	79	CONN, SGL ROW,STRT,SGL PI NS,SNAP-AWAY		R	11	4.000	PIN	2 PCS. OF 2 PINS EACH	Yes		
352300-0104A	*1	80	CAP, .1UF,50V,20%,RAD,MYL AR		R	22	4.000	EA	C30,25,26,27	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400613-0000	PCBA, PRESS/TEMP, REV.'S' (E787) - E2/E3			A				S	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
352300-0104A	*1	81	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	5.000	EA	C28,37,38,44,45	Yes		
352300-0104A	*1	82	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	4.000	EA	C40,41,42,43	Yes		
352100-0104A	*1	83	CAP, .1UF,50V,10%,RAD,X7R		R	11	1.000	EA	C39	Yes		
365000-0040A	*1	84	SKT, 40-POS,DIP,TIN PLATE,L.P.		R	11	1.000	EA	U1	Yes		
365000-0024A	*1	85	SKT, 24-POS,DIP,TIN PLATE,L.P.		R	11	1.000	EA	U5	Yes		
384000-0061A	*1	86	GAS TUBE (SURGE ARRESTER)		R	33	1.000	EA	DS1	Yes		
365000-0148A	*1	87	SOCKET, 48 PIN DIP		R	22	1.000	EA	U3	Yes		

Cumulative Lead Time for 400613-0000 = 77

BATTERY CHARGER BOARD

CHAPTER 6

6.0.0 BATTERY CHARGER BOARD

6.1.0 OVERVIEW

For **ESCORT** monitors that include Battery option, the batteries can be charged by two methods. If the **ESCORT** is switched to the STBY mode, the batteries are being charged by the AC line, which provides maximum charging current. When the **ESCORT** is operating in the ON mode, the batteries are being charged by +21V from the Power Supply Board. By using two separate circuits, current draw can be limited, and this will lower the total power dissipation for battery charging when the **ESCORT** is in use. With either method, the monitor must be plugged into an AC outlet with the AC switch at the back panel in the ON position. The Battery Charger Board is also responsible for AC and battery charging indication.

The battery packs are wired OR'd together.

6.2.0 CHARGING METHODS

When the **ESCORT** is in the STBY mode, the charging circuit draws current through Q2. The AC input is rectified by D1 and D9, and filtered via C3. At this point, approximately 20.5V$\pm$1V is presented to the emitter of Q2. Q2 is controlled by the absence or presence of +21V. With the absence of +21V at the base, Q2 will be turned on, providing current to the charging regulators through D10.

When +21V is present, the monitor is ON and Q2 is turned off, inhibiting current flow. In this case charging current is supplied by regulator U4. U4 is controlled by the CPU signal "BATTERY CHARGE*". If this signal is low, Q1 is turned off and resistor R26 sets a pre-determined voltage reference at pin 2 of U4. The output at U4 pin 1 will supply 18.5V$\pm$.5V through D17 to the charging regulators. When the **ESCORT** is being powered by batteries, the "BATTERY CHARGE*" signal is high, turning off all battery charging capabilities by bringing U4 pin 2 to ground. The output of U4 will then be insufficient to supply the charging regulators with the necessary input for regulation. In order to limit peak power dissipation, the batteries are inhibited from charging while the recorder is running.

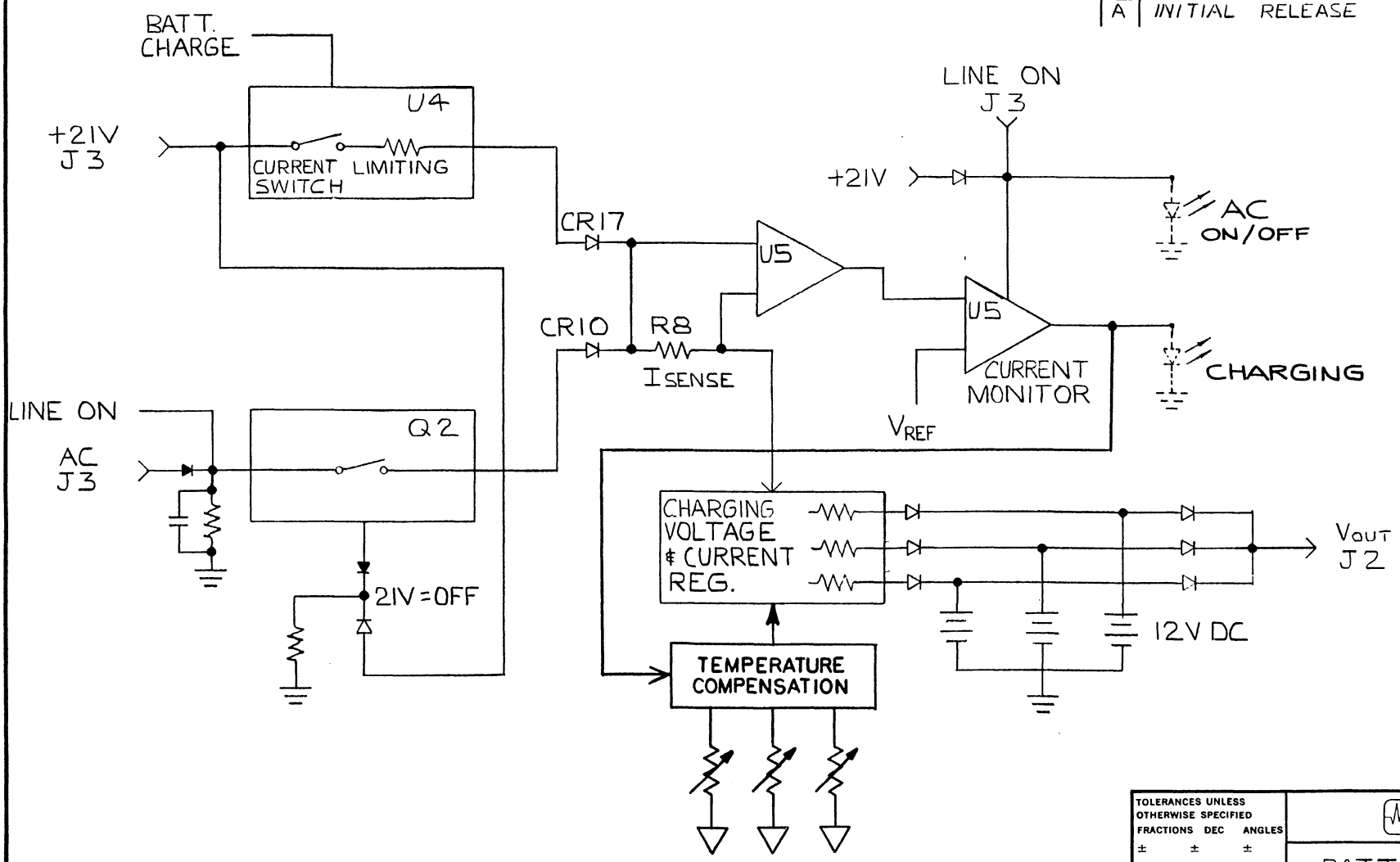
6.3.0 CURRENT LIMITING

U4 has internal current limiting capability that will limit the charging current to 150mA, reducing the total current draw when the unit is ON. When the **ESCORT** is charging in the STBY mode, the charging current is 450mA through U1, U2 and U3 at 150mA per regulator. These three low power regulators will supply the batteries with a charging voltage. R20, R21 and R22 are adjusted to achieve optimum charging voltage to the lead acid batteries. Diodes D3, D4 and D5 provide automatic adjustment to the output of the charging regulators according to the ambient temperature. When the

temperature rises, the voltage across the diodes decreases, in effect reducing the regulators' charging voltage to prevent excessive heating in the batteries while being charged. D6, D7 and D8 will act as blocking diodes when the **ESCORT** is running on AC.

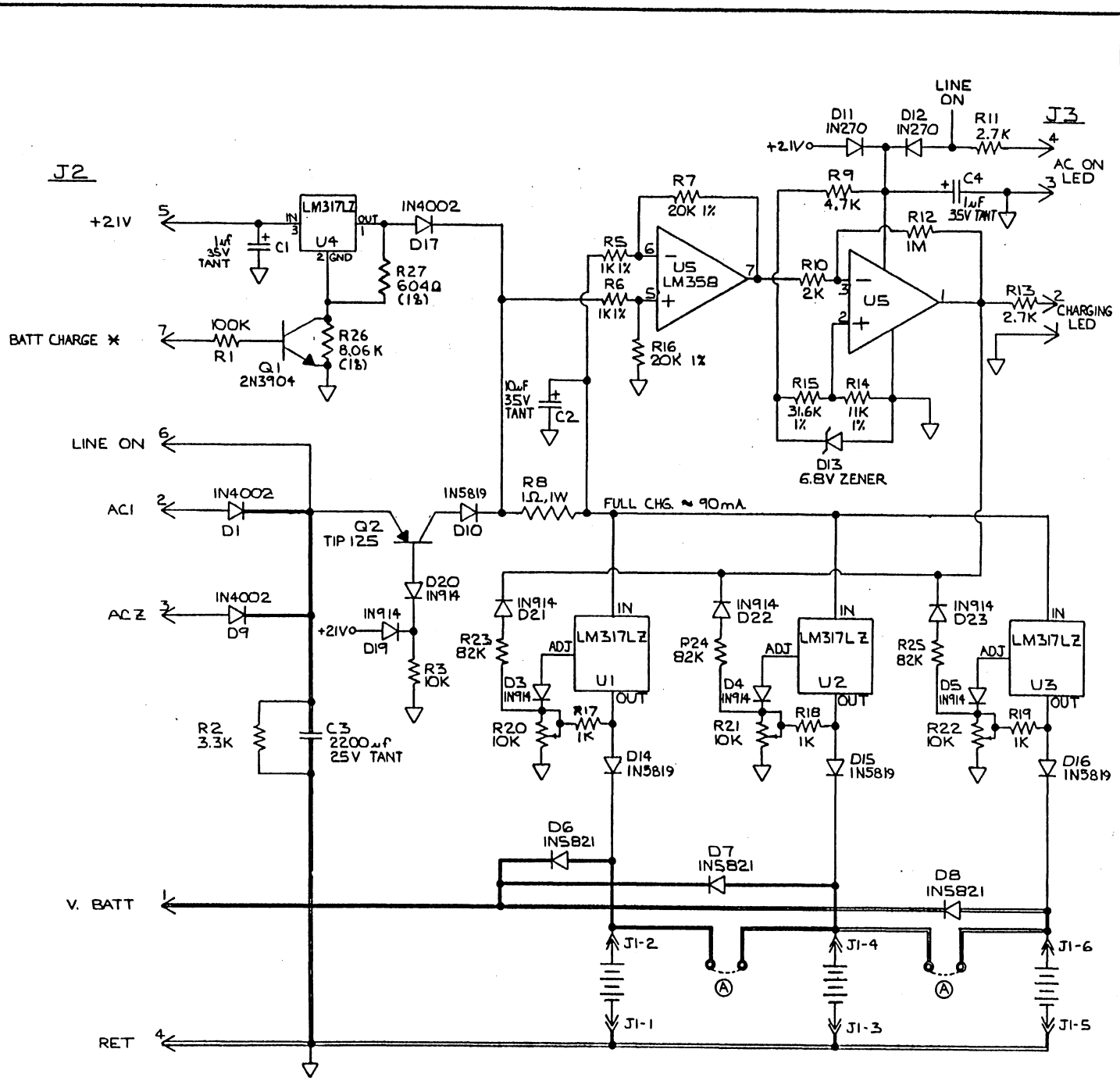
The charging current monitoring circuit, which is comprised of U5 and associated components, will compare the current drawn by batteries. If 90mA or more is sensed through R8, the batteries are in the charging condition; if less than 90mA, the batteries are completely charged. The output at U5 pin 1 will reflect this comparison with an LED. The LED will be ON if the batteries are charging, and OFF when they are fully charged. Once the batteries are fully charged, U5 pin 1 is pulled low near ground level causing D21, D22 and D23 to become forward biased. At this time, R23, R24 and R25 appear to be in parallel with R20, R21 and R22 respectively, and in turn reduce the regulators' outputs to about 13.8 volts to keep the batteries in trickle charge mode. Also included on the Battery Charger Board is the AC DETECT LED, which is controlled by the AC DETECT signal from the Power Supply Board.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	4-15-88	



TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±	MDE MEDICAL DATA ELECTRONICS
APPROVALS / DATE	BATTERY CHARGER BLOCK DIAG.
DRAWN A. KRAUSE 4-15-88	
CHECKED	SCALE Ø / SIZE B / DRAWING NO.
DO NOT SCALE DRAWING	SHEET 1 of 1

6-3



LAST USED: R27
D23
U5
C4
Q2

3. ADJ AT 25°C : SET CHARGE VOLTAGE TO 14.7V WITH APROX. 120mA LOAD. CHARGE VOLTAGE AT 10mA = 13.7 V ± .15V. (REF ONLY)

2. (A) - USE BUSS STRAP JUMPERS WITH SINGLE HIGH CAPACITY BATTERY.

1. BATTERIES ARE REF. ONLY.

NOTES:

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE		
B	ECO 154	12/30/87	
C	ECO 160	2/1/88	
D	ECO 173	2/26/88	
E	ADD CIRC. POTS R20-22	7/7/88	
F	ECO 261	7/29/88	
G	ECO 263	8/16/88	
H	ECO 265	8/16/88	
I	ECO 267	8/16/88	
J	ECO 412	3/21/89	

REV: J

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS DEC ANGLES
± ± ±

APPROVALS	DATE
DRAWN A. KRAUSE	7-29-88
CHECKED	

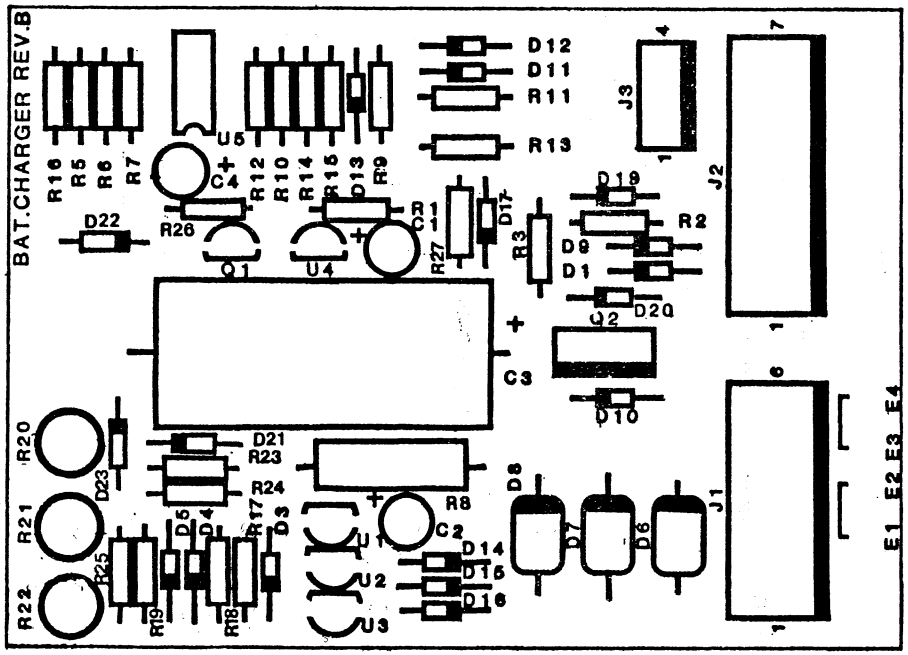
MDE MEDICAL DATA ELECTRONICS

ESCORT II
BATTERY CHARGER

SCALE Ø | SIZE C | DRAWING NO. 400601-0000

DO NOT SCALE DRAWING | SHEET 1 of 3

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS ±	DEC ±	ANGLES ±

APPROVALS	DATE
DRAWN	
CHECKED	

MDE MEDICAL DATA ELECTRONICS

BATTERY CHARGER PCBA

SCALE	SIZE	DRAWING NO.
2/1	B	400601

DO NOT SCALE DRAWING — SHEET 20F 3

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400601-0000	PCBA, BATTERY CHARGER, REV. "J" - E2			A					0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
400600-0000	*1	1	PCB, BATTERY CHARGER, REV. E (E936)	E	R	33	1.000	EA		Yes		
352400-0105A	*1	2	CAP, 1UF,50V,20%,RAD,TANT, MAX: HT. .28; O.D. .16		R	11	2.000	EA	C1,4	Yes		
352401-0106A	*1	3	CAP, 10UF,35V,20%,RAD,TANT		R	11	1.000	EA	C2	Yes		
364000-0011A	*1	4	IC, LM358		R	11	1.000	EA	U5	Yes		
364000-0064A	*1	7	IC, LM317LZ,VOLT. REGULATOR		R	11	4.000	EA	U1-4	Yes		
370200-3162A	*1	8	RES, 31.6K,1/4W,1%,MF		R	11	1.000	EA	R15	Yes		
370100-0104A	*1	9	RES, 100K,1/4W,5%,CF		R	11	1.000	EA	R1	Yes		
370100-0105A	*1	10	RES, 1M,1/4W,5%,CF		R	11	1.000	EA	R12	Yes		
370100-0103A	*1	11	RES, 10K,1/4W,5%,CF		R	11	1.000	EA	R3	Yes		
370100-0272A	*1	12	RES, 2.7K,1/4W,5%,CF		R	11	2.000	EA	R11,13	Yes		
370100-0202A	*1	13	RES, 2K,1/4W,5%,CF		R	11	1.000	EA	R10	Yes		
370100-0472A	*1	14	RES, 4.7K,1/4W,5%,CF		R	11	1.000	EA	R9	Yes		
370200-1102A	*1	15	RES, 11K,1/4W,1%,MF		R	11	1.000	EA	R14	Yes		
370200-1001A	*1	16	RES, 1K,1/4W,1%,MF		R	11	2.000	EA	R5,6	Yes		
370200-2002A	*1	17	RES, 20K,1/4W,1%,MF		R	11	2.000	EA	R7,16	Yes		
370201-0010A	*1	18	RES, 1,1W,M.O.		R	11	1.000	EA	R8	Yes		
376000-0003A	*1	19	XSTR, 2N3904		R	11	1.000	EA	Q1	Yes		
376000-0010A	*1	20	XSTR, TIP 125,DARLINGTON PWR XSTR		R	11	1.000	EA	Q2	Yes		
378000-0002A	*1	21	DIO, 1N4002GP,RCTFR, (MOT ONLY) T&R		R	11	3.000	EA	D1,9,17	Yes		
378000-0036A	*1	22	DIO, 1N5819,1AMP,SCHOTTKY T&R		R	11	4.000	EA	D10,14-16	Yes		
378000-0009A	*1	23	DIO, 1N754A,6.8V,ZENER T&R ***MOT ONLY***		R	11	1.000	EA	D13	Yes		
378000-0023A	*1	24	DIO, 80SQ035 8A RECTIFIER (OR 040/045)PREP INTERFAB		R	44	3.000	EA	D6-8	Yes		
352201-0228A	*1	26	CAP, 2200UF,35V,AX,ELECT, 16X30MM		R	66	1.000	EA	C3	Yes		
378000-0005A	*1	27	DIO, 1N914,SIGNAL T&R		R	11	8.000	EA	D3-5,19-23	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400601-0000	PCBA, BATTERY CHARGER, REV. "J" - E2			A					0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370100-0332A	*1	28	RES, 3.3K,1/4W,5%,CF		R	11	1.000	EA	R2	Yes		
378000-0001A	*1	29	DIO, 1N270 T&R		R	11	2.000	EA	D11,12	Yes		
400646-0000	*1	30	CBL, BATTERY CHARGER, REV . "C" - E2		A	0	1.000	EA		Yes		
400699-0000	*1	31	CHARGER TO ENCL. HARNESS ASSY, REV "B" - E2		A	0	1.000	EA		Yes		
370100-0823A	*1	32	RES, 82K,1/4W,5%,CF		R	11	3.000	EA	R23-25	Yes		
360500-0044A	*1	33	SPCR, #6,.25 RND X .125 L NG		R	11	3.000	EA	DO NOT ISSUE	Yes		
370100-0102A	*1	34	RES, 1K,1/4W,5%,CF		R	11	3.000	EA	R17-19	Yes		
374000-0103A	*1	35	POT, 10K,TRIM,TOP ADJ,OFF CTR LEADS,CERMET		R	22	3.000	EA	R20-22	Yes		
360600-0024A	*1	36	HTSNK, IERC RUR671B		R	22	3.000	EA		Yes		
370200-8061A	*1	38	RES, 8.06K,1/4W,1%,MF (8 .05K N/A :OK PER KR)		R	11	1.000	EA	R26	Yes		
370200-6040A	*1	40	RES, 604,1/4W,1%,MF		R	11	1.000	EA	R27	Yes		

Cumulative Lead Time for 400601-0000 = 66

SWITCHING POWER SUPPLY BOARD

CHAPTER 7

7.0.0 SWITCHING POWER SUPPLY BOARD

7.1.0 OVERVIEW

The Switching Power Supply Board provides the flexibility to operate the **ESCORT** via three separate input circuits, along with producing DC voltages used throughout the monitor. The DC voltages are regulated by a sense line on 15V. Battery level indication also originates on the Switching Power Supply Board.

7.2.0 INPUT CIRCUITS

The **ESCORT** monitor can be powered by three different input modes. The monitor can be:

1. plugged into an AC outlet
2. powered by internal battery packs, or
3. powered via an external DC input located at the rear panel

The auxiliary DC input uses a blocking diode (D2) to protect against reverse polarity. This input can accommodate 10-24V DC at approximately 3A current.

When the **ESCORT** is plugged into an AC outlet, AC power passes through the center tapped power transformer which steps down the line voltage to approximately 26 VAC and provides line power isolation. Full wave rectification is completed by D1. C1 and C2 filter the DC voltage.

The ON/STBY switch interrupts Vin to the pulse width modulator, U1. Local oscillation comes from R2 and C4, which provide a free running frequency to the regulator. Pin 3 of U1 is a 250KHz synchronizing input signal from the CPU, which will preempt the local oscillation. This signal assists in reducing beat frequency noise on ECG and other circuits. It also keeps all output voltages in phase with each other. C5 and R3 are to compensate for and stabilize the frequency. A slight delay upon power up for a soft start is caused by C6 slowly charging to capacity. The switching outputs of U1 pins 11 and 14 go to the high power MOSFET transistors Q1 and Q2. They in turn drive the transformer T1. D9 and D10, clamping diodes, provide spike protection for Q1 and Q2. The voltages derived from T1 are +21V, +8V, +15V and -15V.

7.3.0 VOLTAGE SENSE

As the 15V output has the largest demand for power consumption, it is used by U1 for voltage regulation. A voltage feedback signal, for a closed loop operation, provides a sense line to U1 pin 1. U1 will vary the duty cycle of its switching output pins 11 and 14 to maintain the regulated output of 15V. Mutual inductance from windings in T1 keep all of the other voltages at a constant. Each of the

voltages have their own rectifying and L.C. circuits to provide AC ripple filtering. (These include D5,D6 and L1, C10 for +21V, etc..).

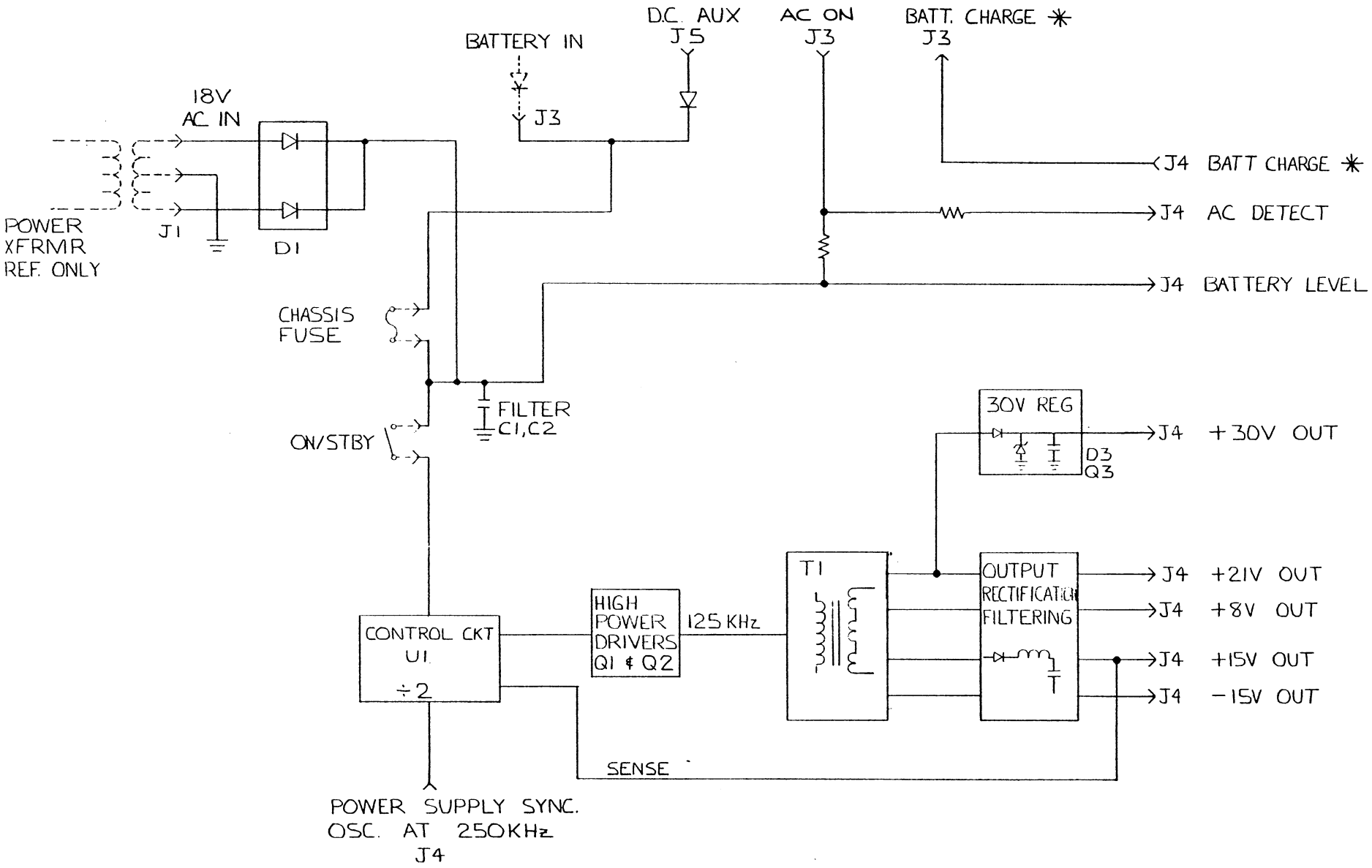
The +30V used for Z-axis, CRT blanking, also originates on the Power Supply Board. It is taken from the unrectified +21V winding of T1. D4 provides rectification and C8 is a prefilter for the voltage. The pass transistor (Q3) is controlled by D3, a 30V zener reference diode. Filtering the output is C9. R7, R8, R9 and R10 are bleeder resistors for the filter caps on the output voltages.

7.4.0 INDICATORS AND SIGNALS

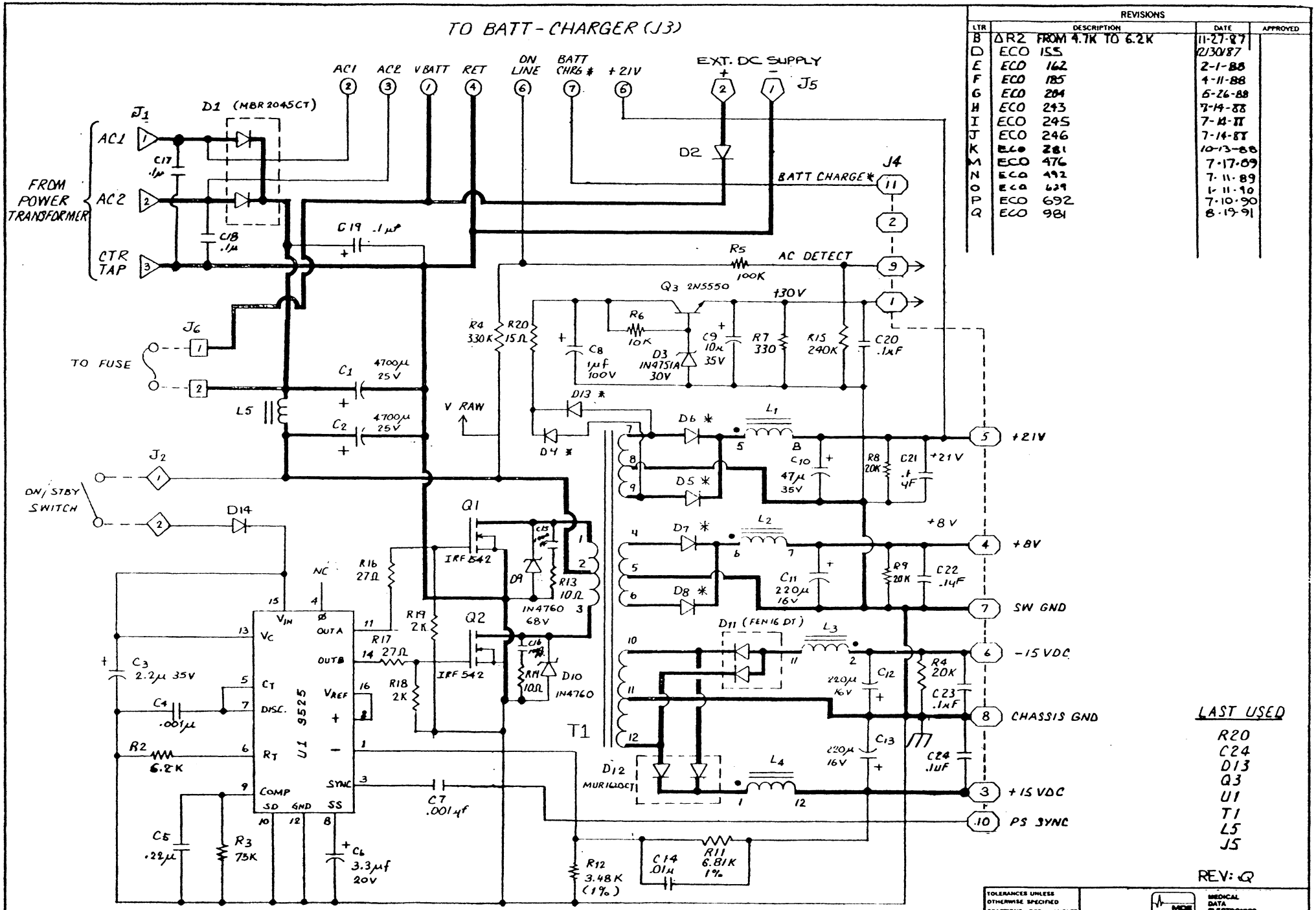
Also contained on the Power Supply Board are battery level and AC detect signals (BATT LEVEL and AC DETECT). BATT LEVEL, J4 pin 2, is sent to the CPU for evaluation to determine the charge level of the batteries. If AC is supplying ESCORT with power, the AC DETECT, J4 pin 9, will be a high signal. When being powered by the battery packs, the signal will be pulled low by circuitry on the Battery Charger Board. Both of these signals apply to ESCORTS with battery option only.

BATTERY CHARGE CONT* signal passes through without any effect from the Power Supply Board.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±		MEDICAL DATA ELECTRONICS	
APPROVALS	DATE	POWER SUPPLY BLOCK DIAG.	
DRAWN A. KRAUSE	4-8-88		
CHECKED		SCALE FULL	SIZE C
		DRAWING NO.	
		DO NOT SCALE DRAWING	SHEET 1 of 1



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
B	ΔR2 FROM 4.7K TO 6.2K	11-27-87	
D	ECO 155	12/30/87	
E	ECO 162	2-1-88	
F	ECO 185	4-11-88	
G	ECO 204	6-26-88	
H	ECO 243	7-14-88	
I	ECO 245	7-11-11	
J	ECO 246	7-14-88	
K	ECO 281	10-13-88	
M	ECO 476	7-17-89	
N	ECO 492	7-11-89	
O	ECO 629	1-11-90	
P	ECO 692	7-10-90	
Q	ECO 981	8-19-91	

LAST USED
R20
C24
D13
Q3
U1
T1
L5
J5

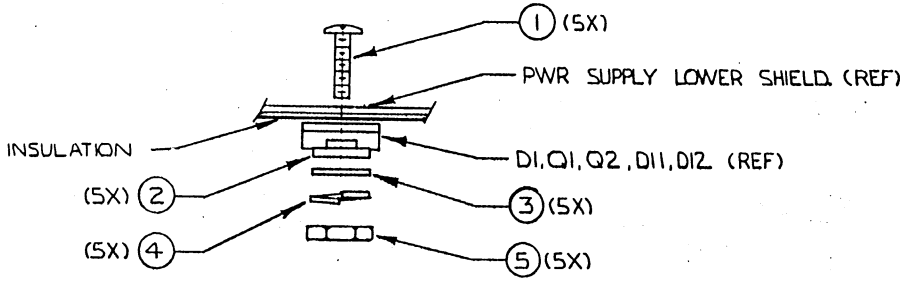
REV: Q

NOTE :

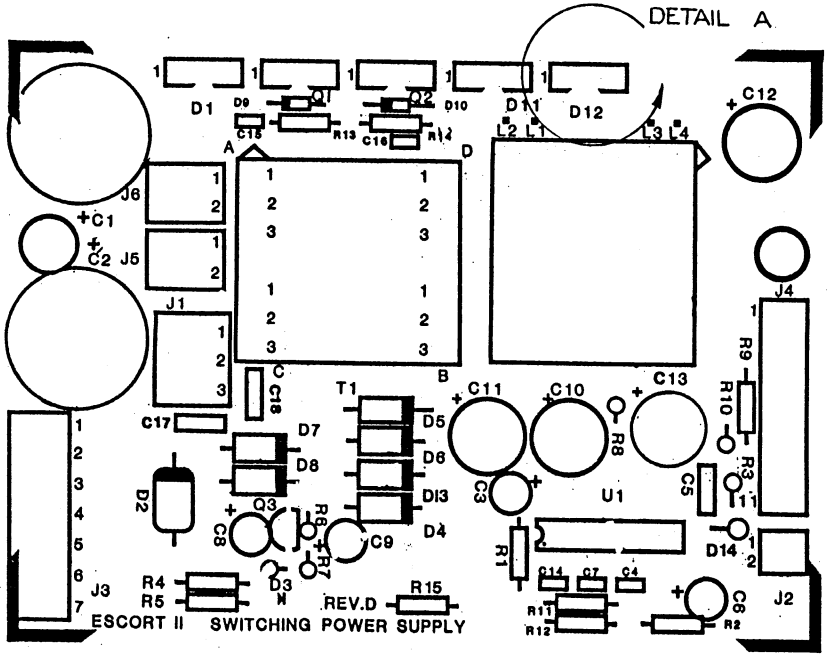
* DIODE D4 TO D8 AND D13 BI P/N FESD RATED 3A, 200V

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±	MEDICAL DATA ELECTRONICS	
APPROVALS DRAWN	DATE	ESCORT II SWITCHING POWER SUPPLY
CHECKED		SIZE C DRAWING NO. 400593 - 1000
		DO NOT SCALE DRAWING SHEET 1 OF 1

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
M	ECO 476	7-17-89	
M1	DCO 045	3-4-91	



DETAIL A



NOTES:

1. INSTALL PRESSED IN STANDOFFS FIRST.
2. ADD SOLDER MASK.

7-5

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS ± DEC ± ANGLES ±		MEDICAL DATA ELECTRONICS	
APPROVALS	DATE	SWITCHING POWER SUPPLY	
DRAWN AJM	10-26-89		
CHECKED		SCALE 2/1	SIZE C
		DRAWING NO. 400593	
		DO NOT SCALE DRAWING	SHEET 2 OF 2

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400593-0000	PCBA, SWITCH.PWR.SUPPLY, REV. P1 (D045) - E2			A				P1	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
400592-0000	*1	1	PCB, SW PWR SUPPLY REV. E 1 (D081)	E1	R	33	1.000	EA		Yes		
352300-0103A	*1	2	CAP, .01UF,50V,20%,RAD,MYLAR		R	22	1.000	EA	C14	Yes		
352300-0015A	*1	3	CAP, .22UF,10%,MYLAR		R	66	1.000	EA	C5	Yes		
352200-0106A	*1	4	CAP, 10UF,35V,RAD,ELECT,5X11MM		R	22	1.000	EA	C9	Yes		
352200-0227A	*1	5	CAP, 220UF,16V,RAD,ELECT,SWTCH SP TYPE,10X16MM		R	22	3.000	EA	C11-13	Yes		
352300-0102A	*1	6	CAP, 1000PF,50V,20%,RAD,MYLAR		R	22	2.000	EA	C15,16	Yes		
352200-0478A	*1	7	CAP, 4700UF,25V,RAD,ELECT,18X36MM		R	22	2.000	EA	C1,2	Yes		
352201-0476A	*1	8	CAP, 47UF,35V,RAD,ELECT,SWTCH SP TYPE,10X16MM		R	22	1.000	EA	C10	Yes		
352200-0105A	*1	9	CAP, 1UF,100V,RAD,ELECT,5X11MM		R	22	1.000	EA	C8	Yes		
352400-0335A	*1	10	CAP, 3.3UF,20V,20%,RAD,TANT		R	11	1.000	EA	C6	Yes		
352401-0225A	*1	11	CAP, 2.2UF,35V,20%,TANT		R	11	1.000	EA	C3	Yes		
354000-0085A	*1	12	CONN, 3-PIN,M,STRT LCK,.156 CTR		R	11	1.000	EA	J1	Yes		
354000-0138A	*1	13	CONN, 2-P,M,STRT LOCK,.1 CTR,HDR		R	11	1.000	EA	J2	Yes		
354000-0139A	*1	14	CONN, 7-P,M,STRT LOCK,.156 CTR,HDR		R	11	1.000	EA	J3	Yes		
354000-0140A	*1	15	CONN, 11-P,M,STRT LOCK,.1 CTR,HDR		R	11	1.000	EA	J4	Yes		
354000-0141A	*1	16	CONN, 2-P,M,STRT LOCK,.156 CTR,HDR		R	11	2.000	EA	J5,6	Yes		
358100-0013A	*1	17	SCR, 4-40 X 3/8,PH PNHD,CAD1		R	11	5.000	EA	XSTR MNTNG - NO ISSUE	Yes		
358200-0001A	*1	18	WSHR, SHLDR		R	11	5.000	EA	1 - DO NOT ISSUE	Yes		
358200-0004A	*1	19	WSHR, #4 FLAT STL CAD1,(.125ID,9/32OD,.025THK)		R	11	5.000	EA	2 - DO NOT ISSUE	Yes		
358200-0009A	*1	20	WSHR, #4 SPLIT LOCK		R	11	5.000	EA	3 - DO NOT ISSUE	Yes		
360500-0022A	*1	21	NUT, #4 HEX,LRG PTTRN		R	11	5.000	EA	4 - DO NOT ISSUE	Yes		
360500-0044A	*1	22	SPCR, #6,.25 RND X .125 LNG		R	11	2.000	EA	5 - DO NOT ISSUE	Yes		
400962-0000	*1	23	SILICONE WAFER, .007 MIL, MAT'L.400-.007MIL,REV A		R	11	1.000	EA		Yes		
364000-0091A	*1	24	IC, SG 3525		R	44	1.000	EA	U1	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
400593-0000	PCBA, SWITCH.PWR.SUPPLY, REV. P1 (D045) - E2			A			P1	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370100-0103A	*1	26	RES, 10K,1/4W,5%,CF		R	11	1.000	EA	R6	Yes		
370100-0104A	*1	27	RES, 100K,1/4W,5%,CF		R	11	1.000	EA	R5	Yes		
370100-0203A	*1	28	RES, 20K,1/4W,5%,CF		R	11	3.000	EA	R8-10	Yes		
370100-0334A	*1	29	RES, 330K,1/4W,5%,CF		R	11	2.000	EA	R4,7	Yes		
370100-0622A	*1	30	RES, 6.2K,1/4W,5%,CF		R	11	1.000	EA	R2	Yes		
370100-0753A	*1	31	RES, 75K,1/4W,5%,CF		R	11	1.000	EA	R3	Yes		
370200-3481A	*1	32	RES, 3.48K,1/4W,1%,MF		R	11	1.000	EA	R12	Yes		
370200-6811A	*1	33	RES, 6.81K,1/4W,1%,MF		R	11	1.000	EA	R11	Yes		
376000-0017A	*1	34	XSTR, BUK456-100A,100V,24 A,PWR (TO-220)MOSFET ONLY		R	11	2.000	EA	Q1,2	Yes		
376000-0018A	*1	35	XSTR, 2N5550,NPN SILICON(VCE 140V)		R	11	1.000	EA	Q3	Yes		
378000-0021A	*1	36	DIO, 1N4760,68V,10%,ZENER T&R ***MOT ONLY***		R	11	2.000	EA	D9,10	Yes		
378000-0002A	*1	37	DIO, 1N4002GP,RCTFR, (MOT ONLY) T&R		R	11	1.000	EA	D14	Yes		
378000-0029A	*1	38	DIO, MBR2060CT,RCTFR,SCHO TTKY,60V (220/PKG)		R	11	1.000	EA	D1	Yes		
378000-0030A	*1	39	DIO, 1N4751A,30V,1W,5%,ZE NER T&R ***MOT ONLY***		R	11	1.000	EA	D3	Yes		
378000-0031A	*1	40	DIO, FE3D,200V,3A,ULTRAFA ST-2ND OP PREP ARGOSY		R	11	7.000	EA	D2,4-8,13	Yes		
378000-0032A	*1	41	DIO, FEN16DT,150V,16A,RCT FR,ULTRAFAST,COM ANOD		R	22	1.000	EA	D11	Yes		
378000-0033A	*1	42	DIO, MUR1620CT,200V,16A,R CTFR,ULTRAFAST,COM ANOD		R	11	1.000	EA	D12	Yes		
400565-0000	*1	43	POWER SUPPLY LOWER SHIELD , REVISION 'F'		R	22	1.000	EA		Yes		
400655-0000	*1	45	SWITCH. POWER TRANSFORMER , REV. 'D' **(FIFO)**		R	22	1.000	EA	T1	Yes		
400656-0000	*1	46	IDCTR(S), MUTUAL, EII SWT CH SPPLY,REV 'A' **FIFO**		R	22	1.000	EA	L1-L4	Yes		
365000-0016A	*1	47	SKT, 16-POS,DIP,TIN PLATE ,L.P.		R	11	1.000	EA		Yes		
370100-0244A	*1	48	RES, 240K,1/4W,5%,CF		R	11	1.000	EA	R15	Yes		
370100-0100A	*1	49	RES, 10,1/4W,5%,CF		R	11	2.000	EA	R13,14	Yes		
352300-0104A	*1	50	CAP, .1UF,50V,20%,RAD,MYL AR		R	22	2.000	EA	C17,18	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400593-0000	PCBA, SWITCH.PWR.SUPPLY, REV. P1 (D045) - E2			A				P1	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
352300-0007A	*1	51	CAP, .001UF,10%, MYLAR		R	66	2.000	EA	C4,7	Yes		
401311-0000	*1	52	IDCTR, EII SWITCHING P.S.		R	33	1.000	EA	L5	Yes		
370100-0270A	*1	53	RES, 27,1/4W,5%,CF		R	11	2.000	EA	R16, 17	Yes		
370100-0202A	*1	54	RES, 2K,1/4W,5%,CF		R	11	2.000	EA	R18, 19	Yes		
352300-0104A	*1	55	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	6.000	EA	C19,20,21,22,23,24	Yes		
370100-0150A	*1	56	RES, 15,1/4W,5%,CF		R	11	1.000	EA	R20	Yes		

Cumulative Lead Time for 400593-0000 = 66

PERFORMANCE CHECK

CHAPTER 8

8.0.0 PERFORMANCE CHECK

8.1.0 OVERVIEW

MDE recommends a yearly performance check to verify all functions on the ESCORT . A calibrated patient simulator, such as the MDE DATASIM Model 2000 or 6000, will be necessary to complete the performance check.

Begin with a thorough visual inspection of the unit, paying particular attention to the power cord.

8.2.0 BATTERIES

***Note:** Medical Data Electronics suggests battery replacement every two (2) years regardless of test results. Batteries used beyond life expectancy may fail without notice and could disrupt power to the ESCORT monitor.*

All lead-acid battery packs should be fully charged prior to performance check; refer to Chapter 6 for charging procedures. If in doubt, charge the batteries.

Connect the ESCORT monitor to a 120 VAC, 60Hz power source. Set the AC switch located on the rear panel of the ESCORT to the "I" position. The yellow *charging* LED located on the front of the battery base should be off and the green *AC ON* LED should be on. If the yellow charging LED is on, allow the batteries to fully charge until the time when the LED turns off.

Turn the AC switch to the "0" position; observe if the monitor operates under battery power. Access the soft key TEST page to view battery status (i.e., HIGH, MID, LOW). Battery status should read: **BATTERY LEVEL: HIGH.**

Turn the ON/STBY switch to STBY, turn the AC switch on the rear panel to the "0" position. Remove the three lead-acid battery packs and measure the voltage with an open load, the voltage should measure approximately 13.0 to 13.5 volts.

Next, cycle the lead-acid battery packs individually as follows:

i. Insure that ON/STBY switch is in STBY position
ii. Insure that AC switch is in "0" position
iii. Insert one battery pack into one of the outer battery slots
iv. Turn the ON/STBY switch to the ON position
v. Confirm that the ESCORT monitor operates and Battery Level indicates HIGH
vi. Turn the ON/STBY switch to STBY position
vii. Remove battery pack and install into adjacent slot
viii. Repeat steps "iii" through "vii" for all three battery slots

Reinstall all three (3) batteries upon successful completion of individual tests.

8.3.0 LEAKAGE TESTING

Note: All leakage tests are usually done with a meter specifically designed for making this measurement on medical equipment. For safety reasons, do not attempt these measurements unless this type of instrument is available.

8.3.1 CHASSIS LEAKAGE

To test the chassis to ground leakage, use a safety leakage tester. There should be less than 100uA read on the meter between chassis and earth ground., with the ground of the monitor open. Reverse the polarity on the AC input and check again.

8.3.2 PATIENT INPUT LEAKAGE

Using the patient lead cable, short all of the leads together. With a meter between the leads and earth ground, less than 20uA should be read. If you do not use a cable, short lead inputs at connector. Meter should read less than 10uA when at the connector.

8.4.0 GROUND CHECK

Test for ground continuity between AC plug ground and chassis ground at unpainted metal screw head on the rear panel. Power cord ground should be less than .15 ohms.

8.5.0 RAM, ROM SELF TEST

Using soft keys, call up the TEST page. Do a RAM self test by pressing soft key TEST RAM. The screen will say RAM TEST IN PROGRESS. Some screen glitches may be observed at this time. When test is completed screen will note PASSED RAM TEST or RAM BAD CALL SERVICE. Repeat the above procedure for ROM testing.

8.6.0 KEYPAD

Test hard key function by pressing all the hard keys, verifying that the key initiates function. Verify audio key click. soft keys require testing only one function.

FUNCTIONAL TESTS

Note: When using patient simulator, the tolerance factor of the simulator must be factored in determining if the monitor is within tolerance.

8.7.0 ECG

Using a calibrated patient simulator, confirm heart rate count at low, mid and high range, such as 20 BPM, 100 BPM, and 250 BPM. Input signal should be 1mV R-wave. Heart rate should be ± 2%, not including simulator accuracy. Check asytole, 00 count.

Verify a normal heart rate count at a low amplitude such as .2mV and a high amplitude such as 3mV. Adjust soft key sizing as necessary.

Verify alarms by turning alarm function on using soft keys. Factory default setting is 140 BPM high and 50 BPM low for adult mode, 200 BPM high and 100 BPM low for neonatal mode. Using patient simulator violate alarm limits, both high and low, returning to NSR in between to reset alarm.

Check pacer flag operation by inserting a pacer spike at 4mV to 200mV typical amplitude, for 200uS to 2mS typical in width. Be sure to have the soft key PACE in the ON mode. Cardiotach should not be affected by pacer spike.

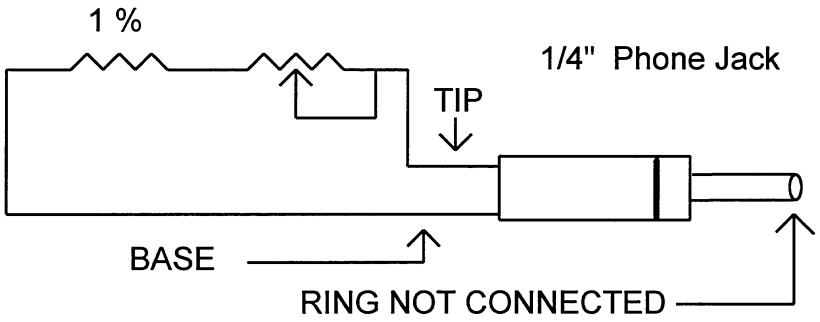
8.8.0 PRESSURE

Zero simulator using manufacturers directions. Confirm pressure readings at a low, mid and high range such as 10mmHg, 100mmHg and 250mmHg. Pressure reading accuracy should be ± 1% or 1mm (whichever is greater) not including simulator tolerance.

If ESCORT is configured for 2 Blood Pressures, repeat the above procedure on BP2.

8.9.0 TEMPERATURE

For temperature testing a small resistor circuit with a high degree of accuracy is necessary. For best results, use 1% resistors along with a potentiometer to adjust the resistance to the exact value required for testing.



A 1/4" stereo phone jack is used to input the resistance that is simulating the temperature. Wire this jack and circuit as in the diagram above with the resistor circuit placed between the tip and the base of the jack. The ring is not connected.

Start with the 1 degree testing circuit. A resistor circuit equaling 18,597 ohms ± 40 ohms should be assembled and placed between the tip and the base of the temperature jack. The monitor should read 1 degree C ± .2 degrees C. Using a circuit equaling 5,998 ohms ± 13 ohms, the temperature should read 25 degrees C ± .2 degrees C, and for a reading of 40 degrees C ± .2 degrees C, use a 3,203 ohm ± 6 ohm reference. Testing low, mid and high range is recommended.

8.10.0 RESPIRATION

Using a patient simulator with an output of 1 ohm impedance change, check respiration at a low, mid and high level, such as 10 BPM, 40 BPM and 80 BPM. Accuracy should be ± 2% or 2 BPM not including simulator tolerance. Verify a normal respiration count at a low impedance change such as .25 ohm and a high impedance change such as 3 ohms. Adjust soft key sizing as necessary. Verify 00 count by simulator apnea function. Also check apnea alarm function.

8.11.0 RECORDER

Verify recorder operation by using hard keys RECORD 1 and RECORD 2. Terminate recording with the RECORD STOP key.

8.12.0 PERFORMANCE CHECK LIST

NEO	_____	**ADULT**	_____	**MODEL**	_____
PORT 1	_____	**PORT 2**	_____	**SERIAL NUMBER**	_____
DEG C	_____	**DEG F**	_____	**DATE**	_____
				TECHNICIAN	_____

BATTERY OPERATION

Batteries charged	OK	_____
Battery #1 operation	OK	_____
Battery #2 operation	OK	_____
Battery #3 operation	OK	_____

LEAKAGE

Chassis leakage	100uA or less	_____
Patient input leakage at ground	20uA or less	_____
without cable	10uA or less	_____
at 120V AC	20uA or less	_____
without cable	10uA or less	_____
Ground check	.15 ohms or less	_____
RAM Self Test	RAM OK	_____
ROM Self Test	ROM OK	_____
Keypad	OK	_____
audio click	OK	_____

ECG TESTS

Heart rate at 1mV low	OK	_____
mid	OK	_____
high	OK	_____
asytole	OK	_____
Normal heart rate at low amplitude	OK	_____
Normal heart rate at high amplitude	OK	_____
Alarm violation high	OK	_____
Alarm violation low	OK	_____
Pacer rejection operation	OK	_____

BLOOD PRESSURE

BP1 reading low	.....	OK _____
mid	.....	OK _____
high	.....	OK _____
BP2 reading low	.....	OK _____
mid	.....	OK _____
high	.....	OK _____

TEMPERATURE

T1 - 1 degree reading	.....	OK _____
25 degrees reading	.....	OK _____
40 degrees reading	.....	OK _____
T2 - 1 degree reading	.....	OK _____
25 degree reading	.....	OK _____
40 degrees reading	.....	OK _____

RESPIRATION

Resp rate at 1 ohm: low	.....	OK _____
mid	.....	OK _____
high	.....	OK _____
Normal resp rate at low impedance change	.....	OK _____
Normal resp rate at high impedance change	.....	OK _____
Apnea alarm violation	.....	OK _____

RECORDER OPERATION ..... OK _____

MECHANICAL DISASSEMBLY

CHAPTER 9

9.0.0 MECHANICAL DISASSEMBLY

CAUTION!

Only qualified Technicians should attempt to perform repairs or removal of any parts in the **ESCORT.** Opening the ESCORT could violate warranty.

9.1.0 SAFETY

High voltage is exposed when the covers are removed from monitor. Disconnect AC power cord and remove batteries to assure current is removed from **ESCORT.** Always observe safe working techniques when troubleshooting or removing components. Work surface should be free of any metal.

9.2.0 FUSE REPLACEMENT

The 3/4 amp Slow Blow Fuse is located in the power module at the rear panel. It is removed by prying the tab at the lower right corner with a small blade screwdriver. Pull out Fuse holder. Lift on slender black tab, while pulling out clear plastic assembly. To replace, insert clear plastic assembly until a click is heard, then replace holder.

9.3.0 DISASSEMBLY

This chapter includes removal instructions only; the reinstallation of assemblies is the opposite of removal.

PLEASE NOTE: Beginning the disassembly procedure there is a list of parts that must be removed prior to initiating the disassembly process. **A connector placement drawing is provided to assist in proper connector replacement. Some connectors are not keyed.**

9.3.1 TOP COVER

Remove three screws on each side. Lift top cover off.

9.3.2 BOTTOM COVER - BATTERY CHASSIS

Remove three screws on each side. Face **ESCORT** toward you and lift front end, allowing back end to rest on battery chassis. Unplug connector between battery chassis and **ESCORT.** Lift ESCORT from chassis.

> **CAUTION:** When reassembling unit, make sure all top and bottom screws are replaced. Failure to do so could cause the unit to come apart in transport.

9.3.3 FACE PLATE

* Remove Top cover and Bottom cover.

Disconnect membrane ribbon cable from CPU Board (J1). Remove screw at bottom and sides of Face Plate. Pull forward slightly on Face Plate and disconnect wires at ON/STBY switch. Pull Face Plate completely off.

9.3.4 RECORDER

* Remove Top cover, Bottom cover and Face Plate.

Disconnect gray ribbon cable (J11 and J12) on CPU Board. Unscrew two screws holding recorder bracket to metal chassis. Pull forward on recorder. Retain cables for new recorder. Test pin to pin continuity before reusing.

9.3.5 PROCESSOR UNIT

* Remove Top cover.

Back off long screw at center of Temp Pressure Board until it is disengaged from nut. Lift ECG and Temp Pressure Boards along with connector plate up out of sockets as a unit.

A. Temperature/Pressure Board

Remove four allen screws using 5/64 allen wrench. Pull away from connector plate slightly. Remove J5 (T1), J4 (T2), J3 (BP11N), and J2 (BP21N). Pull away from connector plate.

B. ECG Board

Pull gray cap off lead select knob. Using "special tool", loosen screw and pull off knob. Remove two allen screws on connector plate using 5/64 allen wrench. Disconnect "sync out" and pull ECG Board away from connector plate.

CAUTION!

Take great care in replacing processor unit. Be sure that both boards are securely in the connector slots.

9.3.6 CPU

* Remove Top cover, Bottom cover, Face Plate and Processor unit.

Remove all connectors to CPU including connectors located under neck of CRT (J2, J3, J4, J5, J11, J13). Remove two screws holding CPU heat sink to rear panel. Loosen three remaining screws on rear panel. Then remove four screws holding CPU in place. Slide CPU Board toward

front of **ESCORT** and lift back end to slide out. When reassembling CPU Board into chassis, first install the four mounting screws loosely. Then install the two rear panel heat sink screws and tighten. Finally, go back and tighten the four mounting screws.

9.3.7 CRT YOKE ASSEMBLY

* Remove Top cover, Bottom cover, Processor unit, and Face Plate.

Caution: Handle CRT with care. Implosion can occur, resulting in flying glass. Always discharge CRT before removing. Disconnect High Voltage unit from CRT. Take long bladed screwdriver and insert under rubber cover of anode on the top of CRT. Make contact with metal prongs and short screwdriver to metal chassis. Unplug yoke connector from CPU and remove four screws holding CRT in place. Pull CRT out slowly stopping to remove connector at back of tube. Loosen yoke clamp to remove yoke.

9.3.8 HIGH VOLTAGE POWER SUPPLY

*Remove Top cover and Bottom cover.

Discharge CRT (see above). Disconnect high voltage unit from CRT, and unplug connector at CPU. Remove four screws holding High Voltage unit in place, preventing washers from falling into **ESCORT**. Lift off unit.

9.3.9 BATTERY CHARGER

* Remove Top cover, Bottom cover, Face Plate, Recorder and CRT yoke assembly.

Once Battery Charger Board is exposed, disconnect J5 on Switching Power Supply Board. Remove three 1/4" nuts holding board in place. Lift board up off of posts.

9.3.10 SWITCHING POWER SUPPLY

* Remove Top cover, Bottom cover, Processor unit, High Voltage Power Supply and CRT Yoke Assembly.

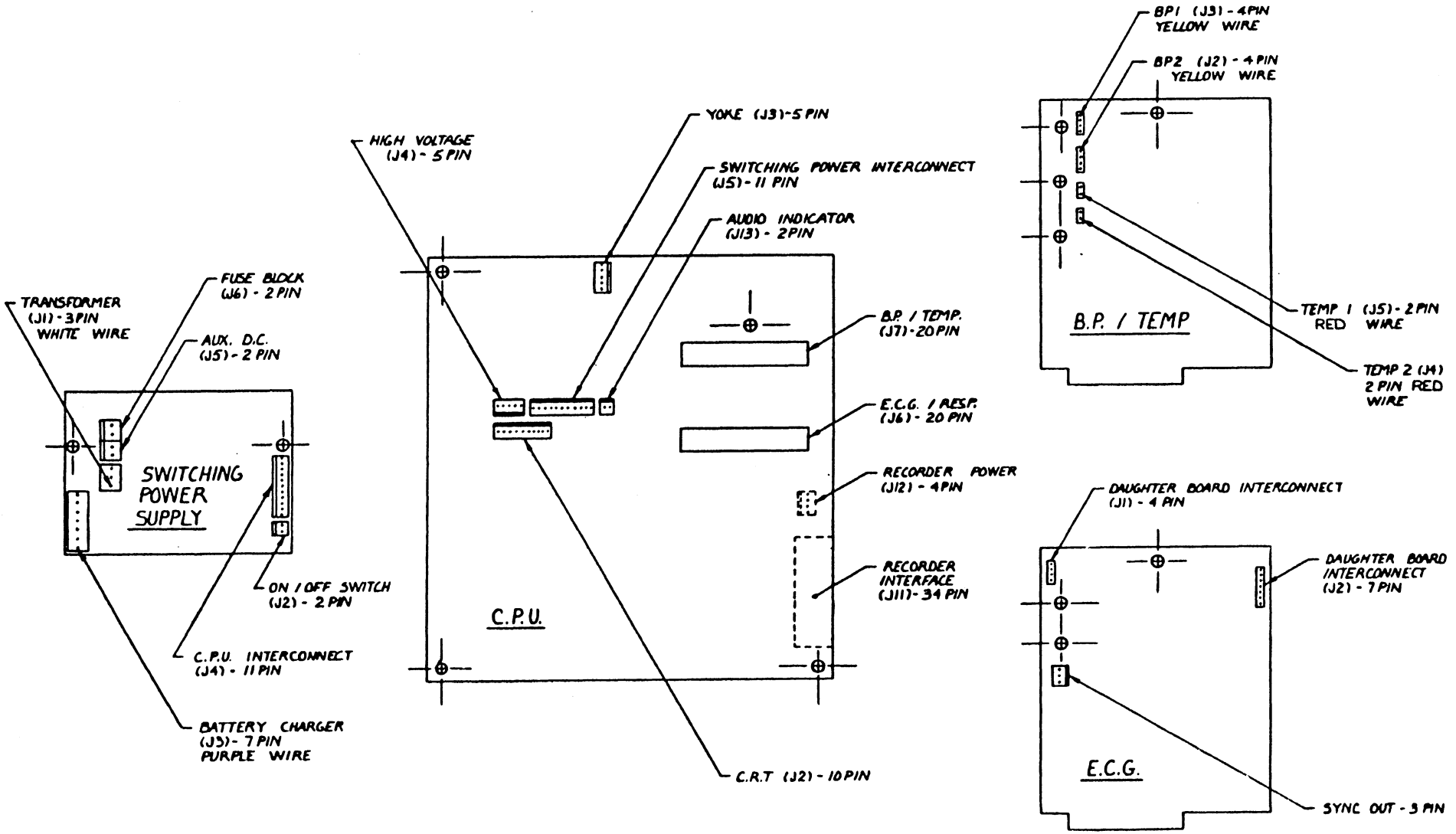
Unplug J1, J4, J5, J6 on Switching Power Supply Board. Using nut driver, remove two 3/16" nuts holding board in place. Lift out. Refer to connector placement drawing when replacing connectors.

9.3.11 AC POWER TRANSFORMER

* Remove Top cover, Bottom cover, Processor unit, CRT Yoke Assembly and High Voltage Power Supply.

Disconnect ground, fuse and switch connectors. Use an 11/32 open ended wrench to remove two nuts holding transformer to chassis. Lift out. Be sure to reconnect ground wire when assembling.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



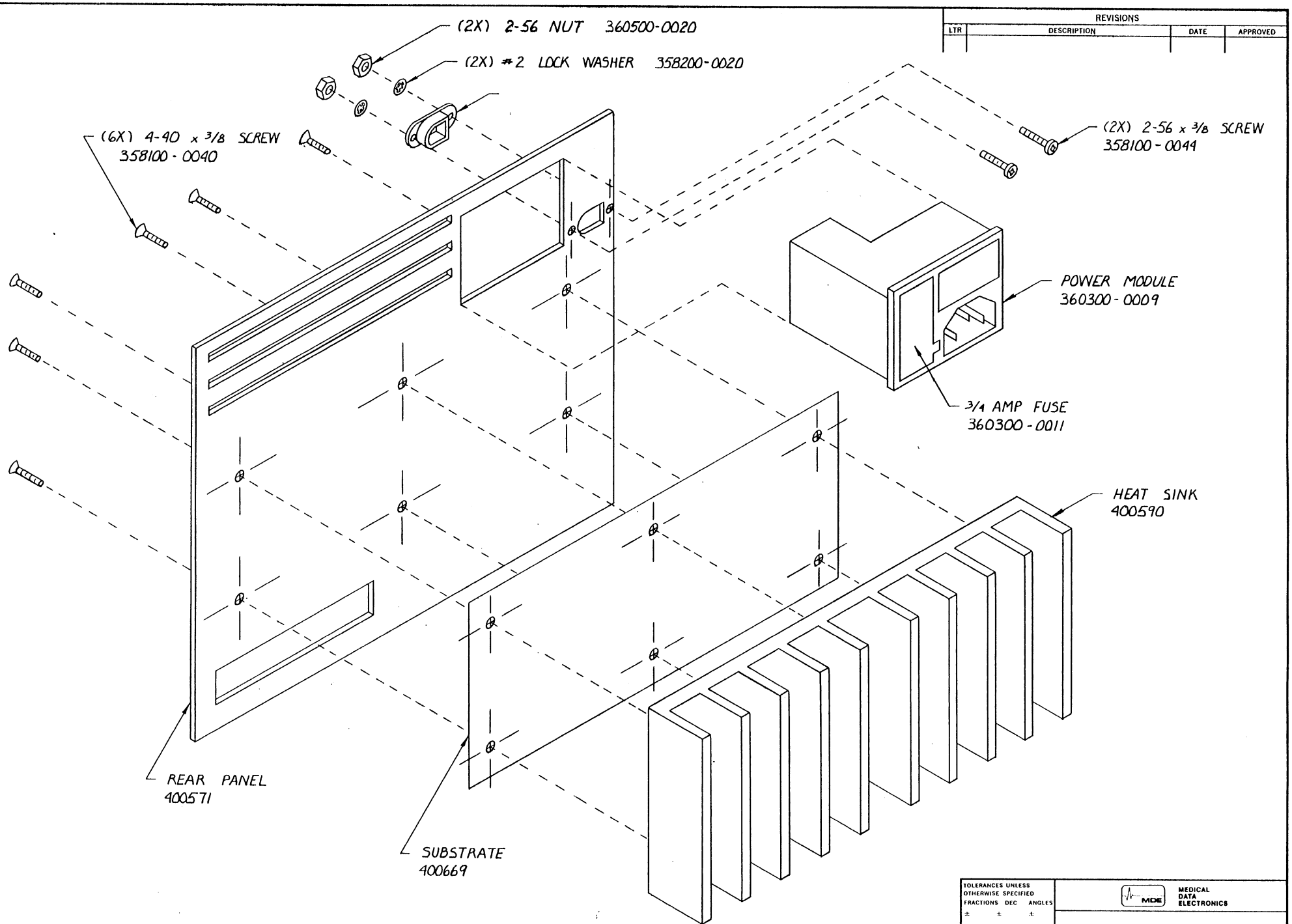
TOLERANCES UNLESS OTHERWISE SPECIFIED			
FRACTIONS	DEC	ANGLES	
±	±	±	
APPROVALS	DATE		
DRAWN			
CHECKED			

MEDICAL DATA ELECTRONICS

CONNECTOR DIAGRAM

SCALE	SIZE	DRAWING NO
3/4	C	

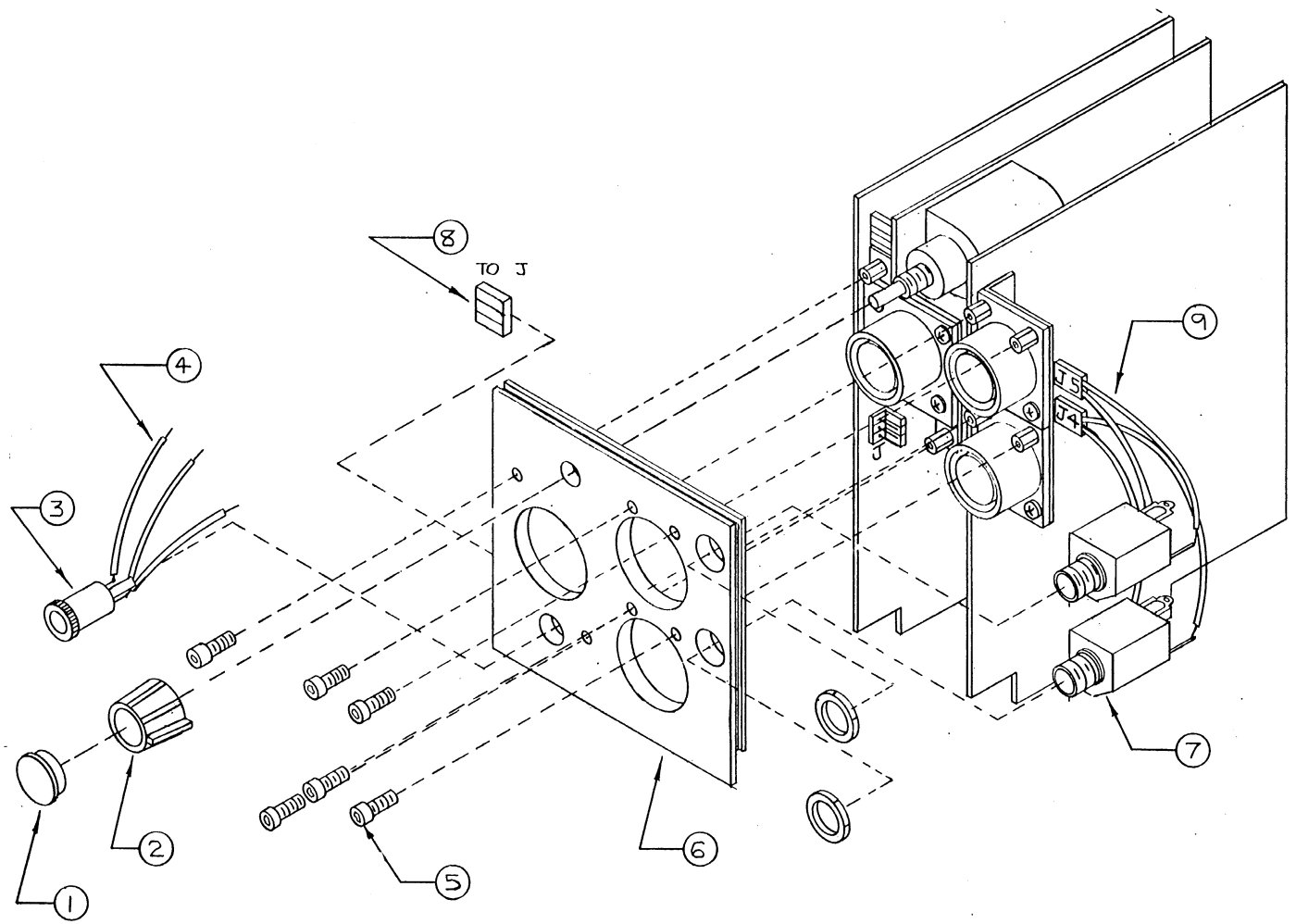
DO NOT SCALE DRAWING — SHEET 1 OF 1



REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

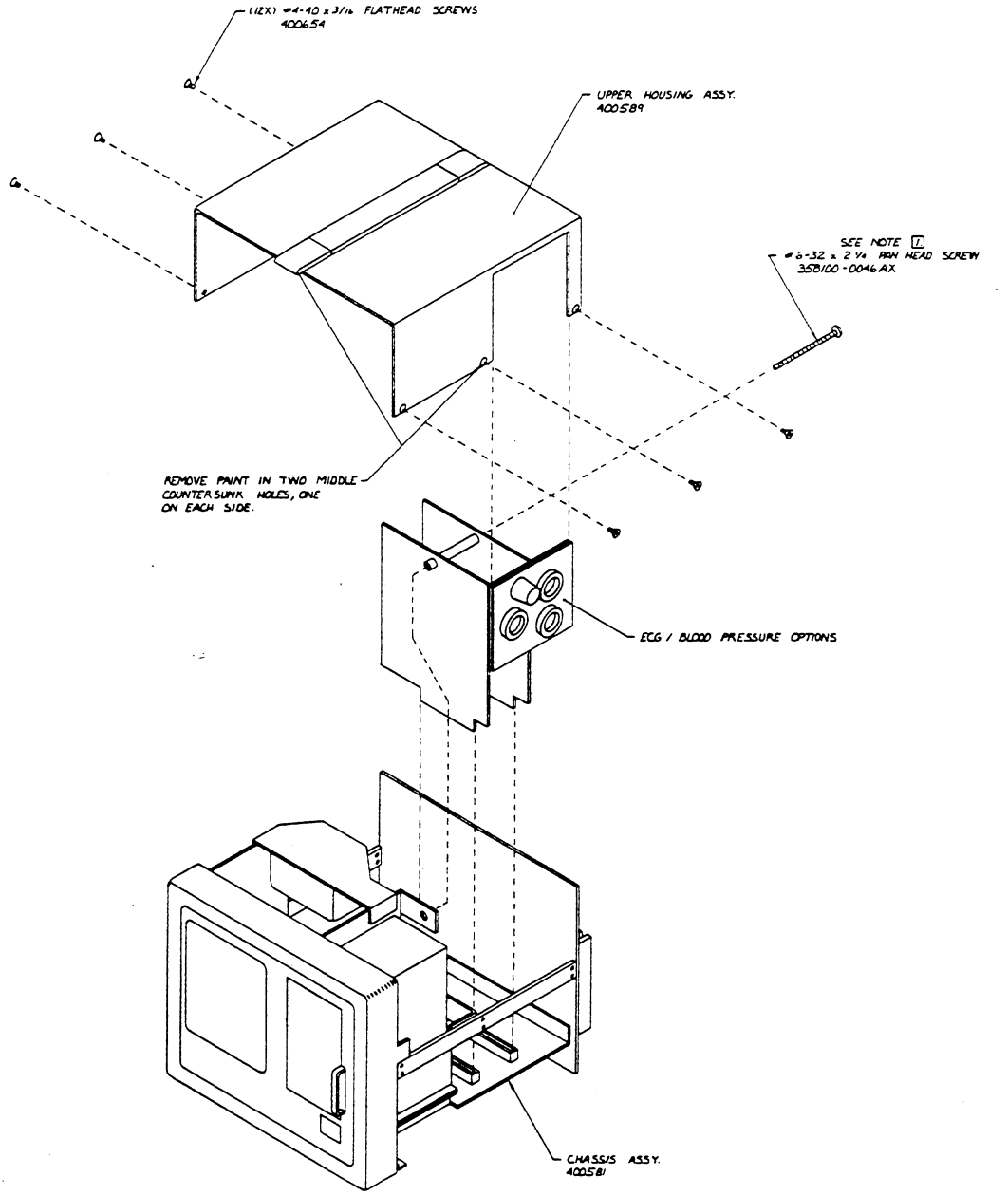
TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±		MDE MEDICAL DATA ELECTRONICS	
APPROVALS	DATE	REAR PANEL ASSY.	
DRAWN [illegible]	12-18-87		
CHECKED [illegible]	12-18-87	SCALE FULL	SIZE C
		DRAWING NO. 400591	
		DO NOT SCALE DRAWING	SHEET 1 OF 1

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	1-13-88	



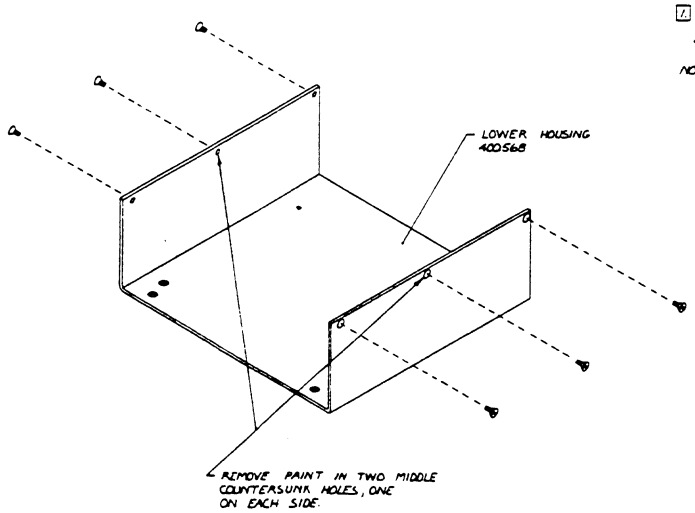
NO.	QTY.	DESCRIPTION	PART NO.
9	2	TEMP CONN. HARNESS	400697-0000
8	1	CONN. 3P FEMALE 24GA.	354000-0087
7	2	TEMP CONN. MN112-B	354000-0149
6	1	CONNECTOR PLATE	FREE STOCK
5	6	2-56 SOC HD. SCREWS	
4	2" EA	WIRE 24 GA. STRANDED	399100-
3	1	STEREO CONNECTOR	354000-0144
2	1	KNOB 15MM W/BLK LINE	360200-0005
1	1	GREY CAP FOR KNOB	360200-0006

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±		MEDICAL DATA ELECTRONICS
APPROVALS	DATE	CONNECTOR PLATE ASSY.
DRAWN A. KRAUSE	12-28-87	
CHECKED		SCALE FULL / SIZE C / DRAWING NO. 400679-0000
		DO NOT SCALE DRAWING / SHEET 1 of 1



1 WHEN BLOOD PRESSURE OPTION IS NOT USED USE #6-32 x 1/2 PAN HEAD SCREW #358100-0023AX INSTEAD OF #6-32 x 2 1/4 PAN HEAD SCREW #358100-0046AX.

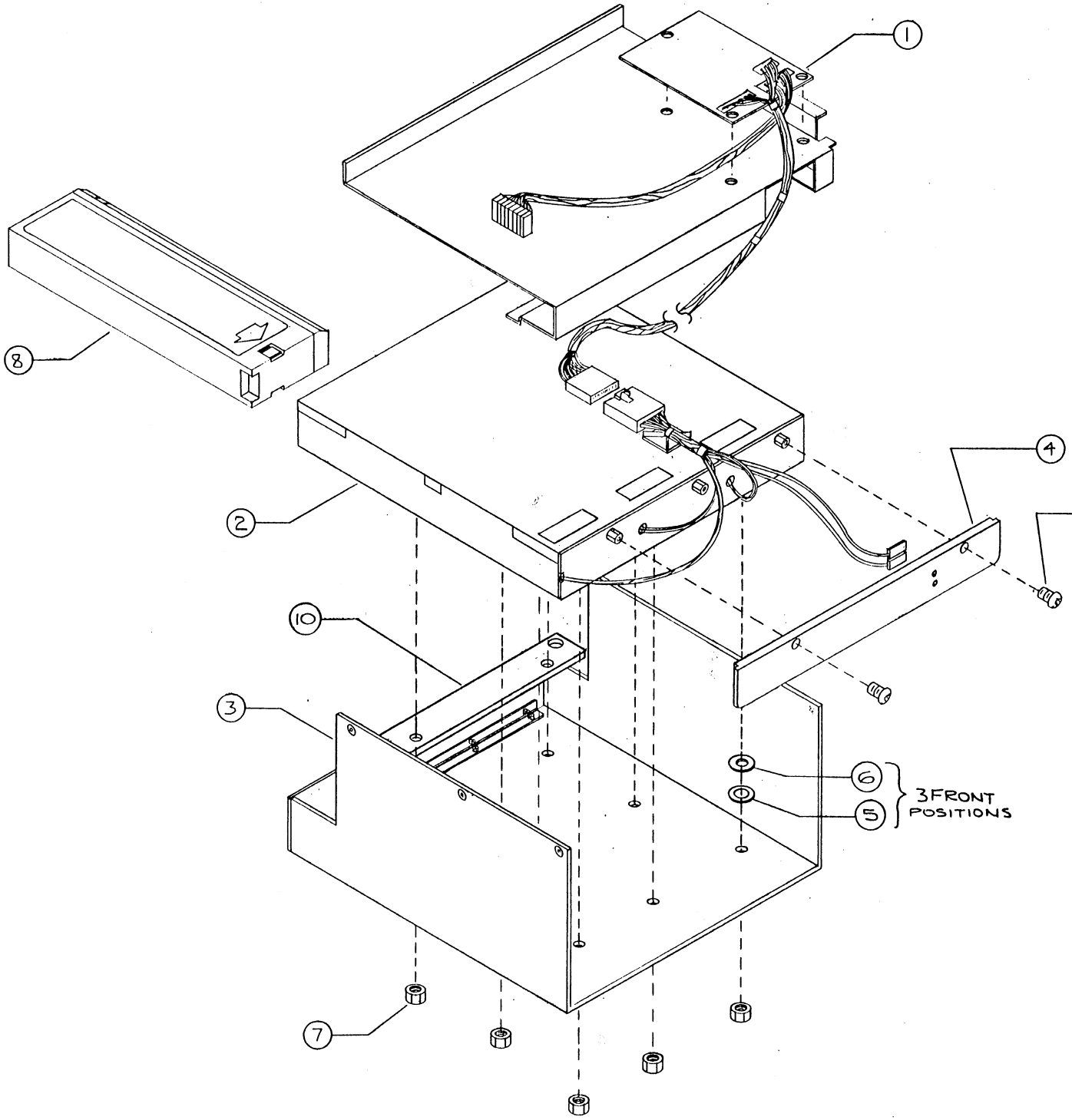
NOTES:



CHASSIS FINAL ASSY.

400581

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	2-12-88	
B	ADD SPACER PLATE	5-1-89	JS



NO.	QTY	DESCRIPTION	MDE #
10	1	PLATE, SPACER	400922-0000
9	2	4-40 x 1/4 BUTTON HD. SCREW	358100-0050AX
8	3	BATT. PACK W/LABEL	400691-0000
7	5	6-32 LOCK NUT	360500-0038AX
6	3	#6 FLAT FIBER WASHER	358200-0012AX
5	3	#6 FLAT STEEL WASHER	358200-0006AX
4	1	BATT. FRONT COVER PLATE	400686-0000
3	1	LOWER BATT. SKIN ASSY.	400616-0000
2	1	BATT ENCL. ASSY.	400604-0000
1	1	BATT CHARGER PCBA	400601-0000

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ± DEC ± ANGLES ±

APPROVALS	DATE
DRAWN A. KRAUSE	2-10-88
CHECKED	

MDE MEDICAL DATA ELECTRONICS

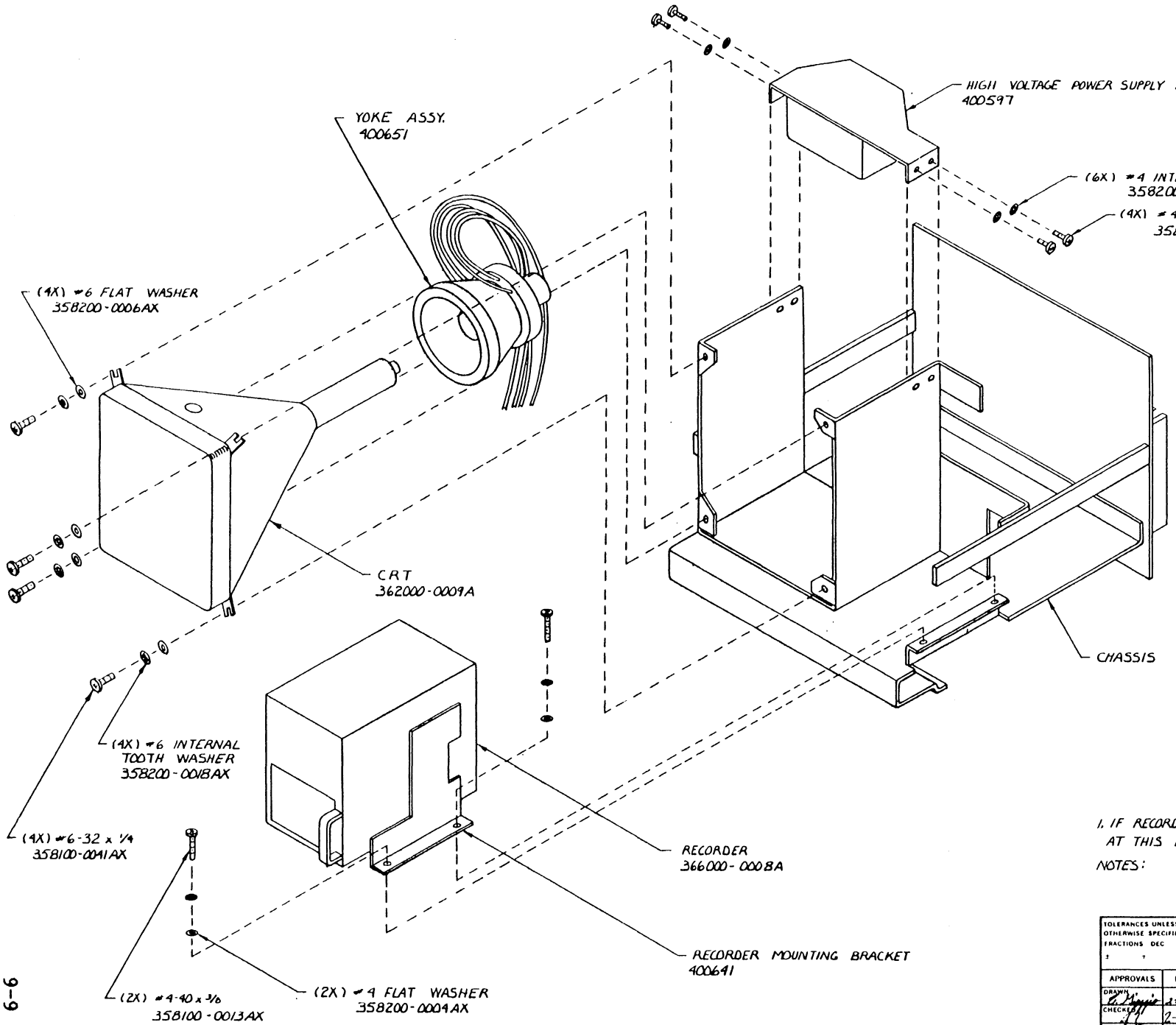
BATTERY OPTION ASSY.

Rev. B

SCALE HALF | SIZE C | DRAWING NO. 400582-0000

DO NOT SCALE DRAWING | SHEET 1 of 1

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

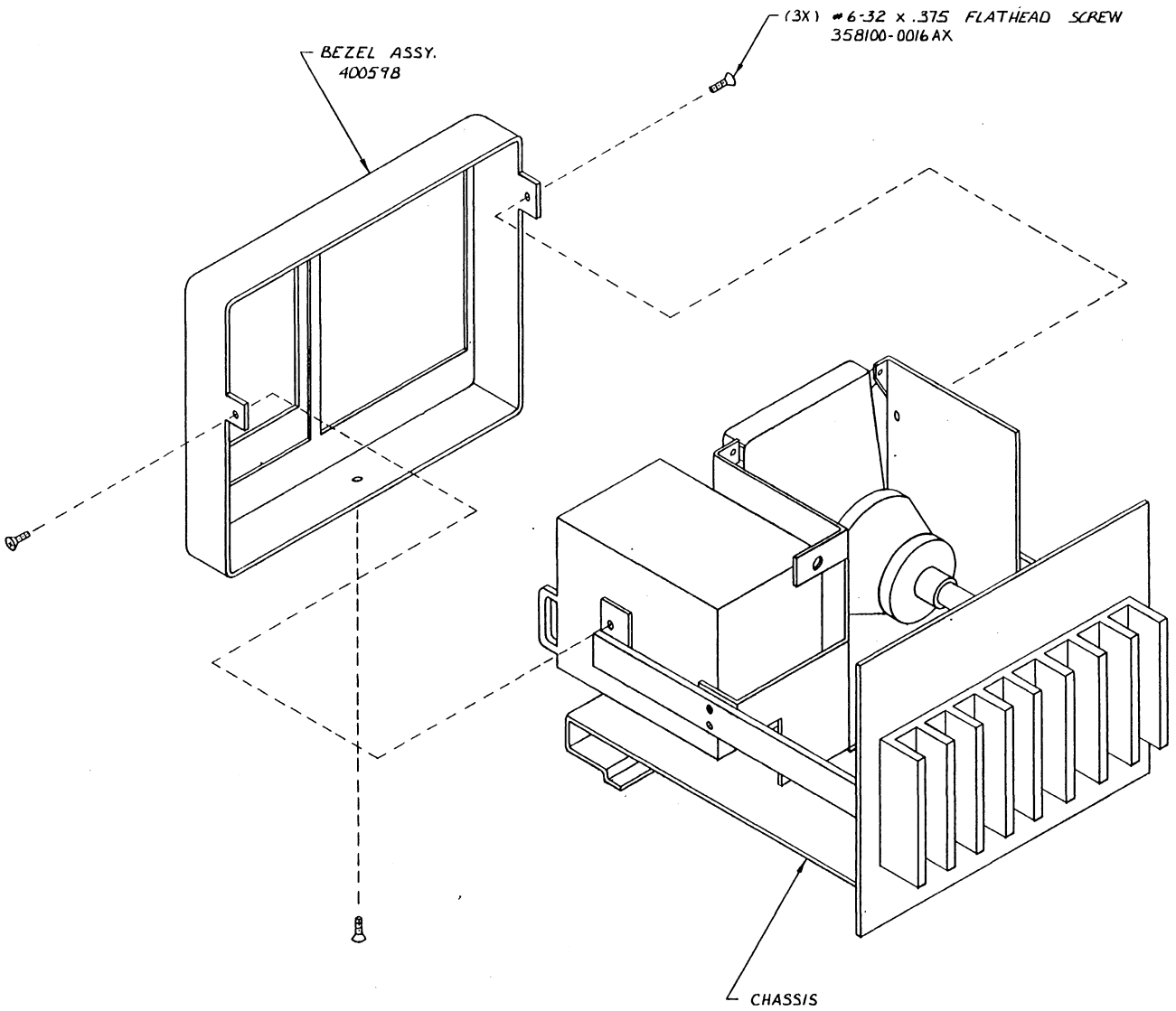


1. IF RECORDER OPTION, INSTALL RECORDER AT THIS LEVEL.

NOTES:

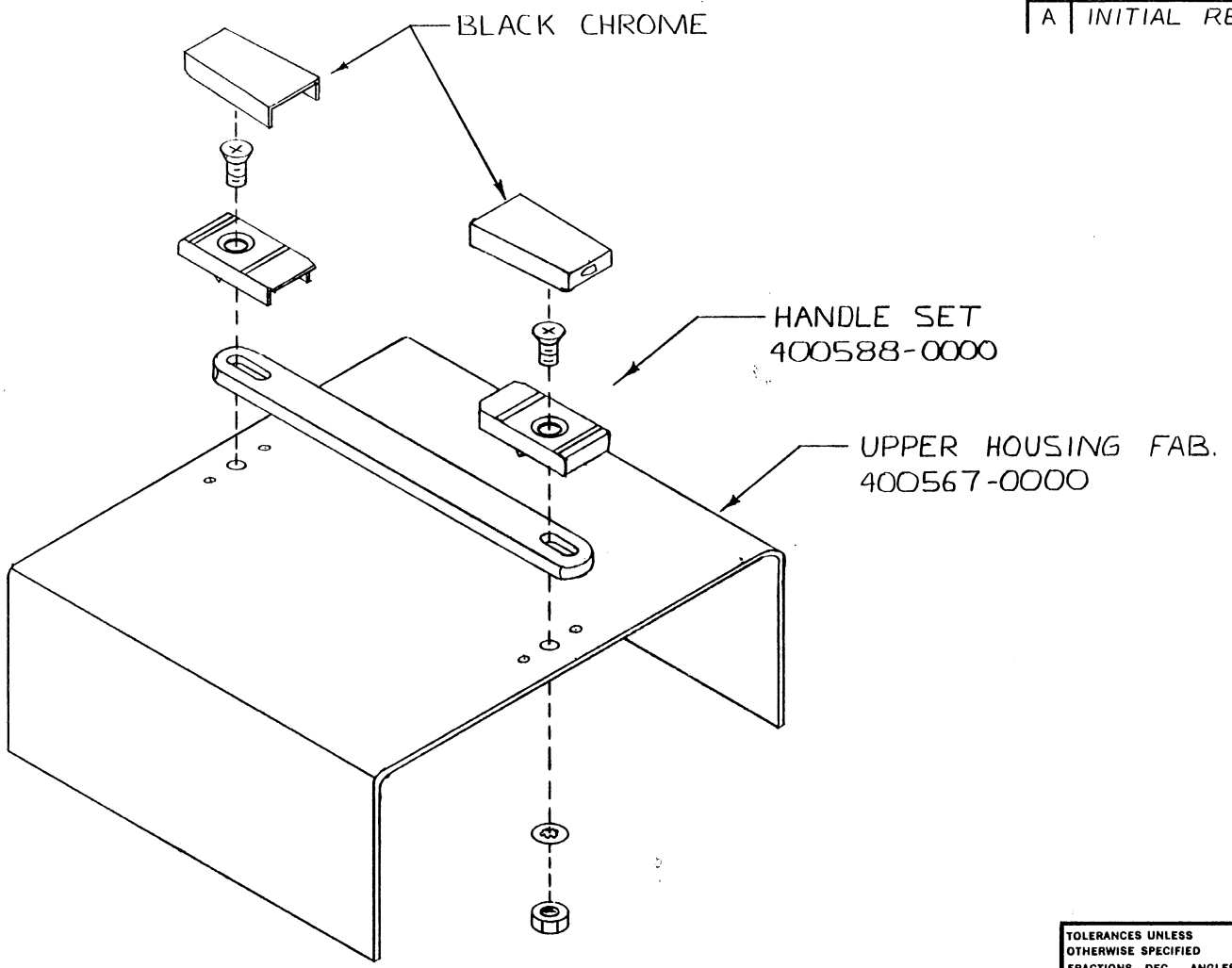
TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± .1 .2		MDE	MEDICAL DATA ELECTRONICS
APPROVALS	DATE	CHASSIS ASSY.	
DRAWN	1-14-88		
CHECKED	2-14-88	SCALE HALF	SIZE C DRAWING NO.
		DO NOT SCALE DRAWING	SHEET 4 OF 6

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±		MDE MEDICAL DATA ELECTRONICS	
APPROVALS	DATE	CHASSIS ASSY.	
DRAWN Ed Higgins	3-16-88		
CHECKED		SCALE HALF	SIZE C	DRAWING NO. 400581
		DO NOT SCALE DRAWING	SHEET 5 OF 6

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	INITIAL RELEASE	2-24-88	



TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS ± DEC ± ANGLES ±		MEDICAL DATA ELECTRONICS	
APPROVALS	DATE	UPPER HOUSING ASSY.	
DRAWN A. KRAUSE	2-24-88		
CHECKED	2-24-88	SCALE HALF	SIZE B — DRAWING NO. 400589-0000
DO NOT SCALE DRAWING			SHEET 1 of 1

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
00001	CHASSIS ASSEMBLY, E2 REV."N1" (D059)				F				N1	15

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401427-0000	*1	1	PCBA, KEYPAD BUFFER EII R EV. A (E822)	A	A	5	1.000	EA	41	Yes		
358100-0010A	*1	3	SCR, 4-40 X 1/2,PH PNHD,C AD1 ONLY		R	11	2.000	EA	26 - DO NOT ISSUE	Yes		
358100-0013A	*1	4	SCR, 4-40 X 3/8,PH PNHD,C AD1		R	11	6.000	EA	24 - DO NOT ISSUE	Yes		
358100-0016A	*1	5	SCR, 6-32 X 3/8,PH FLTHD, 100 DEGREE		R	11	5.000	EA	3 - DO NOT ISSUE	Yes		
358100-0031A	*1	6	SCR, 4-40 X 3/8,BUTTON HD ,BLK OXIDE		R	11	2.000	EA	12 - DO NOT ISSUE	Yes		
358100-0036A	*1	7	SCR, 4-40 X 1/4,PH PNHD,C AD2 OR ANY		R	11	6.000	EA	23 - DO NOT ISSUE	Yes		
358100-0041A	*1	8	SCR, 6-32 X 1/4 PHL PNHD		R	11	7.000	EA	13 - DO NOT ISSUE	Yes		
358200-0004A	*1	9	WSHR, #4 FLAT STL CAD1,(. 125ID,9/32OD,.025THK)		R	11	4.000	EA	25 - DO NOT ISSUE	Yes		
358200-0006A	*1	10	WSHR, #6 FLT STL CAD 1		R	11	4.000	EA	33 - DO NOT ISSUE	Yes		
358200-0007A	*1	11	WSHR, #4 INT TOOTH		R	11	22.000	EA	14 - DO NOT ISSUE	Yes		
358200-0008A	*1	12	WSHR, #8 INT TOOTH		R	11	2.000	EA	6 - DO NOT ISSUE	Yes		
358200-0018A	*1	13	WSHR, #6 INT TOOTH STEEL		R	11	7.000	EA	10 - DO NOT ISSUE	Yes		
360500-0021A	*1	14	NUT, #4 HEX,SM PTRN		R	11	8.000	EA	16 - DO NOT ISSUE	Yes		
358200-0009A	*1	15	WSHR, #4 SPLIT LOCK		R	11	2.000	EA	15 - DO NOT ISSUE	Yes		
360500-0024A	*1	16	NUT, #8 HEX,LRG PTRN		R	11	2.000	EA	5 - DO NOT ISSUE	Yes		
362000-0009A	*1	17	CRT (FOR ESCORT II) **(FIFO)**		R	55	1.000	EA	32	Yes		
400030-0000	*1	18	CBL, PWR SUPPLY-CRT, REV. D D - E2		A	2	1.000	EA	37	Yes		
400032-0000	*1	19	AUDIO INDICATOR ASSY(BEEP ER) REV. A - E2		A	1	1.000	EA	7	Yes		
400569-0000	*1	20	MAIN CHASSIS, REV. 'I'		R	22	1.000	EA	9	Yes		
400570-0000	*1	21	BRKT, CRT, REVISION 'F1' (D043)	F1	R	22	1.000	EA	2	Yes		
400573-0000	*1	22	MOUNTING BAR, FAB. REVISION 'D'		R	33	2.000	EA	4	Yes		
385000-0014A	*1	23	SHRINK TUBING, 3/16 INCH CLEAR MUST BE MARKED UL		R	11	2.250	IN.	42 3PCS @ 3/4" EA	Yes		
400591-0000	*1	24	REAR PANEL ASSEMBLY, EII, REVISION "E"		A	0	1.000	EA	11 - DO NOT ISSUE	Yes		
400593-0000	*1	25	PCBA, SWITCH.PWR.SUPPLY, REV. P1 (D045) - E2	P1	A	0	1.000	EA	21 - DO NOT ISSUE	Yes		

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
500001	CHASSIS ASSEMBLY, E2 REV."N1" (D059)				F				N1	15

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
400596-0000	*1	26	PCBA, CPU ESCORT II, E2 R EV. "AH" (E923)	AH	A	22	1.000	EA	22 - DO NOT ISSUE	Yes		
400597-0000	*1	27	HIGH VOLT PWR SPPLY ASSY REV. B*FIFO*(E767) - E2	B	A	0	1.000	EA	30	Yes		
400598-0000	*1	28	BEZEL ASSEMBLY, ESCORT II , REV. "A" - E2		A	5	1.000	EA	34 - DO NOT ISSUE	Yes		
400630-0000	*1	29	FAB HEAT SINK PLATE, REV. "D" - E2		A	20	1.000	EA	27	Yes		
400632-0000	*1	30	CABLE, CPU POWER CABLE, R EV. "B" - E2		A	0	1.000	EA	29	Yes		
400633-0000	*1	31	CHASSIS XFORMER ASSY., RE V G1 (D038) **(FIFO)**E2	G1	A	0	1.000	EA	8	Yes		
400634-0000	*1	32	FUSE BLOCK ASSEMBLY, REV. "A1" (D017) - E2	A1	A	0	1.000	EA	1	Yes		
400636-0000	*1	33	CABLE, ON/STNBY., E2 RE V."D1" (D051)		A	0	1.000	EA	28	Yes		
400648-0000	*1	34	BRKT, BEZEL MNTNG.REV.'F'		R	22	1.000	EA	18	Yes		
400651-0000	*1	35	YOKE ASSY. W/CONN'S EII R EV C **(FIFO)**		R	33	1.000	EA	31	Yes		
400654-0000	*1	36	FAB GREY PAINT SCREW #4-4 0X3/16 (FROM 358100-43A)		A	5	12.000	EA	**GIVE TO TEST DEPT.*	Yes		
400685-0000	*1	37	SERIAL NUMBER LABEL, EII, *SEE 'Z'/ORDER, REV 'B'		R	11	1.000	EA	39 - DO NOT ISSUE	Yes		
360300-0010A	*1	41	FUSE, 6.3A SLO-BLO 5X20MM		R	11	1.000	EA	-	Yes		
401357-0000	*1	43	SHIP KIT FOR 500001 CHASS IS ASSY. R2 REV. B (E920)	B	A	5	1.000	EA	DO NOT ISSUE	Yes		
400895-0000	*1	45	LABEL, C.S.A. EXPLOSION, 'DANGER:EXPLOSION HAZARD'		R	22	1.000	EA	17	Yes		
400711-0000	*1	46	FAB, FISH PAPER 61.81SQ"/ PC.(7.25" X 7.75"),REV. A		A	0	1.000	EA	38	Yes		
360500-0075A	*1	51	HEX NUT,SS 832(1/4X3/32 T HK) XTRASMALL PATTERN		R	22	1.000	EA	40 - DO NOT ISSUE	Yes		

Cumulative Lead Time for 500001 = 70

ITEM	LEVEL	SEQ.	DESCRIPTION	BEG DATE	END DATE	QUANTITY	UNIT COST	EXTENDED COST	REFERENCE
400567-0000	*1	1				1.0	11.65	11.65	-
			M-001, UPPER HOUSING FAB., REVISION "H"						
400588-0000	*1	2				1.0	6.01	6.01	-
			HANDLE SET, FAB END PCS. ONLY (2/SET), REV. "A"						

TELEMETRY OVERVIEW

CHAPTER 10

10.0.0 TELEMETRY SYSTEMS OVERVIEW

The **ESCORT** telemetry monitor is a universal standard bedside monitor. It is factory configurable for either 200MHz or 450MHz receivers, and is user programmable for most transmitter brands, and all TV bands and channels within the FCC allowable frequency range. The Escort telemetry also has options that can give hardwire/telemetry selectable ECG, hardwire blood pressure, temperature, and modular battery operation (not available on E200T).

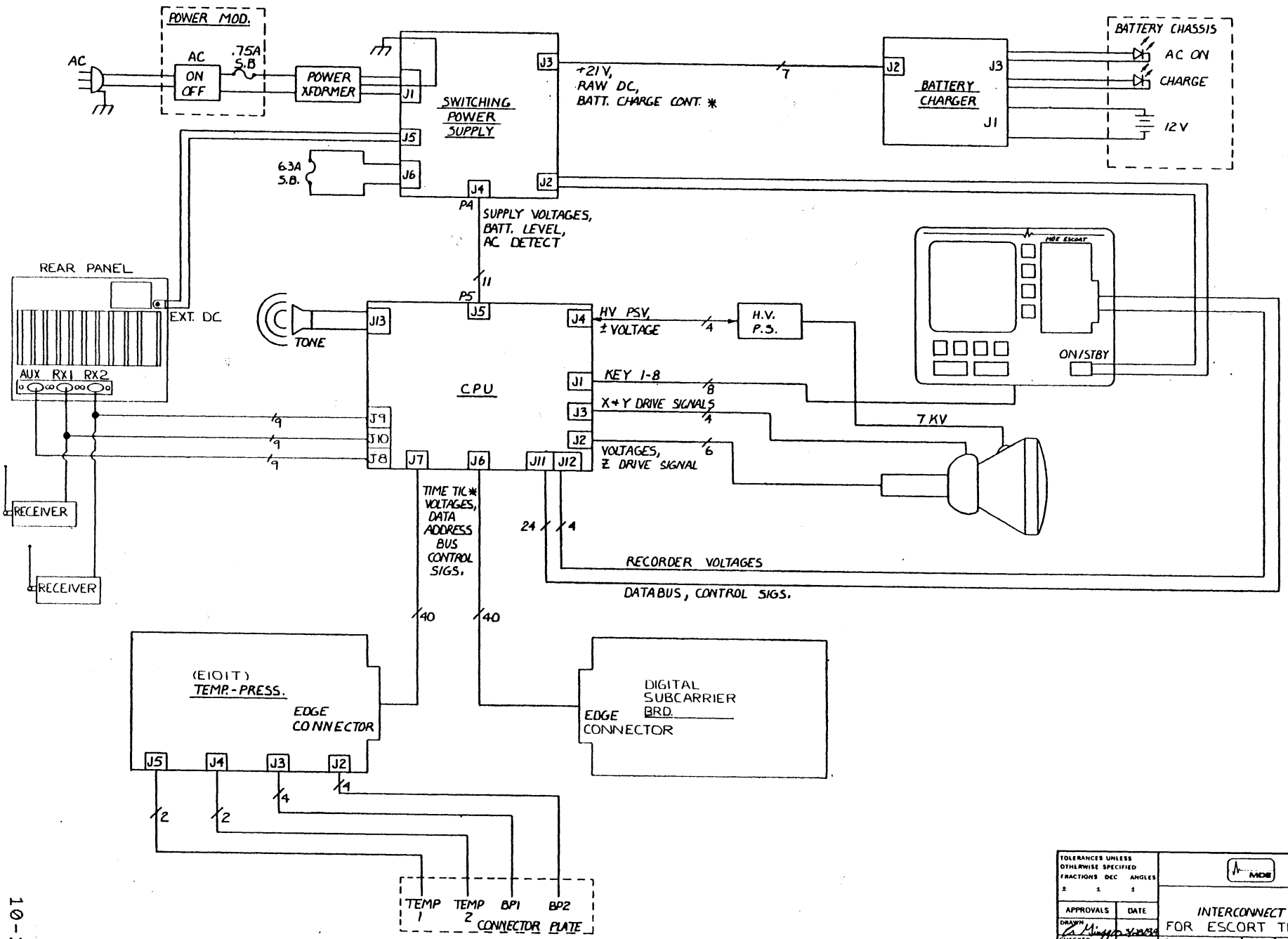
Some of the components comprising the Escort telemetry are also used in the hardwire model. These include the chassis, CRT, face plate, CPU board, switching power supply board, battery charger board, and rear DC auxiliary input. In addition the telemetry model includes lower housing, receivers, antennas, and digital subcarrier board.It can also include a 3 AH battery, hardwire blood pressure board, and recorder, if those options are purchased.

The monitor will receive the FM/FM modulated signal through the antenna which directs the signal to the receiver. The receiver strips off the first FM and sends the subcarrier signal on to the digital subcarrier board through the ribbon cable located at the back of the monitor. The digital subcarrier will then further demodulate, filter, and digitize the ECG signal to send to the CPU board for processing, calculating, and finally, to display on the CRT.

As in the hardwire model, high level,HL, outputs are available at the rear auxiliary output connector. This information can be found in the CPU chapter.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

INTERCONNECT DIAGRAM FOR ESCORT TELEMETRY



10-2

TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	±

APPROVALS	DATE
DRAWN	
CHECKED	

MEDICAL DATA ELECTRONICS

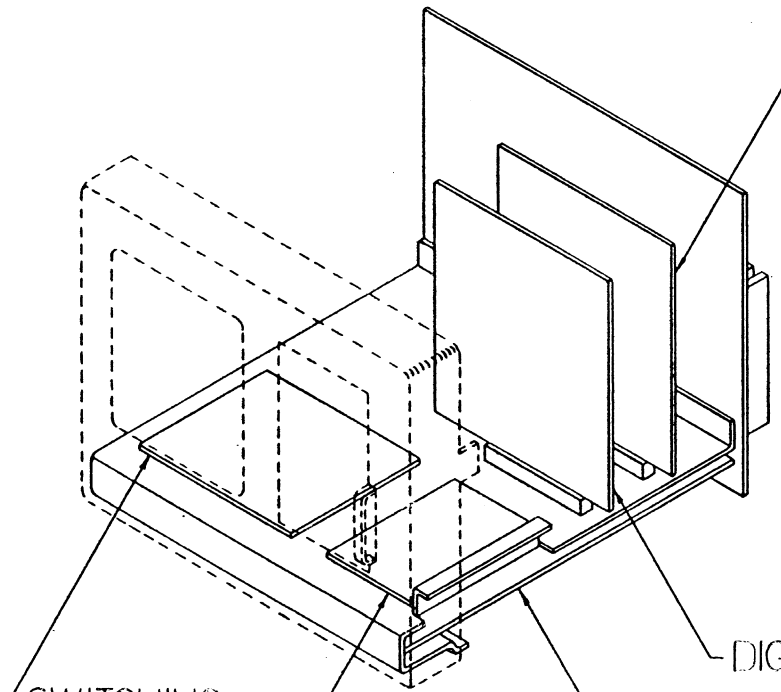
INTERCONNECT DIAGRAM FOR ESCORT TELEMETRY

SCALE | SIZE C | DRAWING NO.

DO NOT SCALE DRAWING | SHEET 1 OF 1

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

TELEMETRY BOARD LOCATION



TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS ± DEC ± ANGLES ±		MDE MEDICAL DATA ELECTRONICS	
APPROVALS	DATE	TELEMETRY BOARD LOCATION	
DRAWN L. Wagner	4-26-88		
CHECKED		SCALE 1/2	SIZE C
		DRAWING NO	
		DO NOT SCALE DRAWING	SHEET 1 OF 1

ESCORT TELEMETRY SPECIFICATIONS

200 MHZ RECEIVER

PER FCC PART 15
Input Carrier Range: 174 to 216 MHz
Tuneable Range: 42 MHz
Carrier Freq Resolution: 2.5 KHz
IF Frequency: 21.4 MHz
Selectable Channels: Up to 840
Sensitivity: 1 uV typical
Image Rejection: 70 dB
Input Signal Range: -20 to -110 dBm
Modulation Type: FM/FM
Subcarrier Frequency: 800 to 8000 Hz
Signal Outputs*: Lead fail, low battery
remote record, pacer, cal

450 MHZ RECEIVER

PER FCC PART 15
Input Carrier Range: 457 to 470 MHz
Tuneable Range: 13 MHz
Carrier Freq Resolution: 12.5 KHz
IF Frequency: 21.4 MHz
Selectable Channels: 189
Sensitivity: 1uV typical
Image Rejection: 50 dB
Input Signal Range: -20 to -110 dBm
Modulation: FM/FM
Subcarrier Frequency: 1000 Hz
Signal Outputs*: Lead fail, low battery
remote record, pacer

*Depends on transmitter capability

DIGITAL SUBCARRIER BOARD

CHAPTER 11

11.0.0 DIGITAL SUBCARRIER BOARD

11.1.0 OVERVIEW

The Digital Subcarrier Board in the **ESCORT 100T/200T** provides a universal method of decoding various biomedical telemetry signals from a wide variety of transmitter manufacturers.

The subcarrier signal is received in an analog format, and is turned into a digital format. This digitized signal then has the subcarrier portion of the signal removed leaving only the digital ECG. The digital representation of the ECG waveform is then sent to the CPU Board for further processing.

This board is also responsible to dispatch to the receiver the data it needs to configure itself to the appropriate TV band and manufacturer type currently being received.

11.2.0 MICROPROCESSOR

A Z-80 type microprocessor is used on the digital subcarrier board. Xtal Y1, an 8 MHz oscillator, is divided by two for a 4 MHz clock signal to drive the microprocessor, U6. RESET* comes in from the CPU Board to reset the processor at pin 26. Pins 17 and 25 are tied high and not used. INTR* at pin 16 will interrupt the processor when the required amount of cycles has been counted by the timers, U7, U9, and U11. The address and data buses communicate data to and from the timers, dual port RAM and ROM as well as other chips. The signal WAIT* at pin 23 inserts wait states to the dual port RAM. Memory request (MR*), write (WR*), read (RD*) and I/O outputs at pins 19-22 are decoded by U15 for the control signals memory read (MRRD*), memory write (MRWR*), I/O write (IOWR*), and I/O read (IORD*).

11.2.1 EPROM, AND DUAL PORT RAM

U8, an 8 X 64K EPROM, is enabled through U16 which decodes A11-A15. That along with memory read (MRRD*) at pin 22 will put the EPROM data on the bus. The same signal, inverted through U17, will enable U13, the dual port RAM. The dual port RAM interfaces the digital subcarrier board to the CPU Board. Data is written to and read from the CPU Board through the edge connector.

11.2.2 DECODERS

U10 decodes address lines A5, A6, A7 for the chip enable signals I/O 1-7. These signals, along with IORD* and IOWR*, will enable various functions throughout the board. U14 decodes for the signals LEVEL SELECT, FLT SEL (filter select) and GATE 0-2. U14 also interfaces to the receiver by sending data to indicate what first FM frequency to decode in the FM/FM demodulation. U5 decodes for the signal GAIN SELECT, which goes to U21 pin 5.

11.2.3 VOLTAGE REGULATORS

U20 and U22 regulate the +10 volts and -10 volts. The voltages are then filtered by C23, C24, C39 and C40.

11.2.4 AMPLIFICATION OF SIGNAL

The subcarrier input (SUB CAR) from the receiver enters the subcarrier board from the edge connector through the CPU Board. the signal enters a variable gain stage comprised of U21 and Q8. The signal GAIN SELECT at U21 pin 5 will adjust the gain stage either high or low depending on the selected manufacturer. The ability to vary the gain eliminates the possibility of clipping the signal and losing information.

11.2.5 THREE CHANNEL FILTERING

The amplified signal then goes to a three channel filtering stage. All three filters are similar in operation, but have a different bandwidth. Which filter is used is dependent on the manufacturer and what parameter is being decoded. For simplicity we will discuss the F1OUT filter located in the center of the schematics.

11.2.6 SWITCHED CAPACITOR FILTERS

R4 and C2 pre-filter the signal. U24 and U2 are switched capacitor filters whose bandpass center frequency is dependent on the clock input at pin 3, (F1CLK). By putting the filters in series, the bandpass is sharpened. The output at U2 pin 2 then goes through a low pass filter to remove any signal from the clock that was input to U24 and U2. The sinewave is then turned into a squarewave by U4, a high gain amplifier, with the edges sharpened by U18 and Q4. The subcarrier signal has now become a digital squarewave, (F1OUT), that can be processed and further decoded.

Aside from the filter circuit just described, the center filter, F1OUT, has additional circuitry. The signal filter select, FLT SEL, is used to lower the bandpass of the filter circuit at the output of U2. The switched capacitor filter is used for detecting auxiliary parameters such as remote record and low battery signals which can be transmitted at very low frequencies. If one of these functions is being looked at, the bandpass center frequency is lowered by turning Q1 and Q2 on. This will put C11 and C12 in parallel with C9 and C10, lowering the cutoff frequency and removing any clock signal that may have entered the subcarrier signal.

The signal LEVEL SELECT puts R43 in parallel with R15 by turning on Q7. This reduces hystersis and will make the comparator, U4, more sensitive when it is looking for small signals like pacers.

Then to reduce noise on the signal, Q7 will switch off and only a large signal will cause U4 to switch high and low.

11.2.7 TIMERS

U7, U9, and U11 are all high performance CMOS programmable interval timers. Each has three independently programmable 16 bit counters. U7 acts as a function generator to the switched capacitor filters, U1, U2, U3, U23, U24, and U25. The microprocessor will program U7 for the appropriate frequency output at pins 10, 13 and 17, (F0CLK, F1CLK, and F2CLK), depending on the selected manufacturer and other parameters. The clock output will be 54.5 times the center frequency required of the switched capacitor filters.

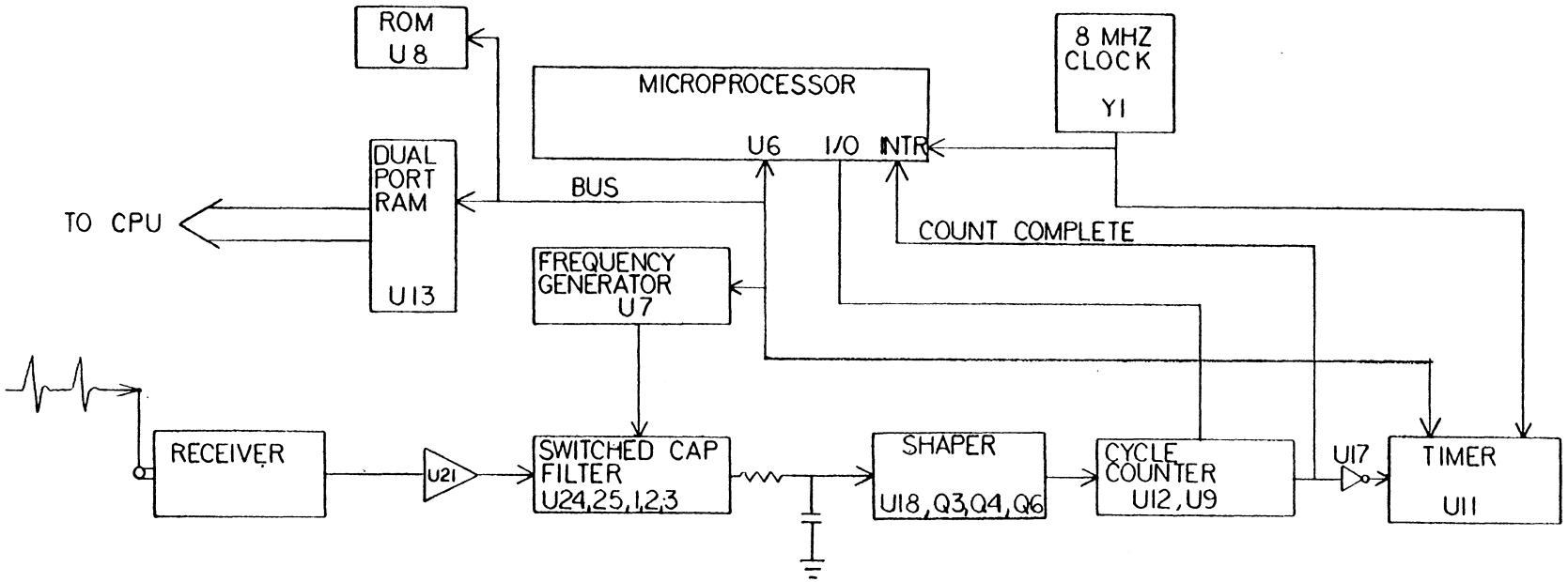
The U9 timer is responsible for counting "cycles". One cycle is equal to the space between positive edges of the square wave. The signals GATE 0-2 will tell U9 to begin counting on the next positive edge of the input at pins 9, 15, and 18, (F0OUT, F1OUT, F2OUT). At this time the outputs, OUT 0-2, will go low to indicate the start of the count. This data goes to U11, after being inverted at U17, which will start counting.

U11's function is to count 8 MHz clocks during the period of time set by the microprocessor called a sample. When the prescribed number of cycles has been counted, the outputs of U9 will go high to signify the end of the sample being taken. This will signal U12, PAL, which will interrupt the microprocessor, (INTR*), to retrieve the data from U11.

This "time counted" along with the number of "cycles counted" is used to calculate the incoming subcarrier frequency.

Once the data has been retrieved, the processor will automatically reset the timers to count the next data sample. The processor then must keep track of where the incoming frequency is, compared to the manufacturers selected center frequency, to determine the actual ECG waveform.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	±

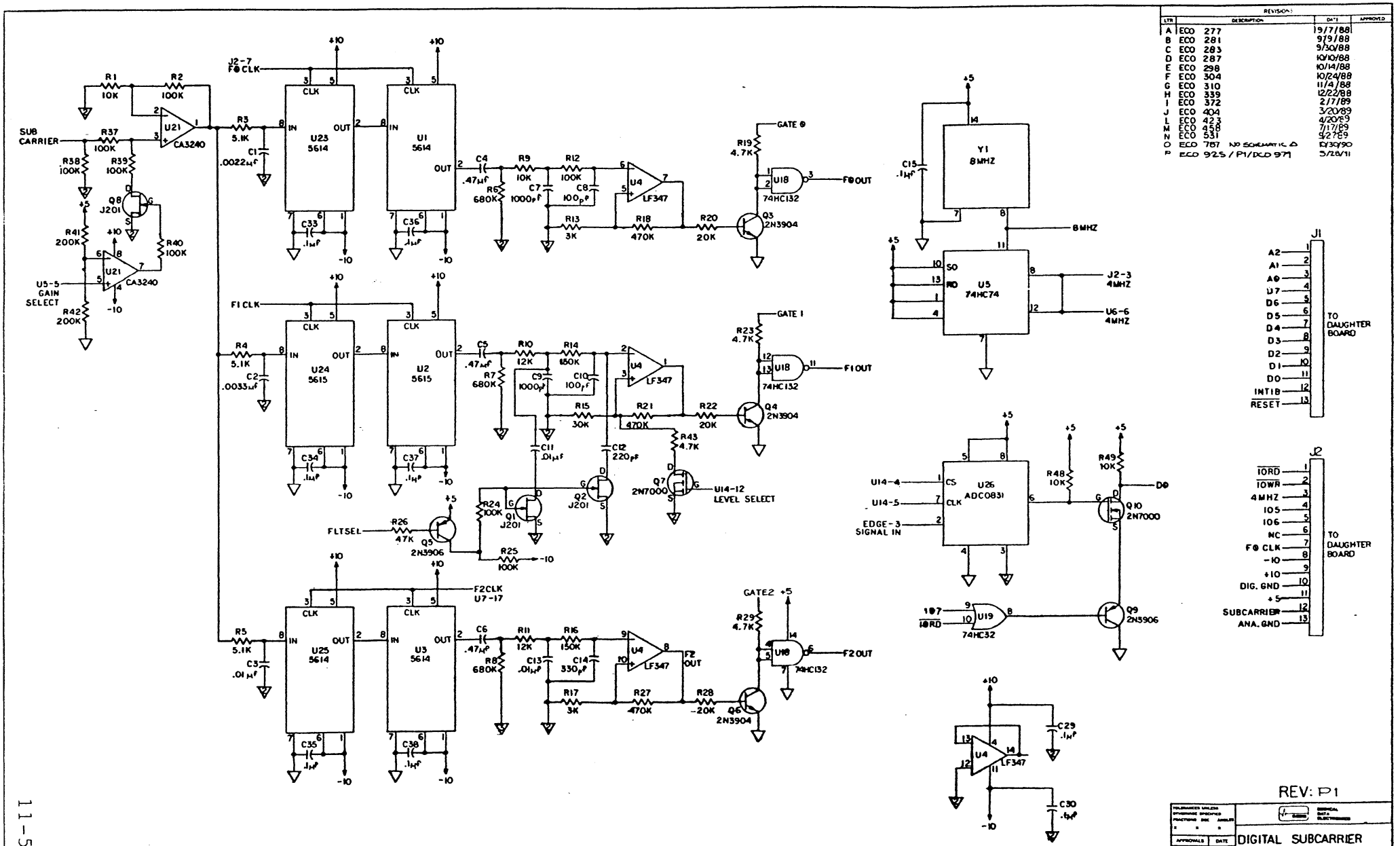
APPROVALS	DATE
DRAWN A. KRAUSE	11-7-88
CHECKED	

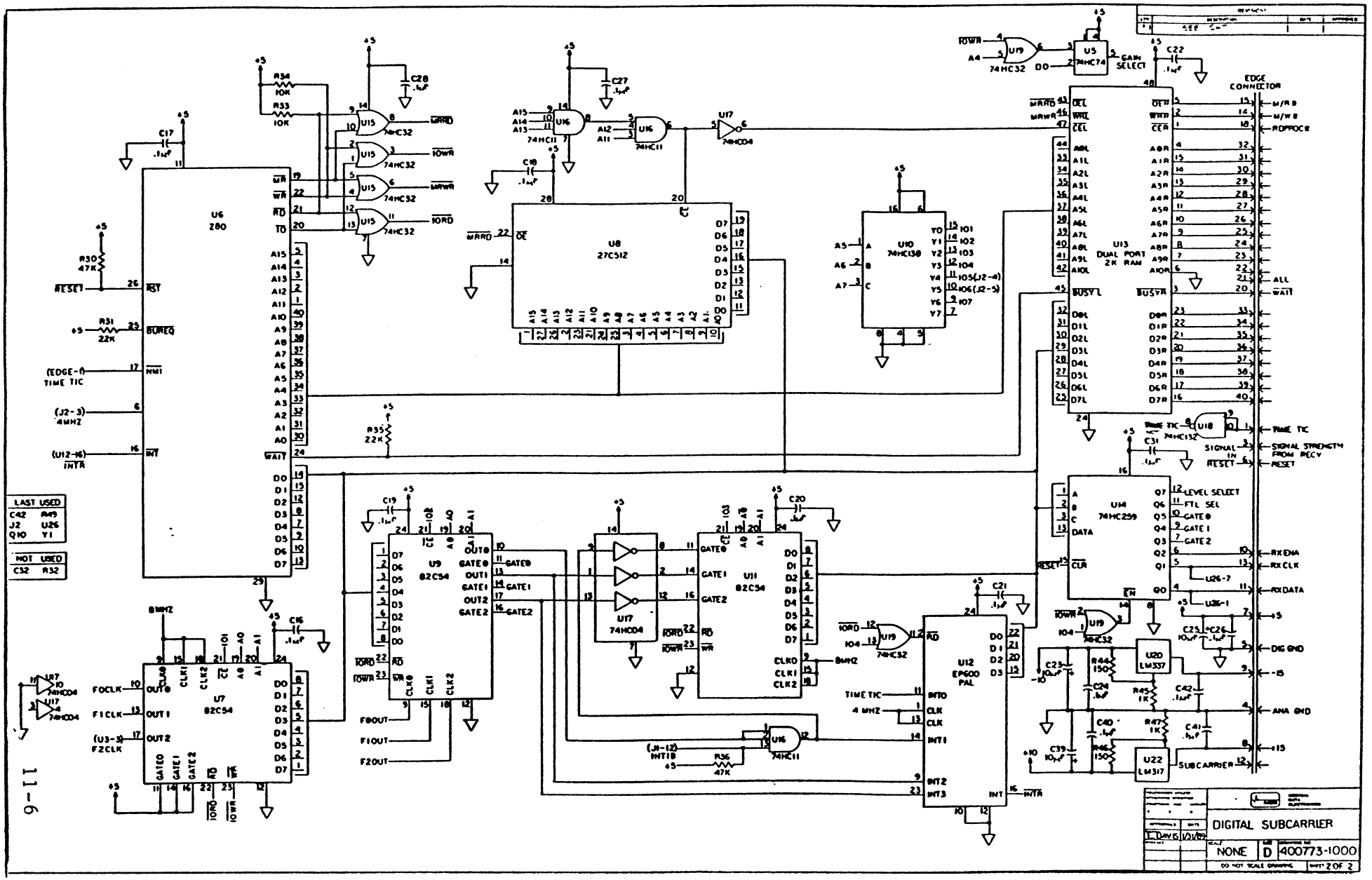
MEDICAL DATA ELECTRONICS

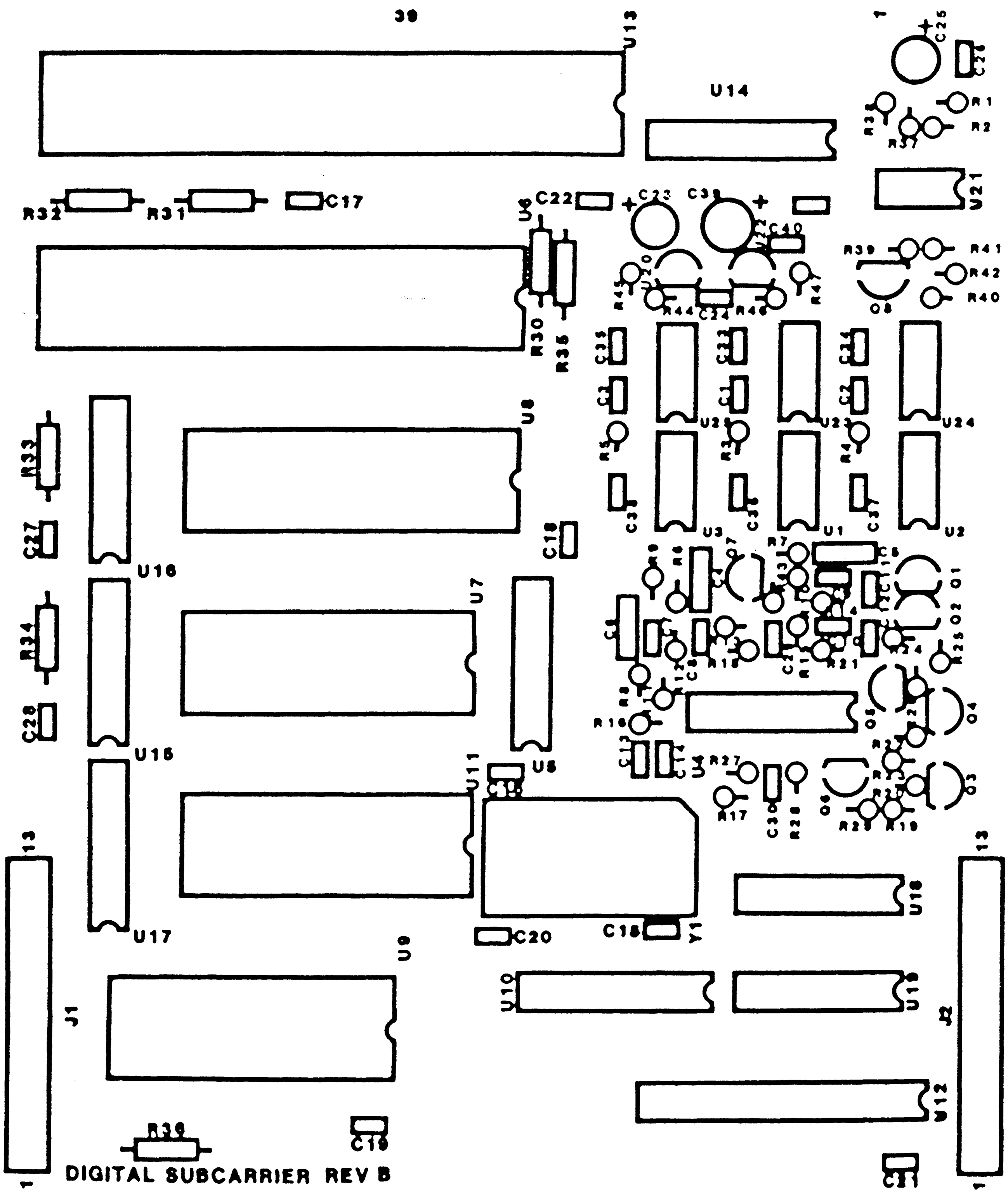
DIGITAL SUBCARRIER BOARD
BLOCK DIAGRAM

SCALE	SIZE	DRAWING NO.
Ø	B	

DO NOT SCALE DRAWING — SHEET 1 OF 1


REVISIONS
LTR DESCRIPTION DATE APPROVED
A ECO 277 9/7/88
B ECO 281 9/9/88
C ECO 283 9/30/88
D ECO 287 10/10/88
E ECO 298 10/14/88
F ECO 304 10/24/88
G ECO 310 11/4/88
H ECO 339 12/22/88
I ECO 372 2/7/89
J ECO 404 3/20/89
K ECO 423 4/20/89
L ECO 458 7/17/89
M ECO 531 9/27/89
N O ECO 787 NO SCHEMATIC Δ 10/30/90
P ECO 925 / P1/DCO 971 5/28/91
SUB CARRIER
GAIN SELECT
F0 CLK
F1 CLK
F2 CLK
FLTSEL
LEVEL SELECT
EDGE-3 SIGNAL IN
GATE 0
GATE 1
GATE2
F0 OUT
F1 OUT
F2 OUT
8MHZ
4MHZ
TO DAUGHTER BOARD
DIGITAL SUBCARRIER
REV: P1
NONE
D
400773-1000
SHEET 1 OF 2
11-5


DIGITAL SUBCARRIER
NONE
D
400773-1000
SHEET 2 OF 2
DO NOT SCALE DRAWING
EDGE CONNECTOR
U6 Z80
U8 27C512
U9 82C54
U7 82C54
U11 82C54
U12 EP600 PAL
U13 DUAL PORT 2K RAM
U14 74HC259
U10 74HC138
U5 74HC74 GAIN SELECT
U15 74HC32
U16 74HC11
U17 74HC04
U18 74HC132
U19 74HC32
U20 LM337
U22 LM317
LAST USED
NOT USED
11-6


39
1
U13
U14
C25
C26
R1
R2
R37
U21
R32
R31
C17
C22
C23
C39
C40
R39
R41
R42
R40
Q8
R44
C24
R46
U6
R30
R35
U25
U23
U24
U16
U8
R33
C27
C18
U3
U1
U2
U7
R34
C28
U15
U5
U11
U4
R27
R17
R28
U17
U9
C20
C16
Y1
U18
U10
U19
J1
J2
U12
R36
C19
C21
13
DIGITAL SUBCARRIER REV B

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400773-0000	PCBA, 200MHZ DIGITAL SUBC., E2 REV. P (E925)			A				P	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
352300-0104A	*1	1	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	5.000	EA	C15,16,18,19,20,	Yes		
352300-0104A	*1	2	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	6.000	EA	C21,22,24,26,27,28,	Yes		
352300-0104A	*1	3	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	6.000	EA	C29,30,31,35,38,40	Yes		
352100-0104A	*1	4	CAP, .1UF,50V,10%,RAD,X7R		R	11	7.000	EA	C36,37,33,34,17,41,42	Yes		
352300-0474A	*1	5	CAP, .47UF, 50V,20%,RAD,MYLAR(METALLIZED POLYESTR)		R	22	3.000	EA	C4,5,6	Yes		
352100-0101A	*1	6	CAP, 100PF,25V,10%,RAD,NP0		R	11	2.000	EA	C8,10	Yes		
352300-0102A	*1	7	CAP, 1000PF,50V,20%,RAD,MYLAR		R	22	2.000	EA	C7,9	Yes		
352300-0103A	*1	8	CAP, .01UF,50V,20%,RAD,MYLAR		R	22	3.000	EA	C3,11,13	Yes		
352100-0221A	*1	9	CAP, 220PF,10%,X7R,.1 L.S.		R	22	1.000	EA	C12	Yes		
352300-0222A	*1	10	CAP, 2200PF,50V OR 100V,1%,MYLAR,.15L.S.		R	77	1.000	EA	C1	Yes		
352100-0331A	*1	11	CAP, 330PF,25V,10%,RAD,X7R		R	22	1.000	EA	C14	Yes		
352300-0332A	*1	12	CAP, .0033UF,50V,20%,RAD, MYLAR,.1 L.S.		R	22	1.000	EA	C2	Yes		
352401-0106A	*1	13	CAP, 10UF,35V,20%,RAD,TANT		R	11	3.000	EA	C23,25,39	Yes		
354000-0171A	*1	14	CONN, 13-SKT STRP,.1CTR,.335HT		R	11	2.000	EA	J1,2	Yes		
356000-0015A	*1	15	REF OSCILLATOR 8MHZ		R	22	1.000	EA	Y1	Yes		
364000-0004A	*1	16	IC, CA3240		R	11	1.000	EA	U21	Yes		
364000-0173A	*1	17	IC, LF347 SCREENED FROM -0009, -0130, -0135		A	5	1.000	EA	U4	Yes		
364000-0025A	*1	18	IC, 74HC04		R	11	1.000	EA	U17	Yes		
364000-0027A	*1	19	IC, 74HC32		R	11	2.000	EA	U15,19	Yes		
364000-0028A	*1	20	IC, 74HC74		R	11	1.000	EA	U5	Yes		
364000-0029A	*1	21	IC, 74HC138		R	11	1.000	EA	U10	Yes		
364000-0064A	*1	22	IC, LM317LZ,VOLT. REGULATOR		R	11	1.000	EA	U22	Yes		
364000-0080A	*1	23	IC, TMPZ84C00P (Z80A, CMOS VERSION)		R	11	1.000	EA	U6	Yes		
364000-0095A	*1	24	IC, MS6132,DUAL PORT RAM, 8 X 2K,48-PIN (OR MS7132)		R	11	1.000	EA	U13	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
400773-0000	PCBA, 200MHZ DIGITAL SUBC., E2 REV. P (E925)			A			P	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
364000-0098A	*1	25	IC, 82C54,CTC		R	11	3.000	EA	U7,9,11	Yes		
364000-0102A	*1	26	IC, 27C512, EPROM, 200NS		R	22	1.000	EA	U8	Yes		
364000-0116A	*1	27	IC, LM337LZ,VOLT. REGULAT OR,TO-92 CASE		R	22	1.000	EA	U20	Yes		
364000-0117A	*1	28	IC, 5614 FILTER		R	22	4.000	EA	U1,23,3,25	Yes		
364000-0118A	*1	29	IC, 5615 FILTER		R	22	2.000	EA	U2,24	Yes		
364000-0119A	*1	30	IC, EP600,PAL (AFTER PROG RAMMING LABELED 4INTS)		R	22	1.000	EA	U12	Yes		
364000-0120A	*1	31	IC, 74HC259		R	22	1.000	EA	U14	Yes		
364000-0121A	*1	32	IC, 74HC11		R	22	1.000	EA	U16	Yes		
364000-0122A	*1	33	IC, 74HC132		R	22	1.000	EA	U18	Yes		
365000-0008A	*1	34	SKT, 8-POS,DIP,TIN PLATE, L.P.		R	11	2.000	EA	U1,23	Yes		
365000-0224A	*1	35	SOCKET, 24 PIN DIP		R	22	1.000	EA	U12	Yes		
365000-0024A	*1	38	SKT, 24-POS,DIP,TIN PLATE ,L.P.		R	11	3.000	EA	U7,9,11	Yes		
365000-0028A	*1	39	SKT, 28-POS,DIP,TIN PLATE ,L.P.		R	11	1.000	EA	U8	Yes		
365000-0040A	*1	40	SKT, 40-POS,DIP,TIN PLATE ,L.P.		R	11	1.000	EA	U6	Yes		
370100-0103A	*1	41	RES, 10K,1/4W,5%,CF		R	11	6.000	EA	R1,33,34,9,48,49	Yes		
370100-0104A	*1	42	RES, 100K,1/4W,5%,CF		R	11	6.000	EA	R37,39,40,38,24,25,	Yes		
370100-0104A	*1	43	RES, 100K,1/4W,5%,CF		R	11	2.000	EA	R2,12	Yes		
370100-0123A	*1	44	RES, 12K,1/4W,5%,CF		R	11	2.000	EA	R10,11	Yes		
370100-0154A	*1	45	RES, 150K,1/4W,5%,CF		R	11	2.000	EA	R14,16	Yes		
370100-0203A	*1	46	RES, 20K,1/4W,5%,CF		R	11	3.000	EA	R20,22,28	Yes		
370100-0204A	*1	47	RES, 200K,1/4W,5%,CF		R	11	2.000	EA	R41,42	Yes		
370100-0223A	*1	48	RES, 22K,1/4W,5%,CF		R	11	2.000	EA	R35,31	Yes		
370100-0302A	*1	49	RES, 3K,1/4W,5%,CF		R	11	2.000	EA	R13,17	Yes		
370100-0303A	*1	50	RES, 30K,1/4W,5%,CF		R	11	1.000	EA	R15	Yes		

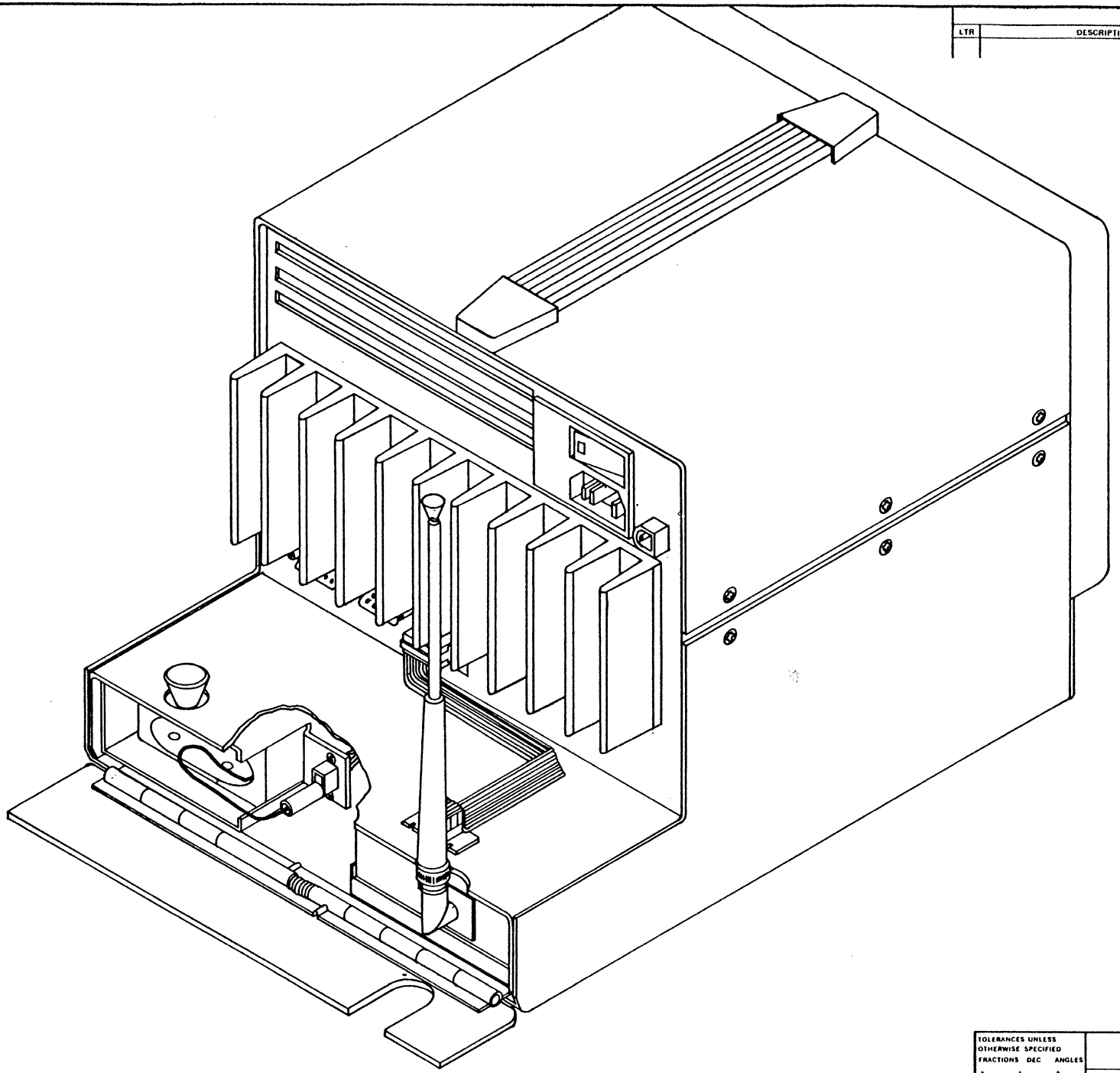
Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400773-0000	PCBA, 200MHZ DIGITAL SUBC., E2 REV. P (E925)			A				P	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370100-0472A	*1	51	RES, 4.7K,1/4W,5%,CF		R	11	4.000	EA	R43,19,23,29	Yes		
370100-0473A	*1	52	RES, 47K,1/4W,5%,CF		R	11	3.000	EA	R26,36,30	Yes		
370100-0474A	*1	53	RES, 470K,1/4W,5%,CF		R	11	3.000	EA	R18,21,27	Yes		
370100-0512A	*1	54	RES, 5.1K,1/4W,5%,CF		R	11	3.000	EA	R3,4,5	Yes		
370100-0684A	*1	55	RES, 680K,1/4W,5%,CF		R	11	3.000	EA	R6,7,8	Yes		
370200-1001A	*1	56	RES, 1K,1/4W,1%,MF		R	11	2.000	EA	R45,47	Yes		
370200-1500A	*1	57	RES, 150,1/4W,1%,MF		R	11	2.000	EA	R44,46	Yes		
376000-0003A	*1	58	XSTR, 2N3904		R	11	3.000	EA	Q3,4,6	Yes		
376000-0011A	*1	59	XSTR, 2N3906,SIGNAL		R	11	2.000	EA	Q5,9	Yes		
376000-0019A	*1	60	XSTR, 2N7000,FET		R	11	2.000	EA	Q7,10	Yes		
376000-0020A	*1	61	XSTR, J201,FET		R	11	3.000	EA	Q1,2,8	Yes		
400772-0000	*1	62	PCB, DIGITAL SUBCARRIER, REVISION 'E'		R	33	1.000	EA		Yes		
360500-0048A	*1	63	SPCR, 1/4 X 1/4,SWAGE TYP E		R	11	1.000	EA		Yes		
364000-0129A	*1	65	IC, ADC0831CCN		R	22	1.000	EA	U26	Yes		
365000-0148A	*1	66	SOCKET, 48 PIN DIP		R	22	1.000	EA	U13	Yes		

Cumulative Lead Time for 400773-0000 = 77

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	±

APPROVALS	DATE
DRAWN F DAVIS	10/5/88
CHECKED	

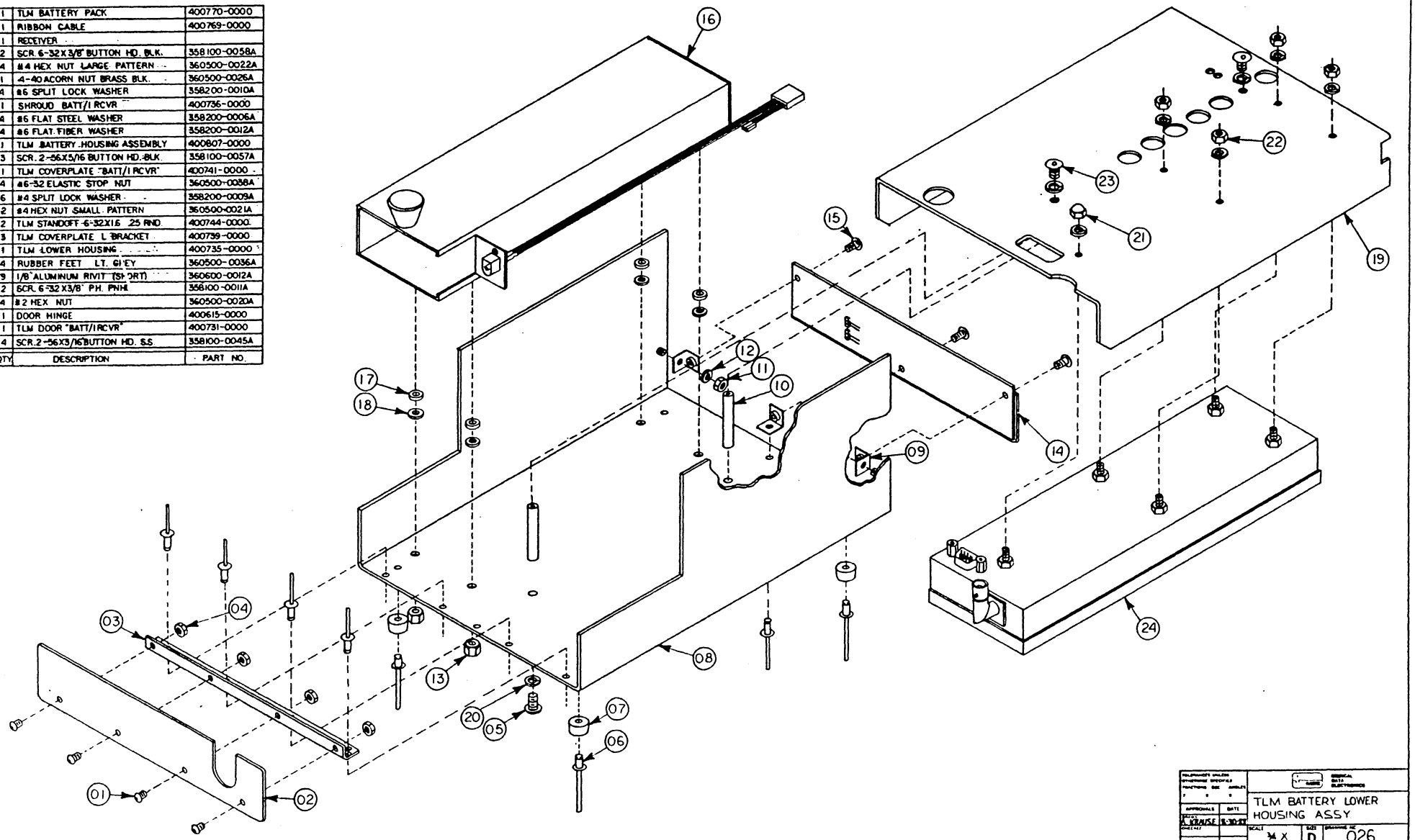
MDE MEDICAL DATA ELECTRONICS

BATTERY HOOKUP

SCALE FULL | SIZE C | DRAWING NO.

DO NOT SCALE DRAWING | SHEET 1 OF 1

NO	QTY	DESCRIPTION	PART NO.
26	1	TLM BATTERY PACK	400770-0000
25	1	RIBBON CABLE	400769-0000
24	1	RECEIVER	
23	2	SCR.6-32X3/8" BUTTON HD. BLK.	358100-0058A
22	4	#4 HEX NUT LARGE PATTERN	360500-0022A
21	1	4-40 ACORN NUT BRASS BLK.	360500-0026A
20	4	#6 SPLIT LOCK WASHER	358200-0010A
19	1	SHROUD BATT/I RCVR	400736-0000
18	4	#6 FLAT STEEL WASHER	358200-0006A
17	4	#6 FLAT FIBER WASHER	358200-0012A
16	1	TLM BATTERY HOUSING ASSEMBLY	400807-0000
15	3	SCR.2-56X5/16 BUTTON HD.-BLK.	358100-0057A
14	1	TLM COVERPLATE "BATT/I RCVR"	400741-0000
13	4	#6-32 ELASTIC STOP NUT	360500-0038A
12	6	#4 SPLIT LOCK WASHER	358200-0009A
11	2	#4 HEX NUT SMALL PATTERN	360500-0021A
10	2	TLM STANDOFF-6-32X1.6 .25 RND.	400744-0000
09	3	TLM COVERPLATE L BRACKET	400739-0000
08	1	TLM LOWER HOUSING	400735-0000
07	4	RUBBER FEET LT. GREY	360500-0036A
06	9	1/8" ALUMINUM RIVIT (SHORT)	360600-0012A
05	2	SCR.6-32X3/8" P.H. PNHL	358100-0011A
04	4	#2 HEX NUT	360500-0020A
03	1	DOOR HINGE	400615-0000
02	1	TLM DOOR "BATT/I RCVR"	400731-0000
01	4	SCR.2-56X3/16 BUTTON HD. S.S.	358100-0045A



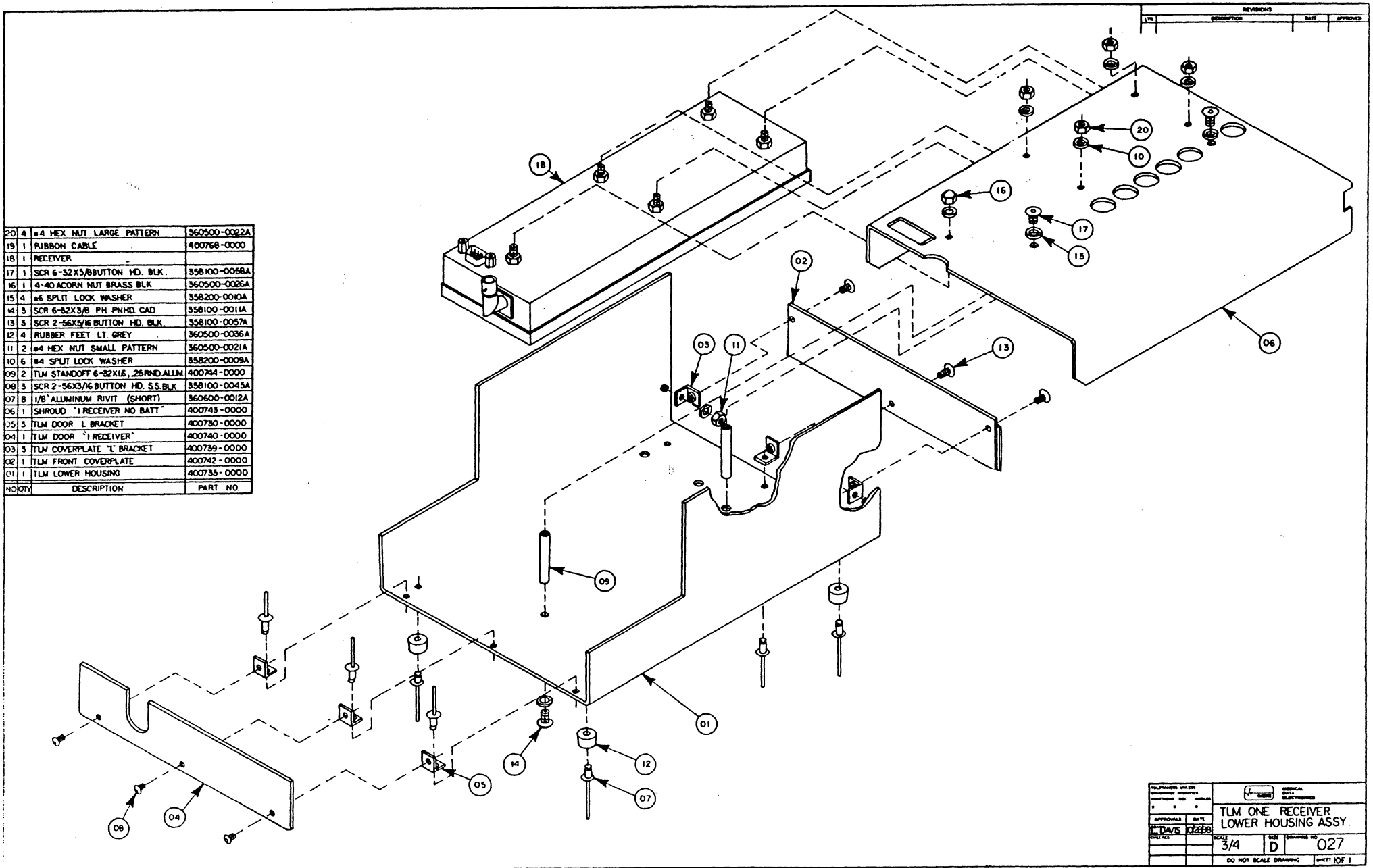
REVISIONS

LTR	DESCRIPTION	DATE	APPROVED

TLM BATTERY LOWER HOUSING ASSY

SCALE 3/4 X | SIZE D | 026

DO NOT SCALE DRAWING | SHEET 1 OF 2



NO	QTY	DESCRIPTION	PART NO
20	4	#4 HEX NUT LARGE PATTERN	360500-0022A
19	1	RIBBON CABLE	400768-0000
18	1	RECEIVER	
17	1	SCR 6-32X3/8BUTTON HD. BLK.	358100-0058A
16	1	4-40 ACORN NUT BRASS BLK	360500-0026A
15	4	#6 SPLIT LOCK WASHER	358200-0010A
14	3	SCR 6-32X3/8 PH. PNHD. CAD	358100-0011A
13	3	SCR 2-56X5/16 BUTTON HD. BLK.	358100-0057A
12	4	RUBBER FEET LT. GREY	360500-0036A
11	2	#4 HEX NUT SMALL PATTERN	360500-0021A
10	6	#4 SPLIT LOCK WASHER	358200-0009A
09	2	TLM STANDOFF 6-32X1.6, .25RND.ALUM.	400764-0000
08	3	SCR 2-56X3/16 BUTTON HD. S.S.BLK.	358100-0045A
07	8	1/8" ALUMINUM RIVIT (SHORT)	360600-0012A
06	1	SHROUD "I RECEIVER NO BATT"	400743-0000
05	3	TLM DOOR L BRACKET	400730-0000
04	1	TLM DOOR "I RECEIVER"	400740-0000
03	3	TLM COVERPLATE "L" BRACKET	400739-0000
02	1	TLM FRONT COVERPLATE	400742-0000
01	1	TLM LOWER HOUSING	400735-0000

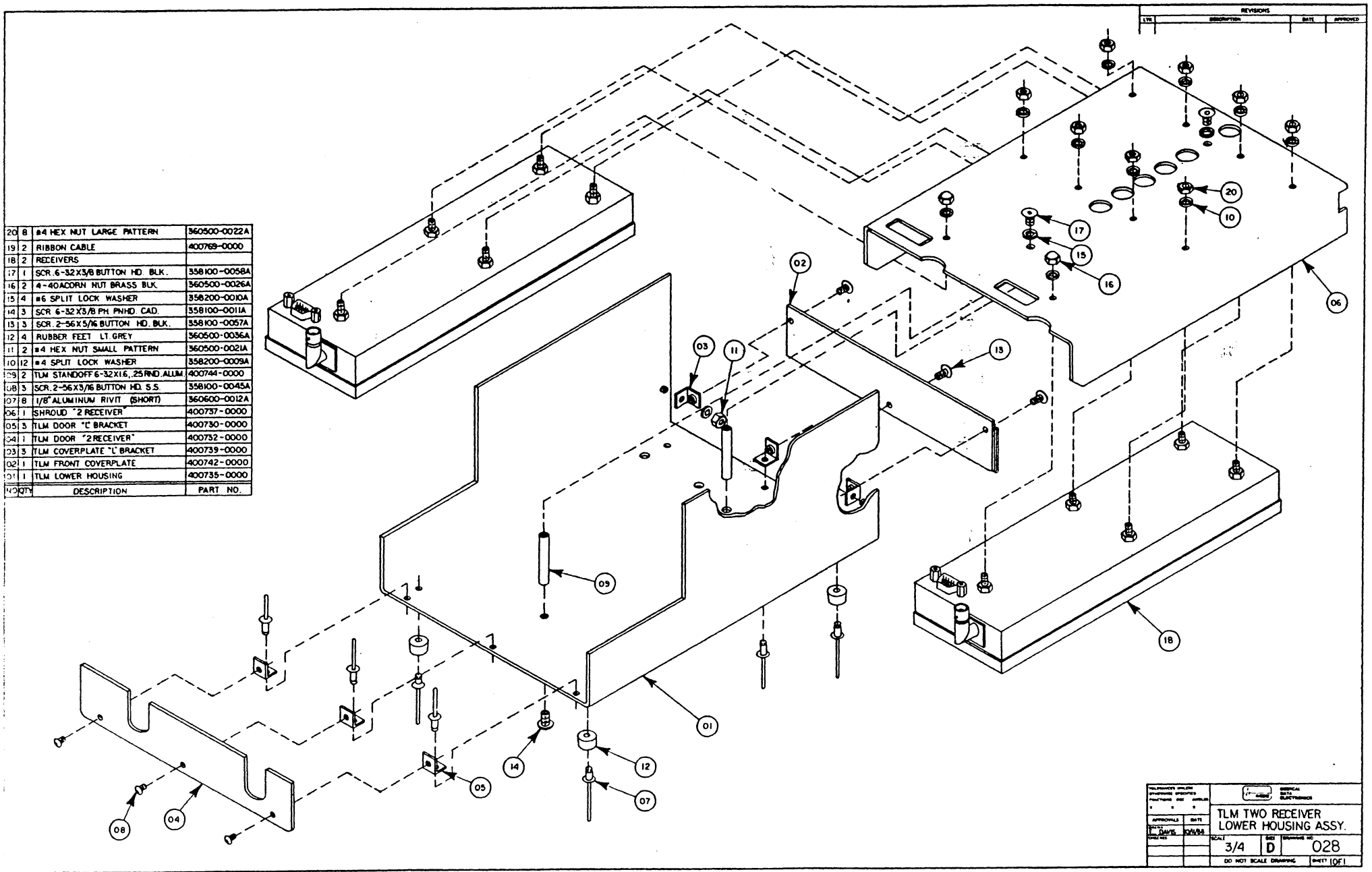
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

APPROVALS	DATE	
E. DAVIS	10/28/88	

TLM ONE RECEIVER
LOWER HOUSING ASSY.

SCALE 3/4 | SIZE D | DRAWING NO. 027

DO NOT SCALE DRAWING | SHEET 1 OF 1



NO	QTY	DESCRIPTION	PART NO.
20	8	#4 HEX NUT LARGE PATTERN	360500-0022A
19	2	RIBBON CABLE	400769-0000
18	2	RECEIVERS	
17	1	SCR. 6-32 X 3/8 BUTTON HD. BLK.	358100-0058A
16	2	4-40 ACORN NUT BRASS BLK.	360500-0026A
15	4	#6 SPLIT LOCK WASHER	358200-0010A
14	3	SCR 6-32 X 3/8 PH. PNHD. CAD.	358100-0011A
13	3	SCR. 2-56 X 5/16 BUTTON HD. BLK.	358100-0057A
12	4	RUBBER FEET LT. GREY	360500-0036A
11	2	#4 HEX NUT SMALL PATTERN	360500-0021A
10	12	#4 SPLIT LOCK WASHER	358200-0009A
09	2	TLM STANDOFF 6-32 X 16, .25 RND. ALUM.	400744-0000
08	3	SCR. 2-56 X 3/16 BUTTON HD. S.S.	358100-0045A
07	8	1/8" ALUMINUM RIVIT (SHORT)	360600-0012A
06	1	SHROUD "2 RECEIVER"	400737-0000
05	3	TLM DOOR "L" BRACKET	400730-0000
04	1	TLM DOOR "2 RECEIVER"	400732-0000
03	3	TLM COVERPLATE "L" BRACKET	400739-0000
02	1	TLM FRONT COVERPLATE	400742-0000
01	1	TLM LOWER HOUSING	400735-0000

REVISIONS

LTR	DESCRIPTION	DATE	APPROVED

TLM TWO RECEIVER
LOWER HOUSING ASSY.

SCALE 3/4 | SIZE D | DRAWING NO 028

DO NOT SCALE DRAWING | SHEET 1 OF 1

ITEM	LEVEL	SEQ.	DESCRIPTION BEG DATE	END DATE	QUANTITY			REFERENCE
400735-0000	#1	1			1.0			
			TM LOWER HOUSING FAB., REVISION "B"					
400731-0000	#1	2			1.0			
			TM DOOR FAB, "BATT/1 RCVR.", REVISION "E1"					
400615-0000	#1	3			1.0			
			DOOR HINGE, REV. "C"					
400741-0000	#1	4			1.0			
			TM COVER PLATE FAB, "BATT/ONE RECEIVER", REV. "A"					
400739-0000	#1	5			3.0			
			TM COVER PLATE "L" BRACKET, REVISION "B"					
400774-0000	#1	6			1.0			
			LABEL, DOOR, TM W/BATTERY					
400736-0000	#1	7			1.0			
			SHROUD, BATT./1 RECEIVER, REV."B" (PLASTIC SHIELD)					
400807-0000	#1	8			1.0			
			TM BATTERY ENCLOSURE ASSY.					
400770-0000	#1	9			1.0			
			TM BATTERY PK. W/LABEL					
400769-0000	#1	10			1.0			
			CBL, RIBBON,2-RCVR OR 1-RCVR W/BATT					
358200-0006A	#1	11			4.0			
			WSHR, #6 FLT STL CAD 1					
358200-0012A	#1	12			4.0			
			WSHR, #6 FLT FIBER					
358200-0009A	#1	13			2.0			
			WSHR, #4 SPLIT LOCK					
360500-0021A	#1	14			2.0			
			NUT, #4 HEX,SM PTRN					
400744-0000	#1	15			2.0			
			TM STANDOFF, #6-32 X 1.6, .25 RND, ALUM., REV."E2"					
360500-0036A	#1	16			4.0			
			HARDWARE, RUBBER FEET, LIGHT GREY					
360600-0012A	#1	17			9.0			
			1/8" ALUMINUM RIVET (SHORT POP RIVET)					
358100-0011A	#1	18			2.0			
			SCR, 6-32 X 3/8,PH PNHD,CAD1 OR 2					
360500-0020A	#1	19			4.0			
			NUT, 2-56 HEX					
358100-0045A	#1	20			4.0			
			SCR, 2-56 X 3/16,BUTTON HD,S.S.					
360500-0038A	#1	21			4.0			
			NUT, #6-32,ELASTIC STOP					
358200-0010A	#1	22			2.0			
			WSHR, #6 SPLT LCK					
360500-0026A	#1	23			1.0			
			NUT, 4-40,ACORN,BRASS,BLK OXIDE					
385000-0017A	#1	24			1.0			
			CABLE TIE MOUNT, ADHESIVE BACKED					
358100-0057A	#1	25			3.0			
			SCR, 2-56 X 5/16,BUTTON HD,SKT,BLK					

Medical Data Electronics
BILL OF MATERIALS WITH BURDEN
AVERAGE COSTS
FOR ASSEMBLY 024 UPPER HOUSING ASSEMBLY TLM

ITEM	LEVEL	SEQ.	DESCRIPTION	BEG DATE	END DATE	QUANTITY			REFERENCE
400771-0000	#1	1				1.0			
			TM UPPER HOUSING FAB., (COVER) (TM ONLY)						
400588-0000	#1	2				1.0			
			HANDLE SET, FAB END PCS. ONLY (2/SET), REV. "A"						

ITEM	LEVEL	SEQ.	DESCRIPTION	BEG DATE	END DATE	QUANTITY			REFERENCE
400735-0000	#1	1				1.0			
			TM LOWER HOUSING FAB., REVISION "B"						
400742-0000	#1	2				1.0			
			TM FRONT COVER PLATE FAB., REVISION "A"						
400739-0000	#1	3				3.0			
			TM COVER PLATE "L" BRACKET, REVISION "B"						
400740-0000	#1	4				1.0			
			TM DOOR FAB, "NO BATT/ONE RECEIVER", REV "E1"						
400730-0000	#1	5				3.0			
			TELEMETRY "L" BRACKET, REVISION "B"						
400768-0000	#1	6				1.0			
			CBL, RIBBON,SINGLE TM RCVR/NO BATT						
400743-0000	#1	7				1.0			
			SHROUD, "NO BATT/1 RCVR.", REV."B"(PLASTIC SHIELD)						
360600-0012A	#1	8				4.0			
			1/8" ALUMINUM RIVET (SHORT POP RIVET)						
358100-0045A	#1	9				3.0			
			SCR, 2-56 X 3/16,BUTTON HD,S.S.						
400744-0000	#1	10				2.0			
			TM STANDOFF, #6-32 X 1.6, .25 RND, ALUM., REV."E2"						
358200-0009A	#1	11				2.0			
			WSHR, #4 SPLIT LOCK						
360500-0021A	#1	12				2.0			
			NUT, #4 HEX,SM PTRN						
360500-0036A	#1	13				4.0			
			HARDWARE, RUBBER FEET, LIGHT GREY						

ANTENNA SYSTEM DESIGN

CHAPTER 12

SECTION 1

ANTENNA SYSTEM DESIGN

12.1.1 ANTENNA LOCATIONS

The first step in designing an antenna system is to determine the location(s) of antennas necessary for reception of adequate RF telemetry signals under the worst possible conditions. A scale plan view of the desired area(s) to be covered should be drawn and locations selected based on the physical characteristics of construction for the area involved. Antennas should be located as high as possible (ceiling level) to best eliminate the effects of people and objects in the covered areas.

The second step involves determining the materials used for partitions and walls. This information can usually be obtained from hospital building maintenance department, and original detailed construction plans are frequently available. Table I shows estimated design distances that may be used when the construction materials are known.

In addition to partitions and wall materials, the ceiling construction should be investigated. Determine the locations of any large metal areas such as heating and cooling ducts, metal lath beneath plaster, foil backed insulation, or wire reinforced ceiling panels. If it is necessary to mount antennas below these metal objects, space the antenna by at least 8 inches from ceiling surfaces. The 8 inch spacing is a copromise, and therefore, there is some degradation of antenna performance. When this problem exists, the coverage areas shown in Table I should be reduced to 75%.

In preparing a scale layout of the areas to be covered, locate the antennas by using the recommended design distances shown in Table I. Allow the antenna coverage to overlap, creating areas to equal the antenna design radius of at least one receiving antenna. An example of a scale plan layout is shown in Fiqure 1-2.

In very simple systems at least two antennas should be used. This reduces the possibility of a drop-out from occurring if blockage or reflection by a piece of equipment causes loss of signal to a single antenna.

From the detailed construction plans, determine any special construction details that may shield the antenna from the patient transmitter. These may include any of the following:

- Steel automatic fire doors
- Elevator shafts
- X-ray rooms (shielded)
- Large installations of metal racks for food
- service, laundries, etc.
- Air conditioning or heating ducts over approximately 20" wide
- Foil-covered insulation

Assume when developing the scale layout that these details will block all telemetry signals. Where such cases of signal interference are known, it is recommended that the maximum distances from these objects to an antenna be reduced to 50% of the distances given by Table I. Figure 1.2 is an example of a floor plan where several such features are represented. Schematics and sample calculations are shown in figures 1.3 and 1.4 respectively.

12.1.2 CABLE ROUTING

After the estimated location(s) of antennas has been determined, possible routing of interconnecting wiring should be laid out on the scale drawing to determine cable length required. Cable lengths should be kept as short as possible to minimize losses. In order to achieve balanced gain from each antenna to the first associated multiplexer, the cables from each antenna should be approximately the same length; i.e., situate the multiplexer equidistant from its associated antennas. The losses can usually be equalized by physical location of the multiplexer or selection of appropriate cable type. Note in Fiqure 1-3 that all antennas to the first multiplexers are at equal distances.

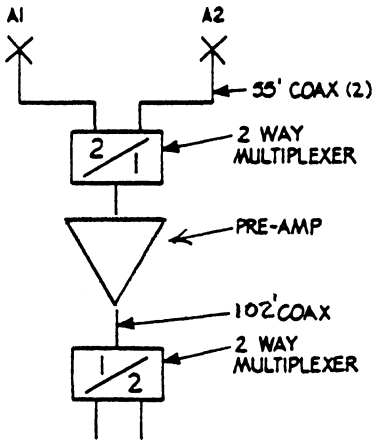
Caution: Many inexpensive RG59U cables are available. Some have been found to have high losses or provide a poor impedance match. It is recommended that only quality cables be used from a reliable supplier.

Avoid routing cables in areas with potential sources of electrical noise such as diathermy, data processing equipment, radio or CATV equipment, heavy electric motors, or elevators wiring and switches. If it is necessary to run lines near others that could be carrying interfering electrical signals, they should be separated as far as possible, and if they intersect, they should be routed at right angles, and through 1/2" rigid conduit grounded at both ends.

12.1.3 SYSTEM LOSS/GAIN CALCULATIONS

A system schematic should be drawn to calculate total losses and determine where amplifiers are required. The goal should be to design a system with zero losses from the antenna to the receiver . Table II shows standard electrical symbols and the losses or gains associated with the elements required for installation. These losses are based on midband frequencies in TV channel 9 or 10. Slight variations will exist for systems using TV channels 7 or 13. However, these variations amount to less than 5% and can therfore be disregarded.

Systems losses are calculated by summing the losses of individual components. A simplified diagram of a system schematic is shown in the adjacent chart. As shown, the dB loss/gain for each component, as obtained from Table II, are totalled to determine the overall loss/gain of 0 dB.



COMPONENT	COMPONENT LOSS	CUMULATIVE GAIN/LOSS
A1 OR A2 ANTENNA	0	0
55' FOAM COAX RG59/U	-2.2	-2.2
2 WAY MULTIPLEXER	-3.8	-6.0
PRE-AMP	+14.0	+8.0
102' FOAM COAX RG59/U	-4.2	+3.8
2 WAY MULTIPLEXER	-3.8	0

FIQURE 1-1 Simplified System Diagram

Fiqure 1-2 is an example of a scale plan layout for a more complex system. Fiqure 1-3 shows the corresponding schematic. Sample calculations are shown in Fiqure 1-4.

The sections specified as "without preamplication" are preliminary calculations to determine the total path losses of all elements, and they thereby enable determination of the best locations for the required preamplifiers. It is important to provide amplification in any system before the losses become large enough to increase the inherent noise generated by preamplifiers.

12.1.4 PREAMPLIFIER NOISE

Each preamplifier added to the system contributes additional low level noise to the signals being transmitted, the amount of which is indicated in preamplifier specifications as "Noise Figure." This noise has the effect of decreasing the effective range of antennas for useable clean RF signals. Calculations for evaluating the effects of Noise Figure and antenna effective range are beyond the scope of these instructions. The rules outlined below are critical in achieving the effective ranges outlined in Table I.

1. No total individual cumulative circuit path loss can be greater than 40 dB.
2. No more than 2 preamplifiers limited to 20 dB maximum gain should be included in each circuit path.
3. First preamplifier gain must be added before the losses from any antenna are greater than -10 dB.
4. A second preamplifier stage should be added when the cumulative gain/loss is greater than 0 dB.

Table I
Antenna Spacing VS Wall Construction

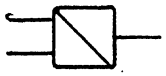
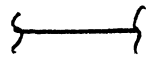
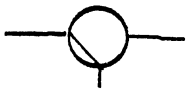
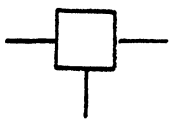
Wall Construction Type	Coverage Area Omni-directional Antenna
I. 1. Wood studs & Sheet-rock 2. Wood studs & plaster on gyspsum board 3. Vertical metal studs greater than 4 feet centers 4. Concrete or block with plaster	60 ft. radius
II. 1. Metal studs 24" O.C. 2. Metal studs with plaster on gypsum board. 3. Reinforced concrete 36" O.C. minimum reinforcing bars	50 ft. radius
III. 1. Foil backed sheet-rock 2. Alum. foil insulation 3. Plaster on metal lath 4. Steel paneling	Line of sight to antenna 50 ft. radius max.

NOTE: 1. Reduce distance shown to 75% when there is metal in the ceiling such as metal lath or air conditioning ducts.

2. Distance shown are based on receiver sensitivities of 1 uV or better.

Table II

Component Loss/Gain Characteristics

SCHEMATIC SYMBOL	ELEMENT	LOSS/GAIN	DC CURRENT @ 14 TO 20 VDC	MDE P/N
	Omni-directional			340000-0001 * TL1800
	Omni-directional Antenna 450-470 Mhz			340000-0010 * TL4750
	Two-way multiplexer	-3.8 dB		340000-0002
	Four-way Multiplexer	-7.5 dB		340000-0003
	RG/59 Cable Solid Polyethelene	-4.9 dB/100'		Belden #8241
	RG/59 Cable Foam Polyethylene	-4.1 dB/100'		Belden #8221
	Terminator	0 dB		340000-0013
	Preamplifiers: 174-216 MHz	+14 dB	55 Ma.	340000-0005 * TA214
	174-216 MHz	+26 dB	85 Ma.	340000-0004 * TA213
	450-470 MHz	+17 dB	55 Ma.	340000-0009 * TA1483
	Directional Coupler insertion loss	-7dB -1dB		340000-0016
	Directional Coupler insertion loss	-12dB -.6dB		340000-0017
	Directional coupler insertion loss	-17dB -.5dB		340000-0018
	Power Supply	-20 VDC	500 Ma.	340000-0008 * PS2000

* Winegard Part Number

SCALE FLOOR PLAN

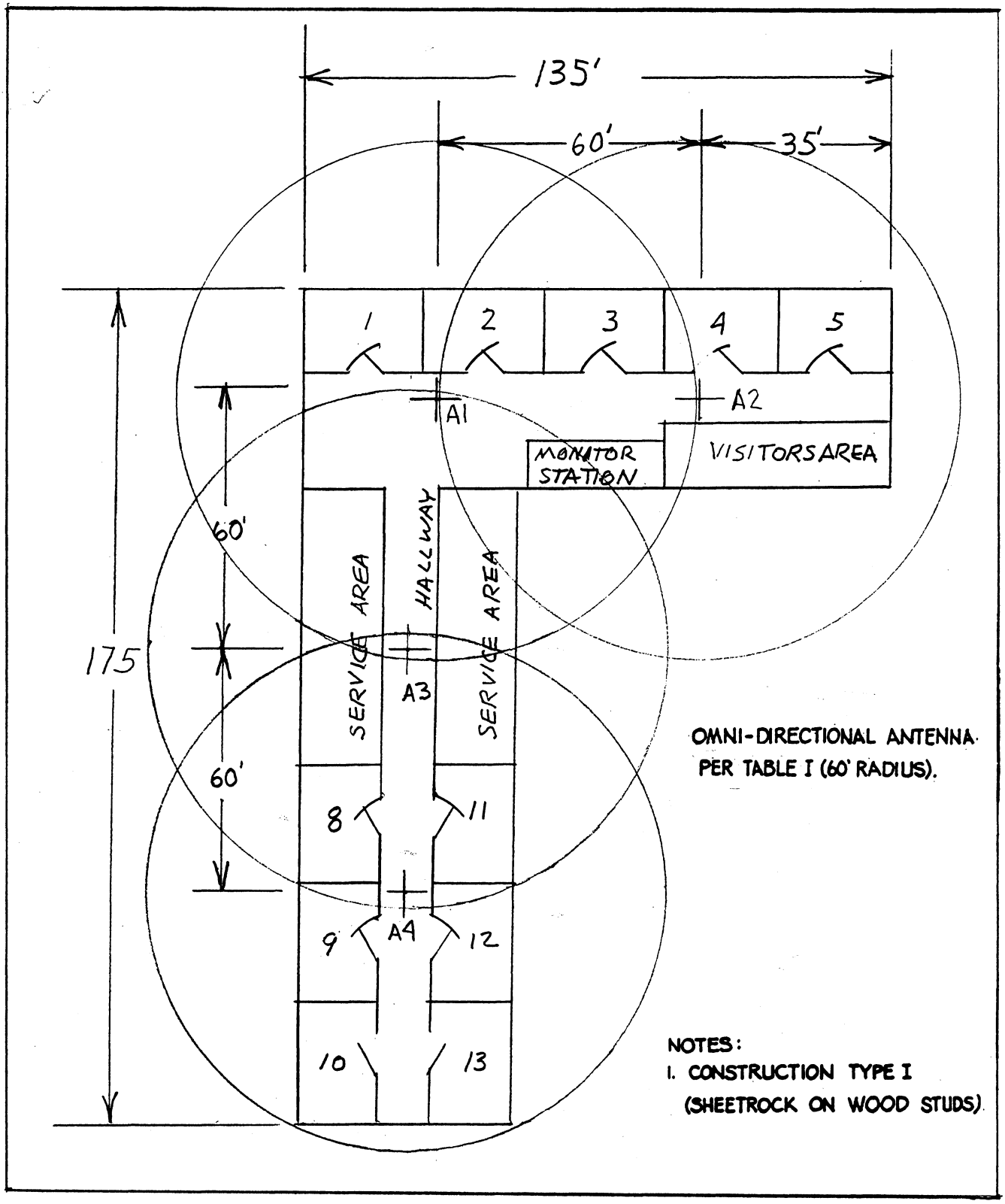


Fig. 1-2

SCHEMATIC

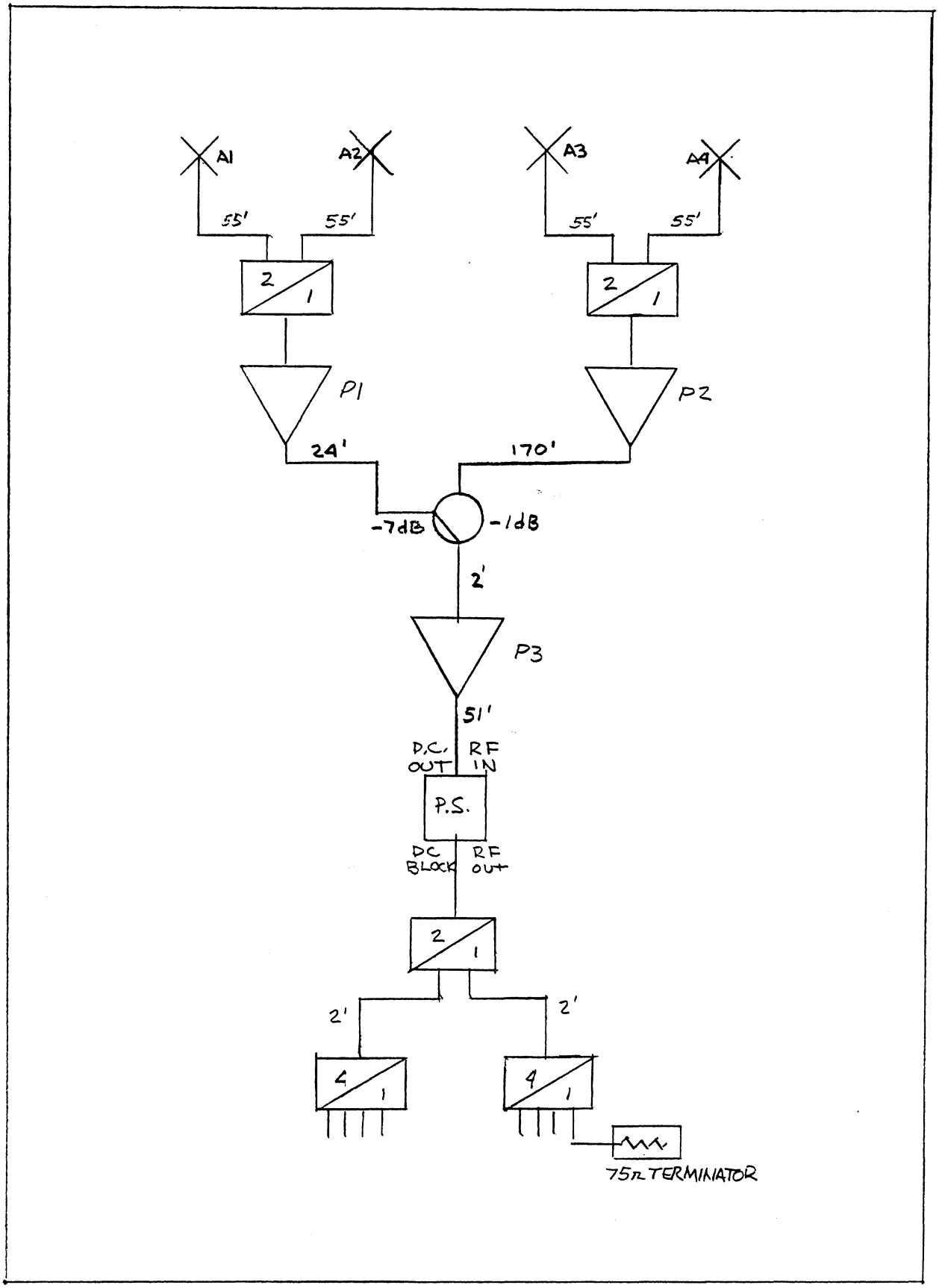


Fig. 1-3

SAMPLE CALCULATIONS

ANTENNA PATH — FROM A1 OR A2 TO MONITOR
WITHOUT PREAMPLIFICATION WITH PREAMPLIFICATION

COMPONENT	COMPONENT LOSS	CUMULATIVE GAIN/LOSS
A1 OR A2 BIDIR. ANTENNA	0	0
55' RG 59/μ FOAM CABLE	-2.2	-2.2
TWO WAY MULTPLX	-3.8	-6.0
24' RG 59/μ FOAM CABLE	-1.0	-7.0
DIRECT. COUPLR.	-7.0	-14.0
51' RG 59/μ FOAM CABLE	-2.1	-16.1
PWR SUPPLY COUPLER	-0.5	-16.6
TWO WAY MULTPLX	-3.8	-20.4
2' RG59/μ FOAM CABLE	-0.1	-20.5
FOUR WAY MULTPLX	-7.5	-28.0
TOTAL		

COMPONENT	COMPONENT LOSS	CUMULATIVE GAIN/LOSS
A1 OR A2 BIDIR. ANTENNA	0	0
55' RG 59/μ FOAM CABLE	-2.2	-2.2
TWO WAY MULTPLX	-3.8	-6.0
PREAMPLIFIER - P1	+14.0	+8.0
24' RG59/μ FOAM CABLE	-1.0	+7.0
DIRECT. COUPLR.	-7.0	0
PREAMPLIFIER - P3	+14.0	+14.0
51' RG59/μ FOAM CABLE	-2.1	+11.9
PWR SUPPLY COUPLER	-0.5	+11.4
TWO WAY MULTPLX	-3.8	+7.6
2' RG59/μ FOAM CABLE	-0.1	+7.5
FOUR WAY MULTPLX	-7.5	0
TOTAL		0

ANTENNA PATH FROM A3 OR A4 TO MONITOR
WITHOUT PREAMPLIFICATION WITH PREAMPLIFICATION

COMPONENT	COMPONENT LOSS	CUMULATIVE GAIN/LOSS
A3 OR A4 ANTENNA	0	0
55' RG 59/μ FOAM CABLE	-2.2	-2.2
TWO WAY MULTPLX	-3.8	-6.0
170' RG 59/μ FOAM CABLE	-7.0	-13.0
DIRECT. COUPLR	-1.0	-14.0
RG 59/μ FOAM CABLE	-2.1	-16.1
PWR SUPPLY COUPLER	-0.5	-16.6
TWO WAY MULTPLX	-3.8	-20.4
2' RG 59/μ FOAM CABLE	-0.1	-20.5
FOUR WAY MULTPLX	-7.5	-28.0
TOTAL		

COMPONENT	COMPONENT LOSS	CUMULATIVE GAIN/LOSS
A3 OR A4 ANTENNA	0	0
55' RG 59/μ FOAM CABLE	-2.2	-2.2
TWO WAY MULTPLX	-3.8	-6.0
PREAMPLIFIER - P2	+14.0	+8.0
170' RG 59/μ FOAM CABLE	-7.0	+1.0
DIRECT. COUPLR.	-1.0	0
PREAMPLIFIER - P3	+14.0	+14.0
51' RG 59/μ FOAM CABLE	-2.1	+11.9
PWR SUPPLY COUPLER	-0.5	+11.4
TWO WAY MULTPLX	-3.8	+7.6
2' RG 59/μ FOAM CABLE	-0.1	+7.5
FOUR WAY MULTPLX	-7.5	0
TOTAL		0

Fig. 1-4

ANTENNA SYSTEM TESTS

12.2.1 TELEMETRY SYSTEM TESTS

System Tests should be conducted on all newly installed antenna systems to insure good electrical connections and balanced RF gain.

12.2.2 ELECTRICAL TESTS — STATIC

After design and installation of wiring, and prior to antenna system turn-on, a static test should be performed to insure good cable connections and grounding. Prior to applying antenna power, connect the power, connect the power coupler and multiplexers to the coaxial lines. Do not connect preamplfiers Couple all preamplifier input and output lines with RF connector. Place an ohm meter on the input to the power supply coupler (no power applied) between DC voltage input and ground. It should be an open circuit greater than 100k ohms. If this reading is low, it indicates a shorted connector or cable. Remove connections one at a time to isolate the faulty wiring.

After verifying the open substitute a test 75 ohm load at one antenna connnection. The DC resistance measured at the power supply coupler should be 75 ohms. Repeat for each of the antenna input leads in the system. This insures continuity to each of the antenna inputs.

12.2.3 RF CONDUCTED GAIN TEST

Connect a signal generator to one of the antenna inputs. Connect Rf Spectrum Analyzer to antenna system output. Generator should be set for 188 Mhz at -60 dBm. The gain from antenna input to antenna system output should be 0 dB ±3dB. This test should be repeated for each antenna input.

12.2.4 ANTENNA SYSTEM RANGE TEST

Connect an MDE telemetry monitor to the output of the antenna system. With the aid of an assistant who is hooked up to telemetry transmitter, walk through the area covered by the antenna system.

Verify that the the observed signal remains noise free or that only momentary short-term (2 sec. or less) noise bursts occur under the longest range conditions.

Marginal performance may be caused by:

1. Hidden metal objects such as air conditioning ducts or other metal conduits detuning an antenna.
2. Large metal objects deflecting the transmitted signal.
3. Improperly located antenna(s).

These conditions can usually be corrected by spacing the antenna(s) away from metal objects, mounting the antenna(s) on extenders, changing antenna location(s) by a few feet, or in more severe cases, by adding an antenna to cover the problem area. Note, however, that if an additional antenna(s) is added, it will be necessary to rebalance the system to maintain an antenna system gain of 0dB +3db.

NIBP

CHAPTER 13

13.0.0 NIBP

13.1.0 OVERVIEW

The NIBP option is separated into three major sections: pneumatic, digital and analog. Included in the pneumatic section are: the pump itself, manifold, valve, check valve, and the interconnecting plumbing. The digital portion includes: EPROM, Dual Port RAM, and other circuitry for processing digital data. The analog section includes: the transducer, fail detect, AC and DC channels, reference voltage generation, A to D conversion, and pump and valve ON/OFF control.

13.1.1 AC/DC CHANNELS

The **ESCORT** uses a two lumen hose to inflate and deflate the cuff. Cuff pressure is sensed through this hose. The DC channel represents actual cuff pressure. The AC element is used to calculate the systolic, mean, and diastolic values.

13.1.2 OVERPRESSURE PROTECTION AND DETECTION

There are three methods of overpressure detection to protect the patient from sustained or excessive cuff inflation. They are: 1) software, 2) hardware and 3) mechanical. The first method is software controlled. The algorithm checks cuff pressure every 4mS looking for a reading of over 240mmHg. If it reads a pressure higher than 240mmHg, the pump and valve will be turned off by the signals PUMP ON and VALVE ON. The cuff is deflated until pressure is below 240mmHg. The monitor will also display the message NIBP ERROR MAX LIMIT on the channel message line. The second method relies on analog hardware. A comparator detects cuff pressure over 275mmHg and turns the pump and valve off by the signal FAIL-INT, deflating the cuff completely. The channel message line will display NIBP FAIL MAX LIMIT. The third method is mechanical. A pressure switch, located in the pneumatics section, senses any pressure over 320mmHg. This switch will interrupt +V to the pump and valve, turning them off and deflating the cuff. No message is associated with this overpressure condition.

13.1.3 BLOOD PRESSURE OR TEMPERATURE OPTIONS

A Daughter Board is installed onto the NIBP option if invasive pressure or temperature options have been selected. The invasive pressure and temperature circuits are functionally identical to the circuits on the Pressure Temperature Board, P/N 400613. Please refer to section 5.0.0 for the theory of operation.

13.2.0 INPUT CIRCUIT

The transducer used in the NIBP option uses a +5VDC excitation and has internal amplification for an approximate output of 1V = 100mmHg at pin 2. R11 and R58 are to adjust, gain and offset errors for a true reading of 1V = 100mmHg at U2 pin 8. This signal becomes the DC channel and is the input to the AC channel, the low pressure comparitor and the high pressure comparitor.

13.2.1 AC CHANNEL

The AC channel strips off the DC component with C9 and C18. U4 provides amplification for the AC signal.

BASELINE RESET resets the AC channel quickly in the event the signal is saturated: U7A discharges C9 by bringing U4 pin 8 to ground; U7B discharges C18.

The AC channel then goes into a gain stage that is software controlled. The signals 20ON and 40ON place R44 and R45 in parallel with R43, selecting one of 4 possible output levels for U43.

The next stage biases the signal to half of the A to D converter's full scale. U4A uses a 1.25V reference to scale up the AC channel so the A to D converter can read both negative and positive signals. U10 selects either the AC or DC channel and converts it to a digital format. The A to D converter uses the 2.5 REF signal to set the scale. ADC DONE is a data available signal signifying that the conversion is complete.

13.2.2 VALVE AND PUMP CONTROL

The signal PUMP-ON is gated together with the signals FAIL-INT and RESET to drive Q2. Q2 turns the pump on by grounding its negative lead. The normally open valve is controlled by the signal VALVE ON which is also gated with FAIL-INT and RESET to drive Q1. When VALVE ON is low, the valve is open, releasing air out of the cuff. FAIL-INT or RESET inhibit the valve and pump. FAIL-INT occurs during any failure, and RESET is active during power up.

When cuff pressure exceeds 320mmHg $\pm$15mmHg, the overpressure switch interrupts +Vin, disabling the pump and valve.

13.2.3 FAIL DETECT

U6 and U2 comprise the Fail Detect circuit. U2A compares the DC pressure signal to a 31mmHg reference. The timer, U6, will time out after 5 minutes if not reset by the cuff pressure going below 31mmHg. If the timer does time out, the signal FAIL 5 - MINUTES will

be active. U2 compares 275mmHg with the DC pressure signal for overpressure. If cuff pressure exceeds 275mmHg, the signal FAIL OVER-PRESS will be active. Either signal will produce the FAIL-INT signal, turning off the pump and valve, and will go on to the Digital Section.

13.2.4 REFERENCE VOLTAGE

Reference Voltages are generated from +15V. The 2.5V zener reference diode, U20, generates the signal 2.5 REF. U2 pin 14 generates 5.0 REF. R6 and R7 form a voltage divider for the 1.25 REF signal.

13.3.0 DIGITAL

The digital section processes data and interfaces signals to and from the NIBP analog section, Blood Pressure or Temperature Daughter Boards, and the CPU Board. A Z-80 type microprocessor is clocked by a 4MHz crystal. RST OUT* from the CPU Board resets U11. TIME TIC* coordinates the fetching of data points. The ROM, U15, holds the microprocessor's program. U17 is an address decoder that decodes address BUS data to enable U15 or U18. U18, a dual Port RAM, passes data to and from the CPU Board. U12 and U13 are input and output ports. U12 outputs signals to the NIBP analog and invasive pressure or temperature sections. U13 receives signals from the NIBP analog section. U19 interfaces with the Invasive Pressure or Temperature Daughter Boards. J2 goes to the Daughter Board (Invasive Pressure or Temperature).

13.4.0 CALIBRATION CHECK PROCEDURE

Calibration of the monitor should be checked at least once a month or where there is doubt about the validity of the pressure readings. The test procedure is designed to confirm accuracy of the monitor as well as to diagnose pneumatic leaks.

CAUTION: Calibration tubing should always be kept dry and free of particulate matter. Moisture or foreign substances introduced into the pneumatic system can cause damage to the unit.

To perform a calibration check, follow these steps:

1. Obtain the calibration kit supplied with the unit.

2. Connect a mercury manometer to the monitor using the parts supplied with the calibration kit.

3. Press the NIBP TEST key and select CAL. Press PAGE HOME. The following is displayed in trace 2 message field:

CAL NIBP
CUFF=XXX

4. Open manometer to air and verify the offset CUFF-XXX is between -3 and +10mmHg.

5. Using the inflation bulb, manually pump up the pressure to 100mmHg; monitor should read CUFF-XXX 100mmHg plus offset, ±4mmHg.

6. Using the inflation bulb, manually pump up the pressure to 200mmHg; monitor should read CUFF-XXX 200mmHg plus offset, ±5mmHg.

7. If indicated pressures are not within tolerance, the monitor must be calibrated. Refer to qualified service personnel.

NOTE

The **ESCORT** also includes a backup automatic safety valve (non-resetable) which, in the event of system failure, will automatically deflate the cuff if pressure exceeds 320mmHg.

13.4.1 LEAK TEST PROCEDURE

If a leak is suspected, use the cuff and hose in question.

1. Cuff should be wrapped tightly on itself.

2. Select the LEAK position of the NIBP TEST key.

3. Press NIBP key followed by the START key.

4. **ESCORT** will inflate cuff and automatically check for a leak. If no leak is detected, a NO LEAK message is displayed. If a leak is detected, a LEAK message is displayed. If a leak is detected, replace or repair leak in cuff/hose before using to monitor a patient.

5. To exit the LEAK test mode, press STOP key.

13.4.2 OSCILLATION WAVEFORM RECORDING

If the **ESCORT** is configured with a recorder, the oscillation waveform can be recorded. The oscillation waveform can be recorded in the TEST mode. To record the waveform:

1. Select the WAVE position of the NIBP TEST key.

2. Press PAGE HOME followed by the NIBP setup key.

3. The oscillation waveform will automatically record for each determination.

4. To exit the waveform test mode, select the OFF position of the NIBP TEST key.

REVISIONS			
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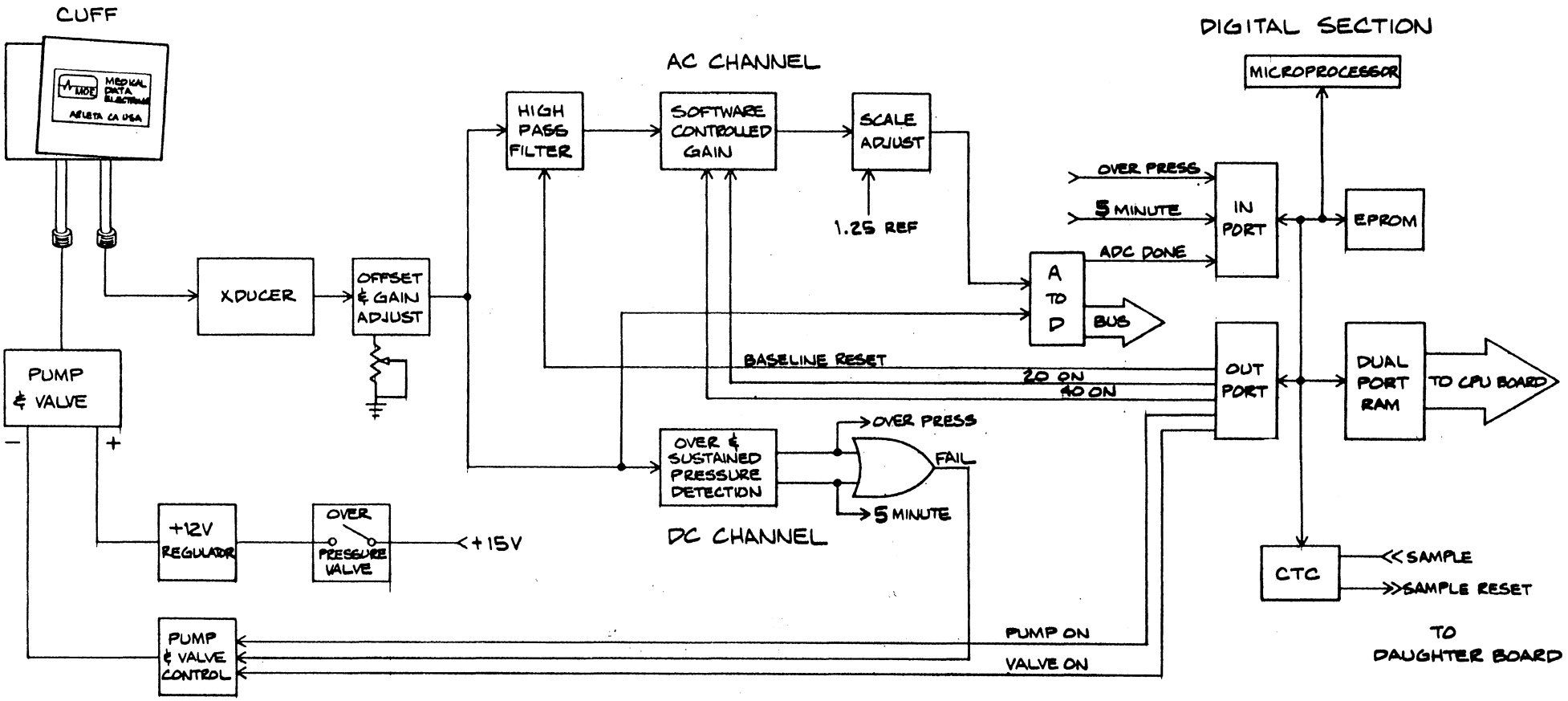

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS ± DEC ± ANGLES ±		MEDICAL DATA ELECTRONICS	
APPROVALS	DATE	NIBP BLOCK DIAGRAM	
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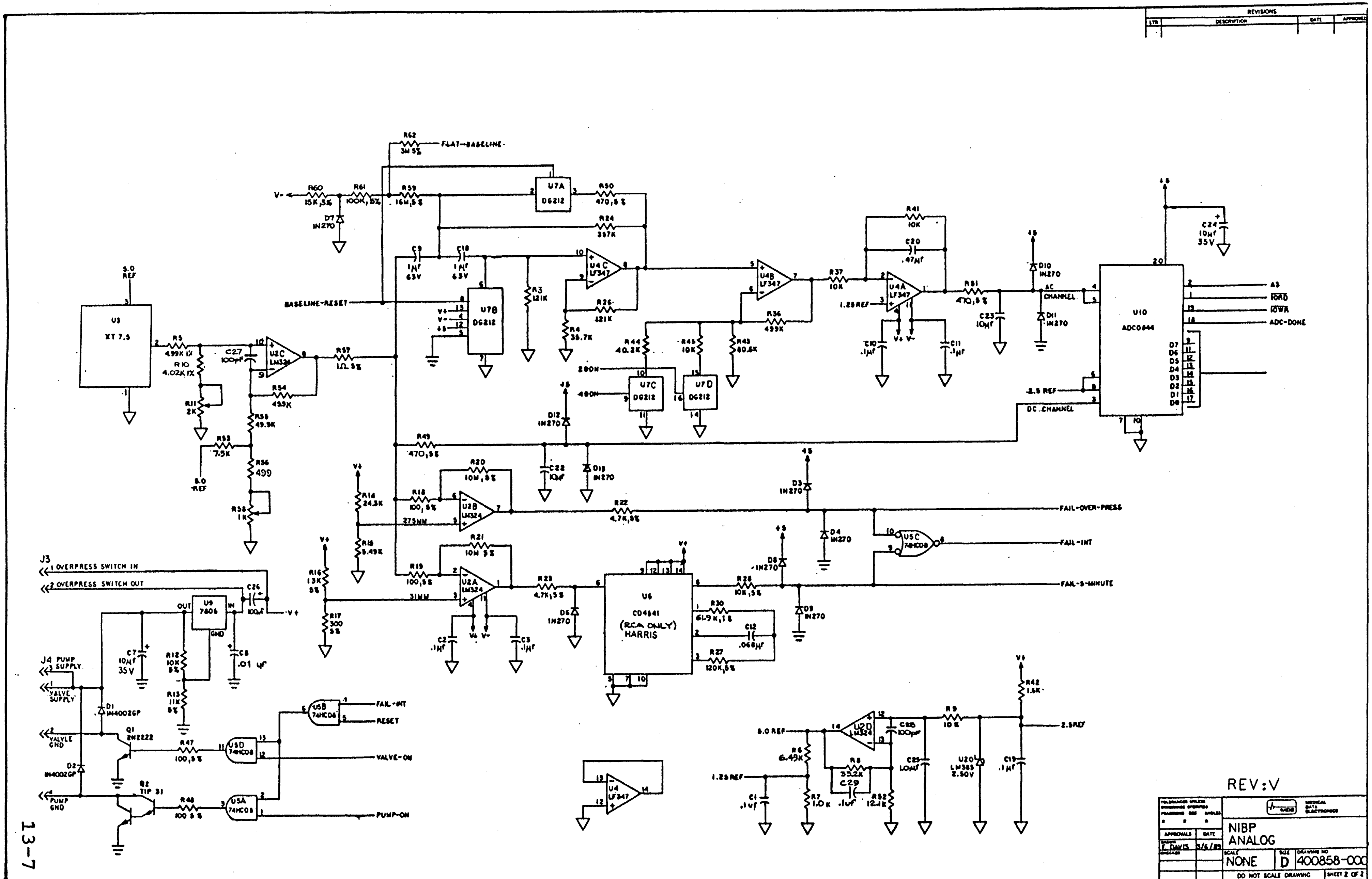
CHECKED		SCALE NONE	SIZE C
		DO NOT SCALE DRAWING	SHEET 1 OF 1


REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
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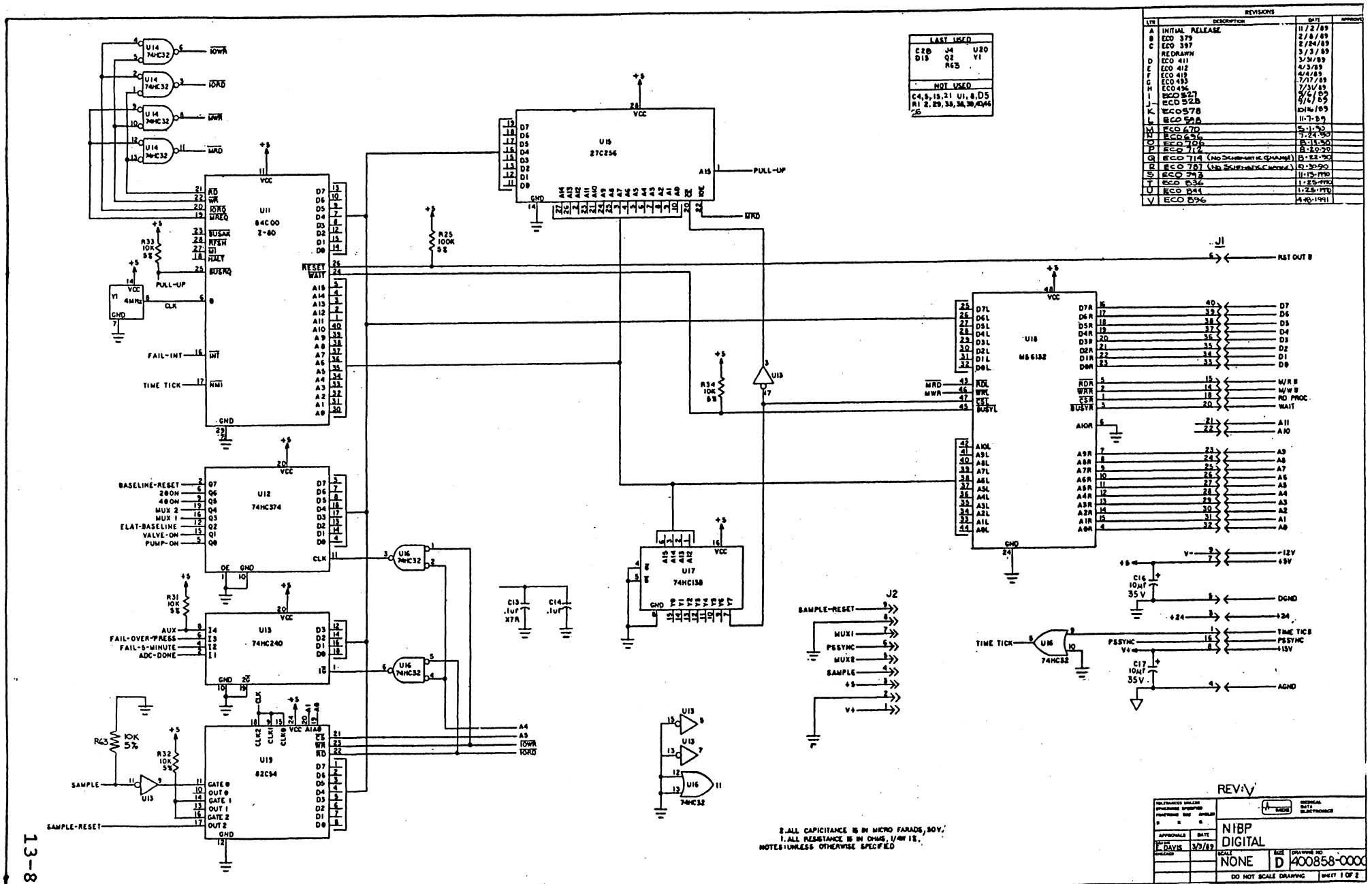
BASELINE-RESET
AC CHANNEL
DC CHANNEL
2.5 REF
A3
RD
WR
ADC-DONE
U10
ADC0844
U3
XT 7.5
U7A DG212
U7B DG212
U7C DG212
U7D DG212
U4A LF347
U4B LF347
U4C LF347
U2A LM324
U2B LM324
U2C LM324
U2D LM324
U6
CD4541
(RCA ONLY)
HARRIS
U5C 74HC08
U5B 74HC08
U5D 74HC08
U5A 74HC08
U9 7806
FAIL-OVER-PRESS
FAIL-INT
FAIL-3-MINUTE
RESET
VALVE-ON
PUMP-ON
J3
1 OVERPRESS SWITCH IN
2 OVERPRESS SWITCH OUT
J4 PUMP
3 SUPPLY
1 VALVE SUPPLY
2 VALVE GND
4 PUMP GND
Q1 2N2222
Q2 TIP 31
D1 1N4002GP
D2 1N4002GP
5.0 REF
1.25 REF
2.5REF
U20 LM385 2.50V
REV:V
NIBP
ANALOG
MEDICAL DATA ELECTRONICS
NONE
D
400858-000
DO NOT SCALE DRAWING
SHEET 2 OF 2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A INITIAL RELEASE 11/2/89
B ECO 379 2/8/89
C ECO 397 2/24/89
REDRAWN 3/3/89
D ECO 411 3/31/89
E ECO 412 4/3/89
F ECO 419 4/4/89
G ECO 493 7/17/89
H ECO 496 7/31/89
I ECO 527 9/6/89
J ECO 525 9/6/89
K ECO 578 10/16/89
L ECO 598 11-7-89
M ECO 670 5-1-90
N ECO 696 7-24-90
O ECO 708 8-15-90
P ECO 712 8-20-90
Q ECO 719 (NO SCHEMATIC CHANGE) 8-22-90
R ECO 761 (NO SCHEMATIC CHANGE) 10-30-90
S ECO 793 11-15-990
T ECO 836 1-25-991
U ECO 841 1-25-991
V ECO 896 4-10-1991
LAST USED
C28 J4 U20
D13 Q2 Y1
R63
NOT USED
C4,5,13,21 U1,8,D5
R1 2,29,35,36,38,40,46
J6
U14 74HC32
U11 84C00 Z-80
U15 27C256
U18 MS6132
U12 74HC374
U13 74HC240
U19 82C54
U16 74HC32
U17 74HC138
Y1 4MHz
R33 10K 5%
R25 100K 5%
R34 10K 5%
R31 10K 5%
R32 10K 5%
R63 10K 5%
C13 .1uF X7R
C14 .1uF
C16 10uF 35V
C17 10uF 35V
J1
J2
RST OUT B
PULL-UP
WRD
IOWA
IORD
IOWR
MWR
MRD
BASELINE-RESET
200N
400N
MUX 2
MUX 1
ELAT-BASELINE
VALVE-ON
PUMP-ON
AUX
FAIL-OVER-PRESS
FAIL-5-MINUTE
ADC-DONE
FAIL-INT
TIME TICK
SAMPLE
SAMPLE-RESET
MUX1
PSSYNC
MUX2
V+
+12V
+5V
DGND
+24
-15V
AGND
M/W B
RD PROC
WAIT
NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTANCE IS IN OHMS, 1/4W 1%.
2. ALL CAPICITANCE IS IN MICRO FARADS, 50V.
REV: V
NIBP DIGITAL
F. DAVIS 3/3/89
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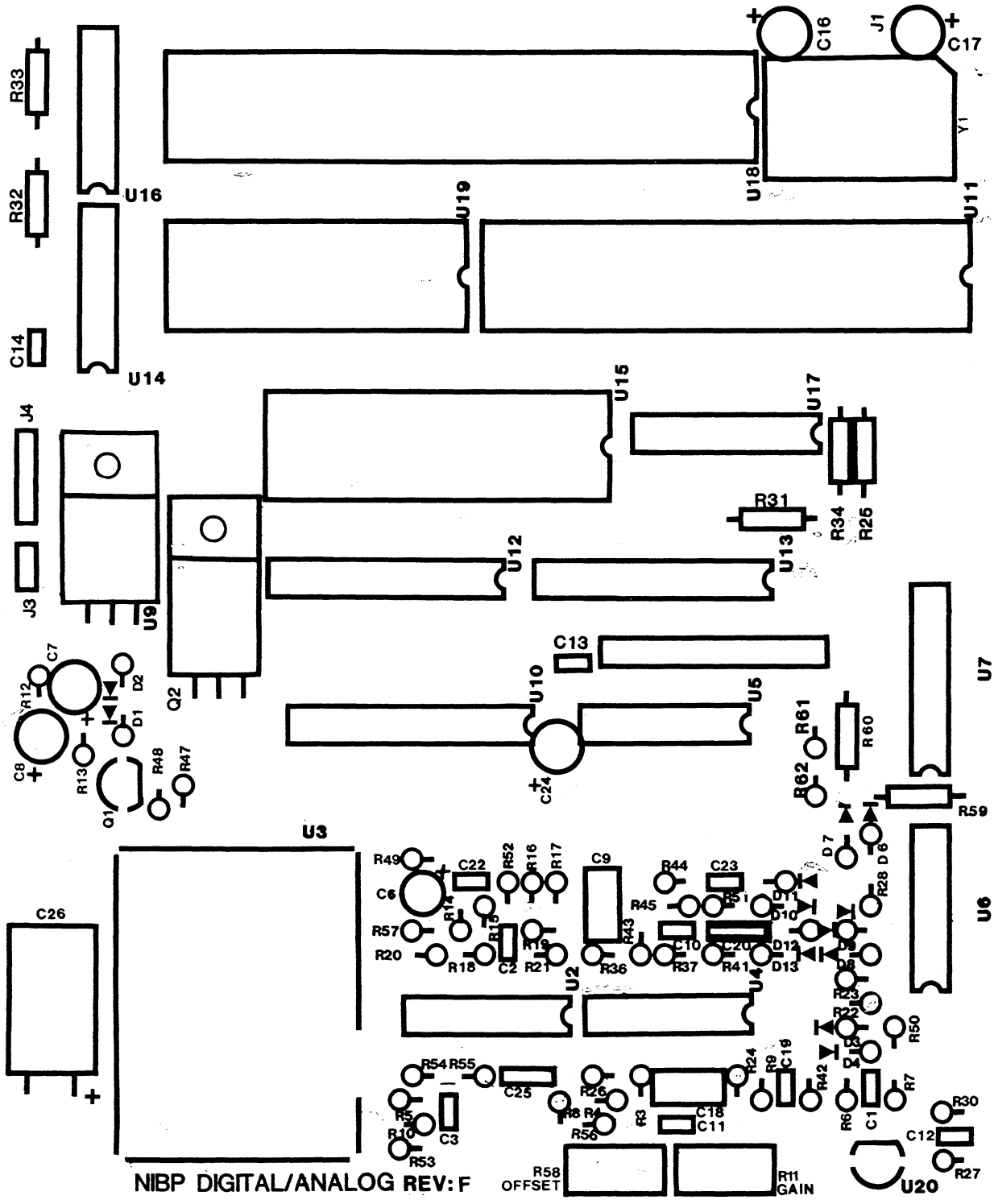
SIZE D
400858-0000
DO NOT SCALE DRAWING
SHEET 1 OF 2



NIBP DIGITAL/ANALOG BOARD

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
400858-0000	PCBA, NIBP, REV. V2 (D070) - E2/E3			A			V2	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
400857-0000	*1	1	PCB, NIBP, REVISION "G"		R	33	1.000	EA		Yes		
352100-0474A	*1	2	CAP, .47UF,50V,10%,RAD,X7R		R	22	1.000	EA	C20	Yes		
352100-0104A	*1	3	CAP, .1UF,50V,10%,RAD,X7R		R	11	2.000	EA	C13,29	Yes		
352300-0020A	*1	4	CAP., 1UF,63V,5%,MYLAR		R	77	2.000	EA	C9,18	Yes		
352300-0021A	*1	5	CAP., .068UF,50V,10%,MYLAR		R	66	1.000	EA	C12	Yes		
352300-0104A	*1	6	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	7.000	EA	C1,2,3,10,11,14,19	Yes		
370100-0010A	*1	7	RES, 1,1/4W,5%,CF		R	11	1.000	EA	R57	Yes		
352300-0008A	*1	8	CAP, .01UF,5%,MYLAR		R	66	1.000	EA	C8	Yes		
352401-0106A	*1	9	CAP, 10UF,35V,20%,RAD,TANT		R	11	6.000	EA	C7,16,17,24,23,22	Yes		
356000-0008A	*1	10	REF OSCILLATOR, 4.0MHZ,CMOS HIGH SPEED		R	22	1.000	EA	Y1	Yes		
354000-0188A	*1	11	CONN, FEMALE, SNAP-AWAY, 20 PIN STRIP,INTERCONNECT		R	11	9.000	EA	J2 (CUT TO 9 PINS)	Yes		
364000-0008A	*1	12	IC, DG212CJ		R	11	1.000	EA	U7	Yes		
364000-0026A	*1	13	IC, 74HC08		R	11	1.000	EA	U5	Yes		
364000-0027A	*1	14	IC, 74HC32		R	11	2.000	EA	U14,16	Yes		
364000-0029A	*1	15	IC, 74HC138		R	11	1.000	EA	U17	Yes		
364000-0036A	*1	16	IC, 7806		R	11	1.000	EA	U9	Yes		
364000-0038A	*1	17	IC, 27C256,CMOS,EPROM,200NS		R	11	1.000	EA	U15	Yes		
364000-0057A	*1	18	IC, LM324, LINEAR		R	11	1.000	EA	U2	Yes		
364000-0080A	*1	19	IC, TMPZ84C00P (Z80A, CMOS VERSION)		R	11	1.000	EA	U11	Yes		
364000-0095A	*1	20	IC, MS6132,DUAL PORT RAM, 8 X 2K,48-PIN (OR MS7132)		R	11	1.000	EA	U18	Yes		
364000-0096A	*1	21	IC, 74HC240		R	11	1.000	EA	U13	Yes		
364000-0097A	*1	22	IC, 74HC374		R	11	1.000	EA	U12	Yes		
364000-0130A	*1	23	IC, LF347 (SCREENED TO +/- 1.5mV), NATIONAL ONLY		A	22	1.000	EA	U4	Yes		
370200-7501A	*1	24	RES, 7.5K,1/4W,1%,MF		R	11	1.000	EA	R53	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400858-0000	PCBA, NIBP, REV. V2 (D070) - E2/E3			A				V2	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
364000-0127A	*1	25	IC, CD4541 **RCA (HARRIS) ONLY**		R	22	1.000	EA	U6	Yes		
364000-0128A	*1	26	IC, ADC844		R	22	1.000	EA	U10	Yes		
370100-0101A	*1	27	RES, 100,1/4W,5%,CF		R	11	4.000	EA	R47,48,18,19	Yes		
370100-0103A	*1	28	RES, 10K,1/4W,5%,CF		R	11	7.000	EA	R12,28,31,32,33,34,63	Yes		
370100-0104A	*1	29	RES, 100K,1/4W,5%,CF		R	11	2.000	EA	R25,61	Yes		
370100-0106A	*1	30	RES, 10M,1/4W,5%,CF		R	11	2.000	EA	R20,21	Yes		
370100-0113A	*1	31	RES, 11K,1/4W,5%,CF		R	11	1.000	EA	R13	Yes		
370100-0124A	*1	32	RES, 120K,1/4W,5%,CF		R	11	1.000	EA	R27	Yes		
370100-0133A	*1	33	RES, 13K,1/4W,5%,CF		R	11	1.000	EA	R16	Yes		
370100-0162A	*1	34	RES, 1.6K,1/4W,5%,CF		R	11	1.000	EA	R42	Yes		
358100-0013A	*1	35	SCR, 4-40 X 3/8,PH PNHD,CAD1		R	11	2.000	EA	DO NOT ISSUE	Yes		
370100-0301A	*1	36	RES, 300,1/4W,5%,CF		R	11	1.000	EA	R17	Yes		
370100-0471A	*1	37	RES, 470,1/4W,5%,CF		R	11	3.000	EA	R50,51,49	Yes		
370100-0472A	*1	38	RES, 4.7K,1/4W,5%,CF		R	11	2.000	EA	R22,23	Yes		
370200-6192A	*1	39	RES, 61.9K,1/4W,1%,MF		R	11	1.000	EA	R30	Yes		
370200-1002A	*1	40	RES, 10K,1/4W,1%,MF		R	11	4.000	EA	R9,37,41,45	Yes		
370200-1213A	*1	41	RES, 121K,1/4W,1%,MF		R	11	2.000	EA	R3,26	Yes		
370200-2432A	*1	42	RES, 24.3K,1/4W,1%,MF		R	11	1.000	EA	R14	Yes		
370200-1001A	*1	43	RES, 1K,1/4W,1%,MF		R	11	1.000	EA	R7	Yes		
370200-3572A	*1	44	RES, 35.7K,1/4W,1%,MF		R	11	1.000	EA	R4	Yes		
370200-3573A	*1	45	RES, 357K,1/4W,1%,MF		R	11	1.000	EA	R24	Yes		
370200-4022A	*1	46	RES, 40.2K,1/4W,1%,MF		R	11	1.000	EA	R44	Yes		
370200-4990A	*1	47	RES, 499,1/4W,1%,MF		R	11	1.000	EA	R56	Yes		
370200-4992A	*1	48	RES, 49.9K,1/4W,1%,MF		R	11	2.000	EA	R54,55	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400858-0000	PCBA, NIBP, REV. V2 (D070) - E2/E3			A				V2	5

Shrinkage Factor: 0.000

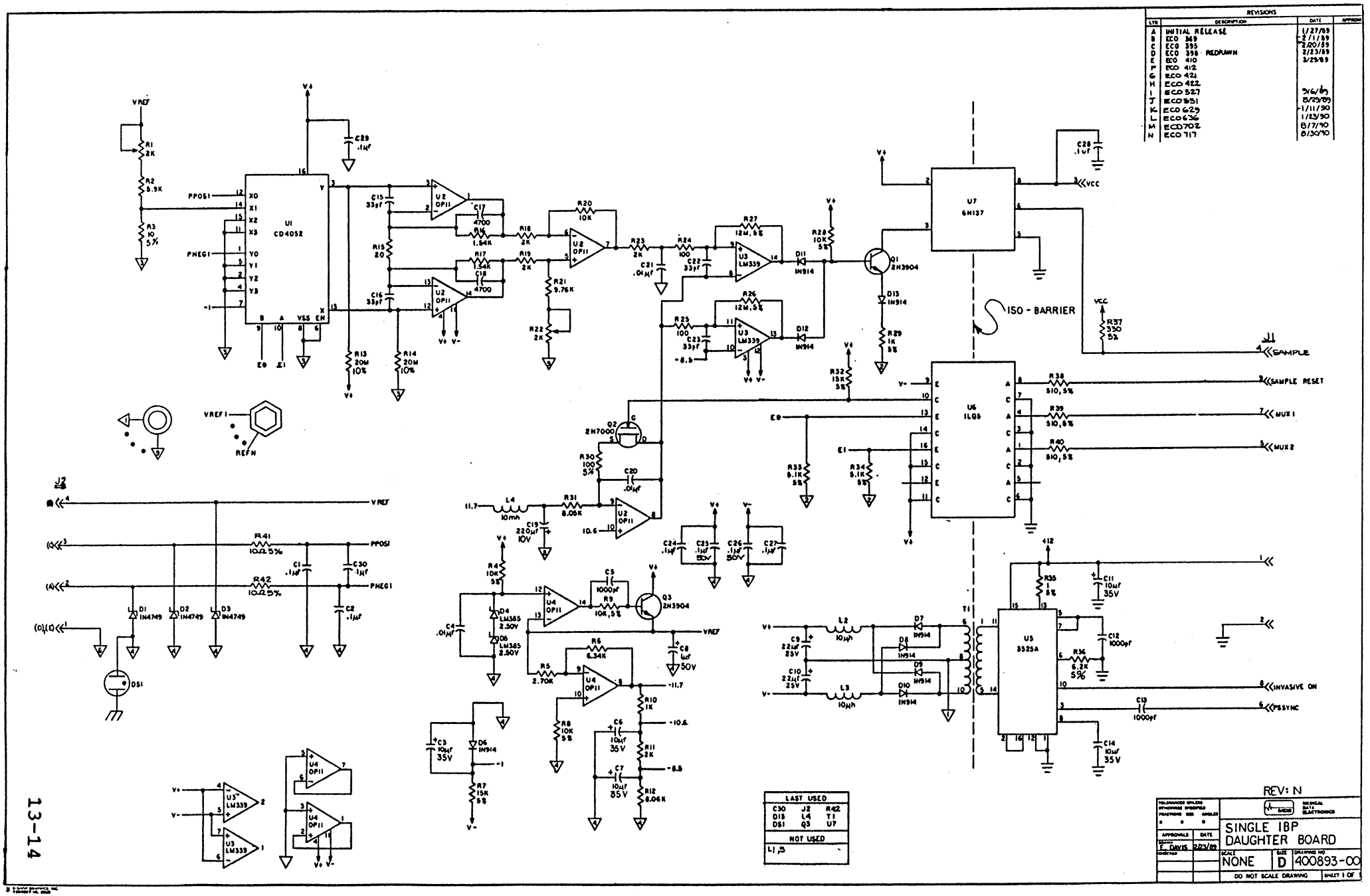
ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370200-4993A	*1	49	RES, 499K,1/4W,1%,MF		R	11	1.000	EA	R36	Yes		
370200-5491A	*1	50	RES, 5.49K,1/4W,1%,MF		R	11	1.000	EA	R15	Yes		
370200-6491A	*1	51	RES, 6.49K,1/4W,1%,MF		R	11	1.000	EA	R6	Yes		
370200-8062A	*1	52	RES, 80.6K,1/4W,1%,MF		R	11	1.000	EA	R43	Yes		
370200-4021A	*1	53	RES, 4.02K,1/4W,1%,MF		R	11	1.000	EA	R10	Yes		
374300-0102A	*1	54	POT, 1K,TRIM,SIDE ADJ,CER MET,3/8 IN.QR,.15LS		R	11	1.000	EA	R58	Yes		
374300-0202A	*1	55	POT, 2K,TRIM,SIDE ADJ,CER MET,3/8 SQR,.15LS		R	11	1.000	EA	R11	Yes		
376000-0007A	*1	56	XSTR, TIP31		R	11	1.000	EA	Q2	Yes		
376000-0013A	*1	57	XSTR, PN2222,PLASTIC		R	11	1.000	EA	Q1	Yes		
378000-0001A	*1	58	DIO, 1N270 T&R		R	11	6.000	EA	D3,4,8,9,10,11,	Yes		
378000-0001A	*1	59	DIO, 1N270 T&R		R	11	4.000	EA	D12,13,6,7	Yes		
378000-0002A	*1	60	DIO, 1N4002GP,RCTFR, (MOT ONLY) T&R		R	11	2.000	EA	D1,2	Yes		
378000-0034A	*1	61	DIO, LM385,ZENER (XSTR NATIONAL ONLY)		R	11	1.000	EA	U20	Yes		
354000-0138A	*1	62	CONN, 2-P,M,STRT LOCK,.1 CTR,HDR		R	11	1.000	EA	J3	Yes		
354000-0148A	*1	63	CONN, 4-P,M,STRT,.1 CTR,LOCKING RAMP		R	11	1.000	EA	J4	Yes		
370200-3322A	*1	64	RES, 33.2K,1/4W,1%,MF		R	11	1.000	EA	R8	Yes		
358200-0002A	*1	65	WSHR, #4 FLT FIBER (4X5/16X3/64)		R	11	4.000	EA	DO NOT ISSUE	Yes		
370100-0166A	*1	66	RES, 16M,1/4W,5%,CF		R	11	1.000	EA	R59	Yes		
370100-0153A	*1	67	RES, 15K,1/4W,5%,CF		R	11	1.000	EA	R60	Yes		
352400-0105A	*1	68	CAP, 1UF,50V,20%,RAD,TANT, MAX: HT. .28; O.D. .16		R	11	1.000	EA	C25	Yes		
365000-0014A	*1	69	SKT, 14-POS,DIP,TIN PLATE,L.P.		R	11	2.000	EA	U2,4	Yes		
358200-0009A	*1	70	WSHR, #4 SPLIT LOCK		R	11	2.000	EA	DO NOT ISSUE	Yes		
360500-0021A	*1	71	NUT, #4 HEX,SM PTRN		R	11	2.000	EA	DO NOT ISSUE	Yes		
365000-0024A	*1	72	SKT, 24-POS,DIP,TIN PLATE,L.P.		R	11	1.000	EA	U19	Yes		

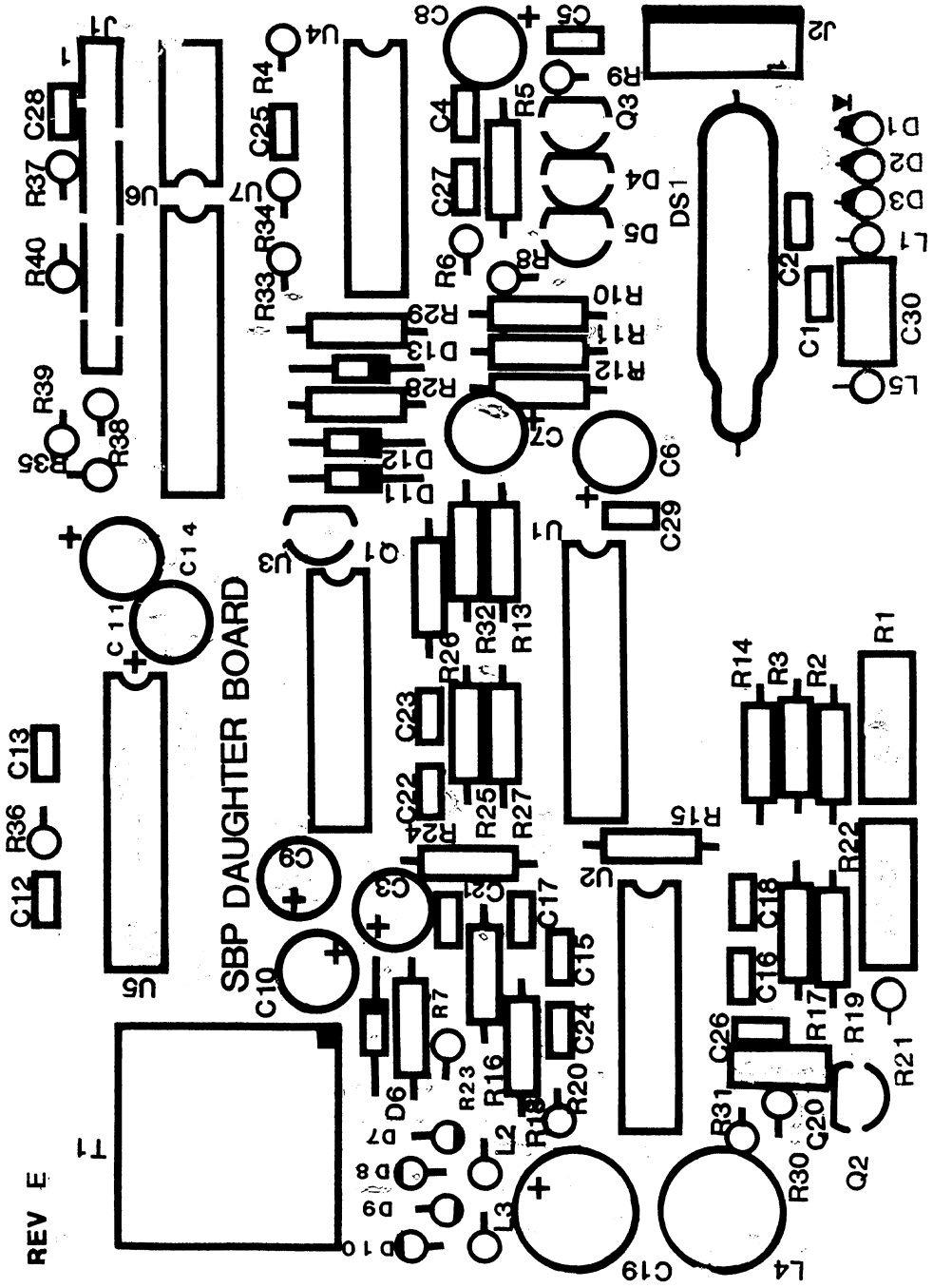
Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
400858-0000	PCBA, NIBP, REV. V2 (D070) - E2/E3			A			V2	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
365000-0228A	*1	73	SKT, 28-POS,LOW PROFILE,GOLD CNTCT W/TIN SHELL		R	22	1.000	EA	U15	Yes		
365000-0040A	*1	74	SKT, 40-POS,DIP,TIN PLATE ,L.P.		R	11	1.000	EA	U11	Yes		
360500-0062A	*1	75	STDOFF, #6,ALUM,1/4 RND X 1.375 LNGTH		R	11	1.000	EA	DO NOT ISSUE	Yes		
400712-0000	*1	76	FAB, FISH PAPER 23.26SQ"/PC.(4.125" X 5.125")REV B		A	0	1.000	EA	DO NOT ISSUE	Yes		
352200-0107A	*1	77	CAP, 100UF,50V,RAD,ELECT, LS TYPE		R	22	1.000	EA	C26	Yes		
370200-4991A	*1	78	RES, 4.99K,1/4W,1%,MF		R	11	1.000	EA	R5	Yes		
370100-0305A	*1	79	RES, 3M,1/4W,5%,CF		R	11	1.000	EA	R62	Yes		
352100-0101A	*1	80	CAP, 100PF,25V,10%,RAD,NP0		R	11	2.000	EA	C27,28	Yes		
401519-0000	*1	81	PCBA, NIBP TRANSDUCER MODULE REV. A2 (D072)	A2	A	5	1.000	EA		Yes		
370200-1212A	*1	83	RES, 12.1K,1/4W,1%,MF		R	11	1.000	EA	R52	Yes		
365000-0148A	*1	87	SOCKET, 48 PIN DIP		R	22	1.000	EA	U18	Yes		
400834-0000	*1	90	LAMINATE FOR 400537-0000 LABELS		R	11	0.250	EA	2 PCS @ 1/8" EA	Yes		

Cumulative Lead Time for 400858-0000 = 82


REVISIONS
LTR DESCRIPTION DATE APPROVED
A INITIAL RELEASE 1/27/89
B ECO 369 2/1/89
C ECO 395 2/20/89
D ECO 398 - REDRAWN 2/23/89
E ECO 410 3/29/89
F ECO 412
G ECO 421
H ECO 422
I ECO 527 9/6/89
J ECO 551 10/29/89
K ECO 629 1/11/90
L ECO 636 1/23/90
M ECO 702 8/7/90
N ECO 717 8/30/90
ISO - BARRIER
LAST USED
C30 J2 R42
D13 L4 T1
DS1 Q3 U7
NOT USED
L1,5
SINGLE IBP
DAUGHTER BOARD
REV: N
SCALE NONE
SIZE D
DRAWING NO 400893-00
DO NOT SCALE DRAWING
SHEET 1 OF 1
13-14



SBP DAUGHTER BOARD

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400893-0000	PCBA, SINGLE IBP DAUGHTER BOARD, REV. N - E2/E3			A				N	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
400894-0000	*1	1	PCB, SINGLE IBP DAUGHTER BD., REVISION 'G'		R	33	1.000	EA	USE UP REV F PCB'S	Yes		
352100-0102A	*1	2	CAP, 1000PF,50V,10%,RAD,X7R		R	11	2.000	EA	C5,13	Yes		
352100-0103A	*1	3	CAP, .01UF,50V,10%,RAD,X7R		R	11	2.000	EA	C4,21	Yes		
352100-0472A	*1	4	CAP, .0047UF,25V,10%,RAD, X7R		R	22	2.000	EA	C17,18	Yes		
352101-0330A	*1	5	CAP, 33PF,100V,5%,RAD,NPO		R	22	4.000	EA	C15,16,22,23	Yes		
352201-0227A	*1	6	CAP, 220UF,10V,RAD,ELECT, .248 X .433 CS		R	66	1.000	EA	C19	Yes		
352301-0103A	*1	7	CAP, .01UF,100V,20%,POLYCARB,.2 L.S.		R	66	1.000	EA	C20	Yes		
352301-0104A	*1	8	CAP, .1UF,5%,MYLAR		R	66	5.000	EA	C1,2,24,27,28	Yes		
352301-0104A	*1	9	CAP, .1UF,5%,MYLAR		R	66	1.000	EA	C29	Yes		
352301-0105A	*1	10	CAP, 1UF,63V,20%,MYLAR		R	22	1.000	EA	C30	Yes		
352400-0105A	*1	11	CAP, 1UF,50V,20%,RAD,TANT, MAX: HT. .28; O.D. .16		R	11	1.000	EA	C8	Yes		
352401-0106A	*1	12	CAP, 10UF,35V,20%,RAD,TANT		R	11	5.000	EA	C3,6,7,11,14	Yes		
352400-0226A	*1	13	CAP, 22UF,25V,20%,TANT		R	11	2.000	EA	C9,10	Yes		
364000-0010A	*1	14	IC, LM339		R	11	1.000	EA	U3	Yes		
364000-0055A	*1	15	IC, CD4052		R	11	1.000	EA	U1	Yes		
364000-0065A	*1	16	IC, OP11FP,OP AMP		R	11	2.000	EA	U2,4	Yes		
378000-0034A	*1	17	DIO, LM385,ZENER (XSTR NATIONAL ONLY)		R	11	2.000	EA	D4,5	Yes		
364000-0091A	*1	18	IC, SG 3525		R	44	1.000	EA	U5	Yes		
364000-0093A	*1	19	IC, ILQ5 QUAD OPTO ISOLATOR		R	22	1.000	EA	U6	Yes		
364000-0099A	*1	21	IC, 6N137		R	11	1.000	EA	U7	Yes		
354000-0103A	*1	22	CONN, SGL ROW,STRT,SGL PINS,SNAP-AWAY		R	11	1.000	PIN	J2 - DO NOT ISSUE	Yes		
354000-0187A	*1	23	CONN, MALE, SNAP-AWAY, 20 PIN STRIP, INTERCONNECT		R	11	9.000	EA	J1-MALE; 9 PIN = 1 PC	Yes		
370100-0010A	*1	24	RES, 1,1/4W,5%,CF		R	11	1.000	EA	R35	Yes		
370100-0101A	*1	26	RES, 100,1/4W,5%,CF		R	11	3.000	EA	R24,25,30	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400893-0000	PCBA, SINGLE IBP DAUGHTER BOARD, REV. N - E2/E3			A				N	0

Shrinkage Factor: 0.000

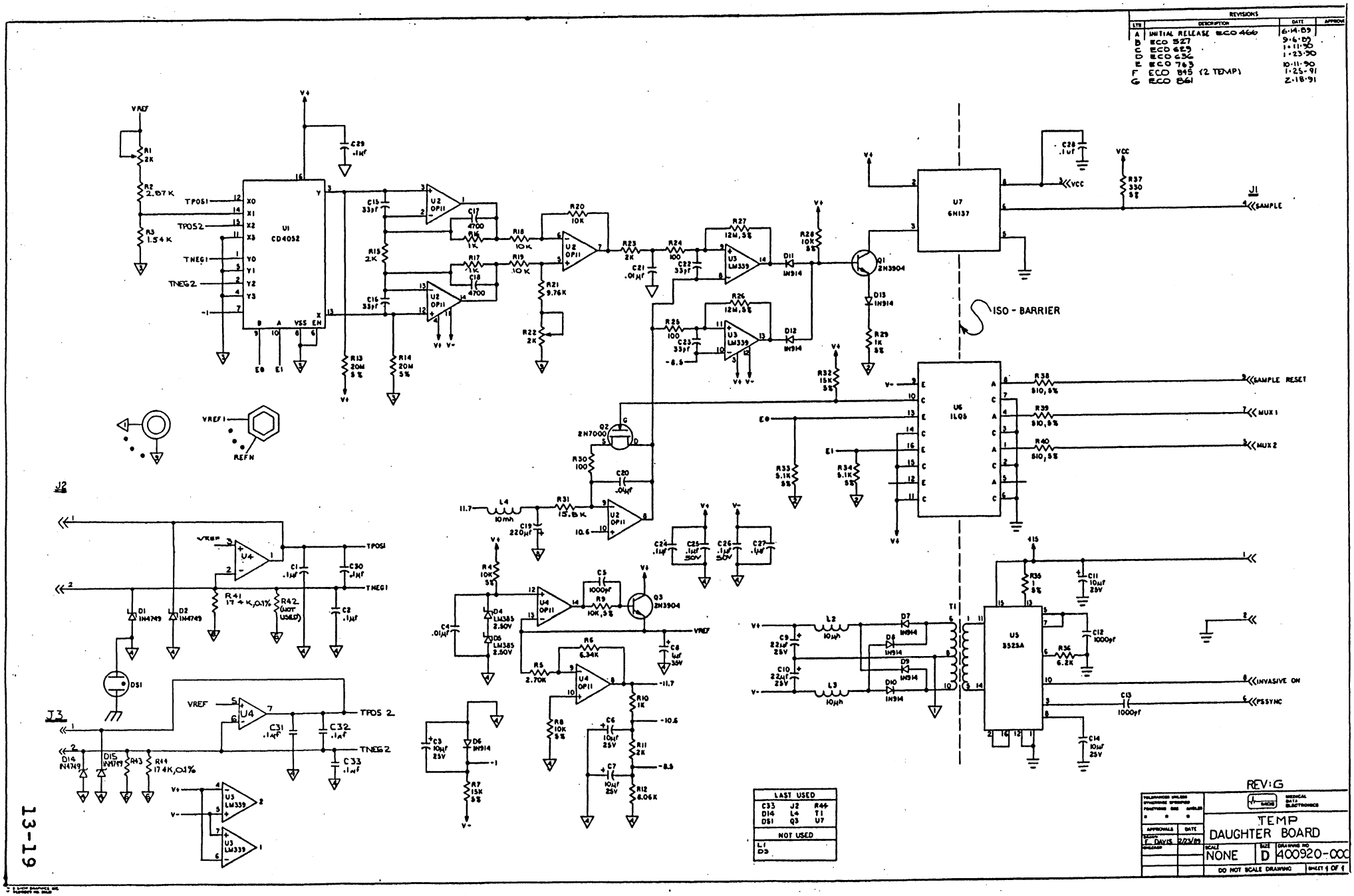
ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370100-0102A	*1	27	RES, 1K,1/4W,5%,CF		R	11	1.000	EA	R29	Yes		
370100-0103A	*1	28	RES, 10K,1/4W,5%,CF		R	11	4.000	EA	R4,8,9,28	Yes		
370100-0126A	*1	29	RES, 12M,1/4W,5%,CF		R	11	2.000	EA	R26,27	Yes		
370100-0153A	*1	30	RES, 15K,1/4W,5%,CF		R	11	2.000	EA	R7,32	Yes		
370100-0206A	*1	31	RES, 20M,1/4W,10%,CF		R	11	2.000	EA	R13,14	Yes		
370100-0331A	*1	32	RES, 330,1/4W,5%,CF		R	11	1.000	EA	R37	Yes		
370100-0511A	*1	33	RES, 510,1/4W,5%,CF		R	11	3.000	EA	R38,39,40	Yes		
370100-0512A	*1	34	RES, 5.1K,1/4W,5%,CF		R	11	2.000	EA	R33,34	Yes		
370100-0622A	*1	35	RES, 6.2K,1/4W,5%,CF		R	11	1.000	EA	R36	Yes		
370200-0200A	*1	36	RES, 20,1/4W,1%,MF		R	11	1.000	EA	R15	Yes		
370200-1001A	*1	37	RES, 1K,1/4W,1%,MF		R	11	1.000	EA	R10	Yes		
370200-1002A	*1	38	RES, 10K,1/4W,1%,MF		R	11	1.000	EA	R20	Yes		
370200-1541A	*1	39	RES, 1.54K,1/4W,1%,MF		R	11	2.000	EA	R16,17	Yes		
370200-2001A	*1	40	RES, 2K,1/4W,1%,MF		R	11	4.000	EA	R11,18,19,23	Yes		
370200-2701A	*1	41	RES, 2.7K,1/4W,1%,MF		R	11	1.000	EA	R5	Yes		
370200-5901A	*1	42	RES, 5.9K,1/4W,1%,MF		R	11	1.000	EA	R2	Yes		
370200-6341A	*1	43	RES, 6.34K,1/4W,1%,MF		R	11	1.000	EA	R6	Yes		
370200-8061A	*1	44	RES, 8.06K,1/4W,1%,MF (8 .05K N/A :OK PER KR)		R	11	2.000	EA	R31,12	Yes		
370200-9761A	*1	45	RES, 9.76K,1/4W,1%,MF		R	11	1.000	EA	R21	Yes		
374300-0202A	*1	46	POT, 2K,TRIM,SIDE ADJ,CER MET,3/8 SQR,.15LS		R	11	2.000	EA	R1,22	Yes		
376000-0003A	*1	47	XSTR, 2N3904		R	11	2.000	EA	Q1,3	Yes		
376000-0019A	*1	48	XSTR, 2N7000,FET		R	11	1.000	EA	Q2	Yes		
378000-0005A	*1	49	DIO, 1N914,SIGNAL T&R		R	11	8.000	EA	D6,7,8,9,10,11,12,13	Yes		
378000-0012A	*1	50	DIO, 1N4749A,24V,ZENER T& R ***MOT ONLY***		R	11	3.000	EA	D1,2,3	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400893-0000	PCBA, SINGLE IBP DAUGHTER BOARD, REV. N - E2/E3			A				N	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
382200-0005A	*1	51	CHOKE, 10UH,MOLDED		R	11	2.000	EA	L2,3	Yes		
382200-0018A	*1	52	CHOKE, 10,000UH MS75089-35		R	11	1.000	EA	L4	Yes		
384000-0061A	*1	54	GAS TUBE (SURGE ARRESTER)		R	33	1.000	EA	DS1	Yes		
400552-0000	*1	55	ESCORT II ISO-TRANSFORMER , REV. 'A' **(FIFO)**		R	22	1.000	EA	T1	Yes		
360500-0060A	*1	57	STDOFF, #4 THREADED,NYLON		R	11	2.000	EA	DO NOT ISSUE	Yes		
358100-0021A	*1	58	SCR, 4-40 X 1/4,PH FLTHD, 100 DEG,ZN		R	11	4.000	EA	DO NOT ISSUE	Yes		
365000-0016A	*1	61	SKT, 16-POS,DIP,TIN PLATE ,L.P.		R	11	1.000	EA	U1	Yes		
352100-0104A	*1	62	CAP, .1UF,50V,10%,RAD,X7R		R	11	2.000	EA	C25,26	Yes		
358100-0066A	*1	64	SCR, 6-32 X 2.75,LONG-LAG		R	11	1.000	EA	DO NOT ISSUE	Yes		
360500-0022A	*1	66	NUT, #4 HEX,LRG PTTRN		R	11	3.000	EA	DO NOT ISSUE	Yes		
352300-0007A	*1	67	CAP, .001UF,10%, MYLAR		R	66	1.000	EA	C12	Yes		
370100-0100A	*1	68	RES, 10,1/4W,5%,CF		R	11	3.000	EA	R3,41,42	Yes		

Cumulative Lead Time for 400893-0000 = 66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C ECO 653 1-11-90
D ECO 634 1-23-90
E ECO 763 10-11-90
F ECO 848 (2 TEMP) 1-25-91
G ECO 861 2-18-91
ISO - BARRIER
TEMP
DAUGHTER BOARD
REV:G
SCALE NONE
SIZE D
DRAWING NO 400920-000
DO NOT SCALE DRAWING
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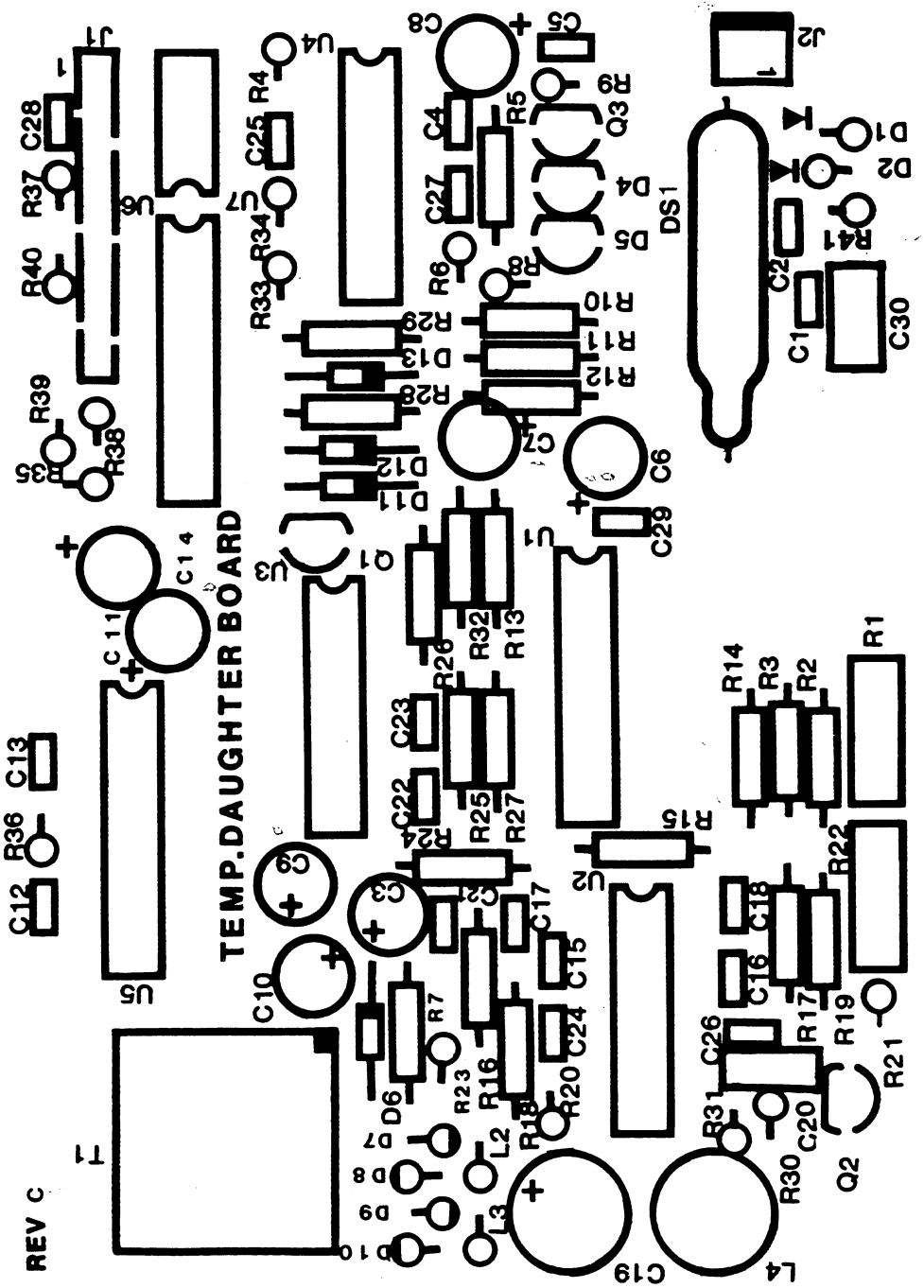
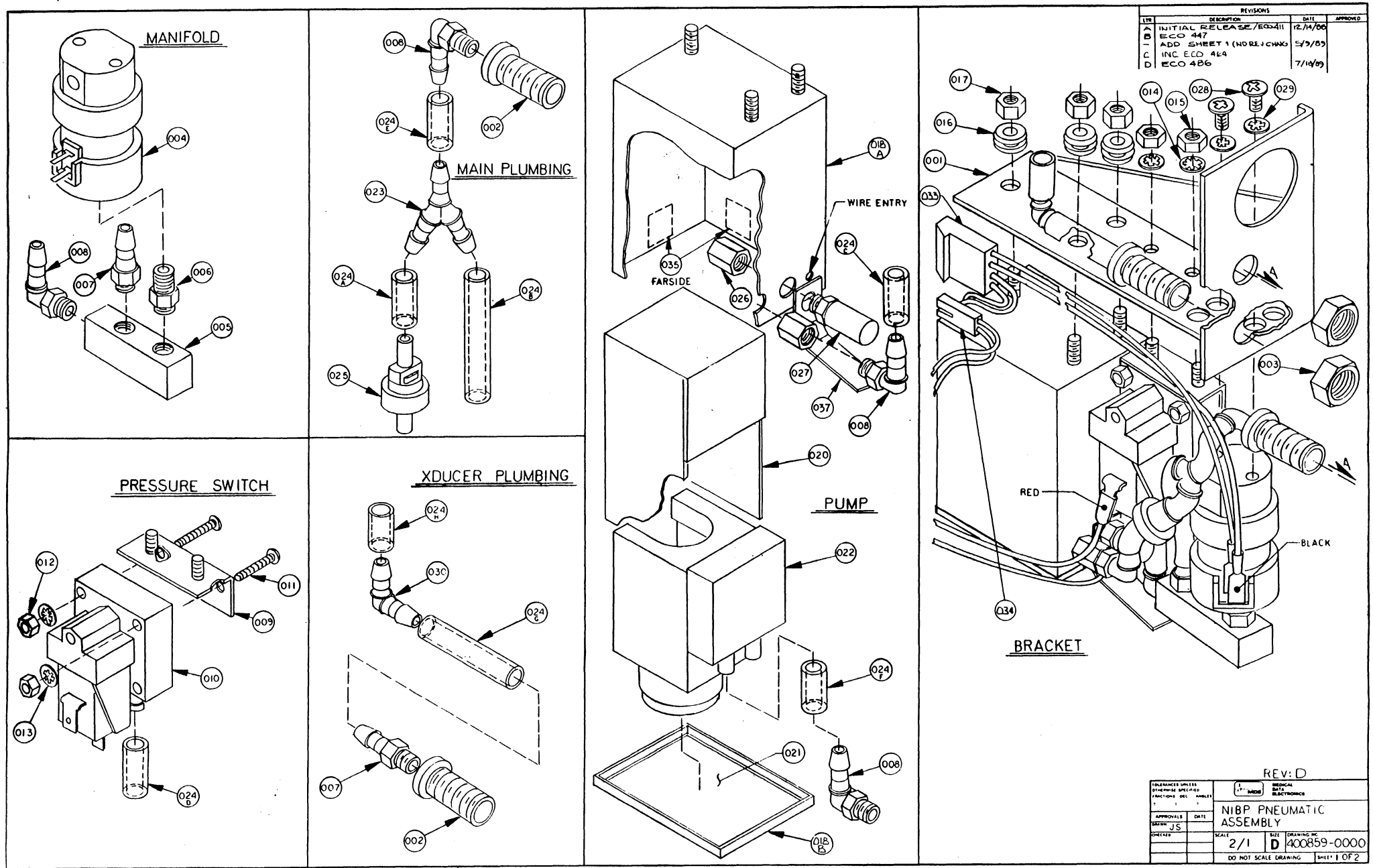
C33 J2 R44
D14 L4 T1
D51 Q3 U7
NOT USED
L1
D3
13-19



TEMP DAUGHTER BOARD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007
006
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MAIN PLUMBING
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002
023
024 A
024 B
025
PRESSURE SWITCH
012
011
009
010
013
024 D
XDUCER PLUMBING
024 H
030
024 C
007
002
018 A
WIRE ENTRY
024 E
035
FARSIDE
026
027
037
008
020
PUMP
022
024 F
021
008
018 B
REVISIONS
LTR | DESCRIPTION | DATE | APPROVED
A | INITIAL RELEASE/EO3411 | 12/14/88
B | ECO 447 | 5/3/89
C | ADD SHEET 1 (NO REV) CHNG | 5/3/89
D | INC ECO 464 | 7/18/89
D | ECO 486 | 7/18/89
017
016
001
033
014
015
028
029
003
RED
BLACK
034
BRACKET
REV: D
NIBP PNEUMATIC ASSEMBLY
SCALE 2/1
SIZE D
DRAWING NO. 400859-0000
DO NOT SCALE DRAWING
SHEET 1 OF 2

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
400920-0000	PCBA, SINGLE TEMP. DGHTR. BD REV. G(E861) - E2/E3				A				G	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
400959-0000	*1	1	PCB, SGL.TEMP DGHTR. BD., RAW BOARD, REV. E (E845)	E	R	5	1.000	EA		Yes		
352100-0102A	*1	2	CAP, 1000PF,50V,10%,RAD,X7R		R	11	2.000	EA	C5,13	Yes		
352100-0103A	*1	3	CAP, .01UF,50V,10%,RAD,X7R		R	11	2.000	EA	C4,21	Yes		
352100-0472A	*1	4	CAP, .0047UF,25V,10%,RAD, X7R		R	22	2.000	EA	C17,18	Yes		
352101-0330A	*1	5	CAP, 33PF,100V,5%,RAD,NPO		R	22	4.000	EA	C15,16,22,23	Yes		
352201-0227A	*1	6	CAP, 220UF,10V,RAD,ELECT, .248 X .433 CS		R	66	1.000	EA	C19	Yes		
352301-0103A	*1	7	CAP, .01UF,100V,20%,POLYCARB,.2 L.S.		R	66	1.000	EA	C20	Yes		
352301-0104A	*1	8	CAP, .1UF,5%,MYLAR		R	66	5.000	EA	C1,2,24,27,28	Yes		
352301-0104A	*1	9	CAP, .1UF,5%,MYLAR		R	66	5.000	EA	C29,30,31,32,33	Yes		
352400-0105A	*1	11	CAP, 1UF,50V,20%,RAD,TANT, MAX: HT. .28; O.D. .16		R	11	1.000	EA	C8	Yes		
352401-0106A	*1	12	CAP, 10UF,35V,20%,RAD,TANT		R	11	5.000	EA	C3,6,7,11,14	Yes		
352400-0226A	*1	13	CAP, 22UF,25V,20%,TANT		R	11	2.000	EA	C9,10	Yes		
364000-0010A	*1	14	IC, LM339		R	11	1.000	EA	U3	Yes		
364000-0055A	*1	15	IC, CD4052		R	11	1.000	EA	U1	Yes		
364000-0065A	*1	16	IC, OP11FP,OP AMP		R	11	2.000	EA	U2,4	Yes		
378000-0034A	*1	17	DIO, LM385,ZENER (XSTR NATIONAL ONLY)		R	11	2.000	EA	D4,5	Yes		
364000-0091A	*1	18	IC, SG 3525		R	44	1.000	EA	U5	Yes		
364000-0093A	*1	19	IC, ILQ5 QUAD OPTO ISOLATOR		R	11	1.000	EA	U6	Yes		
364000-0099A	*1	21	IC, 6N137		R	11	1.000	EA	U7	Yes		
354000-0103A	*1	22	CONN, SGL ROW,STRT,SGL PINS,SNAP-AWAY		R	11	2.000	PIN	J2,3 - DO NOT ISSUE	Yes		
354000-0187A	*1	23	CONN, MALE, SNAP-AWAY, 20 PIN STRIP, INTERCONNECT		R	11	9.000	EA	J1-MALE; 9 PIN = 1 PC	Yes		
370100-0010A	*1	24	RES, 1,1/4W,5%,CF		R	11	1.000	EA	R35	Yes		
370100-0101A	*1	26	RES, 100,1/4W,5%,CF		R	11	3.000	EA	R24,25,30	Yes		
370100-0102A	*1	27	RES, 1K,1/4W,5%,CF		R	11	1.000	EA	R29	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
400920-0000	PCBA, SINGLE TEMP. DGHTR. BD REV. G(E861) - E2/E3			A			G	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370100-0103A	*1	28	RES, 10K,1/4W,5%,CF		R	11	4.000	EA	R4,8,9,28	Yes		
370100-0126A	*1	29	RES, 12M,1/4W,5%,CF		R	11	2.000	EA	R26,27	Yes		
370100-0153A	*1	30	RES, 15K,1/4W,5%,CF		R	11	2.000	EA	R7,32	Yes		
370100-0206A	*1	31	RES, 20M,1/4W,10%,CF		R	11	2.000	EA	R13,14	Yes		
370100-0331A	*1	32	RES, 330,1/4W,5%,CF		R	11	1.000	EA	R37	Yes		
370100-0511A	*1	33	RES, 510,1/4W,5%,CF		R	11	3.000	EA	R38,39,40	Yes		
370100-0512A	*1	34	RES, 5.1K,1/4W,5%,CF		R	11	2.000	EA	R33,34	Yes		
370100-0622A	*1	35	RES, 6.2K,1/4W,5%,CF		R	11	1.000	EA	R36	Yes		
370200-1582A	*1	36	RES, 15.8K,1/4W,1%,MF		R	11	1.000	EA	R31	Yes		
370200-1001A	*1	37	RES, 1K,1/4W,1%,MF		R	11	3.000	EA	R10,16,17	Yes		
370200-1002A	*1	38	RES, 10K,1/4W,1%,MF		R	11	3.000	EA	R20,18,19	Yes		
370200-1541A	*1	39	RES, 1.54K,1/4W,1%,MF		R	11	1.000	EA	R3	Yes		
370200-2001A	*1	40	RES, 2K,1/4W,1%,MF		R	11	3.000	EA	R11,23,15	Yes		
370200-2701A	*1	41	RES, 2.7K,1/4W,1%,MF		R	11	1.000	EA	R5	Yes		
370200-2871A	*1	42	RES, 2.87K,1/4W,1%,MF		R	11	1.000	EA	R2	Yes		
370200-6341A	*1	43	RES, 6.34K,1/4W,1%,MF		R	11	1.000	EA	R6	Yes		
370200-8061A	*1	44	RES, 8.06K,1/4W,1%,MF (8 .05K N/A :OK PER KR)		R	11	1.000	EA	R12	Yes		
370200-9761A	*1	45	RES, 9.76K,1/4W,1%,MF		R	11	1.000	EA	R21	Yes		
374300-0202A	*1	46	POT, 2K,TRIM,SIDE ADJ,CER MET,3/8 SQR,.15LS		R	11	2.000	EA	R1,22	Yes		
376000-0003A	*1	47	XSTR, 2N3904		R	11	2.000	EA	Q1,3	Yes		
376000-0019A	*1	48	XSTR, 2N7000,FET		R	11	1.000	EA	Q2	Yes		
378000-0005A	*1	49	DIO, 1N914,SIGNAL T&R		R	11	8.000	EA	D6,7,8,9,10,11,12,13	Yes		
378000-0012A	*1	50	DIO, 1N4749A,24V,ZENER T& R ***MOT ONLY***		R	11	4.000	EA	D1,2,14,15	Yes		
382200-0005A	*1	51	CHOKE, 10UH,MOLDED		R	11	2.000	EA	L2,3	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400920-0000	PCBA, SINGLE TEMP. DGHTR. BD REV. G(E861) - E2/E3			A				G	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
382200-0018A	*1	52	CHOKE, 10,000UH MS75089-35		R	11	1.000	EA	L4	Yes		
384000-0061A	*1	54	GAS TUBE (SURGE ARRESTER)		R	33	1.000	EA	DS1	Yes		
400552-0000	*1	55	ESCORT II ISO-TRANSFORMER , REV. 'A' **(FIFO)**		R	22	1.000	EA	T1	Yes		
370204-1742A	*1	56	RES, 17.4K,1/4W,0.1%,MF		R	22	2.000	EA	R41,44	Yes		
360500-0060A	*1	57	STDOFF, #4 THREADED,NYLON		R	11	2.000	EA		Yes		
358100-0021A	*1	58	SCR, 4-40 X 1/4,PH FLTHD, 100 DEG,ZN		R	11	4.000	EA		Yes		
365000-0016A	*1	61	SKT, 16-POS,DIP,TIN PLATE ,L.P.		R	11	1.000	EA	U1	Yes		
352100-0104A	*1	62	CAP, .1UF,50V,10%,RAD,X7R		R	11	2.000	EA	C25,26	Yes		
360500-0063A	*1	63	STDOFF, #6, 1/4 RND X .75		R	11	1.000	EA	DO NOT ISSUE	Yes		
358100-0066A	*1	64	SCR, 6-32 X 2.75,LONG-LAG		R	11	1.000	EA	DO NOT ISSUE	Yes		
352300-0007A	*1	67	CAP, .001UF,10%, MYLAR		R	66	1.000	EA	C12	Yes		

Cumulative Lead Time for 400920-0000 = 71

SaO2 OPTION

CHAPTER 14

14.0.0 SAO2 OPTION

14.1.0 OVERVIEW

The **ESCORT** SaO2 option provides an automatically calibrated measurement of blood oxygen content as well as deriving a pulse rate. The pulse oximeter employs spectrophotometric oximetry and plethysmography principles to obtain these readings.

The SaO2 finger sensor has two low voltage LED light sources. One emits a red light (approximately 660nm) and the other emits an infrared light (approximately 920nm). The photo diode across from these two LED's senses the light that has passed through the sensor point. These values are then used by the pulse oximeter to calculate how much red and infrared light has been absorbed. With this information the percent of functional hemoglobin that is saturated with oxygen can be determined.

The **ESCORT** SaO2 option is packaged in two ways: 3 lead ECG SaO2, slot 1 (SLOT1 SaO2); and 5 lead SaO2, slot 2 (SLOT2 SaO2). When configured with SLOT1 SaO2, 3 lead ECG and SaO2 interface circuitry are both implemented on the same PCBA. When configured with SLOT2 SaO2, blood pressure or temperature as well as SaO2 interface circuitry are all implemented on the same PCBA. These circuits are functionally identical to their original circuits with the exception of the interface circuitry for SaO2, isolated power supply, and the Nellcor OEM module. Please refer to Chapter 4 for the ECG and respiration theory of operation and to Chapter 5 for the blood pressure and temperature theory of operation.

14.1.1 NELLCOR OEM MODULE

A Nellcor OEM factory replaceable module is installed in all SaO2 options. This module performs the SaO2 functions of determining blood oxygen content, computing heart rate through pulse picking, and providing a pulse waveform. This information is transmitted from the module to the interface board by RS232 communications. In addition to the RS232 TX and RX signals, an ECG SYNC signal goes to the Nellcor module for C-LOCK (tm) information. This ECG SYNC signal synchronizes the saturation measurements for the best time to perform an SaO2 reading. If ECG SYNC is not present, C-LOCK (tm) will not be operational.

14.2.0 INTERFACE CIRCUITRY

Whether configured with SLOT1 or SLOT2 SaO2, the interface circuitry will be the same. J3 goes to the Nellcor module. The RS232 communications, RX, TX and CTS* (clear to send), go to the opto-

couplers U13 and U14, as do RESET* and ECG SYNC. U13 and U14 provide isolation from line current for the patient. The signal RESET* comes from the CPU board and is active on power up and during hard resets. ECG SYNC signal information is pulled off the bus by U16 and outputted to U14 pin 8 for SLOT1 SaO2. For SLOT2 SaO2, the ECG SYNC signal information comes from the ECG board through the CPU board. The information is similarly pulled off the bus by U4 and fed to U14 pin 8. U4 and U16 are Z-80 compatible, 84 pin, serial/parallel/ counter/timer. U4 and U16 act as an I/O port between the digital and the isolated sections. This IC replaces the three I/O ports on the original ECG/RESP and BP/TEMP PCBA's.

The signal QRS OUT, at J1 pin 2, is a SaO2 module generated ECG synchronizing signal that is routed to the AUX port, J8 pin 1, for the optional SaO2 alarm.

14.3.0 ISOLATED SUPPLY

The isolation power supply circuits for SLOT1 and SLOT2 SaO2 are functionally identical with the exception of the respiration drive that is exclusive to the SLOT1 SaO2. For convenience we shall refer to SLOT1 SaO2 reference designators only. The pulse width modulator, U11, uses +15V as its Vin. PS SYNC keeps the supply voltages all switching on the same edge. The pulse width modulator uses the +5V as the sense line for voltage regulation. Q4 and Q5 drive T1. D19 and D14 are for spike protection. D8, D9, D10, and D13 form a bridge rectifier to turn the AC voltage to a DC voltage. L1 and C33-C34 filter the DC voltage.

The voltage regulation circuit uses D7 for a 2.5V reference input to the op-amp, U15. R58 and R59 divide the +5V in half and input it to U6. The difference is reflected at the output. It then goes to the opto-coupler U8, and on to the pulse width modulator.

3 LEAD - SAO2 (SLOT 1)

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

ISOLATED

NON-ISOLATED

EDGE CONNECTOR

ECG

BP1

SAO2

BP2

ECG / RESP FRONT END PROCESSING

SAMPLE

BASELINE RST

PACE ENABLE

PACE FLAG / LEAD FAIL

OPTO-COUPLER U5 U7 U18

MICRO-PROCESS U15

RST *

TIME TIC *

BUS

DUAL PORT RAM U17

TO CPU

RESP DRIVE

I/O PORT COUNTER U16

+15V

-15V

+5V

EPROM U13

NELLCOR OEM MODULE

J3

RX

TX

CTS *

ECG SYNC

OPTO-COUPLER U8 U14

QRS OUT

+15V

-15V

+5V

RECTIFICATION & FILTERING

+15V

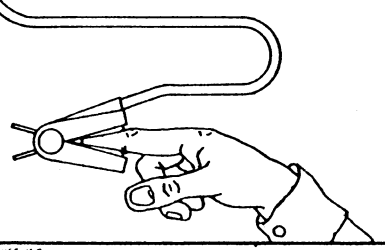
PULSE WIDTH MODULATOR U11

250 KHZ PS SYNC

COMPARATOR U6

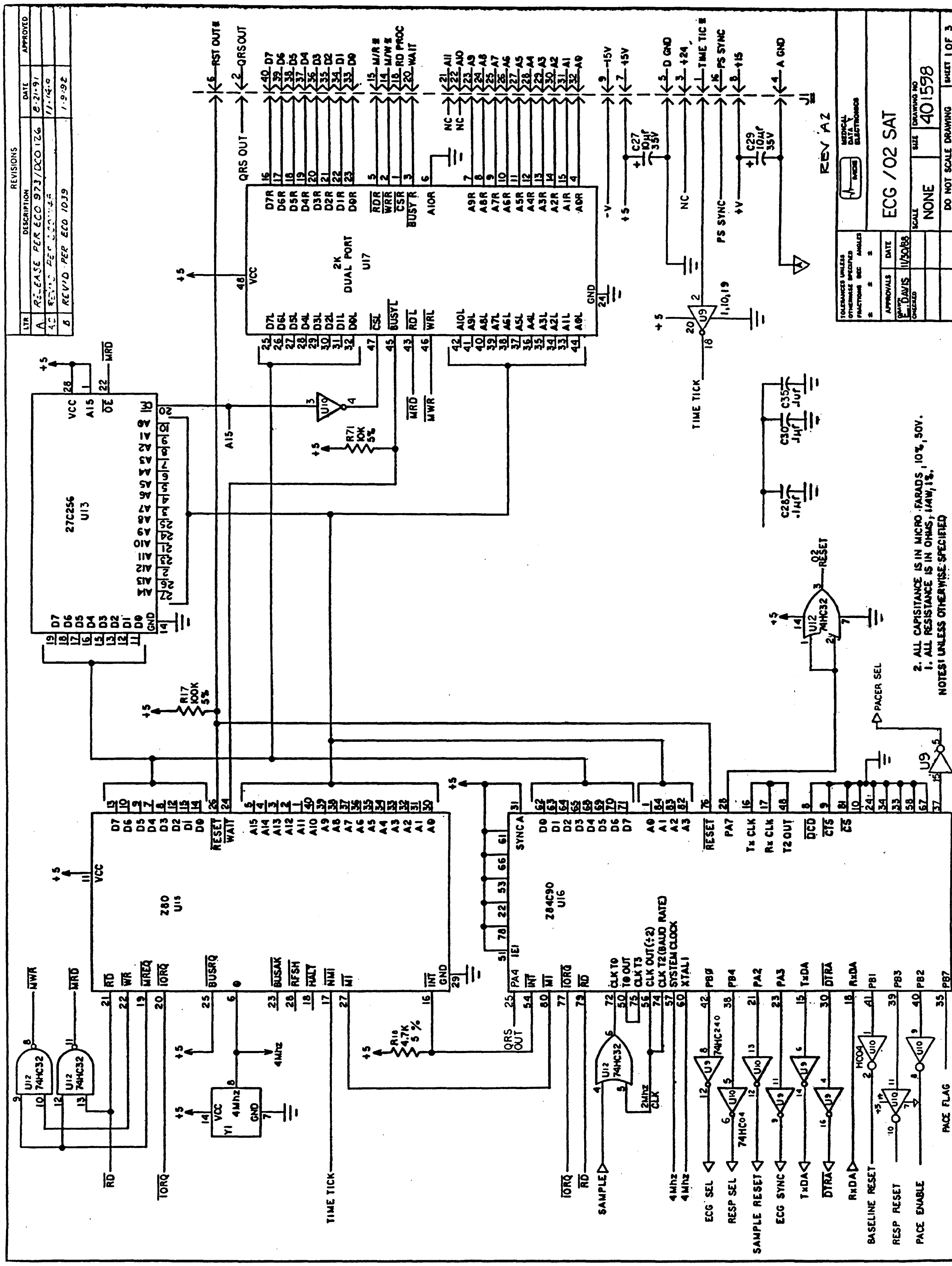
SENSE LINE

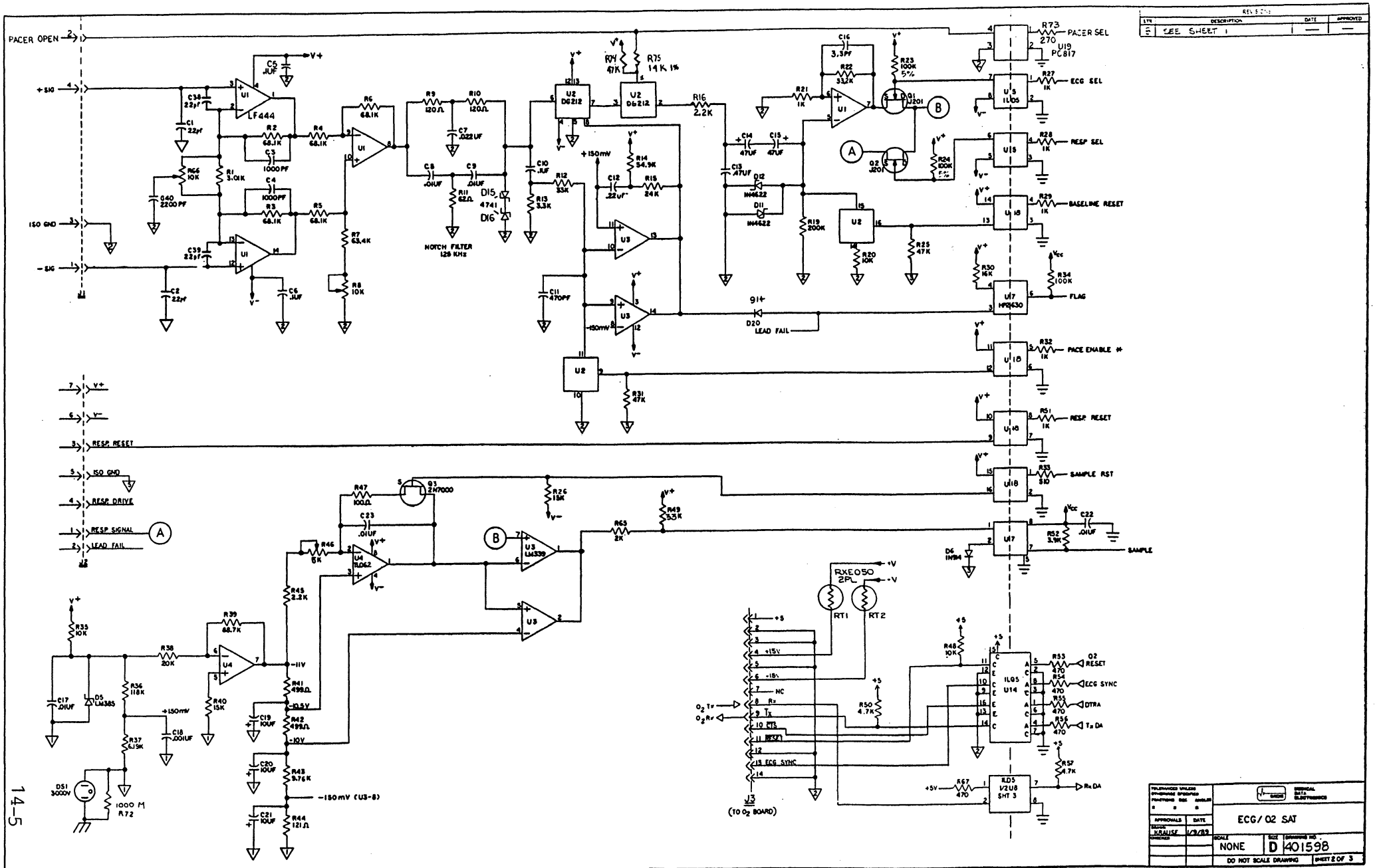
OPTO-COUPLER U8



14-3

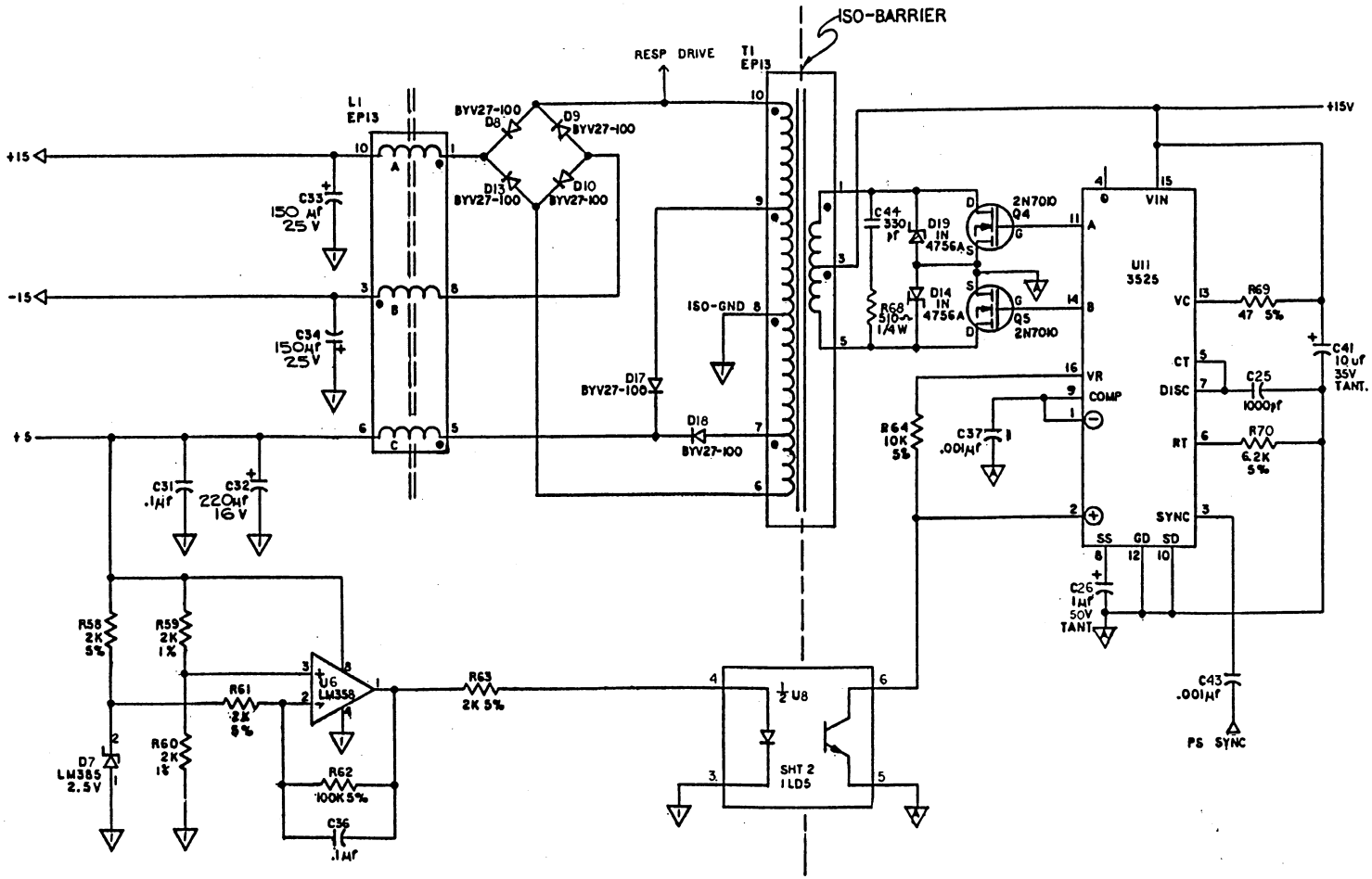
TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ± ± ±		MEDICAL DATA ELECTRONICS	
APPROVALS	DATE	3LEAD-SAO2 (SLOT 1) DIAGRAM	
DRAWN AIM	12-1-89		
CHECKED		SCALE	SIZE C DRAWING NO.
DO NOT SCALE DRAWING			SHEET 1 OF 1


ECG /02 SAT
401598
REV A2
NONE
DO NOT SCALE DRAWING
SHEET 1 OF 3
NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTANCE IS IN OHMS, 1/4W, 1%.
2. ALL CAPISTANCE IS IN MICRO FARADS, 10%, 50V.
Z80
U15
Z84C90
U16
27C256
U13
2K
DUAL PORT
U17

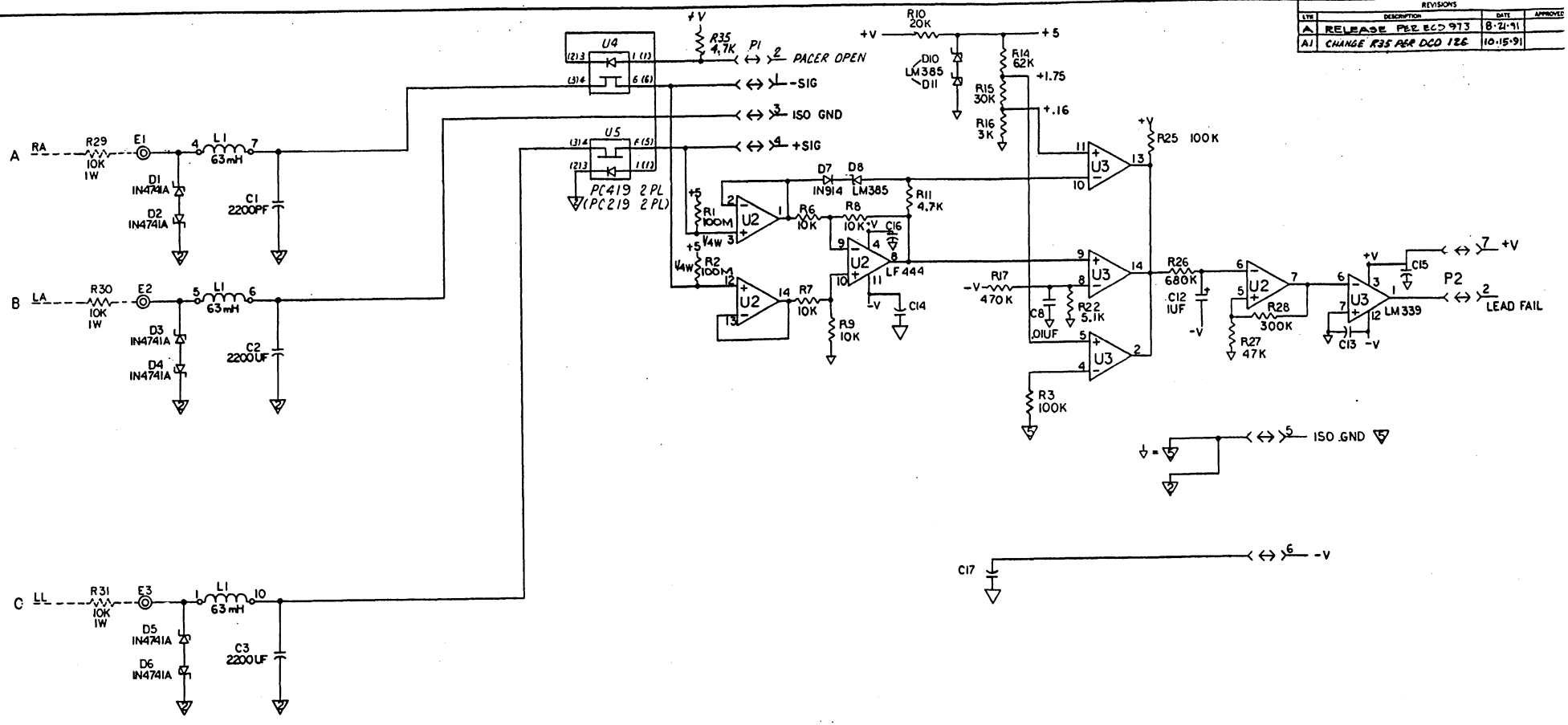

PACER OPEN
+SIG
ISO GND
-SIG
LF444
NOTCH FILTER 125 KHz
+150mV
-150mV
LEAD FAIL
PACER SEL
ECG SEL
RESP SEL
BASELINE RESET
FLAG
PACE ENABLE
RESP RESET
SAMPLE RST
SAMPLE
RESP SIGNAL
RESP DRIVE
RXE050 2PL
RT1
RT2
Q2 RESET
ECG SYNC
DTRA
TxDA
RxDA
(TO O2 BOARD)
SEE SHEET 1
ECG/O2 SAT
NONE
D
401598
DO NOT SCALE DRAWING
SHEET 2 OF 3

14-5

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
5	SEE SHEET 1	—	—



TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES * * *		MEDICAL DATA ELECTRONICS	
APPROVALS	DATE	ECG/02 SAT	
DRAWN E. DAVIS	12/5/88		
CHECKED		SCALE NONE	SIZE — DRAWING NO. 401598
		DO NOT SCALE DRAWING	SHEET 3 OF 3



LAST USED: NOT USED:

R 35
D 15
C 20
U 3
T 1
L 2
Q 1

ALL RESISTORS 1/8 W UNLESS NOTED

◎ FEED THROUGH SOLDER PADS

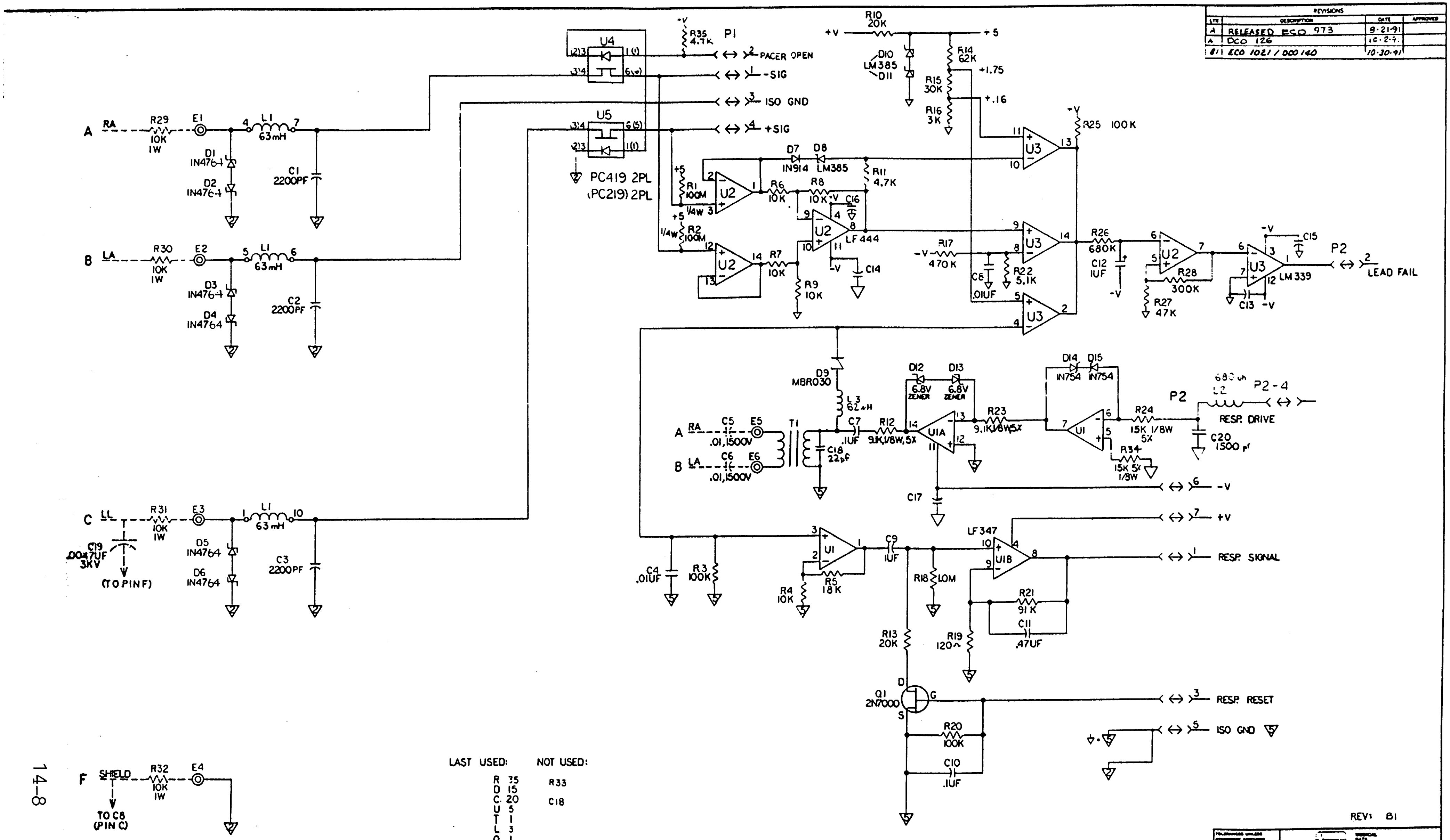
⊣↔⊢ HEADER PIN CONN. .1"/.025

SPARES

REV: A1

ECG, SA02
DAUGHTER BD

SCALE NONE | SIZE D | DRAWING NO 401601



RA
R29 10K 1W
E1
L1 63mH
D1 IN4764
D2 IN4764
C1 2200PF
LA
R30 10K 1W
E2
D3 IN4764
D4 IN4764
C2 2200PF
LL
C19 .0047UF 3KV
(TO PIN F)
R31 10K 1W
E3
D5 IN4764
D6 IN4764
C3 2200PF
SHIELD
TO C8 (PIN C)
R32 10K 1W
E4
U4
U5
PC419 2PL
(PC219) 2PL
P1
PACER OPEN
-SIG
ISO GND
+SIG
R35 4.7K
R1 100M 1/4W
R2 100M 1/4W
U2
LF444
R6 10K
R7 10K
R8 10K
R9 10K
D7 IN914
D8 LM385
R11 4.7K
C14
C16
R10 20K
D10 LM385 D11
R14 62K
R15 30K
R16 3K
+1.75
+.16
U3
R25 100K
R17 470K
C8 .01UF
R22 5.1K
R26 680K
C12 1UF
R28 300K
R27 47K
LM339
C13
C15
P2
LEAD FAIL
D9 MBR030
L3 62uH
T1
RA
C5 .01,1500V
E5
LA
C6 .01,1500V
E6
C7 .1UF
C18 22pF
R12 9.1K,1/8W,5%
U1A
D12 6.8V ZENER
D13 6.8V ZENER
R23 9.1K,1/8W,5%
D14 IN754
D15 IN754
U1
R24 15K 1/8W 5%
R34 15K 5% 1/8W
L2 680uh
P2-4
RESP. DRIVE
C20 1500 pf
C17
-V
+V
C4 .01UF
R3 100K
R4 10K
R5 18K
C9 1UF
R18 10M
LF347
U1B
R21 91K
C11 .47UF
R19 120
R13 20K
Q1 2N7000
R20 100K
C10 .1UF
RESP. SIGNAL
RESP. RESET
ISO GND

LTR	DESCRIPTION	DATE	APPROVED
A	RELEASED ECO 973	9-21-91	
A	DCO 126	10-2-91	
B1	ECO 1021 / DCO 140	10-30-91	

LAST USED: R 35, D 15, C 20, U 5, T 1, L 3, Q 1

NOT USED: R33, C18

ALL RESISTORS 1/8 W UNLESS NOTED

◎ FEED THROUGH SOLDER PADS

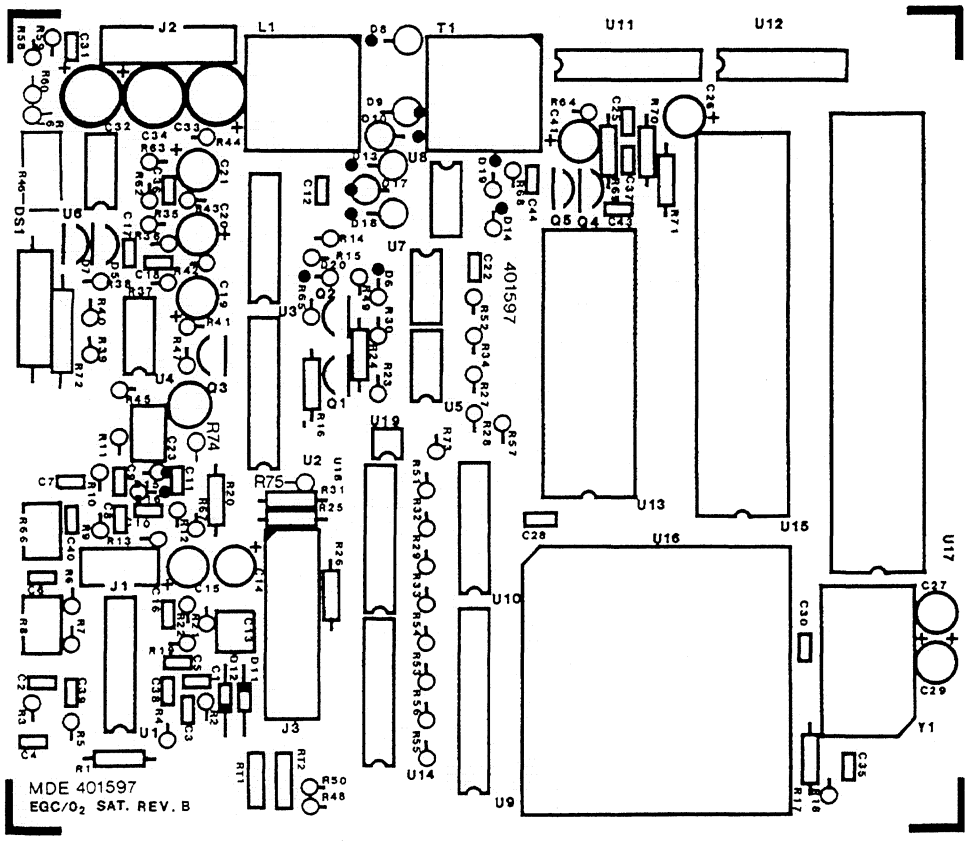
-<↔>- HEADER PIN CONN. .1"/.025

SPARES

REV: B1

ECG W/RESP & O2 SAT DAUGHTER BD

SCALE: NONE | SIZE: D | DRAWING NO. 401600



SLOT 1 - SAO_2

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
401598-0000	PCBA, ECG 3LD SaO2 MOTHER REV. D (E1074)				A				D	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401597-0000	*1	1	PCB, ECG 3LD SaO2 MOTHER REV. B (E1044)	B	R	22	1.000	EA		Yes		
352100-0003A	*1	2	CAP, 3.3PF,50V,+/-.5PF,RAD,NPO EDPT		R	11	1.000	EA	C16	Yes		
100000	*1	3	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	FOR ASSEMBLY	Yes		
352100-0220A	*1	5	CAP, 22PF,50V,10%,RAD,NPO EDPT		R	22	4.000	EA	C1,2,38,39	Yes		
352100-0223A	*1	6	CAP, .022UF,50V,10%,RAD,X7R		R	22	1.000	EA	C7	Yes		
352100-0331A	*1	7	CAP, 330PF,25V,10%,RAD,X7R		R	22	1.000	EA	C44	Yes		
352100-0471A	*1	8	CAP, 470PF,25V,10%,RAD,X7R		R	22	1.000	EA	C11	Yes		
352300-0007A	*1	9	CAP, .001UF,10%, MYLAR		R	66	3.000	EA	C25,37,43	Yes		
352300-0008A	*1	10	CAP, .01UF,5%,MYLAR		R	66	2.000	EA	C8,9	Yes		
352300-0015A	*1	11	CAP, .22UF,10%,MYLAR		R	66	1.000	EA	C12	Yes		
352300-0018A	*1	12	CAP, .47UF,10%,MYLAR		R	66	1.000	EA	C13	Yes		
352300-0102A	*1	13	CAP, 1000PF,50V,20%,RAD,MYLAR		R	66	1.000	EA	C18	Yes		
352300-0103A	*1	14	CAP, .01UF,50V,20%,RAD,MYLAR		R	22	2.000	EA	C17,22	Yes		
352300-0104A	*1	15	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	5.000	EA	C5,6,28,30,31	Yes		
352300-0104A	*1	16	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	2.000	EA	C35,36	Yes		
352300-0222A	*1	17	CAP, 2200PF,50V OR 100V,1%,MYLAR,.15L.S.		R	77	1.000	EA	C40	Yes		
352301-0103A	*1	18	CAP, .01UF,100V,20%,POLYCARB,.2 L.S.		R	66	1.000	EA	C23	Yes		
352301-0104A	*1	19	CAP, .1UF,5%,MYLAR		R	66	1.000	EA	C10	Yes		
352400-0105A	*1	20	CAP, 1UF,50V,20%,RAD,TANT, MAX: HT. .28; O.D. .16		R	11	1.000	EA	C26	Yes		
352203-0227A	*1	21	CAP, 220uF,16V,20%.RAD,ELECT,8mm x 12mm		R	77	1.000	EA	C32	Yes		
352200-0157A	*1	22	CAP, 150uF,25V,20%,RAD,ELECT,8mm x 12mm		R	22	2.000	EA	C33,34	Yes		
352401-0106A	*1	23	CAP, 10UF,35V,20%,RAD,TANT		R	11	6.000	EA	C19,20,21,27,29,41	Yes		
352401-0476A	*1	24	CAP, 47UF,10V,20%,RAD,TANT (10V ONLY)		R	11	2.000	EA	C14,15	Yes		
354000-0196A	*1	25	CONN, SGL ROW,STRT PIN,SNAP-AWAY (ENTER PER PIN)		R	22	4.000	PIN	1 PC. OF 4 PINS	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
401598-0000	PCBA, ECG 3LD SaO2 MOTHER REV. D (E1074)			A			D	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
354000-0196A	*1	26	CONN, SGL ROW,STRT PIN,SNAP-AWAY (ENTER PER PIN)		R	22	7.000	PIN	1 PC. OF 7 PINS	Yes		
354000-0106A	*1	27	CONN, DBL ROW,STRT,SGL PIN,SNAP-AWAY		R	11	14.000	PIN	J3 (14-PIN)	Yes		
356000-0008A	*1	28	REF OSCILLATOR, 4.0MHZ,CMOS HIGH SPEED		R	22	1.000	EA	Y1	Yes		
360500-0048A	*1	29	SPCR, 1/4 X 1/4,SWAGE TYPE		R	11	1.000	EA	DO NOT ISSUE	Yes		
364000-0008A	*1	30	IC, DG212CJ		R	11	1.000	EA	U2	Yes		
364000-0010A	*1	31	IC, LM339		R	11	1.000	EA	U3	Yes		
364000-0011A	*1	32	IC, LM358		R	11	1.000	EA	U6	Yes		
364000-0025A	*1	33	IC, 74HC04		R	11	1.000	EA	U10	Yes		
364000-0027A	*1	34	IC, 74HC32		R	11	1.000	EA	U12	Yes		
364000-0038A	*1	35	IC, 27C256,CMOS,EPROM,200NS		R	11	1.000	EA	U13	Yes		
364000-0080A	*1	36	IC, TMPZ84C00P (Z80A, CMOS VERSION)		R	11	1.000	EA	U15	Yes		
364000-0091A	*1	37	IC, SG 3525		R	44	1.000	EA	U11	Yes		
364000-0093A	*1	38	IC, ILQ5 QUAD OPTO ISOLATOR		R	22	2.000	EA	U14,18	Yes		
364000-0094A	*1	39	IC, HP2630, OPTO ISOLATOR		R	11	1.000	EA	U7	Yes		
364000-0095A	*1	40	IC, MS6132,DUAL PORT RAM, 8 X 2K,48-PIN (OR MS7132)		R	11	1.000	EA	U17	Yes		
364000-0096A	*1	41	IC, 74HC240		R	11	1.000	EA	U9	Yes		
364000-0131A	*1	42	IC, Z84C9008VSC ZILOG		R	11	1.000	EA	U16 - ISSUE TO TEST	Yes		
364000-0132A	*1	43	IC, LF444 NATIONAL ONLY		R	22	1.000	EA	U1	Yes		
364000-0133A	*1	44	IC, TL062ACP		R	11	1.000	EA	U4	Yes		
364000-0134A	*1	45	IC, ILD5 DUAL OPTO		R	11	2.000	EA	U5,8	Yes		
365000-0148A	*1	46	SOCKET, 48 PIN DIP		R	22	1.000	EA	U17	Yes		
365000-0028A	*1	47	SKT, 28-POS,DIP,TIN PLATE,L.P.		R	11	1.000	EA	U13X	Yes		
365000-0040A	*1	48	SKT, 40-POS,DIP,TIN PLATE,L.P.		R	11	1.000	EA	U15X	Yes		
365000-0084A	*1	49	SKT, 84-PIN,PLCC		R	22	1.000	EA	U4X,16X	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
401598-0000	PCBA, ECG 3LD SaO2 MOTHER REV. D (E1074)			A			D	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370100-0101A	*1	50	RES, 100,1/4W,5%,CF		R	11	1.000	EA	R47	Yes		
370100-0102A	*1	51	RES, 1K,1/4W,5%,CF		R	11	5.000	EA	R27,28,29,32,51	Yes		
370100-0103A	*1	52	RES, 10K,1/4W,5%,CF		R	11	5.000	EA	R20,35,48,64,71	Yes		
370100-0104A	*1	53	RES, 100K,1/4W,5%,CF		R	11	5.000	EA	R34,17,23,24,62	Yes		
370100-0121A	*1	54	RES, 120,1/4W,5%,CF		R	11	2.000	EA	R9,10	Yes		
370100-0204A	*1	57	RES, 200K,1/4W,5%,CF		R	11	1.000	EA	R19	Yes		
370100-0222A	*1	58	RES, 2.2K,1/4W,5%,CF		R	11	2.000	EA	R45,16	Yes		
370100-0243A	*1	60	RES, 24K,1/4W,5%,CF		R	11	1.000	EA	R15	Yes		
370100-0332A	*1	61	RES, 3.3K,1/4W,5%,CF		R	11	2.000	EA	R13,49	Yes		
370100-0333A	*1	62	RES, 33K,1/4W,5%,CF		R	11	1.000	EA	R12	Yes		
370100-0392A	*1	63	RES, 3.9K,1/4W,5%,CF		R	11	1.000	EA	R52	Yes		
370100-0470A	*1	64	RES, 47,1/4W,5%,CF		R	11	1.000	EA	R69	Yes		
370100-0471A	*1	65	RES, 470,1/4W,5%,CF		R	11	5.000	EA	R53,54,55,56,67	Yes		
370100-0472A	*1	66	RES, 4.7K,1/4W,5%,CF		R	11	3.000	EA	R18,50,57	Yes		
370100-0473A	*1	67	RES, 47K,1/4W,5%,CF		R	11	3.000	EA	R25,31,74	Yes		
370100-0511A	*1	68	RES, 510,1/4W,5%,CF		R	11	2.000	EA	R33,68	Yes		
370100-0620A	*1	69	RES, 62,1/4W,5%,CF		R	11	1.000	EA	R11	Yes		
370100-0622A	*1	70	RES, 6.2K,1/4W,5%,CF		R	11	1.000	EA	R70	Yes		
370100-0153A	*1	72	RES, 15K,1/4W,5%,CF		R	11	2.000	EA	R26,40	Yes		
370100-0163A	*1	73	RES, 16K,1/4W,5%,CF		R	11	1.000	EA	R30	Yes		
370100-0202A	*1	74	RES, 2K,1/4W,5%,CF		R	11	4.000	EA	R58,61,63,65	Yes		
370200-1001A	*1	76	RES, 1K,1/4W,1%,MF		R	11	1.000	EA	R21	Yes		
370200-1183A	*1	77	RES, 118K,1/4W,1%,MF		R	11	1.000	EA	R36	Yes		
370200-1210A	*1	78	RES, 121,1/4W,1%,MF		R	11	1.000	EA	R44	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401598-0000	PCBA, ECG 3LD SaO2 MOTHER REV. D (E1074)			A				D	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370200-2001A	*1	79	RES, 2K,1/4W,1%,MF		R	11	2.000	EA	R59,60	Yes		
370200-2002A	*1	80	RES, 20K,1/4W,1%,MF		R	11	1.000	EA	R38	Yes		
370200-3011A	*1	81	RES, 3.01K,1/4W,1%,MF		R	11	1.000	EA	R1	Yes		
370200-3322A	*1	82	RES, 33.2K,1/4W,1%,MF		R	11	1.000	EA	R22	Yes		
370200-4990A	*1	83	RES, 499,1/4W,1%,MF		R	11	2.000	EA	R41,42	Yes		
370200-5492A	*1	84	RES, 54.9K,1/4W,1%,MF		R	11	1.000	EA	R14	Yes		
370200-6191A	*1	85	RES, 6.19K, 1/4W 1%, MF		R	11	1.000	EA	R37	Yes		
370200-6342A	*1	86	RES, 63.4K,1/4W,1%,MF		R	11	1.000	EA	R7	Yes		
370200-6812A	*1	87	RES, 68.1K,1/4W,1%,MF		R	11	5.000	EA	R2,3,4,5,6	Yes		
370200-8872A	*1	88	RES, 88.7K,1/4W,1%,MF		R	11	1.000	EA	R39	Yes		
370200-9761A	*1	89	RES, 9.76K,1/4W,1%,MF		R	11	1.000	EA	R43	Yes		
374300-0502A	*1	90	POT, 5K,TRIM,SIDE ADJ,CER MET,3/8 SQR,.15LS		R	11	1.000	EA	R46	Yes		
374401-0103A	*1	91	POT, 10K,TRIMM,MULTI-TURN ,CERMET FILM (860X)		R	11	2.000	EA	R8,66	Yes		
376000-0019A	*1	92	XSTR, 2N7000,FET		R	11	1.000	EA	Q3	Yes		
376000-0020A	*1	93	XSTR, J201,FET		R	11	2.000	EA	Q1,2	Yes		
376000-0021A	*1	94	XSTR, 2N7010		R	44	2.000	EA	Q4,5	Yes		
378000-0005A	*1	95	DIO, 1N914,SIGNAL T&R		R	11	2.000	EA	D6,20	Yes		
378000-0011A	*1	96	DIO, 1N4741A,11V,ZENER T& R ***MOTOROLA ONLY***		R	11	2.000	EA	D15,16	Yes		
378000-0005A	*1	97	DIO, 1N914,SIGNAL T&R		R	11	2.000	EA	D11,12	Yes		
378000-0034A	*1	98	DIO, LM385,ZENER (XSTR NA TIONAL ONLY)		R	11	2.000	EA	D5,7	Yes		
900000	*1	99	ASSEMBLY LABOR & BURDEN		L	0	0.960	HR		Yes		
378000-0041A	*1	100	DIO, BYV27-150 (OR -200) T&R		R	22	6.000	EA	D8,9,10,13,17,18	Yes		
400988-0000	*1	101	ISO-TRANSFORMER, EP13 SWI TCHING SUPPLY		R	33	1.000	EA	T1	Yes		
400989-0000	*1	102	IDCTR, MULTI, EP13		R	22	1.000	EA	L1	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
401598-0000	PCBA, ECG 3LD SaO2 MOTHER REV. D (E1074)			A			D	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
384000-0061A	*1	103	GAS TUBE (SURGE ARRESTER)		R	33	1.000	EA	DS1	Yes		
370401-0108A	*1	104	RES, 1000M,1W,5%,2500V		R	66	1.000	EA	R72	Yes		
370200-1402A	*1	105	RES, 14K,1/4W,1%,MF		R	11	1.000	EA	R75	Yes		
100000	*1	106	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	FOR RESISTORS CHECK	Yes		
100000	*1	107	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	BIN - FILL IF REQUIRE	Yes		
100000	*1	108	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	CUT & JUMP PER	Yes		
100000	*1	109	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	ECO 950 & DCO 089	Yes		
364000-0176A	*1	110	IC, PC817,PHOTOCOUPLER,HIGH DENSITY MNTNG TYPE		R	22	1.000	EA	U19	Yes		
384000-0156A	*1	111	THERMISTOR, PTC RES DEV FOR CIRCUIT PROTECT		R	22	2.000	EA	RT1-2	Yes		
370100-0271A	*1	112	RES, 270,1/4W,5%,CF		R	11	1.000	EA	R73	Yes		
352101-0471A	*1	113	CAP, 470pF,10%,50V,RAD,NP0		R	22	2.000	EA	C3,4	Yes		
378000-0040A	*1	120	DIO, 1N4756A,47V T&R		R	11	2.000	EA	D14,19	Yes		

Cumulative Lead Time for 401598-0000 = 99

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401601-0000	PCBA, ECG 3LD SaO2 DAUGHTER REV. A1 (D126)			A				A1	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401599-0000	*1	1	PCB, ECG 3LD SaO2 DAUGHTER REV. A (E973)		R	22	1.000	EA	-	Yes		
352100-0104A	*1	2	CAP, .1UF,50V,10%,RAD,X7R		R	11	5.000	EA	C13,14,15,16,17	Yes		
352100-0152A	*1	3	CAP, 1500PF,100V,20%,MONOCER,X7R		R	22	1.000	EA	C20	Yes		
352300-0103A	*1	4	CAP, .01UF,50V,20%,RAD,MYLAR		R	22	2.000	EA	C4,8	Yes		
352300-0104A	*1	5	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	2.000	EA	C7,10	Yes		
352300-0222A	*1	6	CAP, 2200PF,50V OR 100V,1%,MYLAR,.15L.S.		R	77	3.000	EA	C1,2,3	Yes		
352300-0474A	*1	7	CAP, .47UF, 50V,20%,RAD,MYLAR(METALLIZED POLYESTR)		R	22	1.000	EA	C11	Yes		
352301-0105A	*1	8	CAP, 1UF,63V,20%,MYLAR		R	66	1.000	EA	C9	Yes		
100000	*1	9	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	FOR ASSEMBLY	Yes		
352400-0105A	*1	10	CAP, 1UF,50V,20%,RAD,TANT, MAX: HT. .28; O.D. .16		R	11	1.000	EA	C12	Yes		
354000-0142A	*1	12	CONN, 7 SKT STRP,.1 SKT SP,.335 HT		R	22	1.000	EA		Yes		
354000-0143A	*1	13	CONN, 4 SKT STRP,.1 SKT SP,.335 HT.		R	22	1.000	EA		Yes		
364000-0010A	*1	14	IC, LM339		R	11	1.000	EA	U3	Yes		
364000-0132A	*1	16	IC, LF444 NATIONAL ONLY		R	22	1.000	EA	U2	Yes		
370101-0103A	*1	18	RES, 10K,1/8W,5%,CF		R	11	5.000	EA	R4,6,7,8,9	Yes		
370101-0203A	*1	19	RES, 20K,1/8W,5%,CF		R	11	2.000	EA	R10,13	Yes		
370402-0103A	*1	20	RES, 10K,1/2W,5%,CC (ALN 8RDLY ONLY)*BULK ONLY*		R	22	4.000	EA	R32,29,30,31	Yes		
370101-0153A	*1	22	RES, 15K,1/8W,5%,CF		R	11	2.000	EA	R24,34	Yes		
370101-0104A	*1	23	RES, 100K,1/8W,5%,CF		R	11	3.000	EA	R3,20,25	Yes		
370101-0105A	*1	24	RES, 1M,1/8W,5%,CF		R	11	1.000	EA	R18	Yes		
370101-0121A	*1	25	RES, 120,1/8W,5%,CF		R	11	1.000	EA	R19	Yes		
370101-0183A	*1	26	RES, 18K,1/8W,5%,CF		R	11	1.000	EA	R5	Yes		
370101-0302A	*1	27	RES, 3K,1/8W,5%,CF		R	11	1.000	EA	R16	Yes		
370101-0303A	*1	28	RES, 30K,1/8W,5%,CF		R	11	1.000	EA	R15	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401601-0000	PCBA, ECG 3LD SaO2 DAUGHTER REV. A1 (D126)			A				A1	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370101-0304A	*1	29	RES, 300K,1/8W,5%,CF		R	11	1.000	EA	R28	Yes		
370101-0472A	*1	30	RES, 4.7K,1/8W,5%,CF		R	11	1.000	EA	R11	Yes		
370101-0473A	*1	31	RES, 47K,1/8W,5%,CF		R	11	1.000	EA	R27	Yes		
370101-0474A	*1	32	RES, 470K,1/8W,5%,CF		R	11	1.000	EA	R17	Yes		
370101-0512A	*1	33	RES, 5.1K,1/8W,5%,CF		R	11	1.000	EA	R22	Yes		
370101-0623A	*1	34	RES, 62K,1/8W,5%,CF		R	11	1.000	EA	R14	Yes		
370101-0684A	*1	35	RES, 680K,1/8W,5%,CF		R	11	1.000	EA	R26	Yes		
370101-0912A	*1	36	RES, 9.1K,1/8W,5%,CF		R	11	2.000	EA	R12,23	Yes		
370101-0913A	*1	37	RES, 91K,1/8W,5%,CF		R	22	1.000	EA	R21	Yes		
370500-0107A	*1	38	RES, 100M,1/4W,5%,M.O. (O R M.G.)		R	33	2.000	EA	R1,2	Yes		
376000-0019A	*1	39	XSTR, 2N7000,FET		R	11	1.000	EA	Q1	Yes		
378000-0005A	*1	40	DIO, 1N914,SIGNAL T&R		R	11	1.000	EA	D7	Yes		
378000-0009A	*1	41	DIO, 1N754A,6.8V,ZENER T& R ***MOT ONLY***		R	11	4.000	EA	D12,13,14,15	Yes		
378000-0054A	*1	42	DIO, 1N4764,100V,ZENER		R	22	6.000	EA	D1,2,3,4,5,6	Yes		
378000-0034A	*1	43	DIO, LM385,ZENER (XSTR NA TIONAL ONLY)		R	11	3.000	EA	D8,10,11	Yes		
378000-0037A	*1	44	DIO, MBR030,SCHOTTKY RCTF R		R	11	1.000	EA	D9	Yes		
382200-0015A	*1	45	CHOKE, 680 UH		R	11	1.000	EA	L2	Yes		
400554-0000	*1	47	IDCTR, MULTI ESCORT II, R EV. 'B' **(FIFO)**		R	22	1.000	EA	L1	Yes		
100000	*1	48	NOTES & SPEC. INSTRUCTION S		P	0	0.000	EA	FOR RESISTORS CHECK	Yes		
100000	*1	49	NOTES & SPEC. INSTRUCTION S		P	0	0.000	EA	BIN - FILL IF REQUIRE	Yes		
364000-0175A	*1	50	IC, PC219,PHOTOCOUPLER,MI NI-FLAT PKG.		R	22	2.000	EA	U4-5	Yes		
370100-0472A	*1	51	RES, 4.7K,1/4W,5%,CF		R	11	1.000	EA	R35	Yes		
900000	*1	99	ASSEMBLY LABOR & BURDEN		L	0	0.580	HR	-	Yes		

Cumulative Lead Time for 401601-0000 = 99

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
401600-0000	PCBA, ECG W/RESP 3LD SaO2 DAUGHTER REV. B1 (D140)			A			B1	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401599-0000	*1	1	PCB, ECG 3LD SaO2 DAUGHTER REV. A (E973)		R	22	1.000	EA	-	Yes		
352100-0104A	*1	2	CAP, .1UF,50V,10%,RAD,X7R		R	11	5.000	EA	C13,14,15,16,17	Yes		
352100-0152A	*1	3	CAP, 1500PF,100V,20%,MONOCER,X7R		R	22	1.000	EA	C20	Yes		
352300-0103A	*1	4	CAP, .01UF,50V,20%,RAD,MYLAR		R	22	2.000	EA	C4,8	Yes		
352300-0104A	*1	5	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	2.000	EA	C7,10	Yes		
352300-0222A	*1	6	CAP, 2200PF,50V OR 100V,1%,MYLAR,.15L.S.		R	77	2.000	EA	C1,3	Yes		
352300-0474A	*1	7	CAP, .47UF, 50V,20%,RAD,MYLAR(METALLIZED POLYESTR)		R	22	1.000	EA	C11	Yes		
352301-0105A	*1	8	CAP, 1UF,63V,20%,MYLAR		R	66	1.000	EA	C9	Yes		
352100-0220A	*1	9	CAP, 22PF,50V,10%,RAD,NPO EDPT		R	22	1.000	EA	C18	Yes		
352400-0105A	*1	10	CAP, 1UF,50V,20%,RAD,TANT, MAX: HT. .28; O.D. .16		R	11	1.000	EA	C12	Yes		
354000-0142A	*1	12	CONN, 7 SKT STRP,.1 SKT SP,.335 HT		R	22	1.000	EA		Yes		
354000-0143A	*1	13	CONN, 4 SKT STRP,.1 SKT SP,.335 HT.		R	22	1.000	EA		Yes		
364000-0010A	*1	14	IC, LM339		R	11	1.000	EA	U3	Yes		
352101-0472A	*1	15	CAP, 4700PF,20%,3KV, Z5U, CERAMIC DISC (5000PF OK)		R	22	1.000	EA	C19	Yes		
364000-0132A	*1	16	IC, LF444 NATIONAL ONLY		R	22	1.000	EA	U2	Yes		
365000-0014A	*1	17	SKT, 14-POS,DIP,TIN PLATE,L.P.		R	11	1.000	EA	U1	Yes		
370101-0103A	*1	18	RES, 10K,1/8W,5%,CF		R	11	5.000	EA	R4,6,7,8,9	Yes		
370101-0203A	*1	19	RES, 20K,1/8W,5%,CF		R	11	2.000	EA	R10,13	Yes		
370402-0103A	*1	20	RES, 10K,1/2W,5%,CC (ALL N BRDLY ONLY)*BULK ONLY*		R	22	4.000	EA	R32,29,30,31	Yes		
370101-0153A	*1	22	RES, 15K,1/8W,5%,CF		R	11	2.000	EA	R24,34	Yes		
370101-0104A	*1	23	RES, 100K,1/8W,5%,CF		R	11	3.000	EA	R3,20,25	Yes		
370101-0105A	*1	24	RES, 1M,1/8W,5%,CF		R	11	1.000	EA	R18	Yes		
370101-0121A	*1	25	RES, 120,1/8W,5%,CF		R	11	1.000	EA	R19	Yes		
370101-0183A	*1	26	RES, 18K,1/8W,5%,CF		R	11	1.000	EA	R5	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
401600-0000	PCBA, ECG W/RESP 3LD SaO2 DAUGHTER REV. B1 (D140)			A			B1	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370101-0302A	*1	27	RES, 3K,1/8W,5%,CF		R	11	1.000	EA	R16	Yes		
370101-0303A	*1	28	RES, 30K,1/8W,5%,CF		R	11	1.000	EA	R15	Yes		
370101-0304A	*1	29	RES, 300K,1/8W,5%,CF		R	11	1.000	EA	R28	Yes		
370101-0472A	*1	30	RES, 4.7K,1/8W,5%,CF		R	11	1.000	EA	R11	Yes		
370101-0473A	*1	31	RES, 47K,1/8W,5%,CF		R	11	1.000	EA	R27	Yes		
370101-0474A	*1	32	RES, 470K,1/8W,5%,CF		R	11	1.000	EA	R17	Yes		
370101-0512A	*1	33	RES, 5.1K,1/8W,5%,CF		R	11	1.000	EA	R22	Yes		
370101-0623A	*1	34	RES, 62K,1/8W,5%,CF		R	11	1.000	EA	R14	Yes		
370101-0684A	*1	35	RES, 680K,1/8W,5%,CF		R	11	1.000	EA	R26	Yes		
370101-0912A	*1	36	RES, 9.1K,1/8W,5%,CF		R	11	2.000	EA	R12,23	Yes		
370101-0913A	*1	37	RES, 91K,1/8W,5%,CF		R	22	1.000	EA	R21	Yes		
370500-0107A	*1	38	RES, 100M,1/4W,5%,M.O. (O R M.G.)		R	33	2.000	EA	R1,2	Yes		
376000-0019A	*1	39	XSTR, 2N7000,FET		R	11	1.000	EA	Q1	Yes		
378000-0005A	*1	40	DIO, 1N914,SIGNAL T&R		R	11	1.000	EA	D7	Yes		
378000-0009A	*1	41	DIO, 1N754A,6.8V,ZENER T& R ***MOT ONLY***		R	11	4.000	EA	D12,13,14,15	Yes		
378000-0054A	*1	42	DIO, 1N4764,100V,ZENER		R	22	6.000	EA	D1,2,3,4,5,6	Yes		
378000-0034A	*1	43	DIO, LM385,ZENER (XSTR NA TIONAL ONLY)		R	11	3.000	EA	D8,10,11	Yes		
378000-0037A	*1	44	DIO, MBR030,SCHOTTKY RCTF R		R	11	1.000	EA	D9	Yes		
382200-0030A	*1	45	INDCTR, 680uH SHIELDED		R	22	1.000	EA	L2	Yes		
352600-0019A	*1	46	CAP, .01UF,1000V,20%,Z5U, CER DISC,.4 L.S.		R	11	2.000	EA	C5,6	Yes		
400554-0000	*1	47	IDCTR, MULTI ESCORT II, R EV. 'B' **(FIFO)**		R	22	1.000	EA	L1	Yes		
364000-0135A	*1	48	IC, LF347, SCREENED TO +/ -1.5mV OFFSET & LOW NOISE		A	22	1.000	EA	U1	Yes		
382200-0027A	*1	49	IDCTR, 82uH,SHIELDED,ISOL ATED		R	22	1.000	EA	L3 IN SERIES WITH D9	Yes		
400553-0000	*1	50	XFMR, ESC. II RESP DRIVE REV. A **(FIFO)**		R	22	1.000	EA	T1	Yes		

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
401600-0000	PCBA, ECG W/RESP 3LD SaO2 DAUGHTER REV. B1 (D140)				A				B1	22

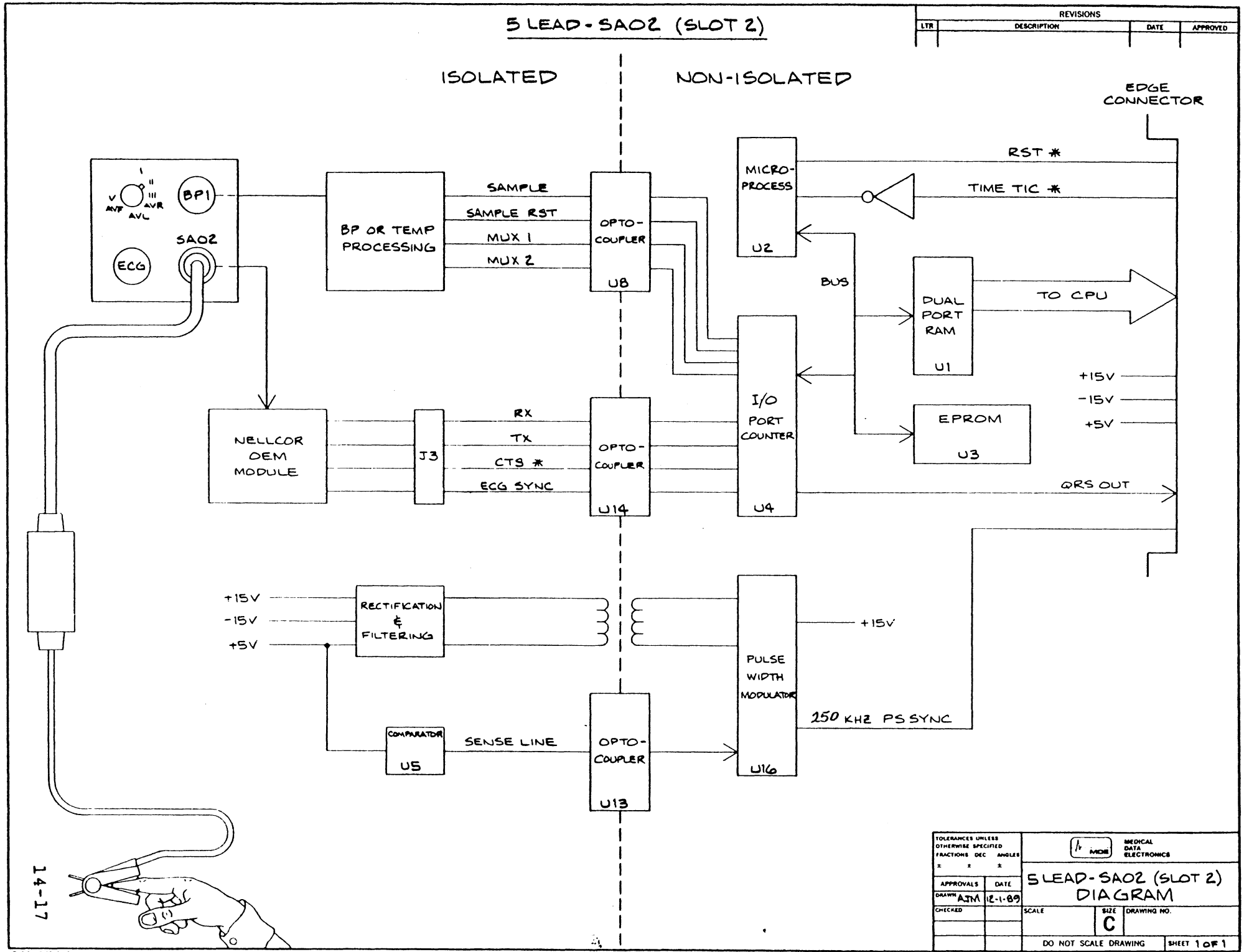
Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
100000	*1	51	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	FOR ASSEMBLY	Yes		
100000	*1	52	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	FOR RESISTORS CHECK	Yes		
100000	*1	53	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	BIN - FILL IF REQUIRE	Yes		
364000-0175A	*1	54	IC, PC219,PHOTOCOUPLER,MINI-FLAT PKG.		R	22	2.000	EA	U4-5	Yes		
370100-0472A	*1	55	RES, 4.7K,1/4W,5%,CF		R	11	1.000	EA	R35	Yes		
399200-0001A	*1	56	24 GA BUSS WIRE, 1000 FT/ROLL		R	11	0.100	FT.	C2 - 1 PC = 1/2 IN.	Yes		
900000	*1	99	ASSEMBLY LABOR & BURDEN		L	0	0.190	HR	-	Yes		

Cumulative Lead Time for 401600-0000 = 99

5 LEAD - SAO2 (SLOT 2)

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	±

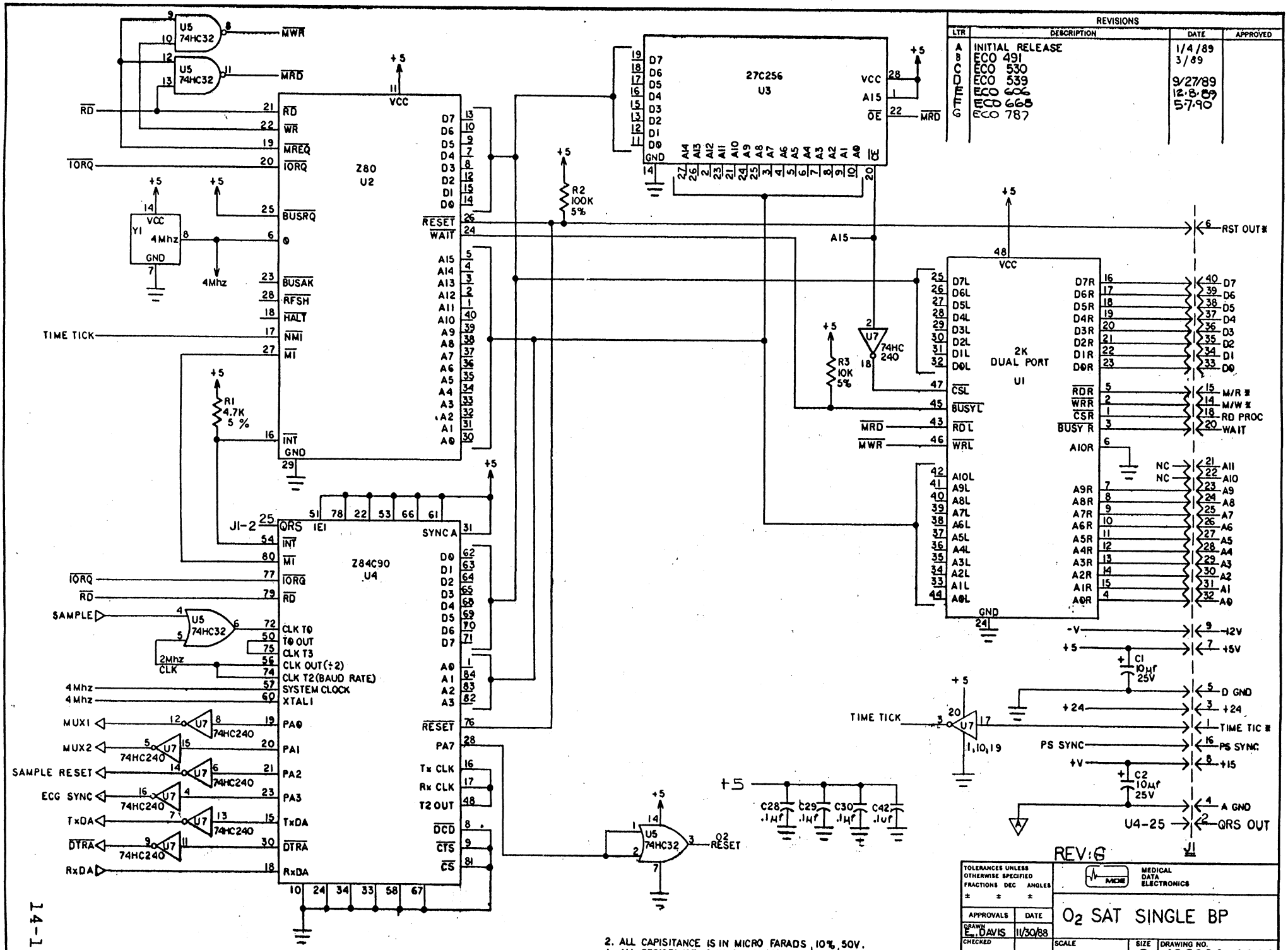
APPROVALS	DATE
DRAWN AJM	12-1-89
CHECKED	

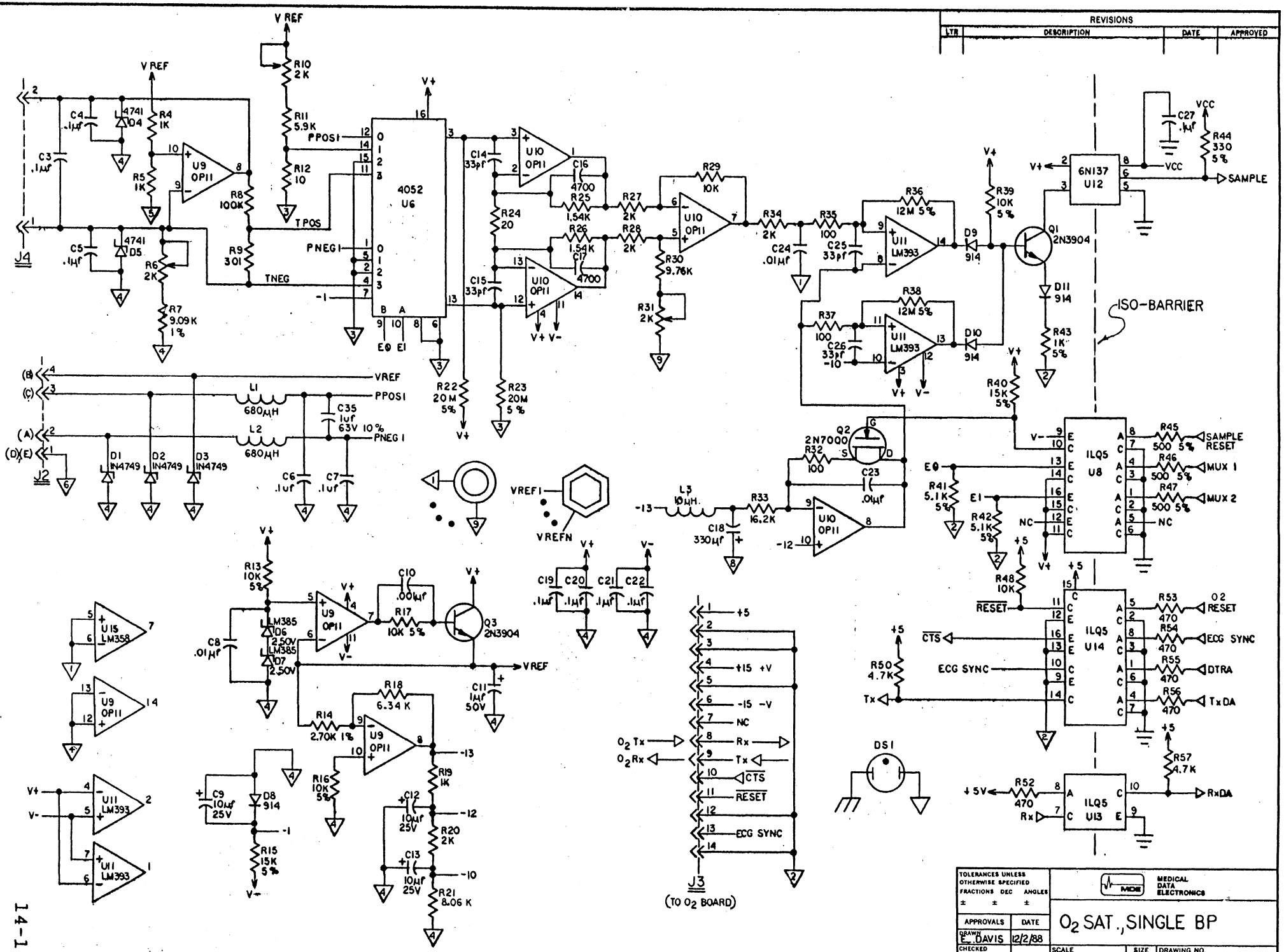
MDE MEDICAL DATA ELECTRONICS

5 LEAD - SAO2 (SLOT 2) DIAGRAM

SCALE	SIZE	DRAWING NO.
	C	

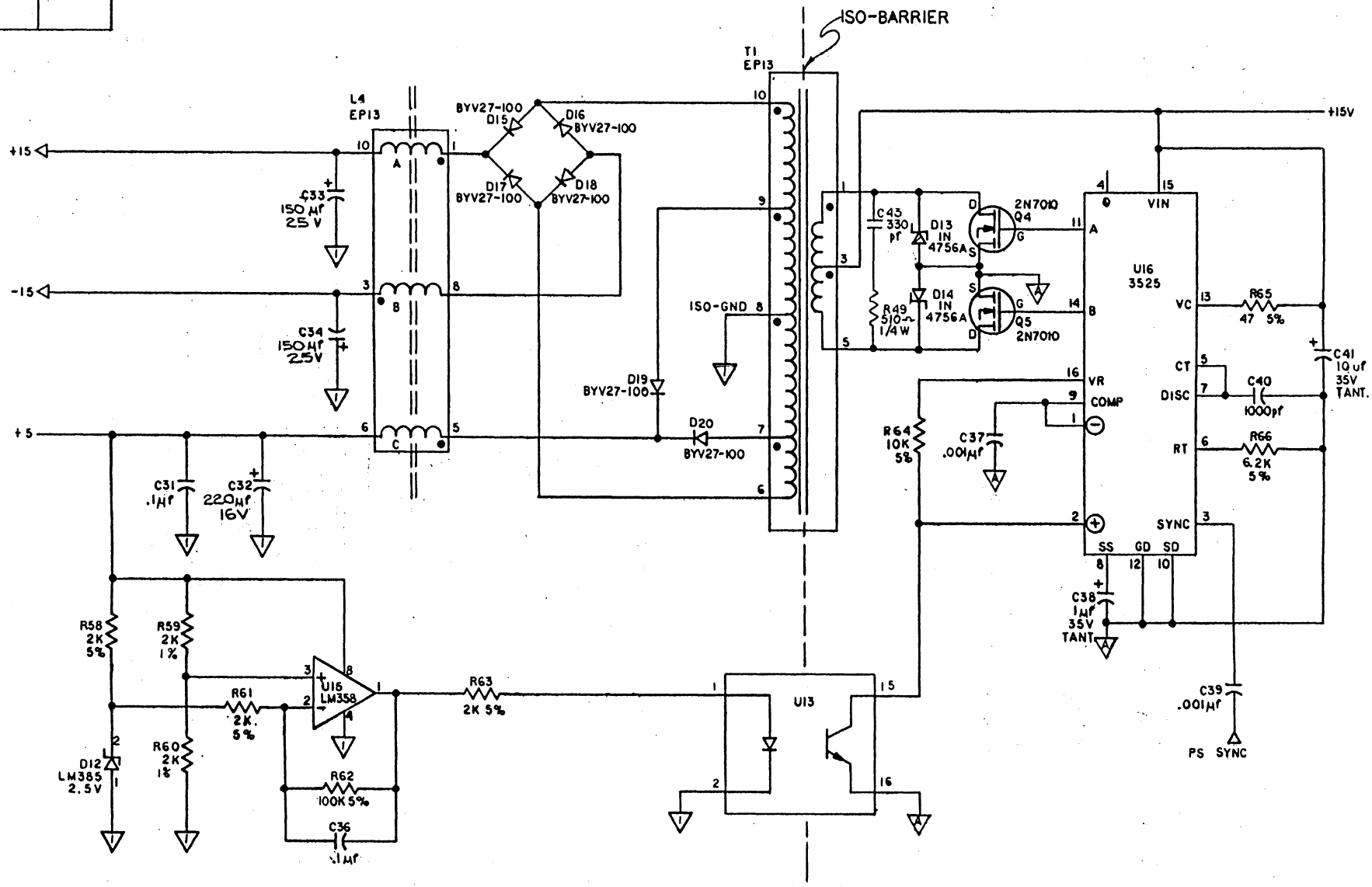
DO NOT SCALE DRAWING — SHEET 1 OF 1


REVISIONS
LTR | DESCRIPTION | DATE | APPROVED
A | INITIAL RELEASE | 1/4/89
B | ECO 491 | 3/89
C | ECO 530
D | ECO 539 | 9/27/89
E | ECO 606 | 12-8-89
F | ECO 668 | 5-7-90
G | ECO 787
U5 74HC32
U7 74HC240
Z80 U2
Z84C90 U4
27C256 U3
2K DUAL PORT U1
Y1 4Mhz
R1 4.7K 5%
R2 100K 5%
R3 10K 5%
C1 10µf 25V
C2 10µf 25V
C28 .1µf
C29 .1µf
C30 .1µf
C42 .1µf
MWR
MRD
IORQ
RD
WR
MREQ
BUSRQ
BUSAK
RFSH
HALT
NMI
MI
INT
RESET
WAIT
TIME TICK
SAMPLE
2Mhz CLK
4Mhz
MUX1
MUX2
SAMPLE RESET
ECG SYNC
TxDA
DTRA
RxDA
RST OUT#
M/R#
M/W#
RD PROC
WAIT
-12V
+5V
D GND
+24
TIME TIC#
PS SYNC
+15
A GND
U4-25 QRS OUT
Q2 RESET
2. ALL CAPISITANCE IS IN MICRO FARADS, 10%, 50V.
1. ALL RESISTANCE IS IN OHMS, 1/4W, 1%.
NOTES: UNLESS OTHERWISE SPECIFIED
REV: G
MDE MEDICAL DATA ELECTRONICS
O2 SAT SINGLE BP
DRAWN E. DAVIS 11/30/88
SCALE NONE
SIZE C
DRAWING NO. 400906-0000
DO NOT SCALE DRAWING
SHEET 1 OF 3
14-18
BISHOP GRAPHICS INC


REVISIONS
LTR
DESCRIPTION
DATE
APPROVED
VREF
R10 2K
R11 5.9K
R12 10
TPOS
TNEG
R9 301
R8 100K
R6 2K
R7 9.09K 1%
C3 .1µF
C4 .1µF
C5 .1µF
4741 D4
4741 D5
R4 1K
R5 1K
U9 OP11
J4
PPOS1
PNEG1
4052 U6
E0 E1
V+ V-
C14 33pf
C15 33pf
C16 4700
C17 4700
R25 1.54K
R26 1.54K
R27 2K
R28 2K
R29 10K
R30 9.76K
R31 2K
R24 20
U10 OP11
R22 20M 5%
R23 20M 5%
R34 2K
R35 100
C24 .01µF
C25 33pf
R36 12M 5%
R37 100
C26 33pf -10
R38 12M 5%
U11 LM393
D9 914
D10 914
D11 914
R43 1K 5%
R39 10K 5%
R40 15K 5%
Q1 2N3904
6N137 U12
VCC
C27 .1µF
R44 330 5%
SAMPLE
ISO-BARRIER
(B)
(C)
(A)
(D)(E)
J2
L1 680µH
L2 680µH
C35 1uf 63V 10%
D1 IN4749
D2 IN4749
D3 IN4749
C6 .1uf
C7 .1uf
VREF1
VREFN
Q2 2N7000
R32 100
C23 .01µF
L3 10µH.
R33 16.2K
C18 330µF
R41 5.1K 5%
R42 5.1K 5%
ILQ5 U8
R45 500 5%
R46 500 5%
R47 500 5%
SAMPLE RESET
MUX 1
MUX 2
NC
R48 10K
RESET
ILQ5 U14
R53 470
R54 470
R55 470
R56 470
O2 RESET
ECG SYNC
DTRA
TxDA
CTS
R50 4.7K
Tx
R57 4.7K
R52 470
Rx
ILQ5 U13
RxDA
+5V
DS1
R13 10K 5%
C8 .01µF
LM385 D6 2.50V
LM385 D7 2.50V
U9 OP11
R17 10K 5%
Q3 2N3904
C10 .001µF
C11 1µF 50V
R18 6.34 K
R14 2.70K 1%
R16 10K 5%
R19 1K
C9 10µF 25V
D8 914
R15 15K 5%
C12 10µF 25V
C13 10µF 25V
R20 2K
R21 8.06 K
C19 .1µF
C20 .1µF
C21 .1µF
C22 .1µF
U15 LM358
U11 LM393
+15 +V
-15 -V
NC
Rx
Tx
CTS
RESET
ECG SYNC
O2 Tx
O2 Rx
J3
(TO O2 BOARD)
TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS DEC ANGLES
APPROVALS DATE
DRAWN E. DAVIS 12/2/88
CHECKED
MEDICAL DATA ELECTRONICS
O2 SAT., SINGLE BP
SCALE NONE
SIZE C
DRAWING NO. 400906-0000
DO NOT SCALE DRAWING
SHEET 2 OF 3
14-19
BISHOP GRAPHICS, INC.

LAST USED	NOT USED
C43 DS1	
D20	R51
J4	
L4	
Q5	
R66	
T1	
U16	
Y1	

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



TOLERANCES UNLESS OTHERWISE SPECIFIED		
FRACTIONS	DEC	ANGLES
±	±	±

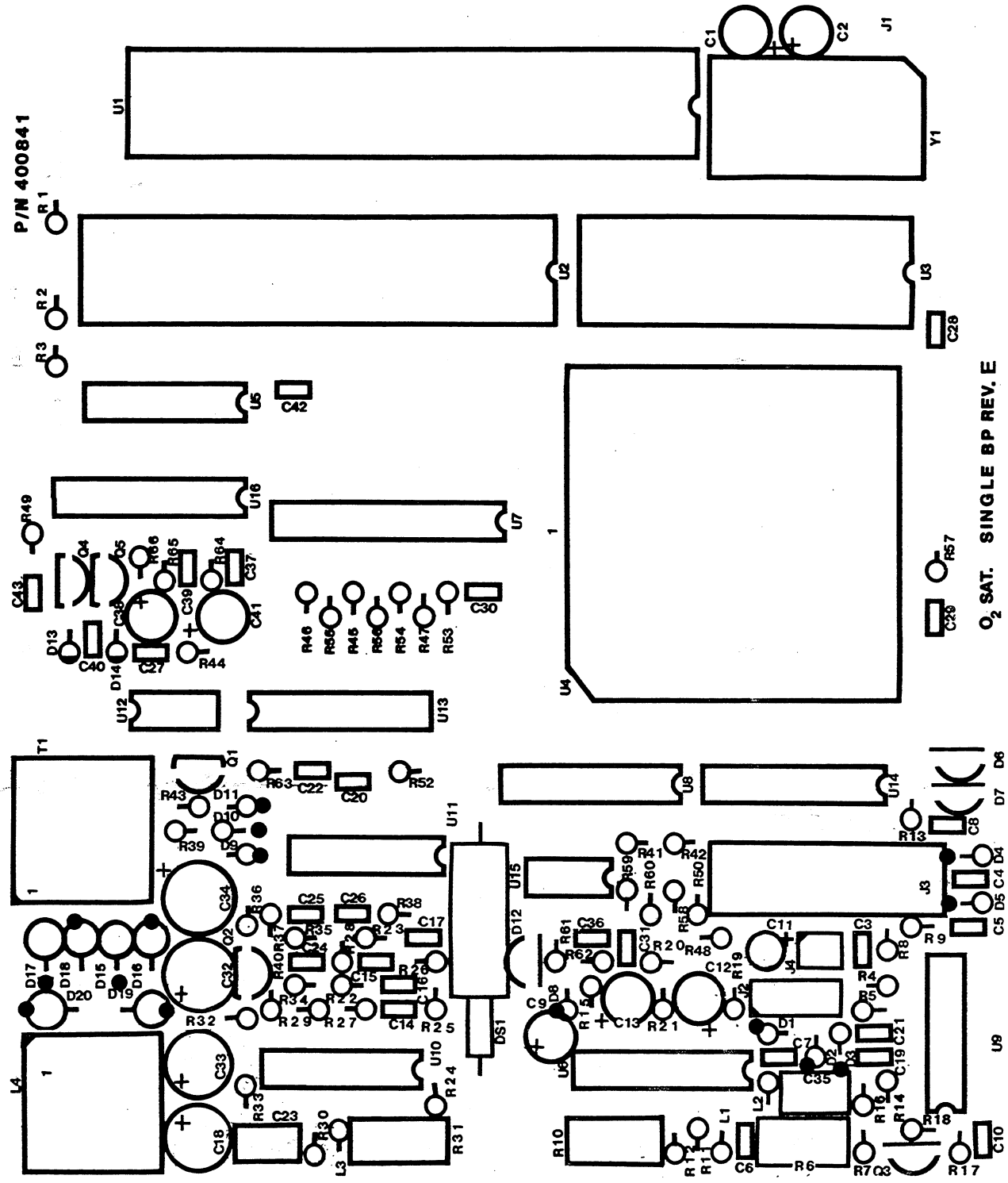
APPROVALS	DATE
DRAWN E. DAVIS	12/5/88
CHECKED	

MEDICAL DATA ELECTRONICS

O_2 SAT., SINGLE BP

SCALE	SIZE	DRAWING NO.
NONE	C	400906-0000

DO NOT SCALE DRAWING — SHEET 3 OF 3



SLOT 2 SaO_2

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
400906-0000	PCBA, O2 SAT. SINGLE BP, REV G (E787) - E2/E3				A				G	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
400841-0000	*1	1	PCB, O2 SAT,SNGL. BP,RAW BD, REVISION 'E'		R	33	1.000	EA	-	Yes		
352100-0102A	*1	2	CAP, 1000PF,50V,10%,RAD,X 7R		R	11	1.000	EA	C37	Yes		
352300-0104A	*1	3	CAP, .1UF,50V,20%,RAD,MYL AR		R	22	7.000	EA	C19,20,21,22,27,28,29	Yes		
352300-0104A	*1	4	CAP, .1UF,50V,20%,RAD,MYL AR		R	22	4.000	EA	C30,31,36,42	Yes		
352101-0330A	*1	6	CAP, 33PF,100V,5%,RAD,NPO		R	22	4.000	EA	C14,15,25,26	Yes		
352201-0337A	*1	7	CAP, 330UF,16V,ELEC,RAD		R	22	1.000	EA	C18	Yes		
352300-0007A	*1	8	CAP, .001UF,10%, MYLAR		R	66	3.000	EA	C10,39,40	Yes		
352300-0012A	*1	9	CAP, .01UF,10%,MYLAR		R	77	2.000	EA	C8,24	Yes		
352300-0017A	*1	10	CAP, .0047UF,10%,MYLAR		R	77	2.000	EA	C16,17	Yes		
352301-0103A	*1	11	CAP, .01UF,100V,20%,POLYC ARB,.2 L.S.		R	66	1.000	EA	C23	Yes		
352301-0104A	*1	12	CAP, .1UF,5%,MYLAR		R	66	4.000	EA	C3,4,5,7	Yes		
352400-0105A	*1	13	CAP, 1UF,50V,20%,RAD,TANT , MAX: HT. .28; O.D. .16		R	11	2.000	EA	C11,38	Yes		
352401-0106A	*1	14	CAP, 10UF,35V,20%,RAD,TAN T		R	11	6.000	EA	C1,2,9,12,13,41	Yes		
352203-0227A	*1	15	CAP, 220uF,16V,20%.RAD,EL ECT,8mm x 12mm		R	22	1.000	EA	C32	Yes		
352200-0157A	*1	16	CAP, 150uF,25V,20%,RAD,EL ECT,8mm x 12mm		R	22	2.000	EA	C33,34	Yes		
354000-0103A	*1	17	CONN, SGL ROW,STRT,SGL PI NS,SNAP-AWAY		R	11	4.000	PIN	J2 (4-PIN) DO NOT ISS	Yes		
354000-0103A	*1	18	CONN, SGL ROW,STRT,SGL PI NS,SNAP-AWAY		R	11	2.000	PIN	J4 (2-PIN) DO NOT ISS	Yes		
354000-0106A	*1	19	CONN, DBL ROW,STRT,SGL PI N,SNAP-AWAY		R	11	14.000	PIN	J3 (14-PIN) DO NOT IS	Yes		
356000-0008A	*1	20	REF OSCILLATOR, 4.0MHZ,CM OS HIGH SPEED		R	22	1.000	EA	Y1	Yes		
364000-0010A	*1	21	IC, LM339		R	11	1.000	EA	U11	Yes		
364000-0011A	*1	22	IC, LM358		R	11	1.000	EA	U15	Yes		
364000-0027A	*1	23	IC, 74HC32		R	11	1.000	EA	U5	Yes		
364000-0038A	*1	24	IC, 27C256,CMOS,EPROM,200 NS		R	11	1.000	EA	U3	Yes		
364000-0055A	*1	25	IC, CD4052		R	11	1.000	EA	U6	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
400906-0000	PCBA, O2 SAT. SINGLE BP, REV G (E787) - E2/E3			A			G	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
364000-0065A	*1	26	IC, OP11FP,OP AMP		R	11	2.000	EA	U9,10	Yes		
364000-0080A	*1	27	IC, TMPZ84C00P (Z80A, CMOS VERSION)		R	11	1.000	EA	U2	Yes		
364000-0091A	*1	28	IC, SG 3525		R	44	1.000	EA	U16	Yes		
364000-0093A	*1	29	IC, ILQ5 QUAD OPTO ISOLAT OR		R	11	3.000	EA	U8,13,14	Yes		
364000-0095A	*1	30	IC, MS6132,DUAL PORT RAM, 8 X 2K,48-PIN (OR MS7132)		R	11	1.000	EA	U1	Yes		
364000-0096A	*1	31	IC, 74HC240		R	11	1.000	EA	U7	Yes		
364000-0099A	*1	32	IC, 6N137		R	11	1.000	EA	U12	Yes		
364000-0131A	*1	33	IC, Z84C9008VSC ZILOG		R	11	1.000	EA	U4 - ISSUE TO TEST	Yes		
365000-0084A	*1	34	SKT, 84-PIN,PLCC		R	22	1.000	EA	U4X	Yes		
370100-0101A	*1	35	RES, 100,1/4W,5%,CF		R	11	3.000	EA	R32,35,37	Yes		
370100-0102A	*1	36	RES, 1K,1/4W,5%,CF		R	11	1.000	EA	R43	Yes		
370100-0103A	*1	37	RES, 10K,1/4W,5%,CF		R	11	7.000	EA	R3,13,16,17,39,48,64	Yes		
370100-0104A	*1	38	RES, 100K,1/4W,5%,CF		R	11	2.000	EA	R2,62	Yes		
370100-0126A	*1	39	RES, 12M,1/4W,5%,CF		R	11	2.000	EA	R36,38	Yes		
370100-0153A	*1	40	RES, 15K,1/4W,5%,CF		R	11	2.000	EA	R15,40	Yes		
370100-0202A	*1	41	RES, 2K,1/4W,5%,CF		R	11	3.000	EA	R58,61,63	Yes		
370100-0206A	*1	42	RES, 20M,1/4W,10%,CF		R	11	2.000	EA	R22,23	Yes		
370100-0331A	*1	44	RES, 330,1/4W,5%,CF		R	11	1.000	EA	R44	Yes		
370100-0470A	*1	45	RES, 47,1/4W,5%,CF		R	11	1.000	EA	R65	Yes		
370100-0471A	*1	46	RES, 470,1/4W,5%,CF		R	11	5.000	EA	R52,53,54,55,56	Yes		
370100-0472A	*1	47	RES, 4.7K,1/4W,5%,CF		R	11	3.000	EA	R1,50,57	Yes		
370100-0511A	*1	48	RES, 510,1/4W,5%,CF		R	11	4.000	EA	R45,46,47,49	Yes		
370100-0512A	*1	49	RES, 5.1K,1/4W,5%,CF		R	11	2.000	EA	R41,42	Yes		
370100-0622A	*1	50	RES, 6.2K,1/4W,5%,CF		R	11	1.000	EA	R66	Yes		

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
400906-0000	PCBA, O2 SAT. SINGLE BP, REV G (E787) - E2/E3				A				G	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370200-0100A	*1	51	RES, 10,1/4W,1%,MF		R	11	1.000	EA	R12	Yes		
370200-0200A	*1	52	RES, 20,1/4W,1%,MF		R	11	1.000	EA	R24	Yes		
370200-1001A	*1	53	RES, 1K,1/4W,1%,MF		R	11	3.000	EA	R4,5,19	Yes		
370200-1002A	*1	54	RES, 10K,1/4W,1%,MF		R	11	1.000	EA	R29	Yes		
370200-1003A	*1	55	RES, 100K,1/4W,1%,MF		R	11	1.000	EA	R8	Yes		
370200-1541A	*1	56	RES, 1.54K,1/4W,1%,MF		R	11	2.000	EA	R25,26	Yes		
370200-1622A	*1	57	RES, 16.2K,1/4W,1%,MF		R	11	1.000	EA	R33	Yes		
370200-2001A	*1	58	RES, 2K,1/4W,1%,MF		R	11	6.000	EA	R20,27,28,34,59,60	Yes		
370200-2701A	*1	59	RES, 2.7K,1/4W,1%,MF		R	11	1.000	EA	R14	Yes		
370200-3010A	*1	60	RES, 301,1/4W,1%,MF		R	11	1.000	EA	R9	Yes		
370200-5901A	*1	61	RES, 5.9K,1/4W,1%,MF		R	11	1.000	EA	R11	Yes		
370200-6341A	*1	62	RES, 6.34K,1/4W,1%,MF		R	11	1.000	EA	R18	Yes		
370200-8061A	*1	63	RES, 8.06K,1/4W,1%,MF (8 .05K N/A :OK PER KR)		R	11	1.000	EA	R21	Yes		
370200-9091A	*1	64	RES, 9.09K,1/4W,1%,MF		R	11	1.000	EA	R7	Yes		
370200-9761A	*1	65	RES, 9.76K,1/4W,1%,MF		R	11	1.000	EA	R30	Yes		
374300-0202A	*1	66	POT, 2K,TRIM,SIDE ADJ,CER MET,3/8 SQR,.15LS		R	11	3.000	EA	R6,10,31	Yes		
376000-0003A	*1	67	XSTR, 2N3904		R	11	2.000	EA	Q1,3	Yes		
376000-0019A	*1	68	XSTR, 2N7000,FET		R	11	1.000	EA	Q2	Yes		
376000-0021A	*1	69	XSTR, 2N7010		R	11	2.000	EA	Q4,5	Yes		
378000-0005A	*1	70	DIO, 1N914,SIGNAL T&R		R	11	4.000	EA	D8,9,10,11	Yes		
378000-0011A	*1	71	DIO, 1N4741A,11V,ZENER T& R ***MOTOROLA ONLY***		R	11	2.000	EA	D4,5	Yes		
378000-0012A	*1	72	DIO, 1N4749A,24V,ZENER T& R ***MOT ONLY***		R	11	3.000	EA	D1,2,3	Yes		
378000-0034A	*1	73	DIO, LM385,ZENER (XSTR NA TIONAL ONLY)		R	11	3.000	EA	D6,7,12	Yes		
378000-0040A	*1	74	DIO, 1N4756A,47V T&R		R	11	2.000	EA	D13,14	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
400906-0000	PCBA, O2 SAT. SINGLE BP, REV G (E787) - E2/E3			A				G	0

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
378000-0041A	*1	75	DIO, BYV27-150 (OR -200) T&R		R	22	6.000	EA	D15,16,17,18,19,20	Yes		
400988-0000	*1	76	ISO-TRANSFORMER, EP13 SWITCHING SUPPLY		R	33	1.000	EA	T1	Yes		
382200-0005A	*1	77	CHOKE, 10UH,MOLDED		R	11	1.000	EA	L3	Yes		
382200-0015A	*1	78	CHOKE, 680 UH		R	11	2.000	EA	L1,2	Yes		
400989-0000	*1	79	IDCTR, MULTI, EP13		R	22	1.000	EA	L4	Yes		
384000-0061A	*1	80	GAS TUBE (SURGE ARRESTER)		R	33	1.000	EA	DS1	Yes		
365000-0040A	*1	81	SKT, 40-POS,DIP,TIN PLATE ,L.P.		R	11	1.000	EA	U2	Yes		
365000-0148A	*1	82	SOCKET, 48 PIN DIP		R	22	1.000	EA	U1	Yes		
365000-0028A	*1	83	SKT, [illegible]-POS,DIP,TIN PLATE ,L.P.		R	11	1.000	EA	U3	Yes		
352100-0331A	*1	84	CAP, 330PF,25V,10%,RAD,X7R		R	22	1.000	EA	C43	Yes		
352301-0105A	*1	85	CAP, 1UF,63V,20%,MYLAR		R	22	1.000	EA	C35	Yes		
352100-0104A	*1	86	CAP, .1UF,50V,10%,RAD,X7R		R	11	1.000	EA	C6	Yes		

Cumulative Lead Time for 400906-0000 = 77

Medical Data Electronics • 12720 Wentworth Street • Arleta, California 91331-4329
(800) 237-5243 • (818) 768-6411 • FAX (818) 768-0759

P/N 400706-0000