

MANUAL  
FOR  
WIND REPORTER INDICATOR  
MODEL 2150  
2151

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FOR  
WIND REPORTER INDICATOR  
MODEL 2150  
2151

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**QUALIMETRICS, Inc.**

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TITLE

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WIND REPORTER INDICATOR  
MODEL 2150  
2151

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WIND REPORTER INDICATOR  
MODEL 2150  
2151

1.0 INTRODUCTION

- 1.1 This manual details all the display components of the wind reporting system:

Model 2150 Master Indicator  
Model 2151 Slave Indicator  
M404492 Analog Output Card  
M404493 Dual Input Card

- 1.2 The system is built around the Model 2150. This master indicator collects data from up to two sensor sites and provides visual display of wind speed and direction from either site, selectable by a front panel switch. Up to three additional dual input cards, M404493, may be added so that eight sensor sites can be monitored by one master. Only one of these sites, however, may be displayed at any given time.

- 1.3 The system can be expanded with the purchase of a Model 2151 Slave. This indicator operates identically to the master except that it does not collect data. It receives all its' information from the master, but displays the information in any selectable manner independently of the master. Slave indicators may be connected in series.

- 1.4 The master and slave operate in one of three selectable modes. Instantaneous mode provides one second averages of wind speed and direction updated every 5 seconds. The 2-minute averaging mode indicates average values of speed and direction from the preceding two minutes, along with maximum and minimum speeds and range of direction values over the same period. These values are updated every 5 seconds. The 10-minute averaging mode provides the same data, but with a 10-minute averaging period. A significant change in wind speed and/or direction, based on I.C.A.O. recommendations, causes flashing of indicators on the front panel to alert the observer of these wind conditions. Alarm conditions at non-displayed sites are also indicated on the front display. The I.C.A.O. recommendations along with alarm indications are given in Table 4.0

- 1.5 The optional M404492 analog output cards allow further system versatility by providing a linear 0 to 1 VDC output

representing a 0 to 200 mph wind speed, and a 0 to 1 VDC output representing 0 to 540° wind direction. These cards may insert into master or slave units according to the rules laid out in Step 3.2. Each analog output card may output an independent mode (instantaneous, 2-min, or 10-min), however the output of all cards in a particular unit represents only the sensor site displayed on the unit's front panel.

## 2.0 SPECIFICATIONS

### 2.1 Input:

Model 2150 ..... 2 channels of speed and direction standard; up to 6 more optional  
Model 2151 ..... output from Model 2150 or other Model 2151

Sample interval ..... 5 seconds; all channels

Display type:

Wind speed ..... 3 ea. red 3-digit LED's for average, maximum, and minimum  
Wind direction ..... 36 green LED's for average, 36 yellow LED's for variation range

Display modes ..... instantaneous, 2-minute average, and 10-minute average

Indicating range ..... 0 to 200 mph, 0 to 174 knots, 0 to 89.4 m/s or 0 to 322 km/hr  
jumper wire selectable

Resolution:

Wind speed ..... 1 mph, 1 knot, 0.1 m/s, or 1 km/hr  
Wind direction ..... 10° azimuth

Optional analog output ..... 0 to 1 VDC, wind speed and direction; instantaneous, 2-minute average, 10-minute average; indicated channel only

Power:

Input voltage ..... 110/220 VAC 50/60 Hz, switch selectable  
Input current ..... 100 mADC, .25A fuse  
Size ..... 8"W X 8"H X 8"D (203 X 203 X 203 mm)  
Weight ..... 9 lbs. max. (4.1 kg)

## 3.0 INSTALLATION

3.1 This instrument is thoroughly assembled and inspected at the factory and is ready for installation. Please refer to

the return authorization card included in the packing box if damage has occurred. Also, notify Qualimetrics, Inc.

3.2 Additional Input and Analog Output Cards: The versatility of the wind reporting system is due in part to the customers ability to add or remove dual input cards (M404493) or analog output cards (M404492) to either the master or slave unit. The Model 2150 comes with one M404493 board installed in its 1<sup>st</sup> position (top slot). If additional boards are to be inserted, follow these steps and obey the important rules listed below.

- a) Make sure all power is off.
- b) Remove the two cover screws on the back and slip off the rear enclosure.
- c) Insert board into one of the four slots according to the rules below. (Note that slot positions are referenced as 1<sup>st</sup> for the top position, 2<sup>nd</sup> for the position second from top, 3<sup>rd</sup> for the position third from top, and 4<sup>th</sup> for the bottom or lowermost slot position.)
- d) Push the board in firmly to insure good contact.
- e) Remove the proper amount of covering tape from the rear enclosure.

#### RULES FOR CARDS

- 1) Cards must be inserted component side up.
- 2) Always fill slot positions top to bottom (1<sup>st</sup> through 4<sup>th</sup>) in order.
- 3) Input cards (M404493) are always placed before analog output cards (M404492) in slot position.
- 4) Input cards (M404493) are not allowed in the Model 2151 Slave Indicator.
- 5) Jumpers on each card, M4044932 and M404492, must be inserted as shown in Table 3.0.

3.3 Mounting: The Models 2150 and 2151 mount in a panel with a square cut out to dimensions of 7.65"  $\pm$  0.1". The panel should not be more than 0.25" thick. Remove the two side brackets and insert the rear end of the indicator unit through the square hole. Secure the unit to the panel with the two side brackets.

3.4 Interfacing: Refer to Wiring Diagram 2150-025 for details on connecting sensors to the Model 2150. This diagram also

TABLE 3.0  
JUMPER TABLE FOR MODELS 2150 AND 2151

CIRCUIT BOARD	JUMPER						RESULT
	W1	W2	W3	W4	W5	W6	
M404486 CPU BOARD	IN	OUT					UNIT IS IDENTIFIED AS A MODEL 2150 MASTER INDICATOR
	OUT	IN					UNIT IS IDENTIFIED AS A MODEL 2151 SLAVE INDICATOR
	IN	OUT					WIND SPEED UNITS ARE IN METERS PER SECOND (M/S)
M404487 DRIVER BOARD	OUT	IN					WIND SPEED UNITS ARE IN MILES PER HOUR (MPH)
	OUT	OUT					WIND SPEED UNITS ARE IN KNOTS (KTS)
	IN	IN					WIND SPEED UNITS ARE IN KILOMETERS PER HOUR (KM/H)
	OUT	OUT					ANALOG OUTPUTS FOR SPEED AND DIRECTION ARE INSTANTANEOUS FOR DISPLAYED SITE
	IN	OUT					ANALOG OUTPUTS FOR SPEED AND DIRECTION ARE 10 MINUTE AVERAGES FOR DISPLAYED SITE
	OUT	IN					ANALOG OUTPUTS FOR SPEED AND DIRECTION ARE 2 MINUTE AVERAGES FOR DISPLAYED SITE
M404492 ANALOG OUTPUT BOARD (OPTIONAL)			IN	OUT	OUT	OUT	CARD MUST BE LOCATED IN FIRST SLOT (TOP POSITION)* (VALID FOR MODEL 2151 ONLY)
			OUT	IN	OUT	OUT	CARD MUST BE LOCATED IN SECOND SLOT (SECOND FROM TOP)*
			OUT	OUT	IN	OUT	CARD MUST BE LOCATED IN THIRD SLOT (THIRD FROM TOP)*
			OUT	OUT	OUT	IN	CARD MUST BE LOCATED IN FOURTH SLOT (BOTTOM POSITION)*
	IN	OUT	OUT	OUT			CARD MUST BE LOCATED IN FOURTH SLOT (BOTTOM POSITION)*
M404493 DUAL CHANNEL INPUT BOARD (MODEL 2150 ONLY)	OUT	IN	OUT	OUT			CARD MUST BE LOCATED IN THIRD SLOT (THIRD FROM TOP)*
	OUT	OUT	IN	OUT			CARD MUST BE LOCATED IN SECOND SLOT (SECOND FROM TOP)*
	OUT	OUT	OUT	IN			CARD MUST BE LOCATED IN FIRST SLOT (TOP POSITION)*
							POWER IS DELIVERED TO MODEL 21501 AT SENSOR SITE
					IN	OUT	NO POWER IS DELIVERED TO MODEL 21501
					OUT	IN	

\* SEE STEP 3.2 FOR OTHER APPLICABLE RULES.

- NOTES:
1. ALL JUMPER COMBINATIONS NOT EXPLICITLY SHOWN ARE INVALID.
  2. BLANKS ARE NON-APPLICABLE TO BOARD OR RESULT.
  3. REFER TO ASSEMBLY FOR JUMPER LOCATIONS.



shows wiring for 2150's that have a combination of M404493 input boards and M404492 analog output boards. To connect a wire to a terminal, simply loosen the screw, insert the stripped wire into the hole directly above, and tighten the screw.

3.5 The Model 2151 will not accept dual input cards, since it obtains all its' information from the master indicator. It will, however, accept up to four M404492 analog output boards. Drawing 2150-025 shows examples of hook up.

3.6 Slave indicators may be connected in series with one another as shown in Drawing Number 2151-025. The communications cable connecting master and slaves may need to be manufactured as shown in the drawing. There is no limit to the number of slave indicators connected in this manner.

3.7 Before connecting a power cord to the power receptacle, make sure the select switch is indicating the correct AC voltage. Turn the unit on with the power switch. Disregard the display for the first few seconds while the unit is in the initialization state.

#### 4.0 THEORY OF OPERATION

4.1 Operation Details: Figure 4.1 shows all front panel controls and indications. A description of each is included.

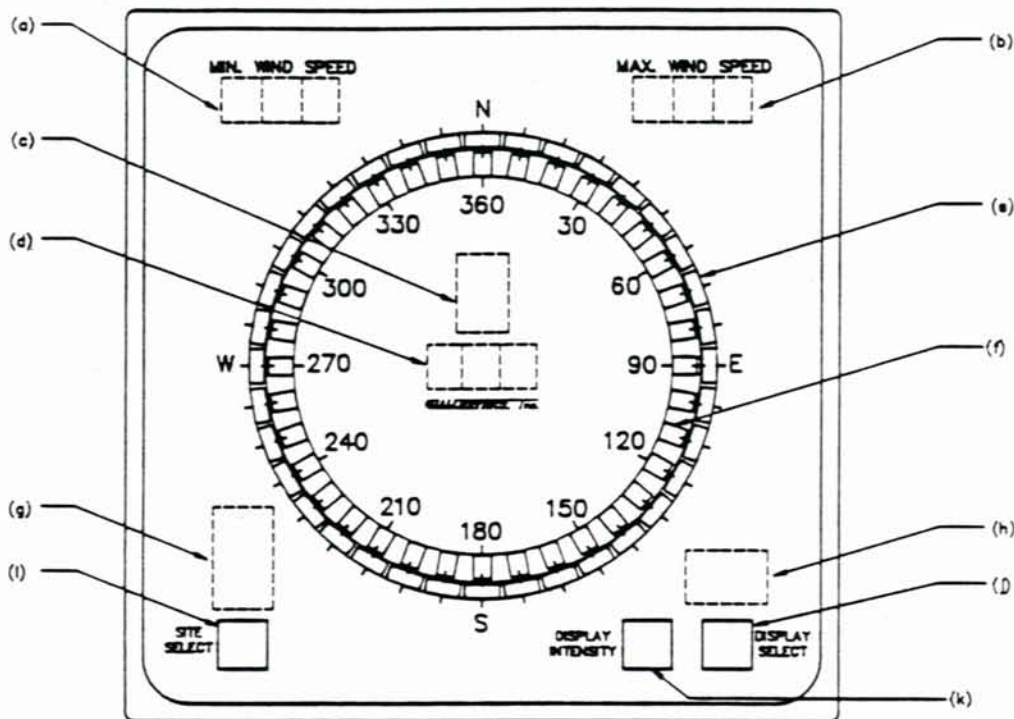
4.2 The master and slave unit operate in one of three distinct modes, selected by depressing the "Display Select" switch on the front panel. The modes of operation are described in Paragraph 1.4 and illustrated in Figures 4.2, 4.3, and 4.4. Mode of operation is indicated directly above the switch.

4.3 The "Display Select" switch may also be used to put the unit into a test pattern that sequentially illuminates all display LEDs. The test pattern is illustrated in Figure 4.5 and should be used to check the condition of all display LEDs.

4.4 The "Site Select" switch may be pressed to select a different sensor site for display. Displayed sensor site is numerically indicated directly above the switch. Changing a sensor site also changes the output of all optional analog output cards (M404492) to reflect the currently displayed site.

4.5 The "Display Intensity" switch changes the brightness of the display to one of eight levels. Depress and hold until display illumination reaches desired level.

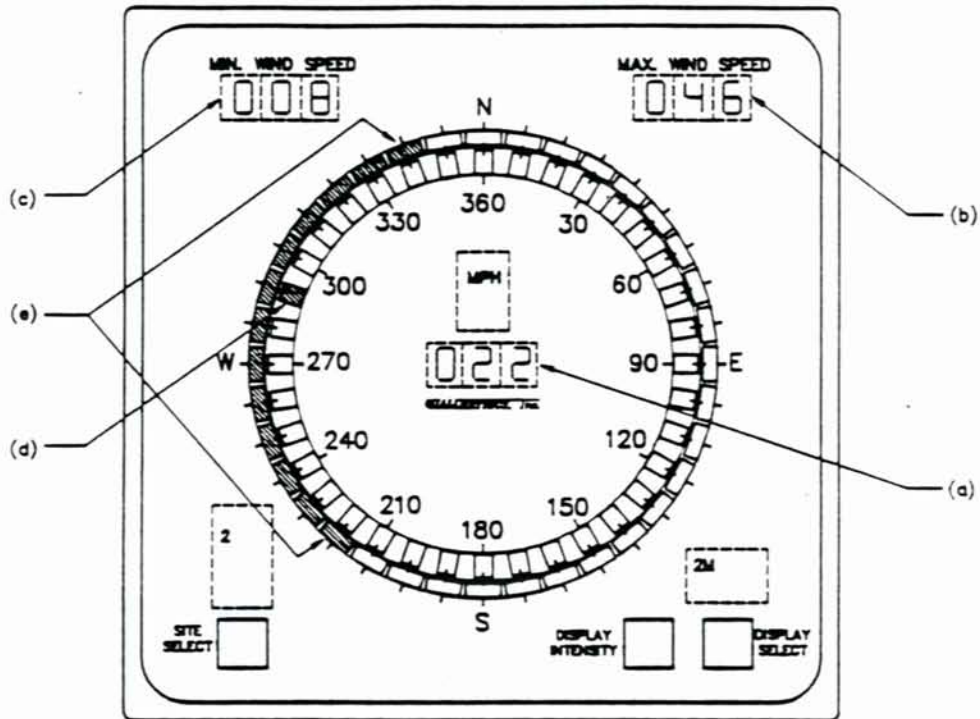
FIGURE 4.1  
FRONT PANEL DISPLAYS AND CONTROLS



LEGEND:

- (a) Minimum wind speed display:
  - minimum wind speed occurring during the previous 2 minutes (2M mode)
  - minimum wind speed occurring during the previous 10 minutes (10M mode)
  - current wind speed based on a 1 second average (INST mode)
- (b) Maximum wind speed display:
  - maximum wind speed occurring during the previous 2 minutes (2M mode)
  - maximum wind speed occurring during the previous 10 minutes (10M mode)
  - current wind speed based on a 1 second average (INST mode)
- (c) Units of measure for wind speed data:
  - M/S = meters per second
  - MPH = miles per hour
  - KTS = knots
  - KM/H = kilometers per hour
- (d) Wind speed display:
  - average wind speed of the previous 2 minutes (2M mode)
  - average wind speed of the previous 10 minutes (10M mode)
  - current wind speed based on a 1 second average (INST mode)
- (e) Wind direction span indicators:
  - range of wind direction during the previous 2 minutes (2M mode)
  - range of wind direction during the previous 10 minutes (10M mode)
  - current wind direction based on a 1 second average (INST mode)
- (f) Wind direction indicators:
  - average wind direction of the previous 2 minutes (2M mode)
  - average wind direction of the previous 10 minutes (10M mode)
  - current wind direction based on a 1 second average (INST mode)
- (g) Indicates sensor site number from which displayed data is gathered.
- (h) Shows the indicator's current mode of operation:
  - 2M = two minute averaging mode
  - 10M = ten minute averaging mode
  - INST = instantaneous mode
  - TST = test pattern
- (i) Selects the sensor site number for display.
- (j) Selects the mode of operation for the indicator, or test pattern for display check.
- (k) Selects one of seven possible brightness levels for the display LED's.

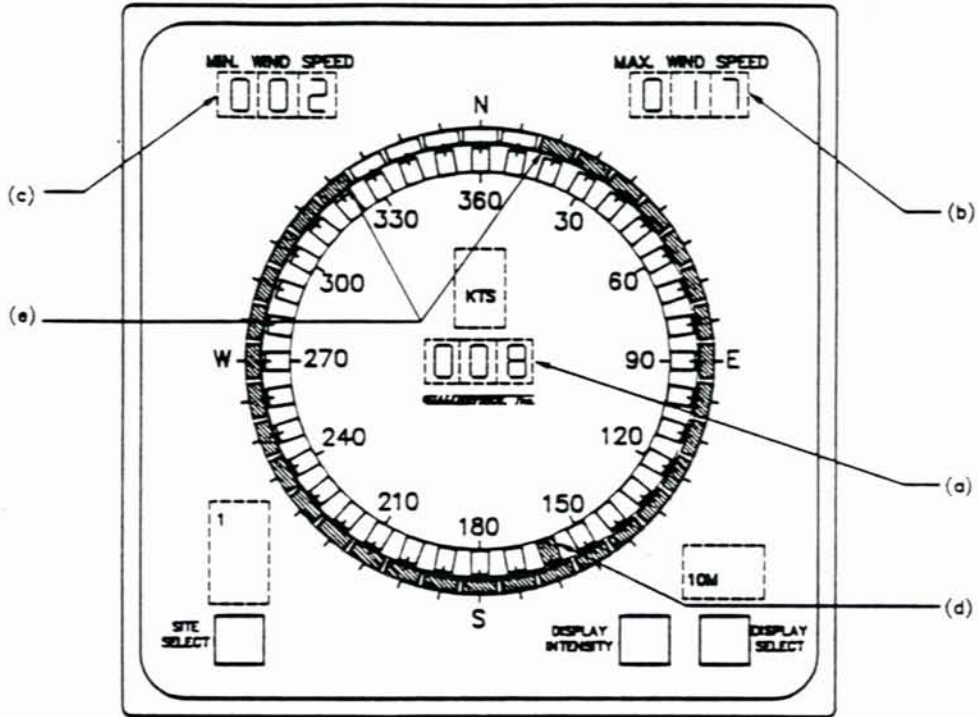
FIGURE 4.2  
TWO MINUTE AVERAGING MODE  
(SAMPLE DISPLAY)



INFORMATION DISPLAYED:

- (a) Wind speed at sensor site #2 averaged 22 miles per hour during the last 2 minutes.
- (b) Maximum wind speed at sensor site #2 was 46 miles per hour over the last 2 minutes.
- (c) Minimum wind speed at sensor site #2 was 8 miles per hour over the last 2 minutes.
- (d) Wind, at sensor site #2, came from an average 290° azimuth direction during the last 2 minutes.
- (e) Wind direction at sensor site #2 varied between 220° and 340° through 270° during the last 2 minutes.

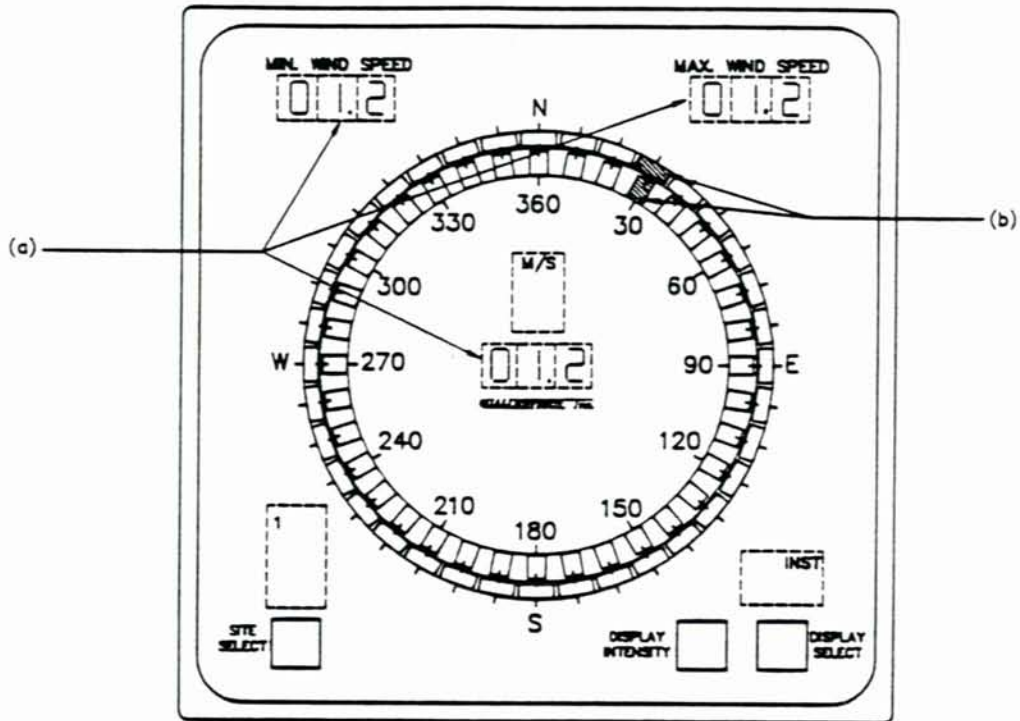
FIGURE 4.3  
TEN MINUTE AVERAGING MODE  
(SAMPLE DISPLAY)



INFORMATION DISPLAYED:

- (a) Wind speed at sensor site #1 averaged 8 knots during the last 10 minutes.
- (b) Maximum wind speed at sensor site #1 was 17 knots during the last 10 minutes.
- (c) Minimum wind speed at sensor site #1 was 2 knots during the last 10 minutes.
- (d) Wind, at sensor site #1, originated from an average 160° azimuth direction during the last 10 minutes.
- (e) Wind direction at sensor site #1 varied between 20° and 320° through 180°, during the last 10 minutes.

FIGURE 4.4  
INSTANTANEOUS MODE  
(SAMPLE DISPLAY)

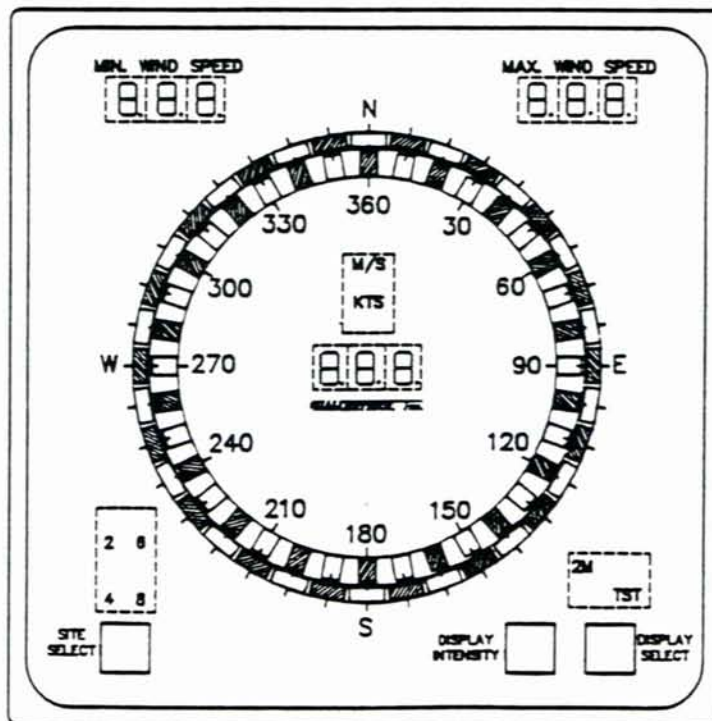
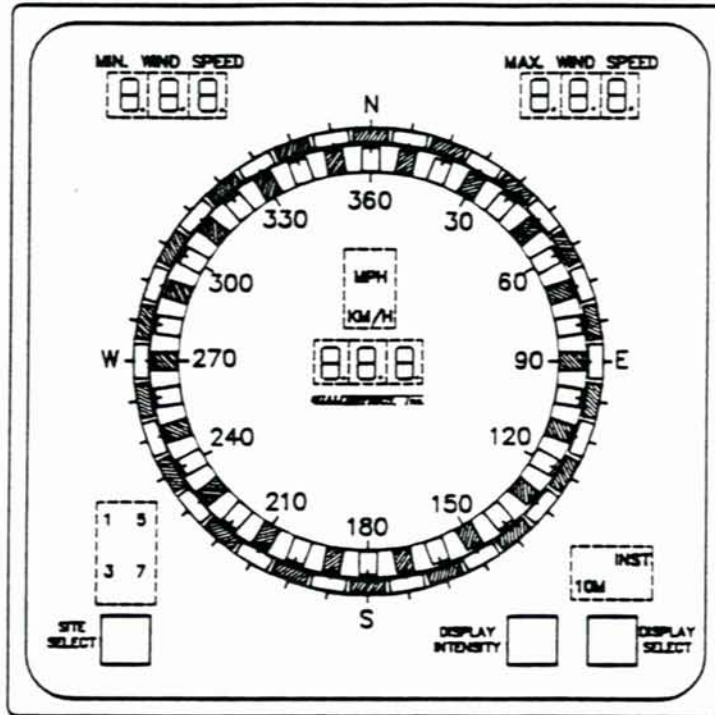


INFORMATION DISPLAYED:

- (a) Wind speed at sensor site #1 is 1.2 meters per second, based on a 1 second average.
- (b) Wind at sensor site #1 is originating from a 30° azimuth direction, based on a 1 second sample.

# FIGURE 4.5 TEST PATTERN

(CONSTANTLY ALTERS BETWEEN THE  
TWO FIGURES SHOWN)



4.6 Both master and slave indicators are programmed to indicate alarm and error conditions on the front panel. Table 4.0 describes the alarm conditions based on I.C.A.O. recommendations, while Table 4.1 lists all error messages. Refer to these tables whenever a condition occurs that appears abnormal.

4.7 Remember that master and slave units may be operated completely independent of each other. Although all sensors are connected to the master, the slaves receive all data so that different site numbers and different modes of operation can be monitored by the slaves. Also remember that output modes of analog output cards are jumper selected (see Table 3.0), and that this output reflects the sensor being currently displayed on the unit.

4.8 Software Description: Both master and slave indicators operate off a program that governs all operations of the wind reporting system. The following paragraphs describe the manner in which data is collected and processed.

- a) Except for specific alarm conditions, wind speed and wind direction are treated as separate entities; all wind speed calculations are performed only with wind speed data and all wind direction calculations are performed only with wind direction data. Therefore, a wind direction indication with zero wind speed is possible.
- b) Upon power up of the system, the microprocessor executes an initialization routine which includes checking how many and what kind of input and output boards are connected to the unit. It then proceeds to enter an infinite loop that performs the following routines every 5 seconds: data collection routine, calculation routine, alarm routine, display routine, and output routine.
- c) The data collection routine begins by allowing the frequencies representing wind speed and direction to trigger a counter for precisely one second, so that the count digitally represents the two parameters. Wind speed is read first. An offset is subtracted so that actual wind speed in miles per hour is stored. The data is checked for validity and rounded to 0 or 200 mph if a 1.5% or less out of bounds error is encountered. If the data exceeds the bounds limits, an error flag is set. Wind direction is then read from the counter and stored as degrees. If the data is 0.83% or less out of range ( $3^\circ$  out of  $360^\circ$ ), the values are rounded to the lower or upper limits; greater errors force an error flag on direction. If 4 consecutive errors are found for speed or direction, the storage arrays for the

# TABLE 4.0

## ALARM CONDITIONS BASED ON I.C.A.O. RECOMMENDATIONS

DISPLAY SYMPTOM	SIGNIFICANCE
Flashing minimum and maximum wind speed display	Warns that the wind speed situation in paragraph 4.5.6 below has been met or exceeded. Flashing begins whenever the latest 1 second sample of wind speed differs by 10 knots or more from the 10 minute mean, and persists for one minute thereafter. Units mode of operation dictates the significance of values displayed.
Flashing wind direction span indicators	Signals that the wind direction situation in paragraph 4.5.6 below has been met or exceeded. If the current 1 second sample of wind direction differs from the 10 minute average by 60° or greater, and if the current and average wind speed over the 10 minutes is greater than 5 knots, then flashing begins and persists for one minute thereafter. Significance of indicated span is governed by the units mode of operation.
Blinking sensor site numbers	Indicates that one or both of the conditions in paragraph 4.5.6 below has been met or exceeded at the particular non-displayed site. Switch display to the blinking site for indication of parameter exceeded. Site numbers remain blinking for one minute after the last alarm condition has been exceeded at the non-displayed site.

The following paragraph is taken from:

Meteorological Service for International  
Air Navigation, International Civil Aviation  
Organization, Annex 3, 9th edition, 1983.

4.5.6. RECOMMENDATION - IN REPORTS FOR TAKE-OFF AND LANDING, VARIATIONS IN THE WIND DIRECTION SHOULD BE GIVEN WHEN THE TOTAL VARIATION IS 60 DEGREES OR MORE WITH MEAN SPEEDS ABOVE 5 KNOTS; SUCH DIRECTIONAL VARIATIONS SHOULD BE EXPRESSED AS THE TWO EXTREME DIRECTIONS BETWEEN WHICH THE WIND HAS VARIED DURING THE PAST TEN MINUTES. VARIATIONS FROM THE MEAN WIND SPEED (GUSTS) DURING THE PAST 10 MINUTES SHOULD BE REPORTED ONLY WHEN THE VARIATION FROM THE MEAN SPEED HAS EXCEEDED 10 KNOTS; SUCH SPEED VARIATIONS (GUSTS) SHOULD BE EXPRESSED AS THE MAXIMUM AND MINIMUM SPEEDS ATTAINED. IN REPORTS FOR TAKE-OFF, SURFACE WINDS OF 5 KNOTS OR LESS SHOULD INCLUDE A RANGE OF WIND DIRECTIONS, WHENEVER POSSIBLE.



TABLE 4.1 ERROR CONDITIONS

DISPLAY SYMPTOM	SIGNIFICANCE	REMEDY
All four wind speed indicators illuminated	Display is not yet stable following a site or display select.	Wait a few seconds for stabilization.
All decimal points lit	Not enough data points have been collected to perform wind speed calculations in 2M or 10M mode. Indicated values are based on data collected thus far.	Following initialization or reset, let an entire sample period for a chosen operation mode expire before considering wind speed calculations valid.
Three consecutive wind direction indicators lit	Not enough data points have been collected for a 2M or 10M average of wind direction. Illuminated center LED represents average wind direction of data collected thus far.	Following initialization or reset, allow an entire sample period to pass before considering average wind direction valid in 2M or 10M mode.
"Checker board" pattern exists on all wind direction and wind direction span indicators	Bad wind direction data exists.	Allow a 1/2 hour warm up period for the model 21501 electronics at sensor site. Make sure slaves are connected to master correctly. If problem persists, check calibration of model 21501.
Speed indicators consecutively output "E.E.", "E.E.4."	On master indicator - wind speeds in excess of 200mph or lower than 0mph are being detected. On slave indicator - data is not being received from master.	Allow a 1/2 hour warm up period for the model 21501 electronics at sensor site. Make sure slaves are connected to master correctly. If problem persists, check calibration of model 21501.
Speed indicators read "E.E.1."	No dual channel input card exists in first slot of master indicator.	Install a M404493 card according to procedures and rules outlined in step 3.2 of "Installation" section.
Speed indicators read "E.E.2."	A dual channel input card follows an analog output card in the master indicator.	Install M404492's and M404493's in accordance to procedures and rules outlined in step 3.2 of "Installation" section.
Speed indicators read "E.E.3."	A blank position is detected between input and/or output cards. Step 3.2 rule 2 is violated.	Install M404492's and M404493's in accordance to procedures and rules outlined in step 3.2 of "Installation" section.

particular site are reset and an error message is sent to the display (see Table 4.1).

- d) The calculation routine is then called to find the minimum, maximum, and average of the valid data stored in the arrays. Wind direction averaging is done vectorially assuming a unity magnitude. Data sets for two and ten minute time intervals are calculated for direction and speed for every valid channel.
- e) The alarm routines are called which set alarm flags for a given channel if that channel meets or exceeds the criteria outlined in Table 4.0.
- f) Next, the display routines call upon the output display drivers to output the selected information onto the face of the unit. At this time, wind speed is converted to jumper selected alternate units according to the formulas:

$$\text{Knots} = \text{mph} * 0.86897624$$

$$\text{Meters per second} = \text{mph} * 0.44704$$

$$\text{Kilometers per hour} = \text{mph} * 1.609344$$

The direction span calculation steps through the values that are stored in the direction array (if 2 or 10 minute modes are selected) and illuminates LEDs accordingly. The algorithm calculates the shortest span between any two direction values, taking into account the wrap around of 0 to 360 and 360 to 0 degrees.

- g) Finally, the output routine is called to send data serially to the slave units through the communications port. Speed and direction each require 2 bytes for channel identification and parameter value.
- h) Note that the only difference between master and slave units is the manner in which they obtain their speed and direction information. The master reads the value from the counter on the input board and determines site number from which counter is read. The slave obtains its' site number, wind speed, and wind direction in digital form from the master. In this way, each unit performs all data manipulation individually so that the units may operate independently of one another.
- i) The software is written so that wind speed and direction for the displayed site number are delivered digitally to the analog output card, if such a card is identified. A jumper on the particular card determines whether instantaneous, 2-minute average, or 10-minute average values will be appear. The D/A convertor yields

a 0-1 VDC output over the wind speed range, and a 0-1 VDC output corresponding to 0-540° direction. The idea behind the 540° indicator is shown in Table 4.2. Basically, directions between 0° - 180° through east can be represented by two different output voltages. Directions between 0° - 180° through west are represented by only one output voltage. This direction output prevents "painting" of a graph display with winds fluctuating around north.

4.9 Circuit Description: Identical circuitry is contained in both Model 2150 and 2151, except that the Model 2150 contains one or more dual channel input boards, M404493. The three main boards are identified as follows:

C.P.U. Board:	Schematic M404486-004 Assembly M404486-003
Driver Board:	Schematic M404487-004 Assembly M404487-003
Display Board:	Schematic M404488-004 Assembly M404488-003

In addition, dual input cards and analog output cards may be added. There are as follows:

Dual input board:	Schematic M404493-004 Assembly M404493-003
Analog output board:	Schematic M404492-004 Assembly M404492-003

The power supply for the entire system is illustrated as:

Power supply board:	Schematic M404491-004 Assembly M404491-003
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The system configuration is shown in Drawing Number 2150-009. The discussion is arranged from input to output.

4.10 Dual Input Board:

a) The mixed waveform containing wind speed and direction information from the sensor site enters at J1 and J2. (The signal from an additional sensor would enter at J3 and J4, but since both signals follow similar paths only the first will be discussed here.) T1 is matched by R2 so that the signal at pins 3 and 4 of T1 is identical to the signal at pins 3 and 4 of the transformer in the Model 21501 electronics package. The amplification stage following T1 adjusts the level of the signal to meet minimum requirements for U1. U1 separates the signal into its upper and lower

SENSOR			WIND DIRECTION OUTPUT FROM M404492 BOARD	
ROTATION	DEGREES	APPROX. DIRECTION	APPROX. VOLTAGE (VDC)	DEGREES
CW	270	WEST	0.50	270
	359	NORTH	0.66	359
	1	NORTH	0.67	361
	90	EAST	0.83	450
CCW	1	NORTH	0.67	361
	359	NORTH	0.66	359
	270	WEST	0.50	270
	181	SOUTH	0.34	181
	179	SOUTH	0.33	179
	90	EAST	0.17	90
CW	1	NORTH	0.00	1
	359	NORTH	0.66	359
	1	NORTH	0.67	361
	90	EAST	0.83	450
	179	SOUTH	1.00	539
	181	SOUTH	0.34	181
	270	WEST	0.50	270

TABLE 4.2  
540° WIND DIRECTION OUTPUT  
FROM ANALOG OUTPUT BOARD

components so that the frequency at pin 1 of U1 represents the wind speed and the frequency at pin 10 represents wind direction.

- b) These frequencies toggle the dual programmable counters of U6 while the  $\overline{\text{GATE}}$  is low for one second during each five second sample period (see 4.12d for a description of this timing circuit). Both counters of U6 will count down from an "FFFF" value. After the  $\overline{\text{GATE}}$  rises, the data on the counters are read according to the codes on address lines A0-A6, assuming the  $\text{IO}/\overline{\text{M}}$  line is high. A7 must remain low since I/O ports with this bit high are reserved for outputting (see 4.11b). The initialization routine in software determines how many input cards must be read.
- c) Jumper W5 is a hard wired connection that supplies power to the Model 21501 electronics package at sensor site. The DC level at J1 is raised to V+, which is tapped off the output of the rectifier on the power supply board. Jumper W6 should NEVER be connected, since it will short the DC of the power supply board to ground.

#### 4.11 C.P.U. Board:

- a) This board controls all operations of the wind reporter. U9 is the NSC800 8-bit microprocessor with 16 address lines. The speed of the processor is set by the crystal, Y1. The 32Kbyte EPROM, U5, contains the program, while the 8Kbyte RAM chips, U1 and U4, provide the support memory. The memory can only be accessed if the I/O line ( $\text{IO}/\overline{\text{M}}$ ) is low, while the highest address bits, A13-A15, determine which memory chip is accessed according to logic dictated by U12 and U10.

- b) With a high I/O line, memory is disabled and I/O ports are called. The eight lower address bits define an I/O port and are reserved as follows:

80-87 for wind direction, mode, site # indication  
88-8F for direction span indicators  
90-97 for max/min wind speed displays  
98-9F for average wind speed display

Writing to any of these ports will deliver data to the corresponding driver on the driver board.

- c) Writing to port A0-AF enables the UART, U6, and at the same time disables U3 which forces dedication of the data bus to the UART. The UART is programmed to send data serially at 1200 baud. On master units, W1 is inserted so that serial data is sent through U8 and out the communication port every five seconds. For slave

units, W1 is removed and W2 is inserted so that incoming serial data can be received by the UART and sent to the microprocessor. In addition, the data gets re-routed out through the communications port so that other slaves connected in series obtain the data at the same time.

- d) The circuit at the lower right of the schematic is used for brightness control for LEDs. When the display intensity switch is closed, U17 begins counting upward under the pulses sent by U11. As the bits of U17 match the bits of U13, U16 sends an inverted pulse out DIM CLR. DIM SET pulses are generated on a continual basis, since the timer is constantly clocking U13.

#### 4.12 Driver Board (also Display Board):

- a) As DIM SET and DIM CLR pulses are generated on the C.P.U. board, U18 adjusts the width of its output pulse to vary the shut down time of all decoder/drivers. LED illumination decreases as pulse width decreases.
- b) The SHUT DOWN line on select decoder/drivers are also controlled by the outputs of U10. Whenever certain data codes are written to I/O port B0, high Levels are input to U10 from U9. As these levels are "and"ed with a 1 Hz signal from U13, the appropriate decoder/driver turns on and off to indicate alarm conditions.
- c) U13 also times the five second sample intervals. Q0, Q1, and Q2 from U13 can be read from the data lines D0-D3 to indicate sample interval expiration.
- d) U8 is timed with the combination oscillator and counter comprised of U16 and U15. This combination plus U18 also lowers the GATE line to the dual input cards for a precise one second period. At the same time, a low can be read from D7 while the second counter of U15 is clocked again.
- e) Other inputs that can be placed on the data bus include the wind speed units on D3 and D4, site select switch on D5, and display select switch on D6.
- f) All remaining components serve to decode and drive the LED's and display segments on the display board.

#### 4.13 Analog Output Board:

- a) During the initialization routine, the microprocessor reads the code on U4 which tells it that an analog output card exists and what calculation mode it wishes to receive. At output time, the data is written to the

D/A chips, U3 and U6, in the order determined by the address lines.

- b) A negative reference on each D/A can be varied for span adjustments, while zeroing is done by adjusting the offset provided by U5. U5 also serves to invert the signal so that the output varies with positive slope.

#### 4.14 Power Supply Board:

- a) Incoming AC power is applied either in series or parallel with the two primary coils of T1, depending on the position of S2. The output of each secondary winding is fully rectified before being regulated by the individual regulator chips. All supply voltages are placed on the bus at the C.P.U. board. V<sub>DS</sub> powers all LEDs and display segments. The +5 VDC powers all TTL components on the C.P.U. and driver boards. The -12 and -12 VDC are delivered to the dual input cards and any analog output cards that are inserted, and regulated to required levels on those boards. The V+ supply is only responsible for powering the Model 21501 electronics package at sensor site.

### 5.0 CALIBRATION

5.1 Dual Input Board: This board should never require adjustments. Perform the following procedure only when a data error indication is displayed for a particular site even when a proper sensor signal is input. Refer to Assembly Drawing M404493-003.

- a) Connect the sensor signal cable to site #1 (J1 and J2). Make sure the Skyvane's propeller is stationary for the duration of this calibration. Allow 1/2 hour warm-up time for the electronics package.
- b) Adjust R4 until a 700 Hz signal is observed at pin 1 of U1. If a frequency other than 700 Hz is observed check calibration of skyvane and sensor electronics.
- c) Next, connect the signal cable to site #2. Adjust R5 until a 700 Hz signal is observed at pin 1 of U7.

5.2 Analog Output Board: Calibrate this board only if the observed analog output differs from what is expected from display indications. Remember that display mode may be different from output mode. Refer to Assembly Drawing M404492-003:

- a) Remove W1 and W2 and set the display to INST mode.

NOTE: Analog output voltages may instantaneously vary above the limits indicated below. Ignore slight variations as long as the average indication is within the limits.

- b) Apply a 700 Hz signal (simulating 0 mph wind) to the input board of any site number, making sure that a 0.1 $\mu$ f capacitor couples the + input with the signal generator. Also make sure the display that drives the questionable analog output board is set to display that site. Switch display off.
- c) Switch display on, and within 20 seconds, adjust R5 so that 0.00  $\pm$ .002 VDC appears on the speed output. Switch display off again.
- d) Switch display on and within 20 seconds adjust R6 until 0.000  $\pm$ .002 VDC appears on the direction output.
- e) After one minute raise the frequency to 900 Hz (simulating 200 mph wind) and adjust R4 so that the speed output is 1.000  $\pm$ .002 VDC.
- f) Raise the frequency to 1470 Hz, (simulating a west wind) and adjust R8 for a 0.500  $\pm$ .002 VDC direction output.

## 6.0 MAINTENANCE

- 6.1 The wind reporter is designed for minimal maintenance. Wipe the display with a damp cloth whenever necessary. Please refer to maintenance of the sensor and platform electronics at sensor site for appropriate maintenance of these devices.

## 7.0 SCHEMATICS AND PARTS LISTS

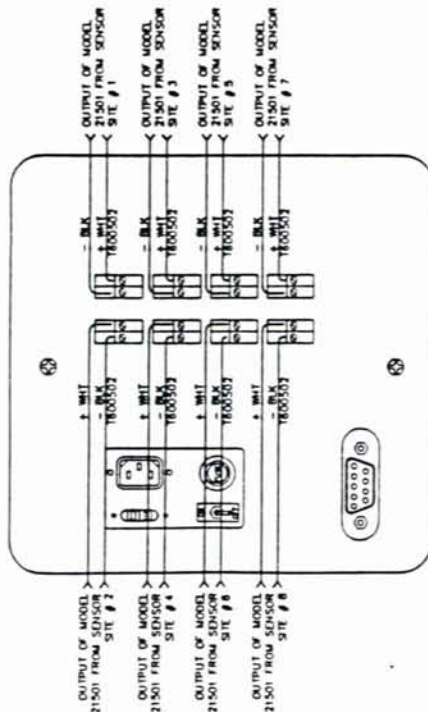
- 7.1 The following pages include schematics, assembly drawings, and parts list for this instrument. Please note that the parts lists are arranged in assembly/sub-assembly form. Each sub-assembly is on its own page. Sub-assemblies and parts are listed in the smallest economical size available from Qualimetrics.

## 8.0 WARRANTY

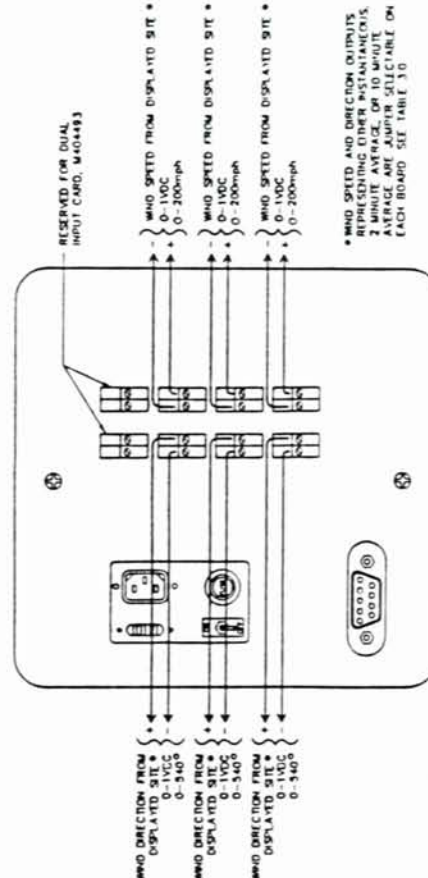
- 8.1 All instruments are warranted for one year, unless otherwise specified, against defects in material or workmanship. Should any instrument prove to be defective within the warranty period, upon written notice and return of the instrument freight prepaid, Qualimetrics will, at its option, repair or replace the defective unit and



return it freight collect. Instruments used or installed,  
and modified or altered by others, may cancel warranty.



REAR PANEL OF MODEL 2150 WITH FOUR DUAL INPUT CARDS (M40493) INSTALLED (EXAMPLE)



REAR PANEL OF MODEL 2150 WITH THREE ANALOG OUTPUT CARDS (M40492) INSTALLED (EXAMPLE)

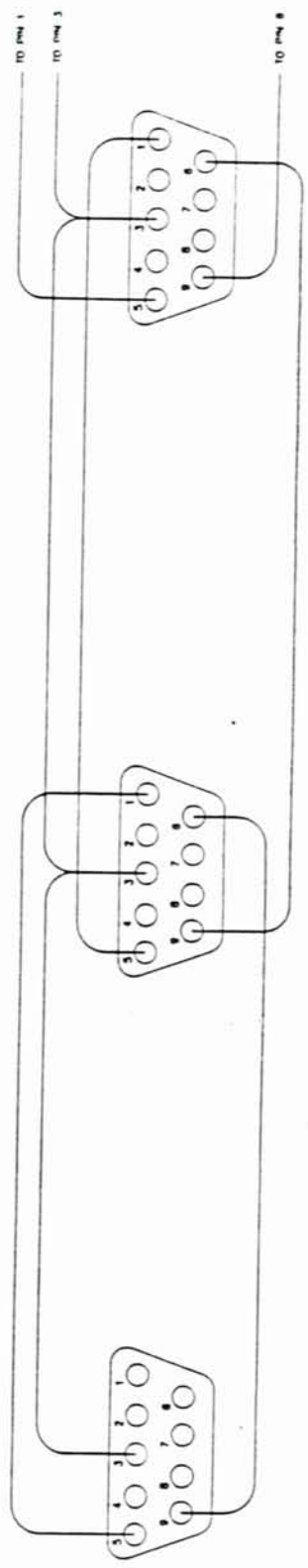
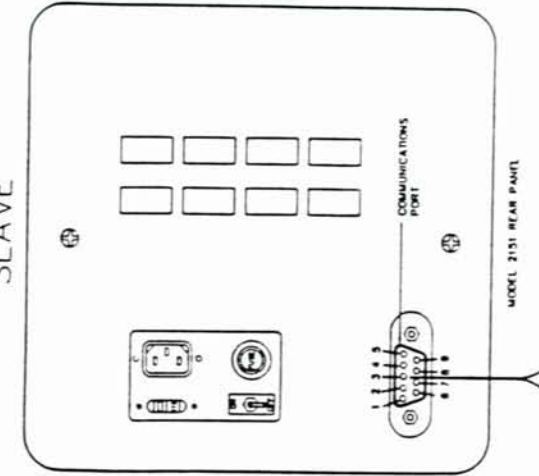
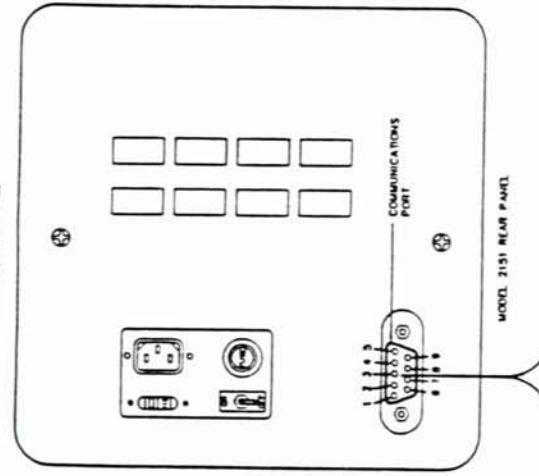
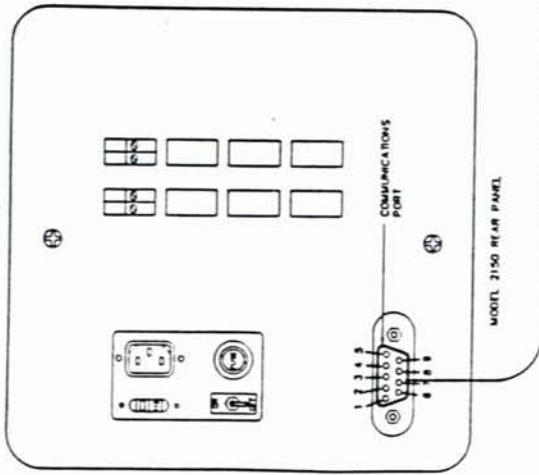
IMPORTANT! COMBINATIONS OF DUAL INPUT BOARDS AND ANALOG OUTPUT BOARDS MUST BE INSERTED INTO MASTER AND/OR SLAVE UNITS ACCORDING TO THE RULES OUTLINED IN STEP 3.2

REV	DATE	BY	CHKD	DESCRIPTION
1	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
2	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
3	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
4	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
5	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
6	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
7	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
8	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
9	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
10	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
11	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
12	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
13	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
14	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
15	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
16	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
17	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
18	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
19	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
20	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
21	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
22	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
23	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
24	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
25	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
26	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
27	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
28	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
29	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
30	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
31	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
32	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
33	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
34	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
35	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
36	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
37	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
38	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
39	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
40	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
41	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
42	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
43	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
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45	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
46	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
47	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
48	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
49	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493
50	12/27/83			REVISED TO REFLECT CHANGES TO M40492 AND M40493

MASTER

SLAVE

SLAVE



CABLE  
DETAIL

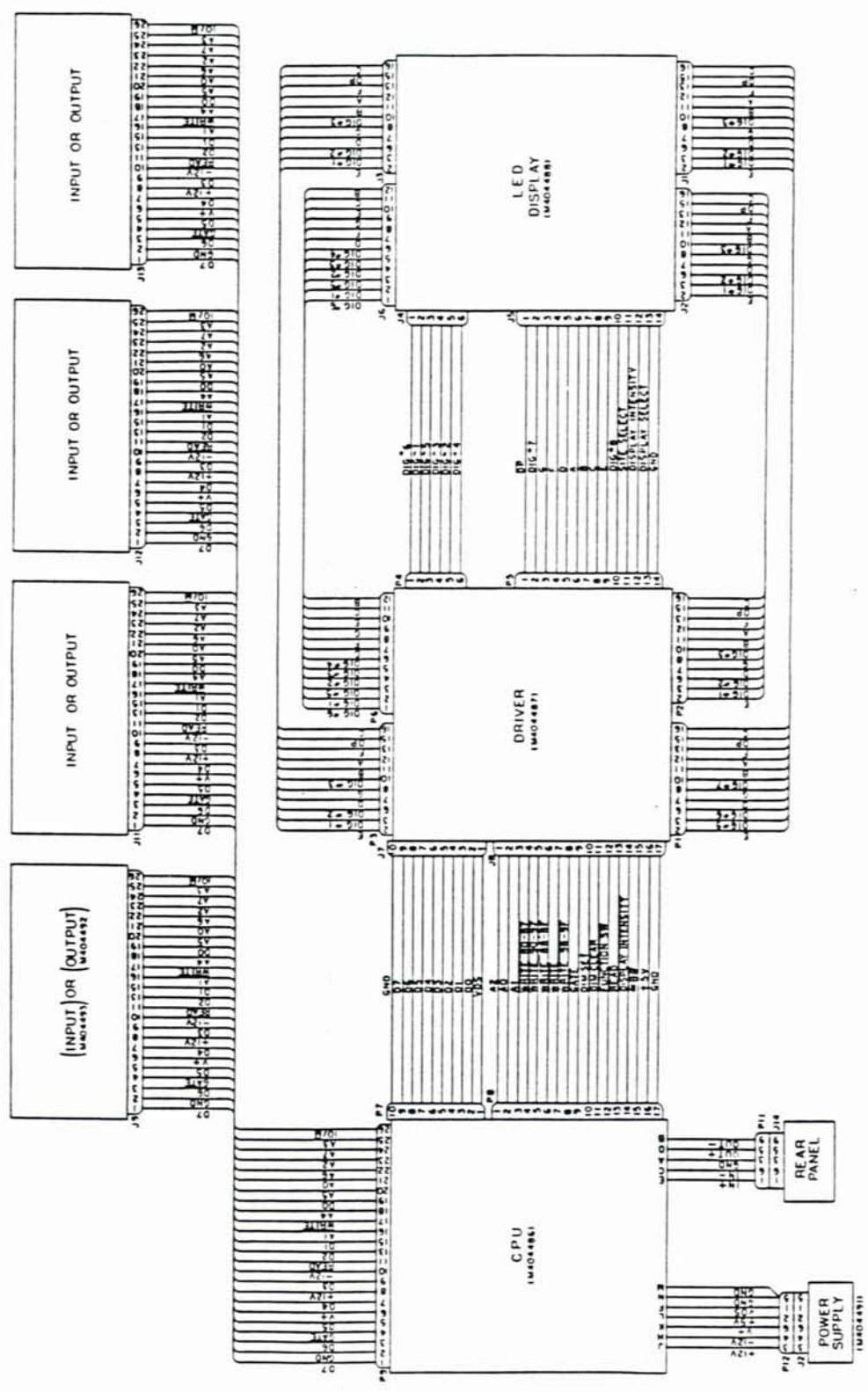
- PM 1 - IN+
- PM 3 - CHD
- PM 3 - OUT+
- PM 8 - IN-
- PM 8 - OUT-

REV	DATE	BY	TEST	DATE	BY	TEST	DATE	BY	TEST	DATE	BY
1	11-17-74										

MODEL 2151 REAR PANEL  
 MODEL 2150 REAR PANEL  
 MODEL 2151 REAR PANEL  
 MODEL 2150 REAR PANEL

PM MASTER/SLAVE INTERCONNECTION DIAGRAM  
 PM 1  
 PM 3  
 PM 8

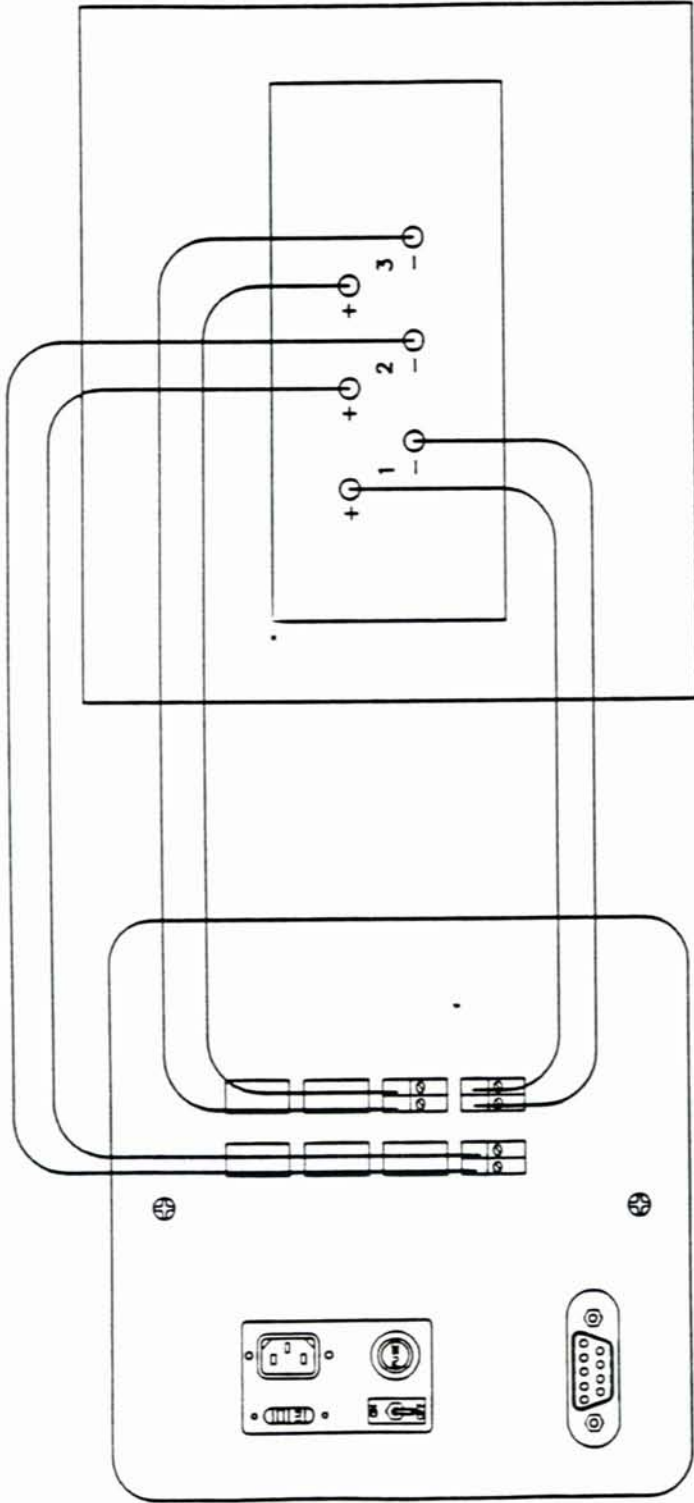
2151-025



REV	DATE	BY	TEST	APP
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2	1/1/78	J.L.		

THE ELEMENTS AND/OR THE OTHER DATA  
 CONTAINED HEREIN ARE THE PROPERTY OF  
 THE UNITED STATES GOVERNMENT AND ARE  
 SUBJECT TO COMPARATIVE EVALUATION  
 WITHOUT INCURRING ANY COST TO THE  
 GOVERNMENT.

QUALITY ASSURANCE  
 MANUFACTURING BLOCK DIAGRAM  
 10



3 PEN RECORDER  
MODEL 8734  
REAR PANEL

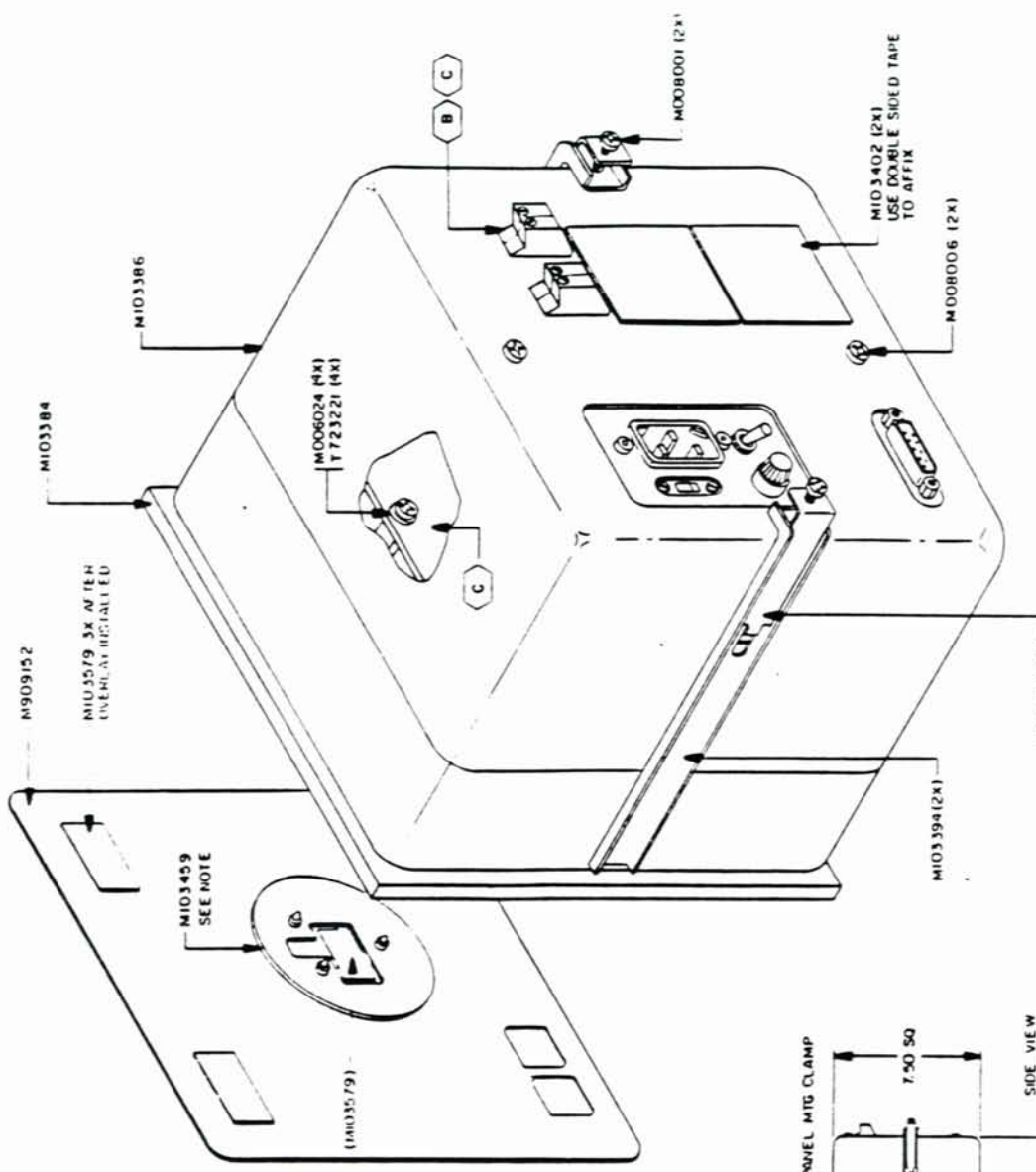
INDICATOR  
MODEL 2150  
OR  
MODEL 2151  
REAR PANEL  
WITH ANALOG OUTPUT  
CARDS (M404492) INSTALLED

- PEN 1 - AVERAGED WIND SPEED
- PEN 2 - AVERAGED WIND DIRECTION
- PEN 3 - INSTANTANEOUS WIND SPEED

REV	EDN	DATED	QTY	NEXT ASST	TOLERANCES UNLESS OTHERWISE NOTED DIMENSIONS IN INCHES ANGLES IN DEGREES FINISH	WEATHER MEASUREMENTS WEATHER ELECTRONICS A Division of GALLI ELECTRIC, Inc.	C
A		1-2-87					TITLE TYPICAL VIEW MASTER/SLAVE INDICATOR USED WITH STRIP CHART RECORDER
B		1-9-87					
					ENG'G	BY K. WEBER	SCALE
					APPROVE	DATE 1/2/87	NONE
					DT 11/5/87	DWG. NO.	SHEET 1 OF 1
					DT	2150-026	

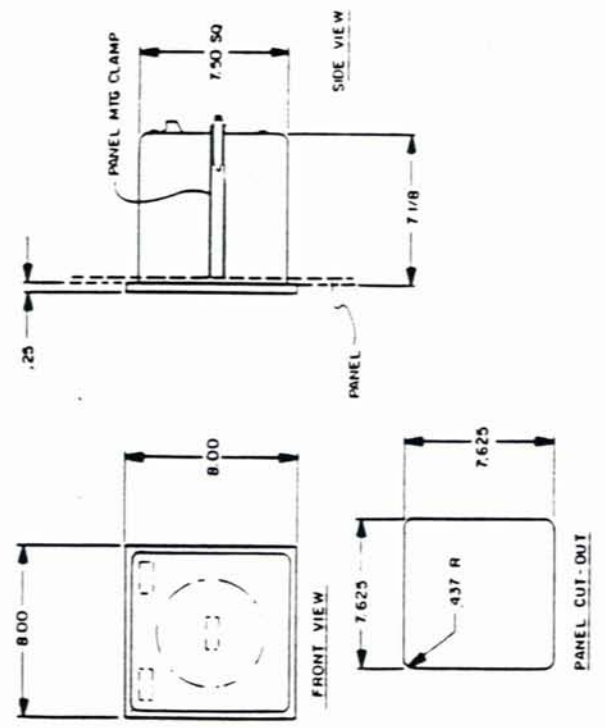
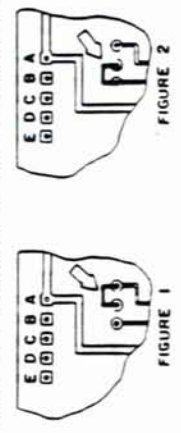
NOTE:

LOCATE BACK-UP PLATE ON DISPLAY BOARD BEFORE AFFIXING OVERLAY TO BEZEL



MODEL NO.	JUMP M-10486	(B) INPUT BO	QTY	(C) PLATE ASM	QTY
2150	FIGURE 1	M40493	1	MIO3403	1
2151	FIGURE 2	D	0	MIO3404	1

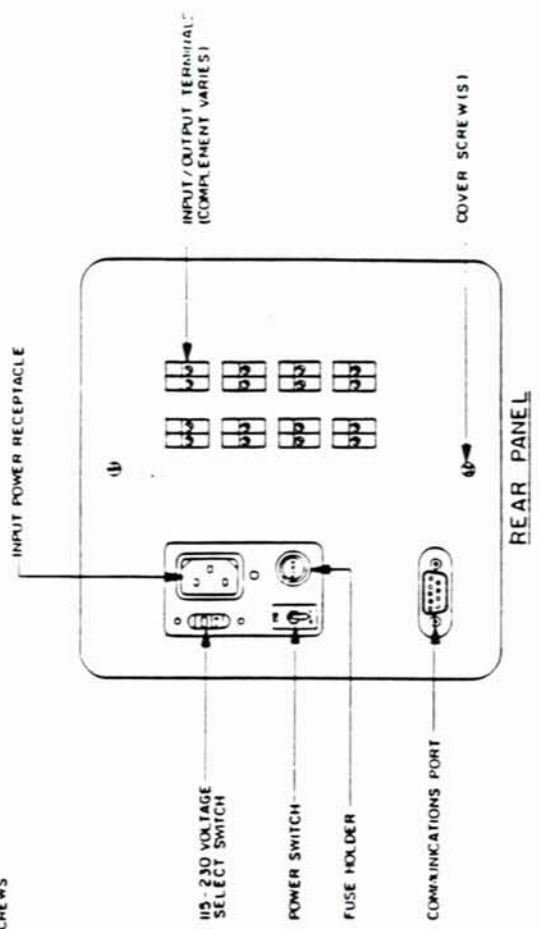
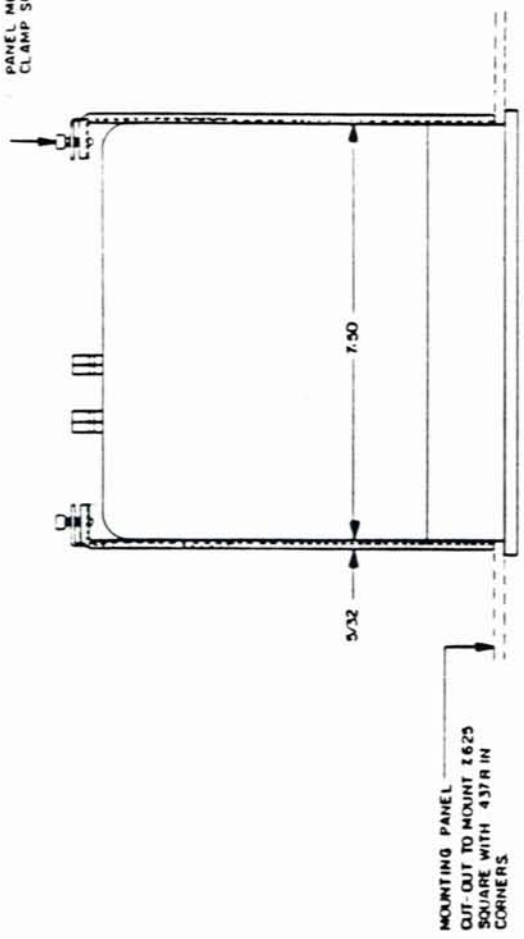
ADDITIONAL INPUT AND/OR OUTPUT BOARDS ARE OPTIONAL



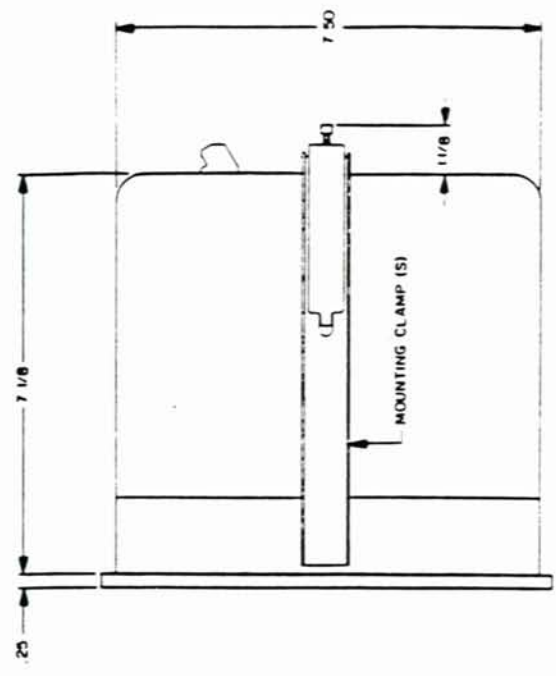
REV	ECN	DATED	QTY	NEXT ASM	TOLERANCES UNLESS OTHERWISE NOTED
A	2395	7/29/85	END ITEM		XXX-.004 XXX-.010 FRACTIONS: 1/32
B	2606	9-2-86			ANGLER : N° CONCENTRICITY: .003 TIR

NOMENCLATURE		MODEL 2150/2151 WIND REPORTER	
MOD	USAGE	BY	DATE
		BY GARHEART	SEPT 85
FINISH AS ISSUED		DT	DT
ENGR		DT 11-1-86	DT 3 SEPT 85
APPRO			
MATERIAL		SEE BILL OF MATERIALS	
DRAWING		DWG NO 2150-003	
SHEET		SHEET 1 OF	
REV		REV	
NONE		NONE	

PANEL MOUNTING CLAMP SCREWS



ALSO INCLUDED BUT NOT ILLUSTRATED - 6 FOOT POWER CORD



TOLERANCES UNLESS OTHERWISE NOTED  
 DIMENSIONS IN PARENTHESES ARE FRACTIONS - 1/32  
 ANGLES IN DEGREES - 30 MIN

REV	ECN	DATE	BY	CHKD	ITEM	MATERIAL	FINISH	APPROV	SCALE	DWG NO	SHEET 1 OF
A	2395	7-29-85								2150-005	2150-005
B	2600	9-2-86								2150-005	2150-005

APPROV: [Signature] DT 3 EC

BY: [Signature] DT 3 EC

SCALE: 3/8 X

DATE: 0113 SEPT 85

FINISH: ANODIZE, PAINT AND IRIDITE

BY: GEARHEART

SCALE: 3/8 X

DWG NO: 2150-005

SHEET 1 OF 1

MONUMENTAL  
 HEATING & AIR CONDITIONING  
 1000 W. 11th St., N. M.

MODELS 2150 B 2151 WIRD REPAIR-TE

MOD USABE 2150, 2151

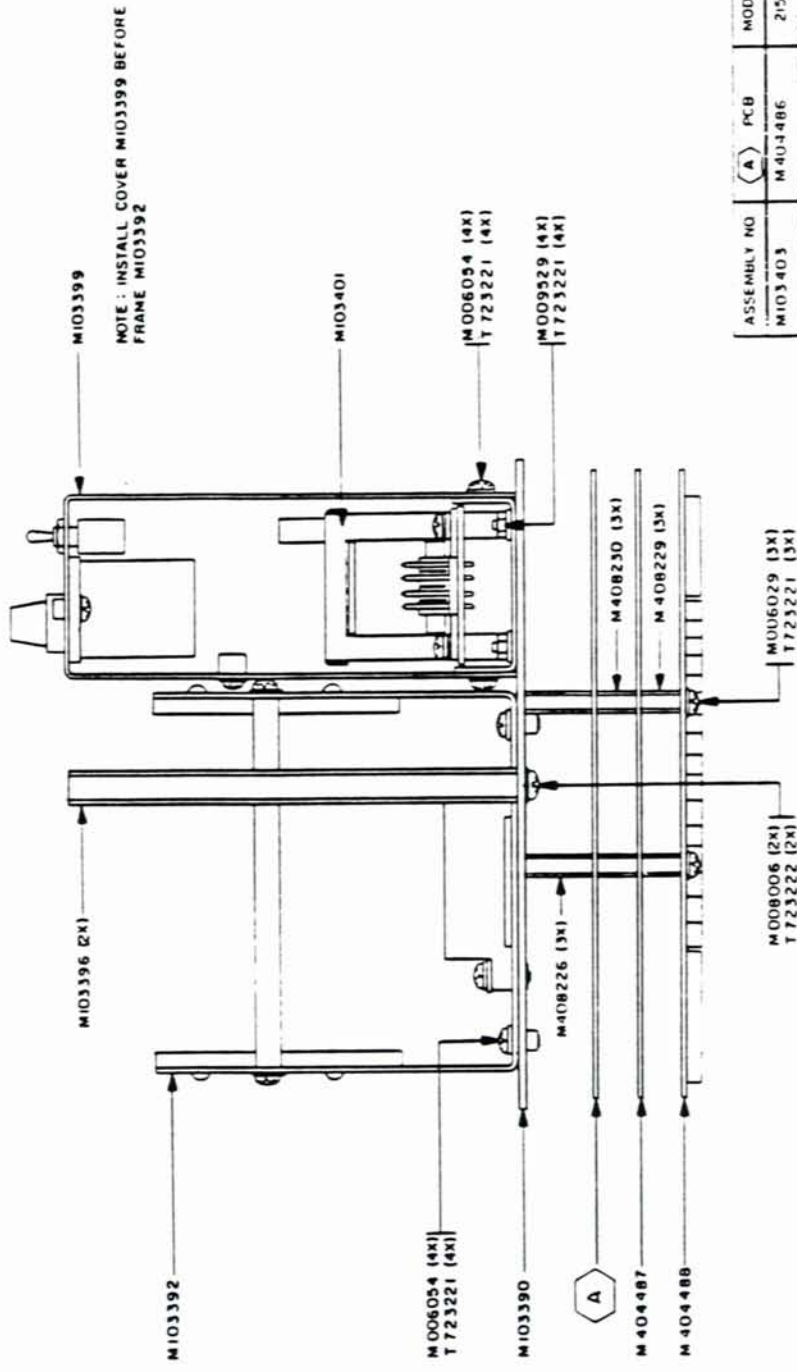
BY GEARHEART

SCALE 3/8 X

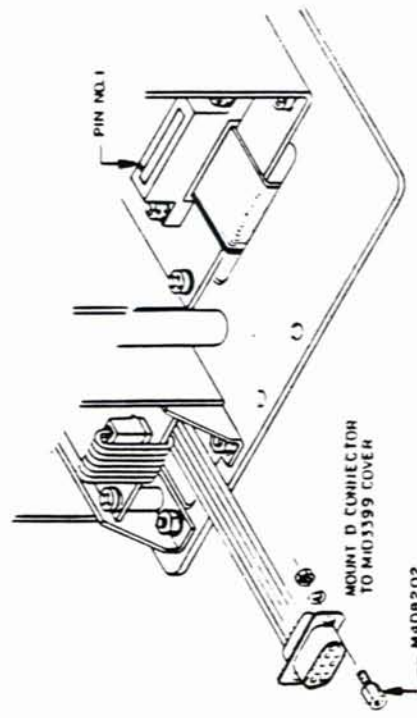
DWG NO 2150-005







ASSEMBLY NO	PCB	MODEL
M103403	M404486	2150
M103404	M404531	2151



REV	ECN	DATE	BY	EXT	ASM	QTY	DESCRIPTION
A	2395	29 AUG 85			2150	1	TOLERANCES UNLESS OTHERWISE NOTED HOLE: ± .004 IN. ± .010 FRACTIONS - .02 HOLE: ± .005 IN. CONCERNING: .003 IN
B	2467	30 JUN 86			2151	1	MATL SEE BILL OF MATERIAL

FINISH	AS ISSUED	BY	DATE
			07/23/73

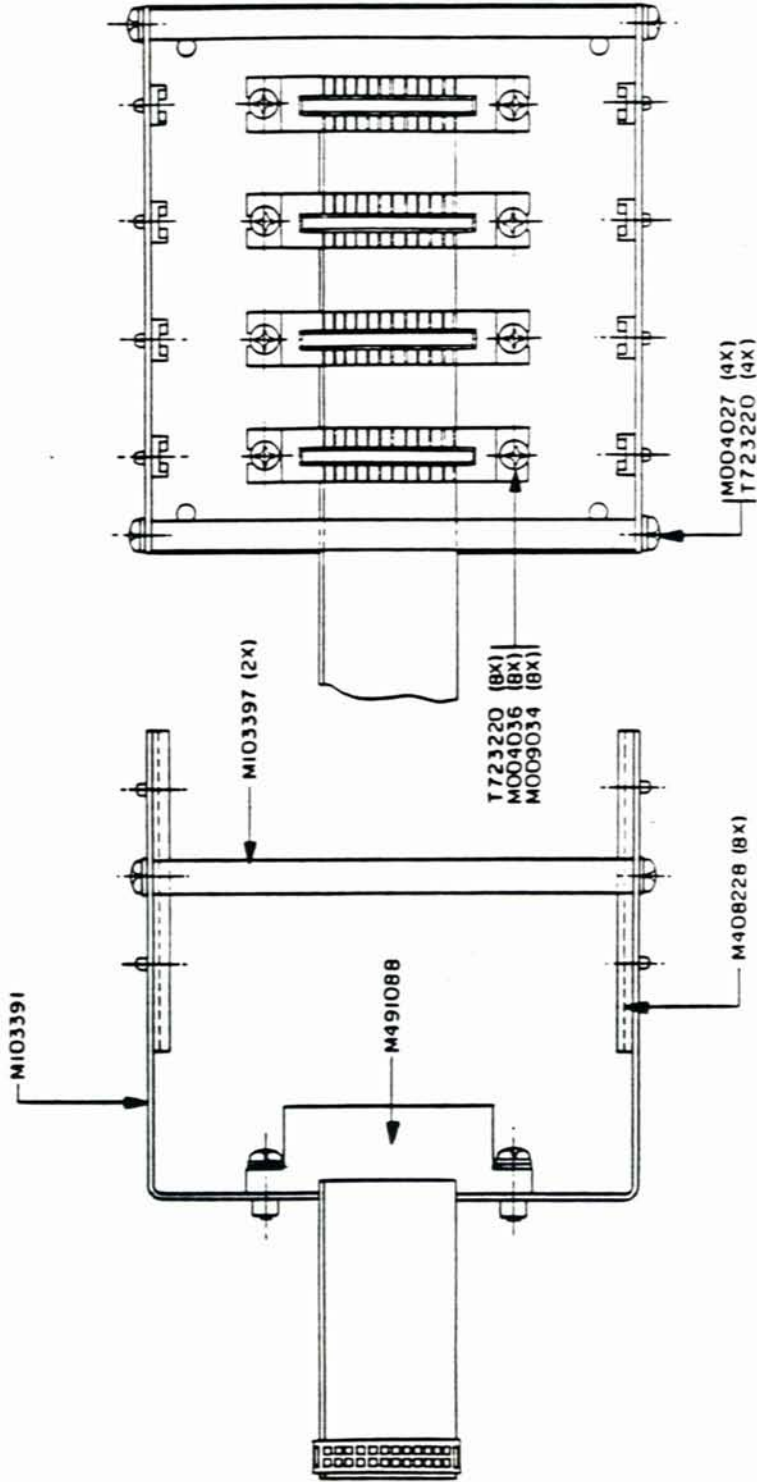
  

MOD	USAGE	SCALE	DWG NO
	2150, 2151	1X	M103403-003

BY	DATE	SHEET	OF
	01 AUG 85	1	1

PLATE ASSEMBLY



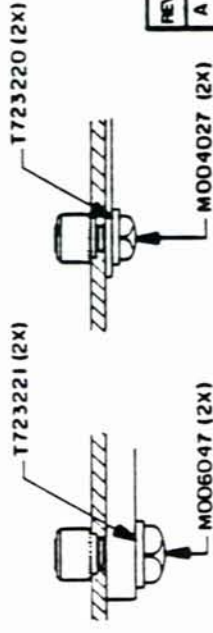
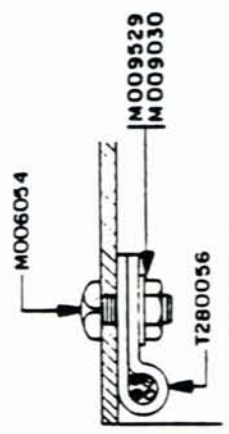
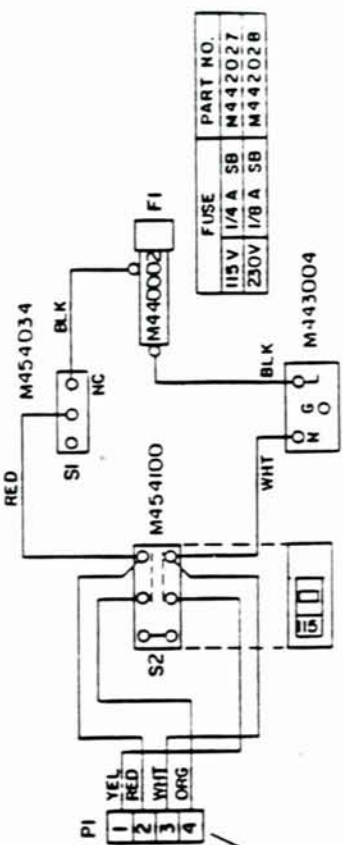
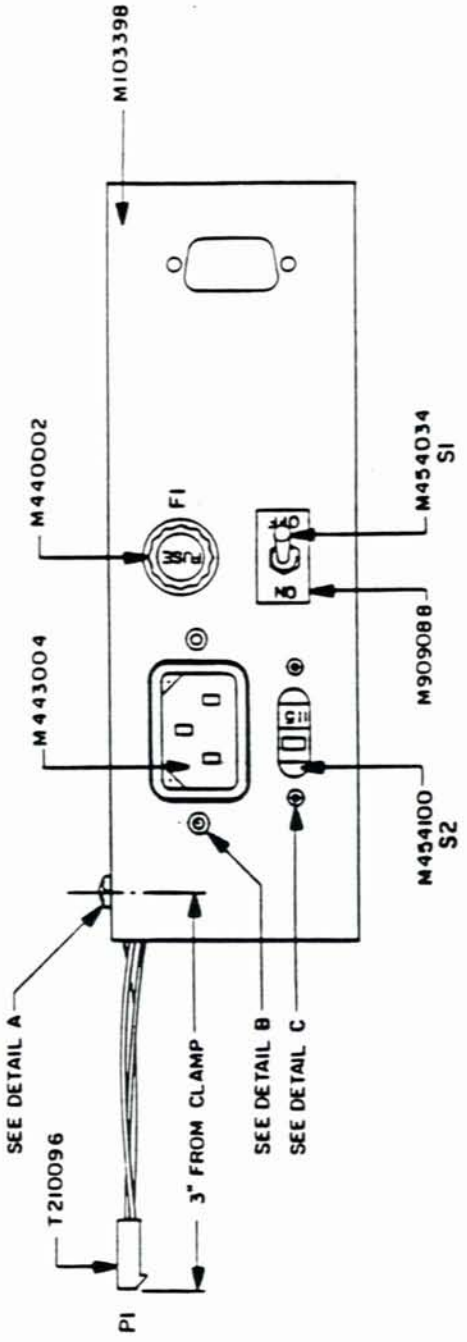
REV	ECN	DATED	QTY	NEXT	ASM
A	2395	7-29-85	1	M1033403	

TOLERANCES UNLESS OTHERWISE NOTED: XXX - ± .008 XX - ± .010 FRACTIONS - ± .02 ANGLES : N° CONCENTRICITY - .003 TIR		Weather Measure WEATHER TROUSERS Division of UTILITIES & L.	
MATERIAL: SEE BILL OF MATERIAL		NOMENCLATURE: CARD FRAME ASSEMBLY	
FINISH: AS ISSUED		MOD USAGE 2150, 2151	
ENGR	DT	BY GEARHEART	SCALE DWG NO
APPRO	DT	IX	M'
	DT 2 2 85	DT 31 JUL 85	192-003
			SHEET 1 OF 1

HOOK-UP WIRE AWG 20

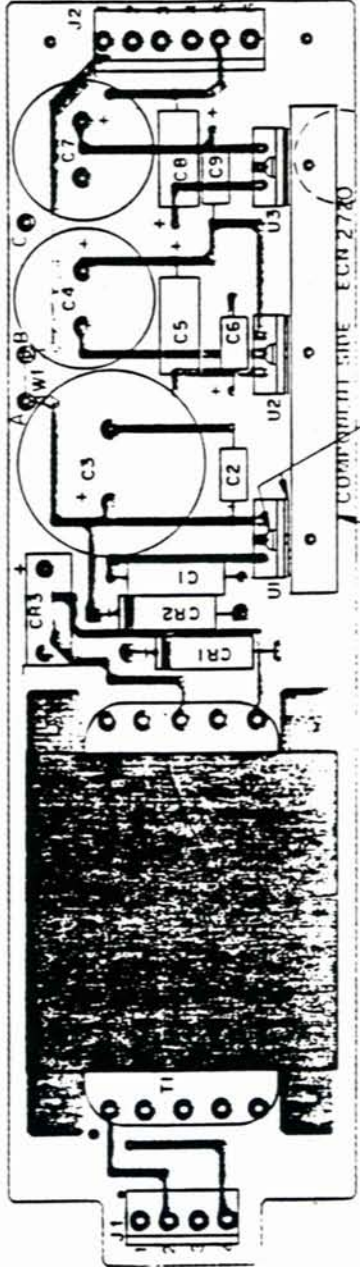
COLOR	NUMBER
BLK	T605011
RED	T605013
ORG	T605014
YEL	T605015
WHT	T605020

POWER CORD M492186  
ALSO FURNISHED



REV	ECN	DATED	QTY	NEXT ASM	TOLERANCES UNLESS OTHERWISE NOTED: XXX - 2.008 XX - 1.010 FRACTIONS - 2.02 ANGLES - N° CONCENTRICITY - .003 TIN
A	2396	29 JUL 85	1	M1033403	

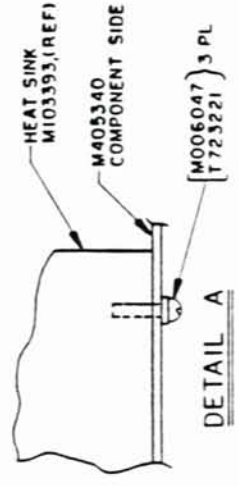
 WEATHER-MEASURE Division of WEATHERLINK S. L.		NOMENCLATURE COVER ASM, PWR SUPPLY
TOLERANCES UNLESS OTHERWISE NOTED: XXX - 2.008 XX - 1.010 FRACTIONS - 2.02 ANGLES - N° CONCENTRICITY - .003 TIN		
MATL SEE BILL OF MATERIAL FINISH AS ISSUED		MOD USAGE 2150, 2151 BY GEARHEART SCALE DWG NO DT 26 JUL 1985 1X M103399-003
ENGR APPRO		



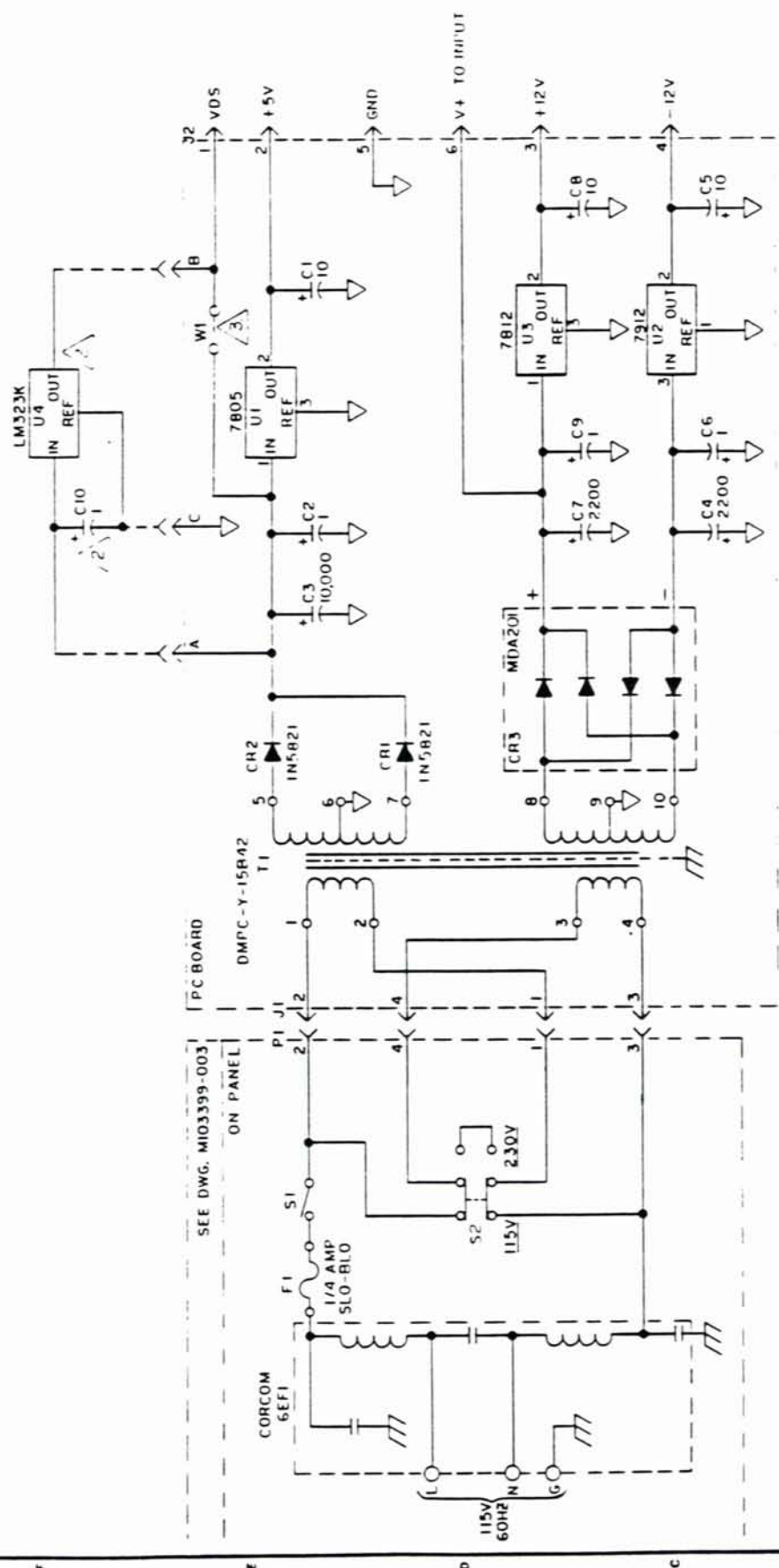
HEAT SINK  
M103393 (REF)

M408195  
M004008  
M408196 } 3 PL

HEAT SINK  
M103393



REFERENCE DOCUMENTS	REV	ECN	DATE	QTY	NEXT ASM	TOLERANCES UNLESS OTHERWISE NOTED DIM. : 0.05 MM - 0.10 FRACTIONS - .01 ANGLES : N° CONCENTRICITY: .003 TIR	WEATHERS WEATHERS
A/W M199259	A	2383	7-11-85				Nomenclature <b>PCB ASSEMBLY                      POWER SUPPLY</b>
FAB M405340	B	2422	10-2-85				
SCH M404491-004	C	2443	11-12-85				
	D	2644	1-5-87				
	E	2721	5-1-87				
	F	2800	1-2-88				
MOD USA 2150 2151 SHEET 1 OF 1 SCALE 2:1 DRG NO M40455C-003 DT 1-23-87 DT 1-23-87 ENGR V. Suba... APPROV							SHEET 1 OF 1 M40455C-003



- NOTES: UNLESS OTHERWISE SPECIFIED;  
 1 ALL CAPACITOR VALUES ARE IN MICROFARADS.  
 2 M404491 INSTALL M103156, C10, U4.  
 3 M404491-56 INSTALL W1, J1, J2, J3 ONLY.

REFERENCE DOCUMENTS		REV	ECN	DATE	QTY	NEXT	ASM
A/W	M139259	7	2183	7/11/85			
FAB	M405340	8	2222	10/2/85			
ASM	M404491-003	0	2175	11/1/85			
		1	2171	7/1/87			

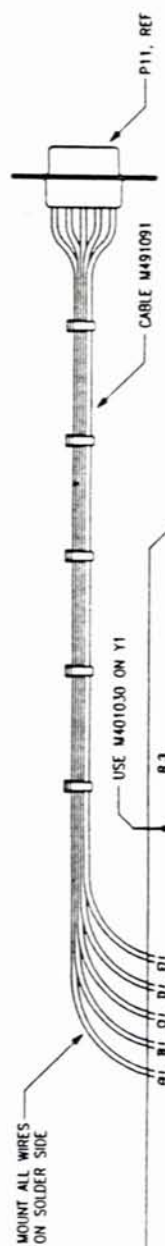
TOLERANCES UNLESS OTHERWISE NOTED	
XXX.XXX	XXX.XX - .010 FRACTIONS - .02
ANGLES	° M° CONCENTRICITY - .003 TIR
MATERIAL FINISH	
ENDOR	DI
APPRO	DI

NOMENCLATURE	
SCHEMATIC POWER SUPPLY	

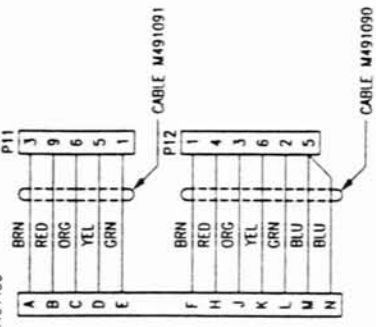
  

MOD	USAGE	REV	NO	SHEET	OF
M404491-003	2150-2151	1	1	1	1

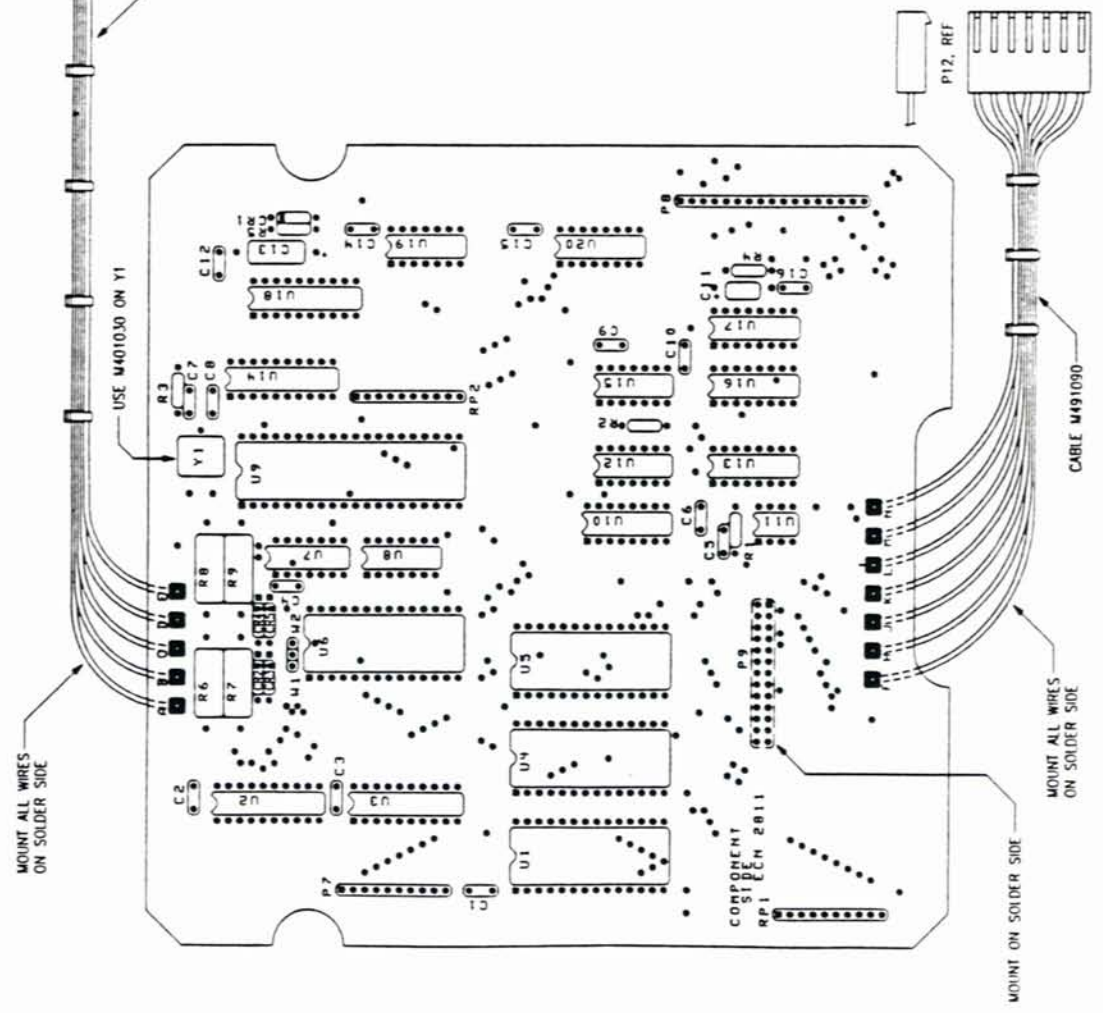


WIRING DIAGRAM

PCB ASSY  
M40486



MASTER OR SLAVE	
2150	M40486 W1 IN
2151	M404531 W2 IN



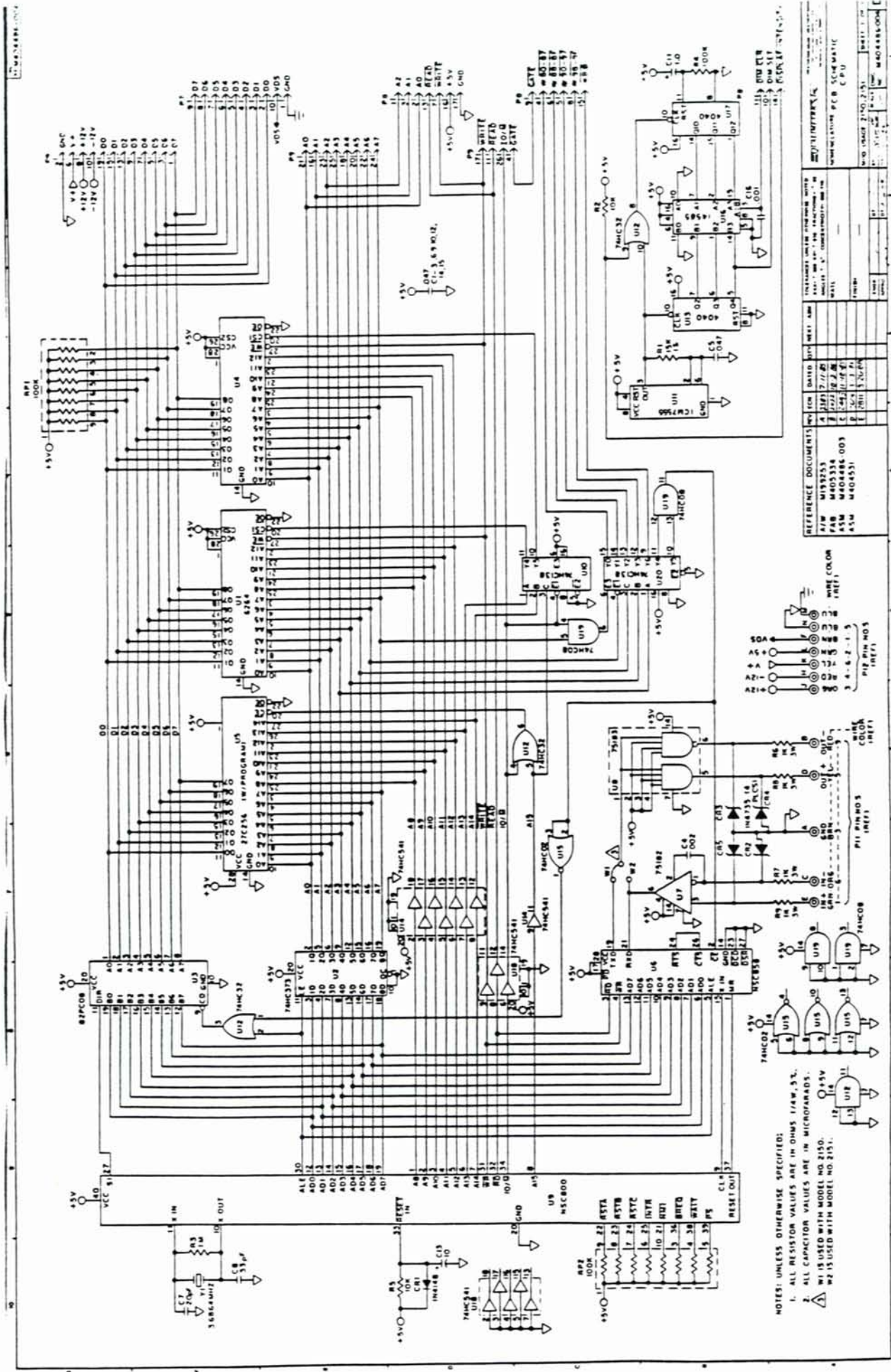
REV	DATE	BY	CHKD	APP'D
A	1212 10-2-82			
B	1213 11-12-82			
C	1208 8-3-86			
D	1211 3-18-86			

ATTACHED DOCUMENTS	DATE
A79 M19253-011	
F48 M40534	
SCM M40486-004	
ASST M40431	

MANUFACTURER	PCB ASSY
PCB ASSY	CPU
DATE	1213
BY	7
CHKD	7
APP'D	7



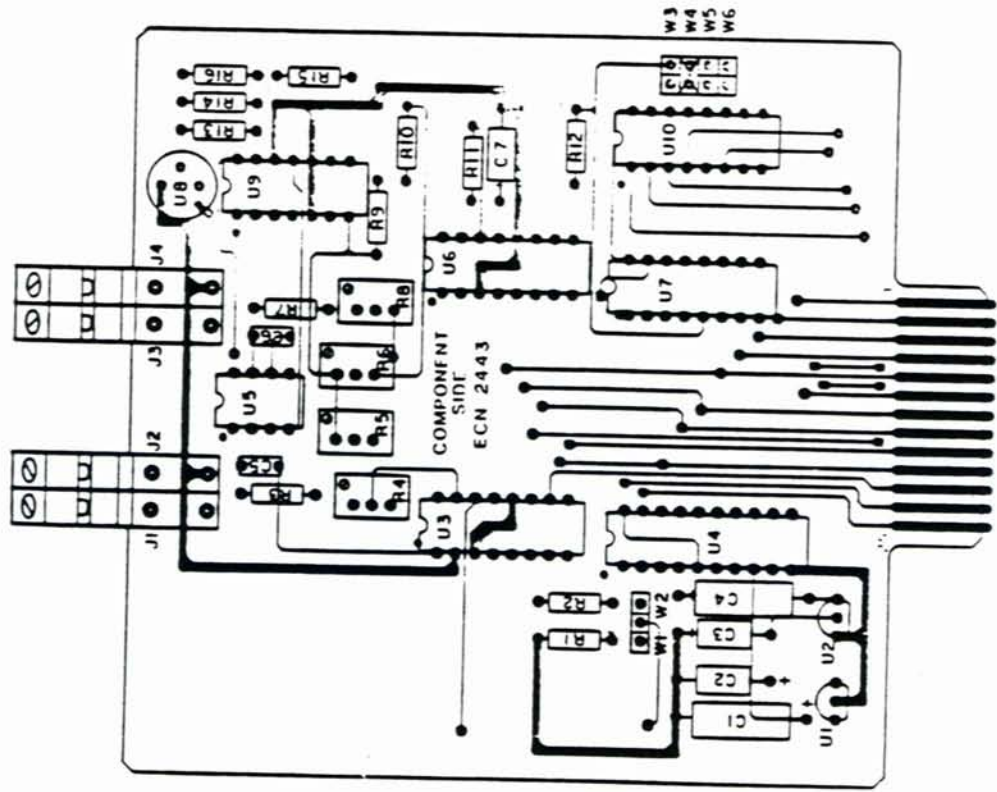
- NOTES: UNLESS OTHERWISE SPECIFIED:
1. ALL RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE SPECIFIED.
  2. ALL CAPACITOR VALUES ARE IN MICROFARADS.
  3. W1 IS USED WITH MODEL NO. 2150.
  4. W2 IS USED WITH MODEL NO. 2151.

NO	DESCRIPTION	REV
1	INITIAL RELEASE	1.0
2	ADDITIONAL CHANGES	1.1
3	REVISIONS	1.2
4	REVISIONS	1.3
5	REVISIONS	1.4
6	REVISIONS	1.5
7	REVISIONS	1.6
8	REVISIONS	1.7
9	REVISIONS	1.8
10	REVISIONS	1.9
11	REVISIONS	2.0

NO	DESCRIPTION
1	INITIAL RELEASE
2	ADDITIONAL CHANGES
3	REVISIONS
4	REVISIONS
5	REVISIONS
6	REVISIONS
7	REVISIONS
8	REVISIONS
9	REVISIONS
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50	REVISIONS

NO	DESCRIPTION
1	INITIAL RELEASE
2	ADDITIONAL CHANGES
3	REVISIONS
4	REVISIONS
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49	REVISIONS
50	REVISIONS

DATE: 1/15/74  
 DRAWN: J. J. [unclear]  
 CHECKED: [unclear]  
 APPROVED: [unclear]  
 TITLE: INITIAL RELEASE



REFERENCE DOCUMENT  
A/W M199260  
FAB M405341  
SCH M404492-003

REV	ECN	DATED	BY	CHKD	APPD	DT	INT. PROJ.	TOLERANCES UNLESS OTHERWISE NOTED DIM. - 0.05 MM - 0.10 FRACTIONS - 0.01 ANGLES - 0° - CONCENTRICITY - 0.03 TIR MATERIAL	FINISH	MOD. USAGE	SCALE	SHEET	OF
A	1152	7/1/85								2150,2151	1:1	1	1
B	1483	7/22/85									1:1	1	1

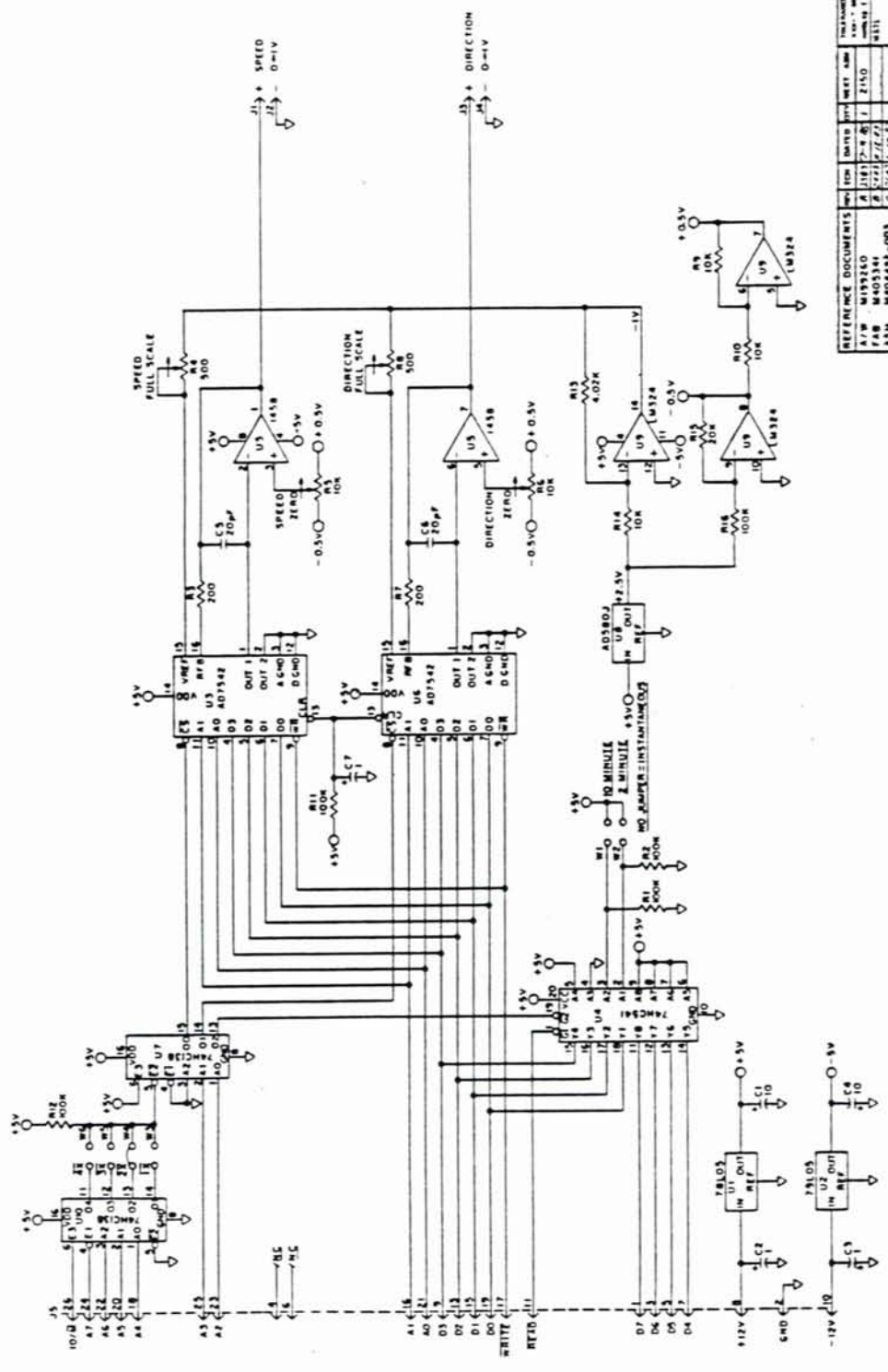
MONUMENTAL  
WEATHERING

NOMENCLATURE  
PCB ASSEMBLY  
DUAL DAC, OUTPUT

BY: J. S. [Signature] DATE: 7/22/85  
018-39-41 2:1 W. 1492-003



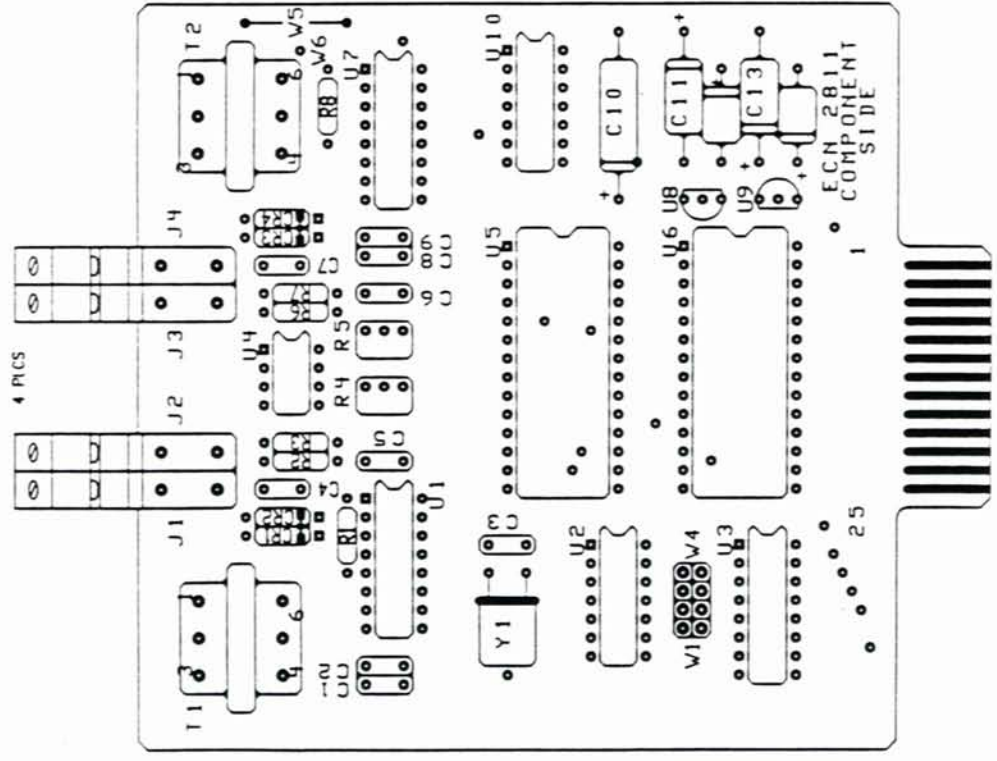
NOTES: UNLESS OTHERWISE SPECIFIED:  
 1. ALL RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE SPECIFIED.  
 2. ALL CAPACITOR VALUES ARE IN MICROFARADS.



REV	DATE	BY	CHKD	APP'D	DESCRIPTION
1	11/17/78	WJ	WJ		INITIAL DESIGN
2	11/22/78	WJ	WJ		REVISED FOR MANUFACTURE
3	12/11/78	WJ	WJ		REVISED FOR MANUFACTURE
4	12/11/78	WJ	WJ		REVISED FOR MANUFACTURE

APPROVED FOR MANUFACTURE: \_\_\_\_\_  
 DATE: \_\_\_\_\_  
 MANUFACTURING PCB SCHEMATIC  
 DUAL DDC CARD

M417073  
4 PICS



REV	ECN	DATED	QTY	NEXT ASSY
A	2383	7-11-85		
B	2443	11-12-85		
C	2811	3-26-88		

REFERENCE DOCUMENTS	REVISIONS	DATE	BY	CHKD	APPROVED
A/W M199261-011					
FAB M405342					
SCH M404493-004					

TELEPHONE UNITS OVERSHE NOTED	SCALE	DATE
200-1 000 35-4 000 100000-1 00	2:1	5 AUG 88

MOD. USAGE	BY	DATE
2150, 2151	D. Teifer	5 AUG 88

REVISIONS	DATE	BY	CHKD	APPROVED
011-2-85				
011-2-85				

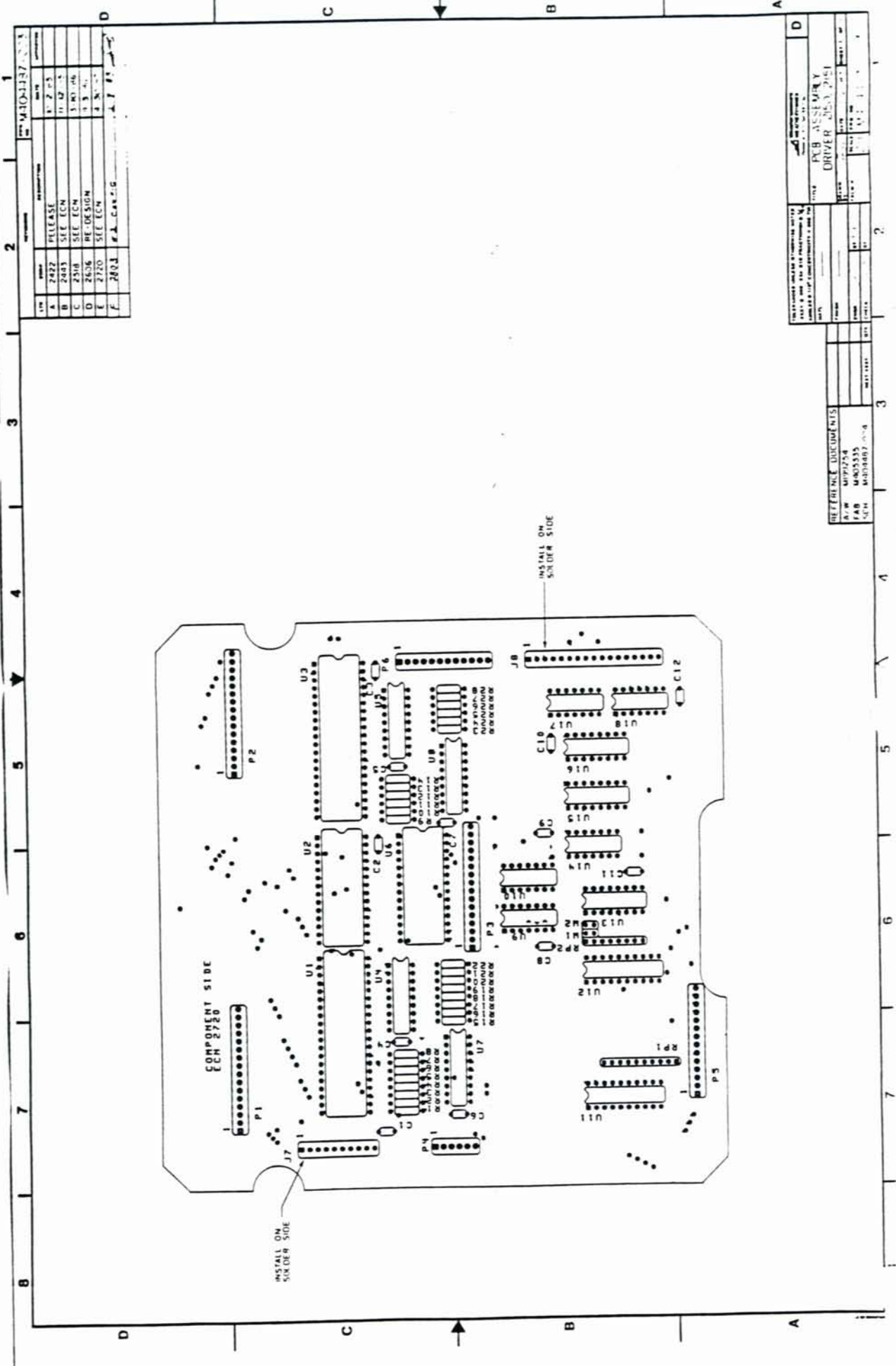
TECHNICAL SERVICES  
OF EASTMAN KODAK COMPANY  
Production of Galleries Inc.

PCB ASSEMBLY  
DUAL CHANNEL, INPUT

MOD. USAGE 2150, 2151  
BY D. Teifer  
DATE 5 AUG 88

SCALE 2:1  
SHEET 1 OF 1  
M404493-003

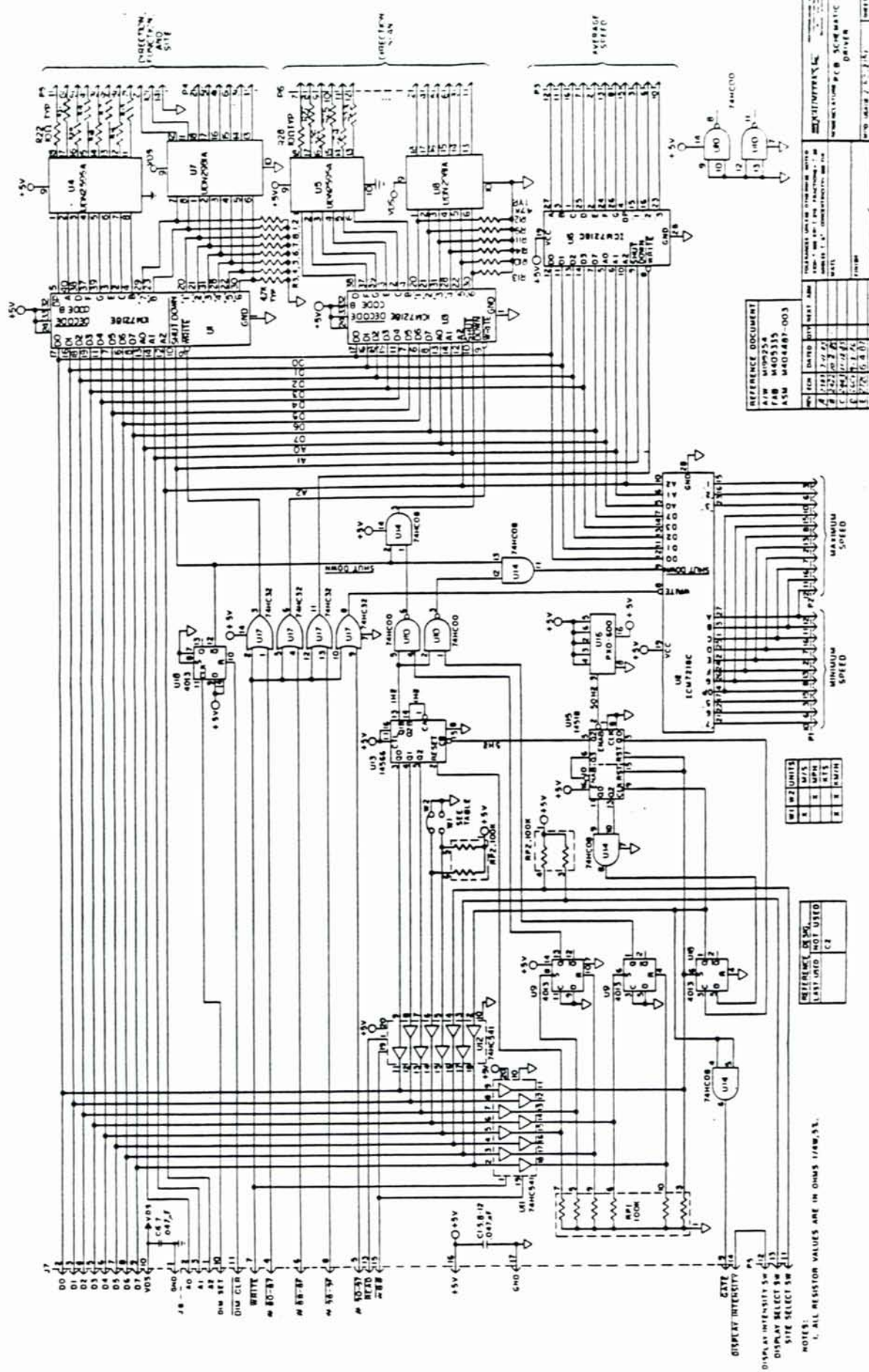




REV	DATE	DESCRIPTION	BY	CHKD
1	11/27/83	RELEASE	...	...
2	11/27/83	SEE ECN	...	...
3	11/27/83	SEE ECN	...	...
4	11/27/83	PRE-DESIGN	...	...
5	11/27/83	SEE ECN	...	...
6	11/27/83	...	...	...
7	11/27/83	...	...	...
8	11/27/83	...	...	...

REV	DATE	DESCRIPTION	BY	CHKD
1	11/27/83	RELEASE	...	...
2	11/27/83	SEE ECN	...	...
3	11/27/83	SEE ECN	...	...
4	11/27/83	PRE-DESIGN	...	...
5	11/27/83	SEE ECN	...	...
6	11/27/83	...	...	...
7	11/27/83	...	...	...
8	11/27/83	...	...	...

REV	DATE	DESCRIPTION	BY	CHKD
1	11/27/83	RELEASE	...	...
2	11/27/83	SEE ECN	...	...
3	11/27/83	SEE ECN	...	...
4	11/27/83	PRE-DESIGN	...	...
5	11/27/83	SEE ECN	...	...
6	11/27/83	...	...	...
7	11/27/83	...	...	...
8	11/27/83	...	...	...



REFERENCE DOCUMENT

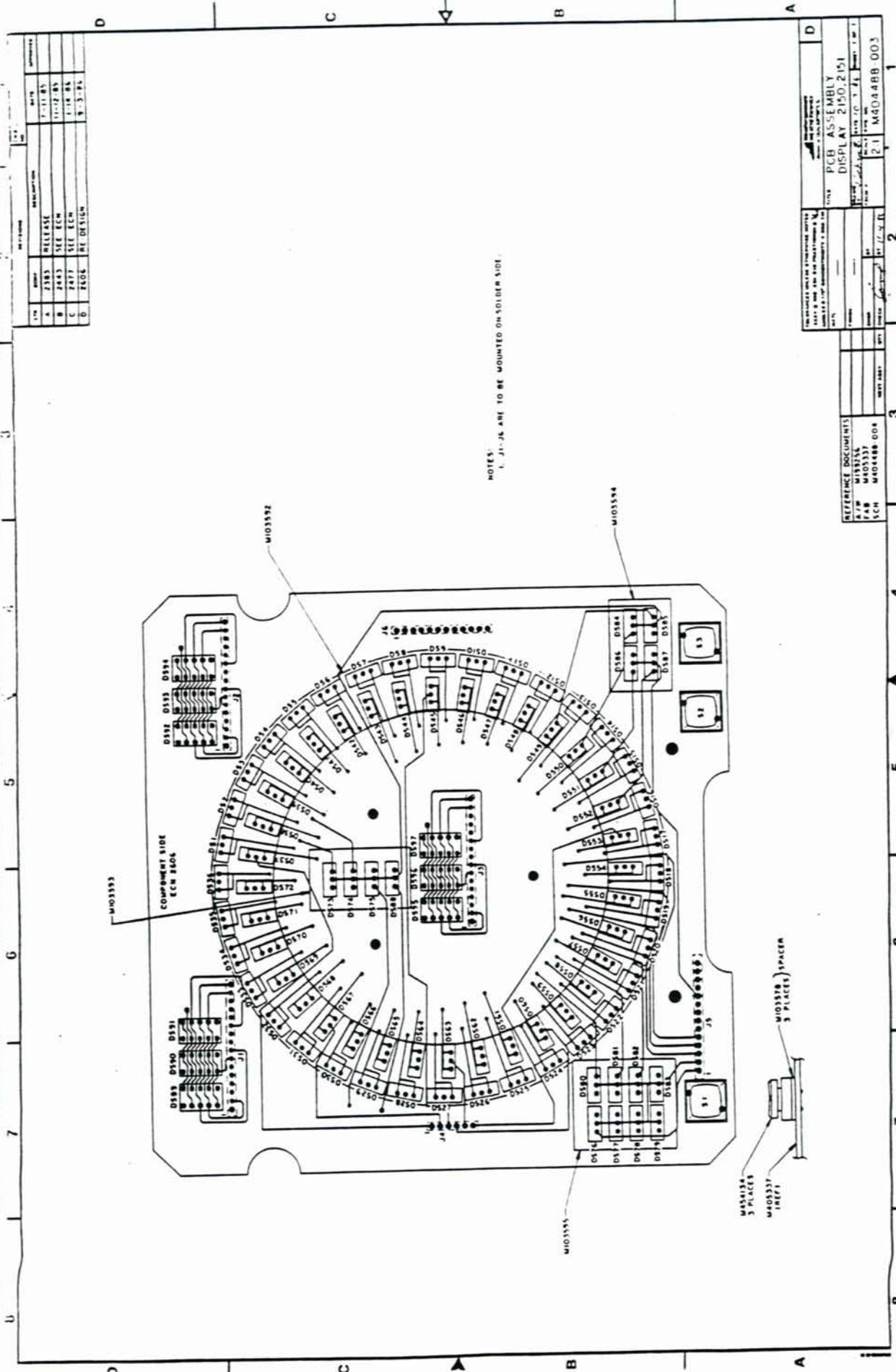
DATE	07/75
REV	1
FILE	MAC0315
ASM	MAC4487-003

DATE PREPARED: 7/75  
DRAWN BY: J.C. CROWE  
CHECKED BY: J.C. CROWE  
APPROVED BY: J.C. CROWE

W	X	M	A	R
1	1	1	1	1
1	1	1	1	1
1	1	1	1	1
1	1	1	1	1

RESISTOR	ON	OFF
LAST	USED	
C1		
C2		

NOTES:  
1. ALL RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE SPECIFIED.



REV	DESCRIPTION	DATE	BY
A	RELEASE	7-11-85	
B	SEE ECM	11-12-85	
C	SEE ECM	1-18-86	
D	RE DESIGN	8-3-86	

NOTES:  
1. J1-J6 ARE TO BE MOUNTED ON SOLDER SIDE.

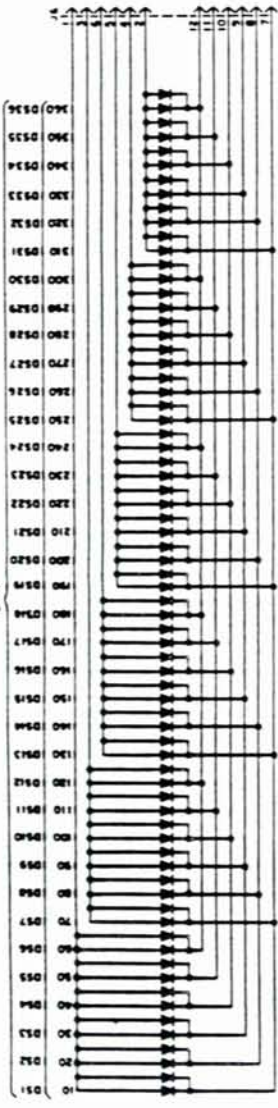
PCB ASSEMBLY	
DISPLAY 2150.2151	
REV	DATE
2	11-18-85
1	7-11-85
1	1-18-86
1	8-3-86

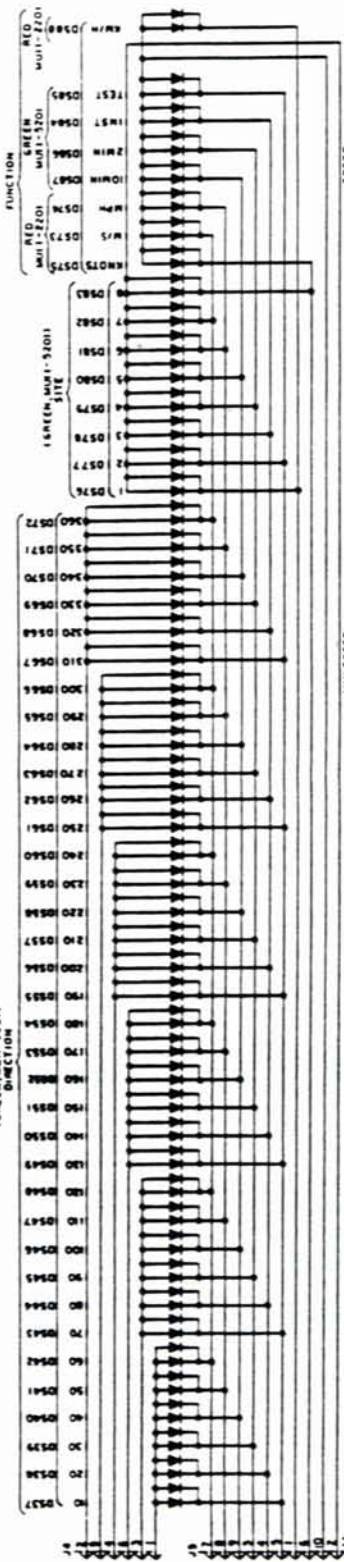
REFERENCE DOCUMENTS:	
A/W	M158234
FAB	M403337
SCM	M40488-004



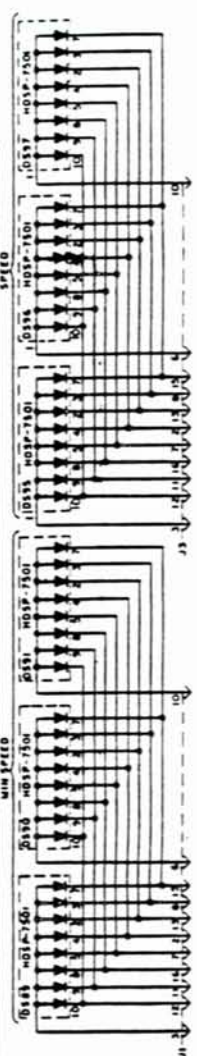
YELLOW MULTI-LED01  
DISPLAY  
MAIN



GREEN MULTI-LED01  
FUNCTION



33 DISPLAY/SELECT  
34 DISPLAY/SELECT  
35 DISPLAY/SELECT



REFERENCE DOCUMENTS

DATE	BY	REV	DESCRIPTION
1/19/88	...	1	...
...	...	...	...

DATE: 1/19/88

BY: ...

REV: 1

DESCRIPTION: ...

PROJECT: ...

DESIGNER: ...

CHECKER: ...

APPROVER: ...

DATE: 1/19/88

BY: ...

REV: 1

DESCRIPTION: ...

PROJECT: ...

DESIGNER: ...

CHECKER: ...

APPROVER: ...

REFERENCE DOCUMENTS

DATE	BY	REV	DESCRIPTION
1/19/88	...	1	...
...	...	...	...

DATE: 1/19/88

BY: ...

REV: 1

DESCRIPTION: ...

PROJECT: ...

DESIGNER: ...

CHECKER: ...

APPROVER: ...

DATE: 1/19/88

BY: ...

REV: 1

DESCRIPTION: ...

PROJECT: ...

DESIGNER: ...

CHECKER: ...

APPROVER: ...

QUALIMETRICS, INC.  
BILL OF MATERIALS LISTING

MASTER PART # 2150-  
DESCRIPTION WIND, REPORTER, MASTER

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
ECN- ENGR. CHANGE NOTICE	0	#2606
SPC- SPECIFICATION DWG	0	2150 003"C"OVER VIEW 005"C"FRT VIEW 009"D"BLCK DIAG 015"D"SYS BLOCK M103403-003"C" INTRNL VIEW
2150-074 ELECT ASSY, MASTER INDICATOR	1	
M006024- MS 6-32 X 1/2 PAN HD S. S. FILIP DR	3	
M008001- MS 8-32 X 3/4 BIN HD N/P BRAS FILIP	2	
M008006- MS 8-32 X 1/2 BIN HD S. S. FILIP	2	
M103384- BEZEL, 2150/1 DISPLAY	1	
M103386- ENCL. WIND DISPLAY 2150//2151	1	
M103394- CHANNEL CLAMP, INDICATOR RETAINER	2	
M103395- CLAMP, RETAINER DISPL	2	



MASTER PART # 2150-  
DESCRIPTION WIND, REPORTER, MASTER

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
M103402- COVER, UNUSED TERMINALS	2	
M103403- CHASSIS ASSY, W/ PWR SUP., CARD FRM, & PCB	1	
M103459- BACKING PLT ASSY, 2150 DISPLAY	1	
M103579- LENS, POLARIZING, CIRCULAR	3	
M404493- PCB ASSY, DUAL CHAN'L INPUT 2150/51	1	
M909152- OVERLAY DECAL (198624) FOR 2150/51 IND.	1	
T430043- SERIAL TAG 0.5X1.7 QUALIMETRICS	1	
T723221- WSHR. LK. INT TOOTH NO. 6 S.S.	3	

QUALIMETRICS, INC.  
BILL OF MATERIALS LISTING

MASTER PART # 2151-  
DESCRIPTION WIND REPORTER, SLAVE

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
ASM- ASSEMBLY DRAWING	0	2150-003 2150-005
ECN- ENGR. CHANGE NOTICE	0	#2606
SPC- SPECIFICATION DWG	0	2150 2150-009 2150-015 M103403-003
2151-074 ELECT ASSY, SLAVE INDICATOR	1	
M006024- MS 6-32 X 1/2 PAN HD S. S. FILIP DR	3	
M008001- MS 8-32 X 3/4 BIN HD N/P BRAS FILIP	2	
M008006- MS 8-32 X 1/2 BIN HD S. S. FILIP	2	
M103384- BEZEL, 2150/1 DISPLAY	1	
M103386- ENCL. WIND DISPLAY 2150//2151	1	
M103394- CHANNEL CLAMP, INDICATOR RETAINER	2	
M103395- CLAMP, RETAINER DISPL	2	

TIME 10:24:11

QUALIMETRICS, INC.  
BILL OF MATERIALS LISTING

11/26/86  
PAGE 2

MASTER PART # 2151-  
DESCRIPTION WIND REPORTER, SLAVE

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
M103402- COVER, UNUSED TERMINALS	2	
M103404- CHASSIS ASSY, W/PWR SUP & PCB'S 2151	1	
M103459- BACKING PLT ASSY, 2150 DISPLAY	1	
M103579- LENS, POLARIZING, CIRCULAR	3	
M909152- OVERLAY DECAL(198624) FOR 2150/51 IND.	1	
T430043- SERIAL TAG 0.5X1.7 QUALIMETRICS	1	
T723221- WSHR. LK. INT TOOTH NO. 6 S: S.	3	

QUALIMETRICS, INC.  
BILL OF MATERIAL SINGLE LEVEL REPORT

RD. TIME	COMPONENT	DESCRIPTION	QTY EACH	UOM
M103403				
	ASSY ASSY, W/ PWR SUP., CARD	NORMAL ORDER QTY: 10		
	ECN	ENGR CHANGE NUMBER	.0000	EA
		RD 01 3572		
M006029		MS 6-32 X 1/4 PAN HD S.S.	3.0000	EA
M006054		MS 6-32 X 5/16 BND HD S.S.	3.0000	EA
M008006		MS 8-32 X 1/2 BIN HD S.S.	2.0000	EA
M009529		NUT 6-32X5/16 HEX	4.0000	EA
M103390		PLATE, COMPONENT MTG. PWR SUP &	1.0000	EA
M103392		CARD FRAME ASSY 2150/51	1.0000	EA
M103396		POST, ENCL. LOCK	2.0000	EA
M103399		COVER ASSY, PWR. SUP. W/AC INPUT	1.0000	EA
M103401		PWR. SUP. SUB-ASSY 2150/51	1.0000	EA
M404486		PCB ASSY, C.P.U. 2150/51	1.0000	EA
M404487		PCB ASSY, DISPL. DRIVER 2150/5	1.0000	EA
M404483		PCB ASSY, WIND DISPLAY	1.0000	EA
M408202		JACK SOCKET ASSY "D" CONN	1.0000	EA
M408226		STANDOFF, 1/4 HEX M-F 6-32 X 3/	3.0000	EA
M408229		STANDOFF, 1/4 HEX M-F 6-32 X .4	3.0000	EA
M408230		STANDOFF, 1/4 HEX 6-32 X .43	3.0000	EA
T723221		WSHR. LK. INT TOOTH NO. 6 S.S	15.0000	EA
T723222		WSHR. LK. INT TOOTH NO. 8 S.S	2.0000	EA
1.0000	MECHANICAL ASSEMBLY	ASM		

QUALIMETRICS, INC.  
BILL OF MATERIALS LISTING

MASTER PART # M103404-  
DESCRIPTION CHASSIS ASSY, W/PWR SUP & PCB'S 2151

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
ECN- ENGR. CHANGE NOTICE	0	#2395, 2606
M006029- MS 6-32 X 1/4 PAN HD S. S. FILIP DR	3	
M006054- MS 6-32 X 5/16 BND HD S. S. FILIP DR	8	
M008006- MS 8-32 X 1/2 BIN HD S. S. FILIP	2	
M009529- NUT 6-32X5/16 HEX	4	
M103390- PLATE, COMPONENT MTG. PWR SUP & CARD FRM	1	
M103392- CARD FRAME ASSY 2150/51	1	
M103396- POST, ENCL. LOCK	2	
M103399- COVER ASSY, PWR. SUP. W/AC INPUT & FUSES	1	
M103401- PWR. SUP. SUB-ASSY 2150/51	1	
M103403-074 ELECT ASSY, CHASSIS PLATE ASM	1	
M404487- PCB ASSY, DISPL. DRIVER 2150/51	1	

TIME 10:24:52

QUALIMETRICS, INC.  
BILL OF MATERIALS LISTING

11/26/86  
PAGE 2

MASTER PART # M103404-  
DESCRIPTION CHASSIS ASSY, W/PWR SUP & PCB'S 2151

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
M404488- PCB ASSY, WIND DISPLAY	1	
M404531- PCB ASSY, C. P. U. 2151	1	
M408202- JACK SOCKET ASSY "D" CONN	1	
M408226- STANDOFF, 1/4 HEX M-F 6-32 X 3/4" BRASS	3	
M408229- STANDOFF, 1/4 HEX M-F 6-32 X .437 ALUM	3	
M408230- STANDOFF, 1/4 HEX 6-32 X .437 ALUM	3	
T723221- WSHR. LK. INT TOOTH NO. 6 S. S.	15	
T723222- WSHR. LK. INT TOOTH NO. 8 S. S.	2	

QUALIMETRICS, INC.  
BILL OF MATERIALS LISTING

MASTER PART # M103392-  
DESCRIPTION CARD FRAME ASSY 2150/51

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
ECN- ENGR. CHANGE NOTICE	0	#2395
M004027- MS 4-40 X 1/4 PAN HD S. S.	4	
M004036- MS 4-40 X 1/2 PAN HD S. S.	8	
M009034- WASHER FLAT #4 SS	8	
M103391- CHASSIS, CARD FRAME	1	
M103392-074 ELECT ASSY, CARD FRM.	1	
M103397- STANDOFF/SPACER 3/16 DIA 4-40 X 4.130"	2	
M408228- CARD GUIDE, PCB	8	
M491088- CABLE ASSY, INPUT/OUTPUT 2150 DISPLAY	1	
T723220- WSHR LK INT TOOTH NO. 4 S. S.	12	

MASTER PART # M103399-  
DESCRIPTION COVER ASSY, PWR. SUP. W/AC INPUT & FUSES

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
ECN- ENGR. CHANGE NOTICE	0	#2395
M004027- MS 4-40 X 1/4 PAN HD S. S.	2	
M006047- MS 6-32 X 3/8 BND HD S. S. FILIP DR	2	
M006054- MS 6-32 X 5/16 BND HD S. S. FILIP DR	1	
M009030- WASHER FLAT #6 SS	1	
M009529- NUT 6-32X5/16 HEX	1	
M103398- COVER, PWR. SUP.	1	
M103399-074 ELECT ASSY, P. S. COVER	1	
M440002- FUSEHLDR, 3AG TYPE STD.	1	
M442027- FUSE SLO BLD 1/4 AMP 3AG	1	
M443004- CONN AC W/FILTER ONLY END PINS	1	
M454034- SWITCH TOGGLE JMT-123	1	



MASTER PART # M103399-  
DESCRIPTION COVER ASSY, PWR. SUP. W/AC INPUT & FUSES

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
M454100- SWITCH SLIDE 115/230V	1	
M492186- CABLE, PWR CORD 3 CND 18GA MODULAR STYL	1	
M909088- LABEL 1W ON/OFF AW198563	1	
T210033- MOLEX TERMINAL PIN	4	
T210096- CONN, MOLEX, PLUG W/LOCK 4 CKT	1	
T280056- CLAMP, IR CLN 1/BNAT	1	
T605011- WIRE HOOKUP 20 GA STRND BLK	8	
T605013- WIRE HOOKUP 20 GA STRND RED	8	
T605014- WIRE HOOKUP 20 GA STRND ORG	8	
T605015- WIRE HOOKUP 20 GA STRND YEL	8	
T605020- WIRE HOOKUP 20 GA STRND WHT	8	
T723220- WSHR LK INT TOOTH NO. 4 S. S.	2	

TIME 10:25:44

QUALIMETRICS, INC.  
BILL OF MATERIALS LISTING

11/26/86  
PAGE 3

MASTER PART # M103399-  
DESCRIPTION COVER ASSY, PWR. SUP. W/AC INPUT & FUSES

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
T723221- WSHR. LK. INT TOOTH NO. 6 S. S.	2	

QUALIMETRICS, INC.  
BILL OF MATERIAL SINGLE LEVEL REPORT

RUN TIME	COMPONENT	DESCRIPTION	QTY EACH	UOM
M103401				
WR.SUP.SUB-ASSY	2150751	NORMAL ORDER QTY: 0		
ECN		ENGR CHANGE NUMBER	.0000	EA
		RD 01 2810		
SCH		SCHEMATIC	.0000	EA
		RD 01 M404491-004		
M006070		MS 6-32 X 5/8 PAN HD S.S.	6.0000	EA
M103400		CHASSIS,PWR.SUP.2150	1.0000	EA
M404556		PCB ASSY, POWER SUPPLY W/HEAT	1.0000	EA
		RD 01 USE SCHEMATIC		
		RD 02 M404491 LVL2720		
M408112		BRKT MTG XFMR FOR 457033 SFM	1.0000	EA
T723221		WSHR.LK.INT TOOTH NO. 6 S.S	6.0000	EA
.6000	MECHANICAL ASSEMBLY	ASM		

QUALIMETRICS, INC.  
BILL OF MATERIAL SINGLE LEVEL REPORT

QTY TIME	COMPONENT	DESCRIPTION	QTY EACH	
M404556				
PCB ASSY, POWER SUPPLY W/HEAT		NORMAL ORDER QTY: 0		
	ASM	ASSEMBLY DRAWING	.0000	EA
		RD 01 M404556-003		
	ECN	ENGR CHANGE NUMBER	.0000	EA
		RD 01 2810		
	SCH	SCHEMATIC	.0000	EA
		RD 01 TABBED ON		
		RD 02 M404491-004		
M004008		MS 4-40 X 5/16 PAN HD S.S.	3.0000	EA
M006J23		MS 6-32 X 3/8 PAN HD S.S.	3.0000	EA
M006047		MS 6-32 X 3/8 BND HD S.S.	5.0000	EA
M103393		HEAT SINK, SQUARE 2150 PWR.S	1.0000	EA
M405340		PCB FAB, PWR. SUP 2150	1.0000	EA
		RD 01 MUST BE ECN LVL		
		RD 02 2720.		
		RD 03 A.W.# M199259		
M408195		MICA INSULATOR, TO220	3.0000	EA
M408196		SHOULDER WASHER, TO220	3.0000	EA
M457048		TRANSFORMER 115/230 +/-+-15 OU	1.0000	EA
		RD 01 T1		
M463056		DIODE RECT IN5821 3.0A 30V	2.0000	EA
		RD 01 CR1,2		
M463062		BRIDGE RECTIFIER 2.0 A 100	1.0000	EA
		RD 01 CR3		
M468014		IC LIN MC7805CT VOLT REG +	1.0000	EA
		RD 01 U1		
M468019		IC LIN MC7812CT VOLT REG +	1.0000	EA
		RD 01 U3		
M468026		IC LIN MC7912CT VOLT REG	1.0000	EA
		RD 01 U2		
M472020		CAP, ELECT 10.0 MF 20V TAN	3.0000	EA
		RD 01 C1,5,8		
M472028		CAP, ELECT 1.0 MF 35V TAN	3.0000	EA
		RD 01 C2,6,9		
M472111		CAP, ELECT 2200.0 MF 35V	2.0000	EA
		RD 01 C4,7		
M472132		CAP, ELECT. 10,000 MF 25V ALUM	1.0000	EA
		RD 01 C3		
T210095		CONN, MOLEX CENTR WAFER 4 CKT	1.0000	EA
		RD 01 J1		
T210097		CONN, MOLEX CENTR WAFER 6 CKT	1.0000	EA
		RD 01 J2		
T723221		WSHR. LK. INT TOOTH NO. 6 S.S	3.0000	EA
1.3000	PCB WORK CELL	ASSEMBLE		
.0000	MECHANICAL ASSEMBLY	ELECTRONICS		
.0000	MACHINING	MACHINE SHOP		

QUALIMETRICS, INC.  
BILL OF MATERIAL SINGLE LEVEL REPORT

RUN TIME	COMPONENT	DESCRIPTION	QTY EACH	UOM
	M404486			
3 ASSY, C.P.U.	2150/51	NORMAL ORDER QTY: 10		
ASM		ASSEMBLY DRAWING	.0000	EA
		RD 01 M404486-003		
ECN		ENGR CHANGE NUMBER	.0000	EA
		RD 01 2811		
PRD		PROGRAMING PER CUST SPEC	1.0000	HR
		RD 01 PROGRAM M595018		
		RD 02 FOR 2150 MASTER		
		RD 03 PROGRAM M595019		
		RD 04 FOR 2150 SLAVE		
SCH		SCHEMATIC	.0000	EA
		RD 01 M404486-004		
M405334		PCB AFB, CPU 2150	1.0000	EA
		RD 01 AW 199253 @ ECN		
		RD 02 2811		
M421033		POST, JUMPER TERM 36 POS DUAL R	13.0000	EA
		RD 01 P9		
M421034		CUP, JUMPER TERM, PCB	1.0000	EA
		RD 01 W1		
M421064		DIP SOCKET 8 PIN TI C840802	1.0000	EA
		RD 01		
M421065		DIP SOCKET 14 PIN TI C841402	5.0000	EA
		RD 01		
M421066		DIP SOCKET 16 PIN TI C841602	5.0000	EA
		RD 01		
M421068		DIP SOCKET 20 PIN TI C842002	4.0000	EA
		RD 01		
M421071		DIP SOCKET 28 PIN TI C842802	3.0000	EA
		RD 01		
M421072		DIP SOCKET 40 PIN TI C844002	1.0000	EA
		RD 01		
M421099		HEADER, MALE, 3 PIN	1.0000	EA
M421147		HEADER STRIP 17 POS. SOCKET SNG	1.0000	EA
		RD 01 P8		
M421157		HEADER FEMALE, SNGL. ROW 10 PI	1.0000	EA
		RD 01 P7		
M463023		DIODE SWTH IN4148 10MA 75V SI	1.0000	EA
		RD 01 CR1		
M463072		DIODE ZEN. IN4735A 6.2V 1 W	4.0000	EA
		RD 01 CR2-5		
M470080		IC DIG CD4040 CMS CNTR RIPL/	2.0000	EA
		RD 01 U13,17		
M470190		IC DIG MC14585 CMS COMP 4BIT	1.0000	EA
		RD 01 U16		
M470205		IC DIG 82PC08 PMS BI-DIR 3BI	1.0000	EA
		RD 01 U3		
M470213		IC DIG 74HC138 CMS DECODE 1 0	2.0000	EA
		RD 01 U10,20		
M470214		IC DIG 74HC373 PMC OCTAL "D" LT	1.0000	EA
		RD 01 U2		

QUALIMETRICS, INC.  
BILL OF MATERIAL SINGLE LEVEL REPORT

RUN TIME	COMPONENT	DESCRIPTION	QTY EACH	UOM
M470216		IC DIG NSC 800 NI,CMS CPU,2.5	1.0000	EA
M470221		IC DIG 74HC08 MCS QUAD 2-IN	1.0000	EA
		RD 01 U19		
M470223		IC DIG 74HC32 CMS QUAD 2-IN	1.0000	EA
		RD 01 U12		
M470236		IC DIG 74HC02 CMS QUAD 2-IN	1.0000	EA
		RD 01 U15		
M470248		IC DIG HM6264 CMS RAM 8K X8	2.0000	EA
		RD 01 U1,U4		
M470250		IC DIG 74HC541 CMS OCTAL BUFF	2.0000	EA
		RD 01 U14,13		
M470252		IC DIG ICM7555 CMS TIMER	1.0000	EA
		RD 01 U11		
M470264		IC DIG MBM27C256-30 EPROM 32	1.0000	EA
		RD 01 PROGRAM TO		
		RD 02 M595018 THEN		
		RD 03 INST'L IN US		
M470269		IC DIG NSC858 CMS UART	1.0000	EA
		RD 01 U6		
M470270		IC DIG 75182 DUAL DIFF.LINE	1.0000	EA
		RD 01 U7		
M470271		IC DIG 75183 DUAL DIFF.LINE	1.0000	EA
		RD 01 U8		
M472003		CAP,MONO-CER 20 PF 200V	1.0000	EA
		RD 01 C7		
M472004		CAP,MONO-CER 33 PF 200V	1.0000	EA
		RD 01 C8		
M472020		CAP,ELECT 10.0 MF 20V TAN	1.0000	EA
		RD 01 C13		
M472027		CAP,MONO-CER 2000 PF 1KV	1.0000	EA
		RD 01 C4		
M472028		CAP,ELECT 1.0 MF 35V TAN	1.0000	EA
		RD 01 C11		
M472051		CAP,MONO-CER 1000 PF 200V	1.0000	EA
		RD 01 C16		
M472053		CAP,MONO-CER .047 MF 50V	10.0000	EA
		RD 01 C1-3,5,6,9,		
		RD 02 10,12,14,15		
M475041		RES CC1/4W 10.0 K 5%	2.0000	EA
		RD 01 R2,5		
M475056		RES CC1/4W 100.0 K 5%	1.0000	EA
		RD 01 R4		
M475068		REC CC1/4W 1.0 M 5%	1.0000	EA
		RD 01 R3		
M475143		RES ARRAY 9 100.0 K 2% PN 1	2.0000	EA
		RD 01 RP1,2		
M477026		RES MF 15.0 K 1% 100PPM	1.0000	EA
		RD 01 R1		
M477369		RES WW, 1.0 K 3 W 1%	4.0000	EA
		RD 01 R6-9		
M434022		CRYSTAL, 3.6864 MHZ, HC18/U	1.0000	EA
		RD 01 Y1		
		RD 02 USE M401030 TO		
		RD 03 HOLD Y1 AND TO		

QUALIMETRICS, INC.  
 BILL OF MATERIAL SINGLE LEVEL REPORT

RUN TIME	COMPONENT	DESCRIPTION	QTY EACH	UOM	C V
	M491090	RD 04 ISOLATE LEADS			
	M491091	CABLE ASSY,CPU TO PWR SUP	2	1.0000	EA
2.5000	PCB WORK CELL	CABLE ASSY,CPU OUTPUT		1.0000	EA
		ELECTRONICS			

QUALIMETRICS, INC.  
BILL OF MATERIAL SINGLE LEVEL REPORT

RU. TIME	COMPONENT	DESCRIPTION	QTY EACH	UOM
	M404487			
13	ASSY,DISPL.DRIVER	NORMAL ORDER QTY: 10		
	ASM	ASSEMBLY DRAWING	.0000	EA
		RD 01 M404487-003		
	ECN	ENGR CHANGE NUMBER	.0000	EA
		RD 01 2811		
	SCH	SCHEMATIC	.0000	EA
		RD 01 M404487-004		
	M405335	PCB FAB,DISPL DRIVER	1.0000	EA
		RD 01 PCB MUST BE AT		
		RD 02 EC#2720 LVL		
	M421033	POST,JUMPER TERM 36 POS DUAL R	2.0000	EA
		RD 01 W1,2		
	M421034	CUP, JUMPER TERM, PCB	1.0000	EA
		RD 01 W2		
	M421065	DIP SOCKET 14 PIN TI C841402	5.0000	EA
		RD 01 SOC.FOR		
		RD 02 U9,10,14,17,13		
	M421066	DIP SOCKET 16 PIN TI C841602	3.0000	EA
		RD 01 SOC. FOR		
		RD 02 U13,15,16		
		RD 03		
	M421067	DIP SOCKET 18 PIN TI C841802	4.0000	EA
		RD 01 SOC. FOR		
		RD 02 U4,5,7,8		
	M421068	DIP SOCKET 20 PIN TI C842002	2.0000	EA
		RD 01 SOC. FOR		
		RD 02 U11,12		
	M421071	DIP SOCKET 28 PIN TI C842802	2.0000	EA
		RD 01 SOC. FOR		
		RD 02 U2,6		
		RD 03		
	M421072	DIP SOCKET 40 PIN TI C844002	2.0000	EA
		RD 01 SOC. FOR		
		RD 02 U1,3		
	M421144	HEADER,FEMALE 16 PIN S	3.0000	EA
		RD 01 P1-3		
	M421145	HEADER STRIP, 17 POS.POST SNG	1.0000	EA
		RD 01 J8		
	M421148	HEADER STRIP 12 POS.SOKET SNG	1.0000	EA
		RD 01 P6		
		RD 02		
	M421150	HEADER STRIP 6 POS.SOKET SNG	1.0000	EA
		RD 01 P4		
	M421158	HEADER MALE, SNGL. ROW 10 PI	1.0000	EA
		RD 01 J7		
	M421163	HEADER STRIP, 14 POS. POST SN	1.0000	EA
		RD 01 P5		
	M470023	IC DIG CD4013 CMS DUAL "D" F	2.0000	EA
		RD 01 U9,18		
	M470091	IC DIG MC14518 CMS DUAL 3CD	1.0000	EA
		RD 01 U15		



QUALIMETRICS, INC.  
BILL OF MATERIAL SINGLE LEVEL REPORT

RUN TIME	COMPONENT	DESCRIPTION	QTY EACH	UOM
M470221		IC DIG 74HC08 MCS QUAD 2-IN RD 01 U14	1.0000	EA
M470223		IC DIG 74HC32 CMS QUAD 2-IN RD 01 U17	1.0000	EA
M470235		IC DIG 74HC00 CMS QUAD 2-IN RD 01 U10	1.0000	EA
M470239		IC DIG ICM7218E CMS UNIV 8DIG RD 01 U1,3 RD 02	2.0000	EA
M470250		IC DIG 74HC541 CMS OCTAL BUFF RD 01 U11,12	2.0000	EA
M470253		IC DIG ICM7218C CMS 8 DIGIT L. RD 01 U2,6	2.0000	EA
M470265		IC DIG PX0-600 PROG OSC . RD 01 U16	1.0000	EA
M470267		IC DIG MC14566 BCP TIME BASE RD 01 U13	1.0000	EA
M470332		IC DIG, UDN 2595A 3 CHAN CUR RD 01 U4,5	2.0000	EA
M470333		IC DIG, UDN 2981A 8 CHAN CUR RD 01 U7,8	2.0000	EA
M472053		CAP, MONO-CER .047 MF 50V RD 01 C 1 THRU 12	12.0000	EA
M475003		REC CC1/4W 10.0 OHM 5% RD 01 R15,16,17,18,19 RD 02 20,21,22,23,24, RD 03 25,26,27,28	14.0000	EA
M475034		RES CC1/4W 4.7 K 5% RD 01 R1,2,3,4,5,6,7, RD 02 8,9,10,11,12, RD 03 13,14,	14.0000	EA
M475148		RES ARRAY 9 100.0 K 2% PN 1 RD 01 RP1	1.0000	EA
M475154		RES ARRAY 7 100.0 K 2% PIN 1 RD 01 RP2	1.0000	EA
2.5000	PCB WORK CELL	ELECTRONICS		

QUALIMETRICS, INC.  
BILL OF MATERIALS LISTING

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WATER PART # M404488-  
DESCRIPTION PCB ASSY, WIND DISPLAY

COMPONENT PART #	DESCRIPTION	QTY	REFERENCE
ASB-	ASSEMBLY DRAWING	0	M404488-003
ECN-	ENGR. CHANGE NOTICE	0	#2606
SCN-	SCHEMATIC	0	M404488-004
M103578-	SPACER, SHIM SWITCH	3	FOR SWITCHES
M103592-	SPACER, RING DISPLAY	1	SPACER
M103593-	SPACER, UNITS DISPLAY	1	SPACER
M103594-	SPACER, INTERVAL DISPLAY	1	SPACER
M103595-	SPACER SITE DISPLAY	1	SPACER
M404488-074	ELECT ASSY, DISPL. PCB	0	
M405337-	PCB FAB, WIND RCDR DISPLAY	1	PCB MUST BE AT EC #2606
M421143-	HEADER, MALE                      16 PIN      SNGL ROW	3	J1-3
M421151-	HEADER STRIP, 12 POS. POST      SNGL ROW	1	J6
M421152-	HEADER STRIP      6 POS. POST      SNGL ROW	1	J4
M421162-	HEADER STRIP, 14 POS. POST      SNGL ROW	1	J5
M454134-	SWITCH	3	S1, 2, 3
M456048-	INDICATOR, DUAL L. E. D.      YELLOW	36	DSI-36

QUALIMETRICS, INC.  
BILL OF MATERIALS LISTING

MASTER PART # M404488-  
DESCRIPTION PCB ASSY, WIND DISPLAY

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
M456049- INDICATOR, DUAL L. E. D. GREEN	48	DS37-72, 76-87
M456050- INDICATOR, DUAL L. E. D. RED	4	DS-73-75, 88
M456055- DISPLAY, 7 SEG., HI-EFF RED MICRO-BRITE	9	DS

MASTER PART # M404492-  
DESCRIPTION PCB ASSY, DUAL D. A. C. 2150/51

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
ASM- ASSEMBLY DRAWING	0	M404492-003
ECN- ENGR. CHANGE NOTICE	0	# 2647
SCH- SCHEMATIC	0	M404492-004
M404492-074 ELECT ASSY, DUAL DAC	0	ELECT. ASM
M405341- PCB FAB, DUAL D. A. C.	1	AW M199260
M417073- TERMINAL BLOCK, SINGL, PC MT. ENCL-FEEDTHRU	4	J1, 2, 3, 4
M421033- POST, JUMPER TERM 36 POS DUAL ROW .1 X .1	6	W1-6
M421034- CUP, JUMPER TERM, PCB	1	W4
M421064- DIP SOCKET 8 PIN TI C840802	1	8 PIN
M421065- DIP SOCKET 14 PIN TI C841402	1	14 PIN
M421066- DIP SOCKET 16 PIN TI C841602	4	16 PIN
M421068- DIP SOCKET 20 PIN TI C842002	1	20 PIN
M468017 IC LIN 1458 OP AMP DUAL 8-DIP	1	U5
M468021- IC LIN LM324N OP AMP QUAD 14-DIP	1	U9
M468046- IC LIN MC78L05AC VOLT REG + 5V TO-92	1	U1
M468047- IC LIN MC79L05AC VOLT REG - 5V TO-92	1	U2
M468067- IC LIN AD580LH VOLT REF +2.5 TO-92	1	U8

MASTER PART # M404492-  
DESCRIPTION PCB ASSY, DUAL D. A. C. 2150/51

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
M470183- IC DIG AD7542J CMS D. A. C. 12 BIT	2	U3, 6
M470213- IC DIG 74SC138 CMS DECODER 10FB INVT	2	U7, 10
M470250- IC DIG 74SC541 CMS OCTAL BUFF/LN DR	1	U4
M472003- CAP, MONO-CER 20 PF 200V	2	C5, 6
M472020- CAP, ELECT 10.0 MF 20V TANT, AXL	2	C1, 4
M472028- CAP, ELECT 1.0 MF 35V TANT AXL	3	C2, 3, 7
M477006- RES MF 200.0 OHM 1% 100PPM	2	R3, 7
M477024- RES MF 10.0 K 1% 100PPM	3	R9, 10, 14
M477028- RES MF 20.0 K 1% 100PPM	1	R15
M477037- RES MF 100.0 K 1% 100PPM	5	R1, 2, 11, 12, 16
M477072- RES MF 4.02 K 1% 100PPM	1	R13
M480006- POT TRIM PC100.0 OHM M/TRN RECT END ADJ	2	R4, R8
M480012- POT TRIM PC 10.0 K M/TRN RECT END ADJ	2	R5, R6

QUALIMETRICS, INC.  
BILL OF MATERIAL SINGLE LEVEL REPORT

UN TIME	COMPONENT	DESCRIPTION	QTY EACH	UOM	V
	M404493				0
	ASSY, DUAL CHAN'L INPUT	2 NORMAL ORDER QTY: 10			
	ASM	ASSEMBLY DRAWING	.0000	EA	
		RD 01 M404493-003			
	ECN	ENGR CHANGE NUMBER	.0000	EA	
		RD 01 2811			
	SCH	SCHEMATIC	.0000	EA	
		RD 01 M404493-004			
	M405342	PCB FAB, DUAL CHAN'L INPUT 2	1.0000	EA	
		RD 01 A/W 199261 @			
		RD 02 ECN 2811			
	M417073	TERMINAL BLOCK, SINGL, PC MT. ENC	4.0000	EA	
		RD 01 J1-4			
	M421033	POST, JUMPER TERM 36 POS DUAL R	4.0000	EA	
		RD 01 W1-4			
	M421034	CJP, JUMPER TERM, PCB	1.0000	EA	
		RD 01 W4			
	M421064	DIP SOCKET 8 PIN TI C340802	1.0000	EA	
	M421065	DIP SOCKET 14 PIN TI C841402	2.0000	EA	
	M421066	DIP SOCKET 16 PIN TI C841602	3.0000	EA	
	M421071	DIP SOCKET 28 PIN TI C342802	2.0000	EA	
	M457057	XFRMR, TELE COUPLING, 600-600CT	2.0000	EA	
		APPROVED SOURCES:			
		STANCOR TTPC-6			
		MICROTRAN T2114			
		RD 01 T1, T2			
	M463072	DIODE ZEN. IN4735A 6.2V 1 W	4.0000	EA	
		RD 01 CR1-4			
	M468015	IC LIN SE532 OP AMP DUA	1.0000	EA	
		RD 01 U4			
	M468046	IC LIN MC78L05AC VOLT REG +	1.0000	EA	
		RD 01 U9			
	M468047	IC LIN MC79L05AC VOLT REG -	1.0000	EA	
		RD 01 U8			
	M470213	IC DIG 74HC138 CMS DECODE 1 0	1.0000	EA	
		RD 01 U3			
	M470223	IC DIG 74HC32 CMS QUAD 2-IN	1.0000	EA	
		RD 01 U10			
	M470236	IC DIG 74HC02 CMS QUAD 2-IN	1.0000	EA	
		RD 01 U2			
	M470268	IC DIG MT 3865XC TOUCH TONE	2.0000	EA	
		RD 01 U1, 7			
	M470374	IC DIG, CDP1878E DUAL CNTR/T	2.0000	EA	
		RD 01 U5, 6			
	M472002	CAP, MONO-CER 10 PF 200V	1.0000	EA	
		RD 01 C3			
	M472016	CAP, MONO-CER .1 MF 50V	2.0000	EA	
		RD 01 C5, 6			
	M472020	CAP, ELECT 10.0 MF 20V TAN	2.0000	EA	
		RD 01 C11, 13			
	M472028	CAP, ELECT 1.0 MF 35V TAN	2.0000	EA	
		RD 01 C12, 14			

QUALIMETRICS, INC.  
BILL OF MATERIAL SINGLE LEVEL REPORT

RUN TIME	COMPONENT	DESCRIPTION	QTY EACH	UOM	C V
1472035		CAP., MONO-CER .0047MF 100V RD 01 C1,2,8,9	4.0000	EA	
1472074		CAP, ELECT 22.0 MF 35V RD 01 C10	1.0000	EA	
1472085		CAP, DIP'D CER 2.2 MF 50V RD 01 C4,7	2.0000	EA	
1477062		RES MF 604.0 OHM 1% 100PPM RD 01 R2,3,6,7	4.0000	EA	
1477096		RES MF 2.0 MEG 1% 100PPM RD 01 R1,8	2.0000	EA	
1480060		POT TRIM PC 2.0 K M/TRN SQR RD 01 R4,5	2.0000	EA	
1484026		CRYSTAL, 3.579545 MHZ, HC18/U RD 01 Y1	1.0000	EA	
1.4000	PCB WORK CELL	ELECTRONICS			

MASTER PART # M404531-  
DESCRIPTION PCB ASSY, C. P. U. 2151

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
ASM- ASSEMBLY DRAWING	0	TABBED ON M404486-003
ECN- ENGR. CHANGE NOTICE	0	#2443, 2594 #2606
NOT- NOTE: SEE REMARKS FOR SPECIAL INST:	1	DO NOT INSTALL U4
PRO- PROGRAMING PER CUST SPEC	1	PROGRAM TO M595019
SCH- SCHEMATIC	0	TABBED ON M404486-004
M404531- PCB ASSY, C. P. U. 2151	0	
M405334- PCB AFB, CPU 2150	1	M199253, PCB MUST BE AT ECN #2606
M421033- POST, JUMPER TERM 36 POS DUAL ROW .1 X .1	13	P9
M421034- CUP, JUMPER TERM, PCB	1	W1
M421064- DIP SOCKET 8 PIN TI C840802	1	SOCKET
M421065- DIP SOCKET 14 PIN TI C841402	5	SOCKET
M421066- DIP SOCKET 16 PIN TI C841602	5	SOCKET
M421068- DIP SOCKET 20 PIN TI C842002	4	SOCKET



QUALIMETRICS, INC.  
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MASTER PART # M404531-  
DESCRIPTION PCB ASSY, C.P.U. 2151

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
M421071- DIP SOCKET 28 PIN TI C842802	3	SOCKET
M421072- DIP SOCKET 40 PIN TI C844002	1	SOCKET
M421099- HEADER, MALE, 3 PIN SINGL ROW	1	
M421147- HEADER STRIP 17 POS. SOKET SINGL ROW	1	P8
M421155- HEDR. STRP, SINGL ROW, 4 POS, RT. ANGL.	1	P10
M421157- HEADER FEMALE, SINGL. ROW 10 PIN	1	P7
M463023- DIODE SWTH IN4148 10MA 75V SI	1	CR1
M470190- IC DIG MC14585 CMS COMP 4BIT MAGNITUD	1	U16
M470205- IC DIG 82PC08 PMS BI-DIR 8BIT XCVR	1	U3
M470213- IC DIG 74SC138 CMS DECODER 10FB INVT	2	U10, 20
M470214- IC DIG 74SC373 DMC OCTAL "D" LTCH N-INV	1	U2
M470216- IC DIG NSC-800 CMS CPU LD-PWR	1	
M470221- IC DIG 74HC08 MCS QUAD 2-IN AND	1	U19
M470223- IC DIG 74HC32 CMS QUAD 2-IN OR	1	U12
M470236- IC DIG 74HC02 CMS QUAD 2-IN NOR	1	U15
M470248- IC DIG HM6264 CMS RAM 8K X8 (64K)	1	U1

MASTER PART # M404531-  
DESCRIPTION PCB ASSY, C. P. U. 2151

COMPONENT PART # \	DESCRIPTION	QTY	REFERENCE
M470250-	IC DIG 74SC541 CMS OCTAL BUFF/LN DR	2	U14, 18
M470252-	IC DIG ICM7555 CMS TIMER	1	U11
M470264-	IC DIG MBM27C256-30 EPROM 32 X 8 CMOS	1	PROGRAM TO M595019, THEN INSTAL IN U5
M470269-	IC DIG NSC858 CMS UART	1	U6
M470270-	IC DIG 75182 DUAL DIFF. LINE RCVR	1	U7
M470271-	IC DIG 75183 DUAL DIFF. LINE DRIVER	1	U8
M472003-	CAP, MONO-CER 20 PF 200V	1	C7
M472004-	CAP, MONO-CER 33 PF 200V	1	C8
M472020-	CAP, ELECT 10.0 MF 20V TANT, AXL	1	C13
M472027-	CAP, MONO-CER 2000 PF 1KV	1	C4
M472028-	CAP, ELECT 1.0 MF 35V TANT AXL	1	C11
M472051-	CAP, MONO-CER 1000 PF 200V	1	C16
M472053-	CAP, MONO-CER .047 MF 50V	10	C1-3, 5, 6, 9, 10, 12, 14, 15
M475041-	RES CC1/4W 10.0 K 5%	2	R2, 5
M475056-	RES CC1/4W 100.0 K 5%	1	R4

MASTER PART # M404531-  
DESCRIPTION PCB ASSY, C. P. U. 2151

COMPONENT PART # \ DESCRIPTION	QTY	REFERENCE
M475068- REC CC1/4W 1.0 M 5%	1	R3
M475148- RES ARRAY 5 100.0 K 2% INDV RES SIP10	2	RP1,2
M477026- RES MF 15.0 K 1% 100PPM	1	R1
M477086- RES MF 40.2 K 1% 100PPM	2	U13,17
M484022- CRYSTAL MM18N 3.6864 MHZ	1	Y1
M491090- CABLE ASSY, CPU TO PWR SUP 2150/51	1	
M491091- CABLE ASSY, CPU OUTPUT	1	