

# **Model 820-202**

## **RD-2**

**SERIAL NUMBER** \_\_\_\_\_

**August 22, 2001**  
**Revision G**

**CUSTOM OPTIONS / CONFIGURATIONS** - Any Custom Options or Configurations are described starting at sheet ii.

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**CUSTOM OPTIONS/CONFIGURATIONS**

There are no custom options in this unit.

## SECTION ONE

### GENERAL INFORMATION

#### 1.1 SCOPE OF MANUAL

This manual contains the information necessary to operate and maintain the TrueTime Series RD-2 two-inch Remote Time Display.

#### 1.2 PURPOSE OF EQUIPMENT

The RD-2 Series is a family of time code displays designed around a versatile microprocessor. These instruments decode and display the time encoded in standard time code signals.

#### 1.3 PHYSICAL SPECIFICATIONS

The physical specifications are:

Height:	3.47 in (8.81 cm)
Width:	17.75 in including knobs in the wall or ceiling mounted configuration. Rack mount brackets are provided in the standard configuration.
Depth:	4.0 in (10.16 cm) plus mating connectors
Weight:	Approximately 10 lb. (4.5 Kg)

#### 1.4 ENVIRONMENTAL SPECIFICATIONS

The environmental specifications are:

Operating Temperature:	0° to +50°C (+32° to +122°F)
Storage Temperature:	-17° to +100°C (0° to +212° F)
Humidity:	95% relative, non-condensing
Cooling Mode:	Convection

#### 1.5 POWER SPECIFICATIONS

The input power specifications are:

Voltage:	95 to 260 VAC
Frequency:	47 Hz to 440 Hz
Power:	Approximately 20 W
Connector:	CORCOM 6EF1

## 1.6 INPUT SIGNAL SPECIFICATIONS

The input signal specifications are:

Input Code Format:	AM IRIG B, NASA-36, MILA, CS3-112
Carrier Frequency:	100 Hz to 10 kHz
Amplitude:	0.2 to 10 VPP
Ratio:	2:1 to 6:1
Impedance:	100 k $\Omega$ to ground
Polarity:	Positive or negative
Direction:	Forward
Error Bypass:	3 frames for IRIG B, NASA-36, and CS3-112; none for MILA
Connector:	Female BNC

### **NOTE:**

When the display is decoding CS3-112 code, the display will only decode and display Event Count Status time, Predicted Time of Launch can not be displayed. The unit will accept CS3-114 code, but will only display the Event Count Status time.

If the count time is greater than minus 100 days, the sign bit will not be displayed. When the count time is less than -100 days (e.g. -99 days), the sign bit will be displayed in the left most digit of the display.

### 1.6.1 DAYS BLANKING

This display is capable of automatically blanking the "Days" digits (DOY) when IRIG B, MILA or CS3 serial time codes are decoded and displayed. This is controlled by a switch on the 800-5079 processor board. When SW1 section 2 is in the ON position, the DOY digits will blank. All other modes are unchanged.

## 1.7 DISPLAY SPECIFICATIONS

The display specifications are:

Display:	Nine 16-segment LED displays
Digit Size:	2.0 in. (5.08 cm)
Intensity:	4 mcd/segment minimum
Blanking:	Display blanks when input lost

## SECTION TWO

### INSTALLATION AND OPERATION

#### 2.1 **INTRODUCTION**

This section contains installation instructions and operating procedures.

#### 2.2 **INSTALLATION**

Unpack the unit and carefully inspect it for shipping damage. Any damage must be reported to the carrier immediately.

If desired, mount the display on a wall or ceiling using the remote mounting kit provided.

Fabricate any cables required. Connect a code signal to the rear-panel input connector. Connect the power cord to the rear-panel connector.

**CAUTION!** There are extremely dangerous voltages present in this unit. **DO NOT** remove the top cover without **FIRST** disconnecting the primary power! Only skilled technicians should access the inside of this unit.

#### 2.3 **OPERATION**

Press the top of the rear-panel-mounted POWER switch. The numeric display will first illuminate all display segments as a lamp test. At the end of the initialization sequence the display will show the time translated from the input code. If no input code is present the display will blank.

**SECTION THREE**  
**THEORY OF OPERATION**

**3.1 INTRODUCTION**

The following pages contain detailed descriptions of the circuits on each card used in this unit. They are arranged in numerical order. Use these descriptions in conjunction with the detail drawings found in SECTION FIVE.

# CIRCUIT BOARD DESCRIPTION

800-5030

## DISPLAY DRIVER BOARD

### 1.0 General Information

This circuit board is used to store the LED segment driver data that is generated by the MPU.

### 2.1 Display Driver

The MPU converts the number that is to be displayed into the segments that have to be illuminated to display that number. For example, to display Units of Seconds seven of the following segments have to be illuminated: A, B, C and D. A, B and C are written into Z1 and the D is written into Z2. Z1 and Z2 are latches that have high current outputs.



# CIRCUIT BOARD DESCRIPTION

800-5079

## DISPLAY DECODER

### 1.0 General Information

The 800-5079 Assembly provides input code decoding, processor control and I/O control.

### 1.1 AGC Circuit

Reference drawing 800-5079, sheet 2. The input code is applied to Z3-1 through C1 or optionally through the coupling transformer T1. Switch Z1 reverses the polarity of the signal applied to Z3-5 and Z3-6. The buffered input signal at Z3-7 is applied to the attenuator R10-Q1 then to the amplifier Z4. The normalized code output at Z4-1 drives the amplitude sensor Z4. The voltage at Z4-6 is approximately -2v. When the normalized output is more negative than -2v, Z4-7 is low discharging C8 which decreases the resistance of Q1 thereby attenuating the input to Z4-3. If the Z4-5 is more positive than -2v, Z4-7 is high and C8 is charged increasing the resistance of Q1 and increasing the signal level at Z4-3. The normalized output signal at Z4-1 is approximately 4 vpp.

### 1.2 Decoder Circuit

Reference drawing 800-5079, sheets 2 and 3. The normalized code output at Z4-1 also drives the the code activity detector Z5, the polarity detector Z11, zero-axis detector Z6 and the high-amplitude-carrier-cycle detector Z7.

Comparator Z5 clocks flip-flop Z15 high when the input code level exceeds the threshold set by Pot R8. The processor reads this signal (ACT) from register Z31.

The zero-axis detector Z6 produces a square wave (CAR) with the same frequency as the input code carrier. Comparator Z7 detects negative-going high-amplitude carrier cycles (MK). Comparator Z11 detects positive-going high-amplitude-carrier cycles. Flip-flop Z15 is set by negative-going cycles and reset by positive-going cycles. From CAR and MK, Z19, Z14 and Z10 produce a demodulated code signal at Z8-6 which is delayed from on-time by two carrier cycles. This signal clocks the state of Z15-9 which indicates whether the last high-amplitude cycle was positive- or negative-going into Z18. The processor interprets this signal when read from register Z31 as polarity.

One-shot Z12 generates a 100 nanosecond wide pulse which synchronizes the divide-by-ten counters in Z16. The first counter in Z16 counts the number of carrier cycles that occur during the period when the demodulated code signal at Z8-5 is high. Every ten cycles the second counter in Z16 loads the hi-carrier-cycle count into register Z17. A count of 2 corresponds to a 0 code bit. A count of 5 corresponds to a 1 code bit and a count of 8 corresponds to a position marker or a frame reference.

The primary timing input to the processor is the interrupt /IRQ derived from the carrier. /IRQ is a 100PPS signal produced by flip-flop Z18. It indicates that a code bit has been decoded, stored in Z17 and is ready to be read by the MPU. The outputs of Z17 are placed on the MPU data bus when /RDCDATA is low and R//W is high.

### 1.3 Processor Control

Reference drawing 800-5079, sheet 4. Z29 is the processor. At turn-on Z30 generates a power-on reset and also loads the configuration into the processor through Z31. The 4.9152 MHz from crystal Y1 is divided by four to produce the processor clock E. E is slightly greater than 1 MHz. Transceiver Z28 is used to isolate the data bus, D0 - D7, from the remainder of the logic. When the read/write line R//W is low, Z28 moves data away from the processor. When A15 is high the program memory Z25 is selected by Z26-10. When A14 is high and A15 is low decoder Z27 is enabled. Decoders Z27 and Z33 provide read and write strobes. Register Z32 buffers data to the Display Assembly. Register Z31 interfaces the code activity signal ACT, the polarity signal POL and data from connector J4 to the data bus. Register Z22 buffers data from connector J3 and data encoded by switch S1 to the data bus. Z27-14 enables the write decoder for the hundreds of days and tens of days. Z27-13 enables the write decoder on the Display Assembly for the remaining digits. Z35 controls the polarity switch and the colons.

# CIRCUIT BOARD DESCRIPTION

800-5079

(Insert paper copy here)

## CIRCUIT BOARD DESCRIPTION

800-5030

(Insert paper copy here)

## SECTION FOUR

### MAINTENANCE AND TROUBLESHOOTING

#### 4.1 INTRODUCTION

Effective maintenance and troubleshooting of this system requires a thorough understanding of equipment characteristics, operating procedures, theory of operation, and knowledge of both linear and logic circuit elements. The equipment characteristics, operating procedures, and the theory of operation for the system processor are provided in SECTION ONE through SECTION THREE of this manual.

#### 4.2 PREVENTIVE MAINTENANCE

A systematic preventive maintenance routine will reduce the possibility of a malfunction. This routine should include inspection, qualification and cleaning of the instrument.

##### 4.2.1 Inspection

**CAUTION:** Disconnect equipment from the primary power prior to inspection. Dangerous voltages are present that can cause serious injury or loss of life.

Exercise care when handling this equipment. It contains precision parts that can be damaged by improper handling. Do not touch connector pin surfaces. Foreign material deposited on contact surfaces can cause corrosion, resulting in equipment damage or failure. Inspect the unit for damaged components, loose or frayed connections, and corrosion on metal surfaces. If damage is found, correct it immediately.

##### 4.2.2 Cleaning

**CAUTION:** Disconnect equipment from the primary power prior to cleaning. Dangerous voltages are present that can cause serious injury or loss of life.

Accumulations of dust and dirt can impair cooling and generally distracts from equipment appearance. A soft cloth and a commercial cleaner (such as Windex) may be used to clean the paint and the lens. Be careful not to get the cleaner into switches.

##### 4.2.3 Qualification

Verify that the unit meets all of the applicable specifications listed in SECTION ONE. Failure to meet a specification is an indication of malfunction and should be corrected immediately.

#### 4.3 TROUBLESHOOTING

**CAUTION:** Only a qualified technician should attempt repair to this unit. Dangerous voltages are present that can cause serious injury or loss of life. The power supply in particular uses high voltages.

The following suggestions are general in nature. When followed, they will minimize equipment down time. Use these suggestions in conjunction with the drawings in SECTION FIVE and the circuit descriptions in SECTION THREE to diagnose equipment malfunctions.

##### 4.3.1 General Troubleshooting Procedures

Since an apparent problem may actually be the result of operator error, misunderstanding or misuse, the technician will need a thorough understanding of the normal operation. Refer to SECTION TWO for a description of normal operation. Thoroughly evaluate the procedures used by the operator when the malfunction occurred.

#### **4.3.2 Power Circuits**

Verify that power supply is as specified. Verify that the primary power fuse has not blown and that primary power is present. Check external loads where applicable.

#### **4.3.3 Locating Drawings**

Reduced drawings of all mechanical assemblies and circuit card detail drawings are located in SECTION FIVE of this manual. The index contains a list of the drawings in this manual.

#### **4.3.4 Locating Circuits**

SECTION THREE provides a written description of each circuit card. Use this information in conjunction with the detail drawings while troubleshooting.

#### **4.3.5 Circuit Card Removal**

**CAUTION:** Disconnect equipment from the primary power prior to disassembly. Dangerous voltages are present that can cause serious injury or loss of life.

To remove a circuit card first remove the screws that secure the lid to the case. Remove the screws from the case which hold the spacers to the case. Lift the circuit cards and their spacers from the case. Reinstall the circuit cards in the same positions that they occupied before disassembly.

#### **4.3.6 Replacing Components**

It is imperative that the IC's are replaced with exactly the same type of component. Do not guess in this area. Use the parts lists to find the exact IC part number. Be sure not to bend under the IC legs when replacing them.

When replacing soldered components use a low temperature iron and be careful not to disturb the etch. Use a resin-core flux and clean the soldered joints carefully with alcohol. Do not allow the cleaner to penetrate the pots or switches.

## SECTION FIVE

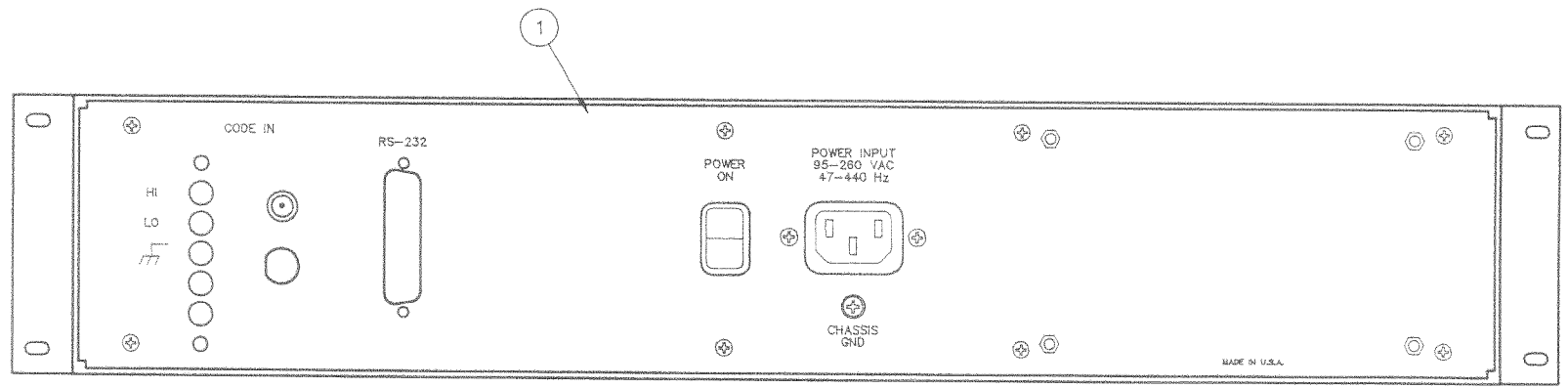
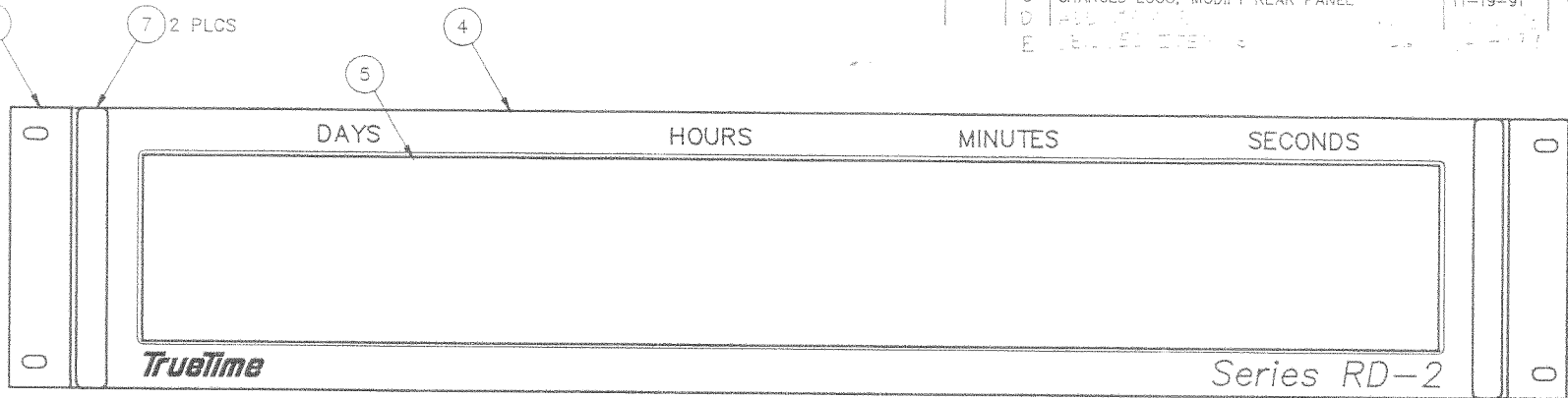
### DRAWINGS

#### 5.1 DRAWINGS

820-202	Top Assembly
820-7202	Wiring Diagram
800-5079	Display Decoder Assembly
800-5030	Display Board Assembly
800-1025	Rear Panel Assembly
800-1026	Wall/Ceiling Mount Kit

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	C	CHANGED LOGO; MODIFY REAR PANEL	11-19-91	
	D	ADD LOGO		
	E	REVISED ITEM #		

2 PLCS (6) (7) 2 PLCS

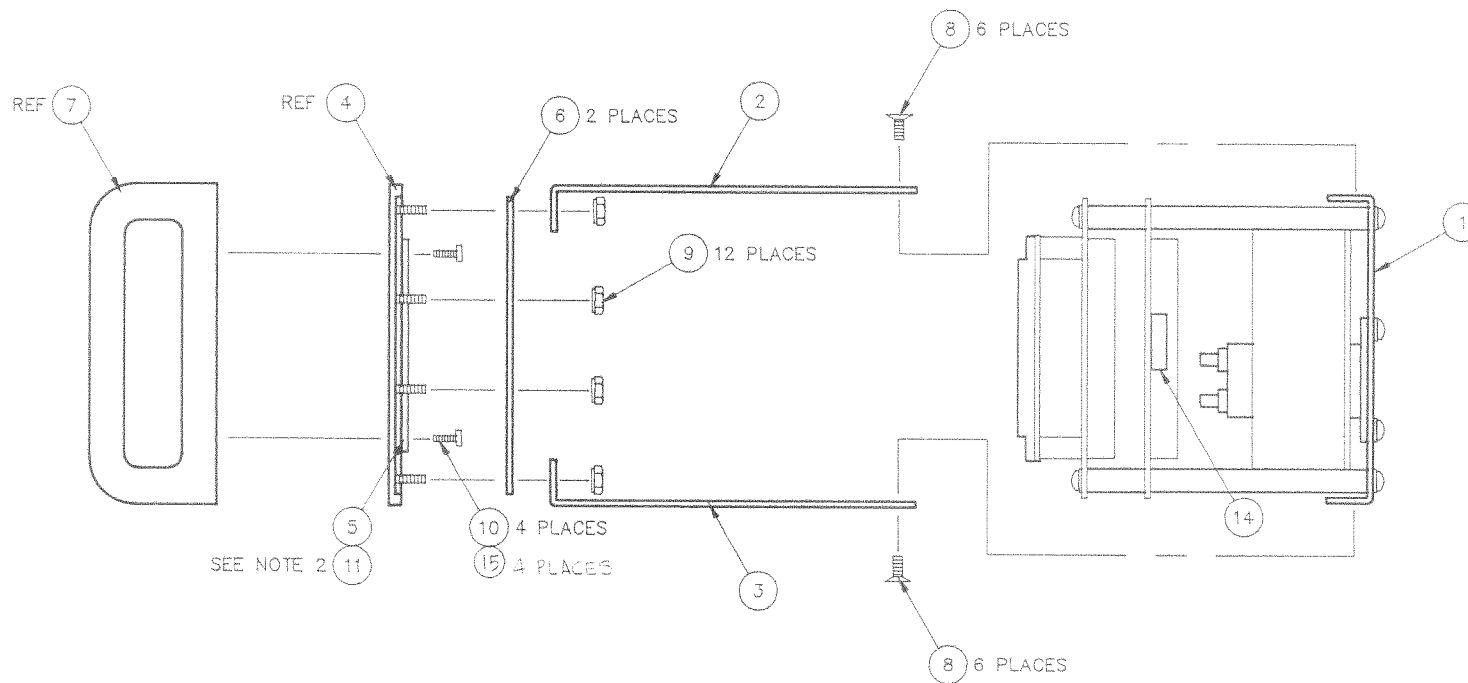


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 AND IT SHALL BE RETURNED UPON DEMAND

FILENAME: \820\202-1  
 DATE: 11-19-91

APPROVALS		DATE	 SANTA ROSA, CA	
DRAWN BY	<i>die</i>	11-91		
CHECKED BY	<i>im</i>			
APPROVED BY	<i>im</i>		TCU REMOTE DISPLAY MODEL RD-2	
NEXT ASSY		SIZE	CODE IDENT NO.	DRAWING NO.
		B		820-202
		SCALE	NONE	SHEET 1 OF 2





2. SECURE LENS (ITEM 5) TO THE FRONT PANEL (ITEM 4) BY APPLYING PLASTIC ADHESIVE (ITEM 11) EVENLY AROUND THE SLOT ON THE FRONT PANEL  
 NOTES: (CONT.)

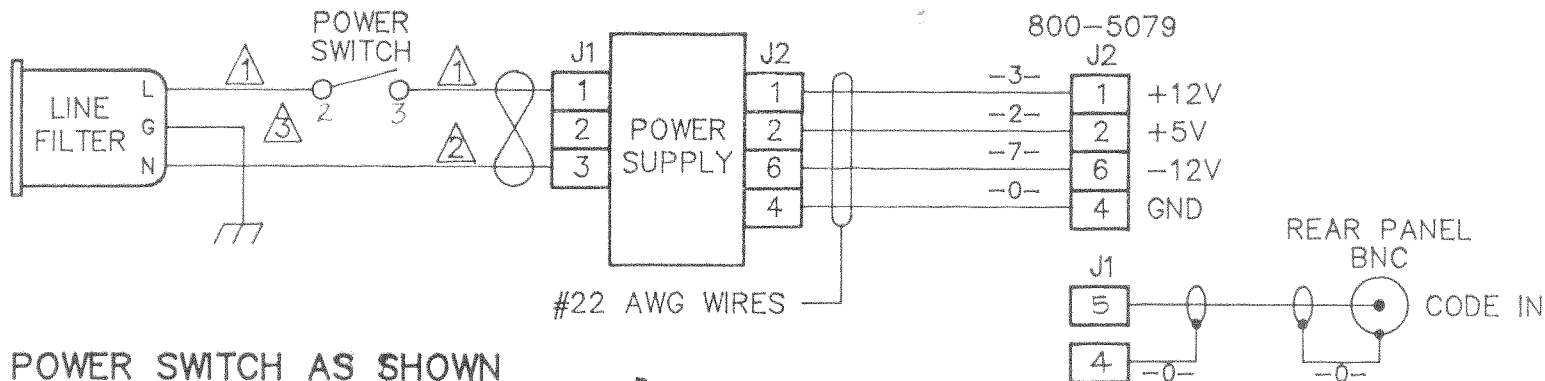
FILENAME: \820\202-2  
 DATE: 11-19-91

SIZE	CODE IDENT NO.	DRAWING NO.	REV
B		820-202	1
SCALE NONE		SHEET 2 OF 2	

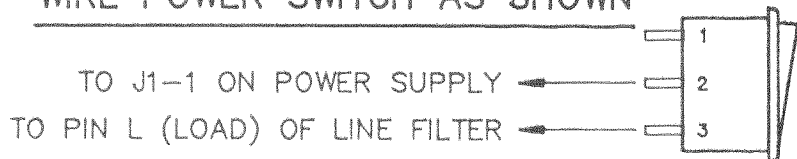
MAX \* BILL OF MATERIALS \* SINGLE-LEVEL EXPLOSION BY PART IDENTIFIER W/REFERENCE

PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF DATE	ECN #	QTY/ASSY	REV UOM LVL	REFERENCE DESCRIPTION
820-202	TCU REMOTE DISPLAY 2 IN.					EA	
0000-APPROVAL	PARTS LIST APPROVAL		000000		1.0000	EA	
0000-PL	PARTS LIST REV LEVEL		000000		1.0000	EA	REV E (01-14-99)
0000-PRINT	REFERENCE PRINT		000000		1.0000	EA	820-202 REV E
0001-PRINT	REFERENCE PRINT		000000		1.0000	EA	820-7202
240-006-003	SCREW PH PN SS 6-32X3/8	SCREW PAN	000000		4.0000	EA	10
241-006-002B	SCREW PH FH SS 6-32X1/4	SCREW FH BLACK 100 DEGREE	000000		12.0000	EA	08
251-006	NUT KEP SS 6-32 .250 HEX	KEPNUT SMALL PATTERN	000000		12.0000	EA	09
265-006	WSHR STAR SS 6 IT	STARWASHER	000000		4.0000	EA	15
283-002	PLASTIC ADHESIVE 5 OZ	3M 4475	000000		0.2500	EA	11
332-002	CORD POWER	BELDEN 17250	000000		1.0000	EA	12 SHIPPING KIT
500-202	SHIP LIST FOR 820-202	RD-2 2-INCH DISPLAY	000000		0	EA	SHIP LIST
560-3019	EPROM OR PAL PROGRAMMING		000000		1.0000	EA	14 800-5079 Z25
800-1017-1	FRONT PANEL (STD RD2)	PAINT/SCREEN	000000		1.0000	EA	04
800-1019	LENS PLASTIC	FAB	000000		1.0000	EA	05
800-1020-001	COVER TOP	FAB	000000		1.0000	EA	02
800-1020-002	COVER BOTTOM	FAB	000000		1.0000	EA	03
800-1021	RACK BRACKET	FAB	000000		2.0000	EA	06
800-1025	ASSY RD-2 REAR PNL/CHASSI		000000		1.0000	EA	01
900-1026	HANDLE ALUMINUM (RD-2)		000000		2.0000	EA	07
LA	LABOR ASSEMBLY COST HRS		000000		2.2300	EA	
LT	LABOR TEST COST HOURS		000000		1.5000	EA	

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	C	REDRAWN; 800-5079 WAS 800-5029	11-19-91	
	D	CHANGED 800-5079 J1 TERMINATION	02-14-92	<i>[Signature]</i>



**WIRE POWER SWITCH AS SHOWN**



- ③ USE TRUETIME #315-016-189UL
- ② USE TRUETIME #315-024-006UL
- ① USE TRUETIME #315-024-001UL

NOTES: UNLESS OTHERWISE SPECIFIED

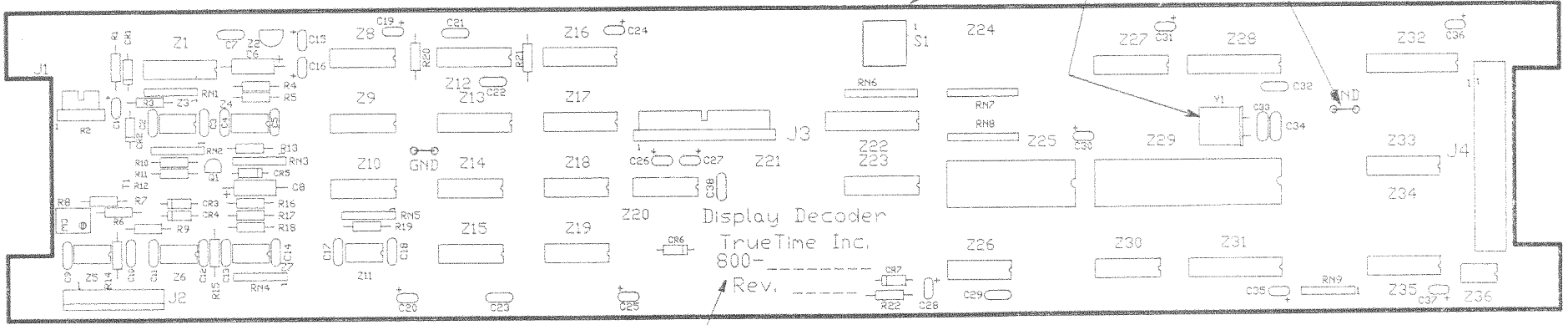
		<b>TrueTime</b> SANTA ROSA, CA	
APPROVALS		DATE	
DRAWN BY <i>[Signature]</i>		11-91	
CHECKED BY			
APPROVED BY <i>[Signature]</i>			
NEXT ASSY		SIZE	CODE IDENT NO.
		A	
		DRAWING NO.	
		820-7202	
		SCALE NONE	REV
			D
FILENAME: \820\7202		SHEET 1 OF 1	
DATE: 11-19-91			

FILENAME: \820\7202  
DATE: 11-19-91

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REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
C		REDRAWN; UPDATED PER REVISION 11/13/91 PCB (VE)	11/13/91	[Signature]
D		CHG PER ECO 117		
E		UPDATED PER ECO 618 (VE)	01/13/92	[Signature]
F		ADD ITEM 3	4-2-92	[Signature]
		UPDATED PRINT PER ECO 117		
H		ECO 902	1-23-99	[Signature]
J		ECO 114B	3-26-98	[Signature]



Display Decoder  
 TrueTime Inc.  
 800-  
 Rev. \_\_\_\_\_  
 STAMP PART N° & REV LEVEL

1. VALUES OF RESISTORS ARE IN  $\Omega$  AND CAPACITORS ARE IN  $\mu F$ .  
 NOTES: UNLESS OTHERWISE SPECIFIED

		UNLESS OTHERWISE SPECIFIED		CONTRACT NO		KINEMATRICS/TRUETIME SANTA ROSA, CA	
		DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES XX XXX		APPROVALS		DATE	
		ALL THREADS TO BE CLASS 1 PER ANSI Y14.6 MACH COR -- .005 TO .015R OR CHAM SH MATL -- BREAK EDGES .015 MAX R DIM AND TOL APPLY FIN TREAT		DRAWN BY [Signature]		11-91	
		MATERIAL		CHECKED [Signature]		11-91	
		FINISH		APPROVED [Signature]		ASSEMBLY DECODER	
NEXT ASSY		USED CN		NEXT ASSY		SIZE	CODE IDENT NO
APPLICATION		DO NOT SCALE DRAWING				B	800-5079
						DRAWING NO	
						800-5079	
						REV	
						J	
						SCALE NONE	
						SHEET 1 OF ...	

MAX \* BILL OF MATERIALS \* SINGLE-LEVEL EXPLOSION BY PART IDENTIFIER W/REFERENCE

PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF DATE	ECN #	QTY/ASSY	REV UOM LVL	REFERENCE DESCRIPTION
800-5079	ASSY DECODER					EA	
0000-APPROVAL	PARTS LIST APPROVAL		0000		1.0000	EA	<i>Cwfts 3-30-98</i>
0000-PL	PARTS LIST REV LEVEL		0000		1.0000	EA	REV J (03-26-98)
0000-PRINT	REFERENCE PRINT		0000		1.0000	EA	800-5079 REV J
0000-REV	PCB REV LEVEL HERE >>>>		0000		1.0000	EA	800-2026 REV C
002-056	RES 200 OHM 1/4W 5%	222J201	0000		1.0000	EA	R6
002-063	RES 390 OHM 1/4W 5%	R25J391	0000		2.0000	EA	R4,9
002-073	RES 1K OHM 1/4W 5%	R25J102	0000		2.0000	EA	R3,20
002-084	RES 3K OHM 1/4W 5%		0000		1.0000	EA	R18
002-097	RES 10K OHM 1/4W 5%	R25J103	0000		3.0000	EA	R1,11,17
002-101	RES 15K OHM 1/4W 5%	R25J153	0000		1.0000	EA	R7
002-105	RES 22K OHM 1/4W 5%	R25J223	0000		2.0000	EA	R13,19
002-113	RES 47K OHM 1/4W 5%	R25J473	0000		1.0000	EA	R14
002-118	RES 75K OHM 1/4W 5%	R25J753	0000		1.0000	EA	R5
002-121	RES 100K OHM 1/4W 5%	R25J104	0000		1.0000	EA	R16
002-125	RES 150K OHM 1/4W 5%	R25J154	0000		2.0000	EA	R10,15
002-129	RES 220K OHM 1/4W 5%	R25J224	0000		1.0000	EA	R22
008-1431	RES 1.43K OHM 1/8W 1%	RN55D1431FJ	0000		1.0000	EA	R21
011-077-06S	RESNET 1.5K OHM 6-P ISL	DALE CSC06A03-152G	0000		2.0000	EA	RN3,5
011-089-06C	RESNET 4.7K OHM 6-P COM	DALE CSC06A01-472G	0000		2.0000	EA	RN4,9
011-089-06S	RESNET 4.7K OHM 6-P ISL	BOURNS 4606X-102-472	0000		2.0000	EA	RN1,2
011-089-08C	RESNET 4.7K OHM 8-P COM	BOURNS 4308R-101-472	0000		1.0000	EA	RN6
011-097-08C	RESNET 10K OHM 8-P COM	DALE CSC08A01-103G	0000		2.0000	EA	RN7,8
019-008	POT 20K 20 TURN T ADJ	BECKMAN 68WR20K	0000		1.0000	EA	R8
023-010-025	CAP AE 10UF 25V A	PANASONIC ECE-B1EU100	0000		1.0000	EA	C6
023-100-035	CAP AE 100UF 35V A	PANASONIC ECE-B1VU101	0000		1.0000	EA	C8
029-014	CAP MICA 18PF V R 5%	CORNELL CD15CD180D03	0000		2.0000	EA	C33,34
032-041-025	CAP TANT 10UF 25V R		0000		1.0000	EA	C1
036-095	CAP MONO 0.1UF 100V R 20%	MURATA RPE12225U104M50V	0000		18.0000	EA	
	C2-5,7,9-14,17,18,21-23,29,32						
037-033	CAP TANT 2.2UF 35V R	NEMCO TB2.2/35 K1	0000		14.0000	EA	
	C15,16,19,20,24,25-28,30,31,35-37						
055-914A	DIODE 1V 20MA	1N914A	0000		7.0000	EA	CR1-7
059-49152	XTAL 4.9152	MTRON MP1-4.9152	0000		1.0000	EA	Y1
065-004	SWITCH DIP 4-SEC	C&K BD04	0000		1.0000	EA	S1
175-1087	XSISTOR FET P-CHANNEL	NATIONAL P1087	0000		1.0000	EA	Q1
176-082	TLO82CP DUAL OP AMP	TLO82CP	0000		2.0000	EA	Z3,4
176-231	MAX231 RS232 INTERFACE	MAXIM #MAX231	0000		1.0000	EA	Z20
176-311	LM311N VOLTAGE COMPARATOR	NATIONAL #LM311N	0000		4.0000	EA	Z5-7,11
176-40107	40107 DUAL 2-INPUT BUFFER	HARRIS CD40107BE	0000		1.0000	EA	Z36
176-63B03	63B03 PROCESSOR	HITACHI HD63B03RP	0000		1.0000	EA	Z29 SOCKETED
176-79L05	MC79L05ACP -5V REGULATOR	MC79L05ACP	0000		1.0000	EA	Z2
177-27256	CERAMIC 27C256 @ 200NS	INTEL,AMD,GI,TI,NATL ONLY	0000		1.0000	EA	Z25 SOCKETED
178-74HC00	MM74HC00N QUAD NAND GATE	MM74HC00N	0000		1.0000	EA	Z19
178-74HC08	MC74HC08 QUAD AND GATE	MC74HC08	0000		1.0000	EA	Z9
178-74HC107	74HC107 DUAL JK FLIP-FLOP	74HC107	0000		1.0000	EA	Z8

MAX \* BILL OF MATERIALS \* SINGLE-LEVEL EXPLOSION BY PART IDENTIFIER W/REFERENCE

PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF DATE	ECN #	QTY/ASSY	REV UOM LVL	REFERENCE DESCRIPTION
178-74HC138	MC74HC138 1 OF 8 DECODER	MC74HC138	0000		2.0000	EA	Z27,33
178-74HC14	74HC14 HEX SCHM INVERTER	SN74HC14N	0000		2.0000	EA	Z14,26
178-74HC173	74HC173 QUAD D FLIP-FLOP	74HC173	0000		2.0000	EA	Z17,35
178-74HC193	74HC193N UP/DN COUNTER	74HC193N	0000		1.0000	EA	Z13
178-74HC221.7	ONE SHOT TIME CONT T=.7RC	HARRIS CD74HC221	0000		1.0000	EA	Z12
178-74HC244	MC74HC244 3-STATE BUFFER	MC74HC244	0000		3.0000	EA	Z22,31,32
178-74HC245	74HC245 8 BUS XCEIVER	74HC245	0000		1.0000	EA	Z28
178-74HC390	74HC390 DUAL BI-QUINARY	74HC390	0000		1.0000	EA	Z16
178-74HC4053	74HC4053 MULTIPLEXER	74HC4053	0000		2.0000	EA	Z1,23
178-74HC74	MC74HC74 DUAL D FLIP-FLOP	MOTOROLA MC74HC74AN	0000		4.0000	EA	Z10,15,18,30
273-009	TERMINAL TEST POINT	COMP CORP PJ-201-25	0000		2.0000	EA	02
290-001	TAPE FOAM DBL SIDE.5X1/16	3M# Y-4950	0000		0.1000	SI	03 SECURE Y1 TO BOARD
379-028-001	SOCKET IC 28 PIN MACHINE	ROBINSON NUGENT ICT286STG	0000		1.0000	EA	Z25
379-040	SOCKET IC 40 PIN MACHINE	ROBINSON NUGENT ICT406STG	0000		1.0000	EA	Z29
386-341	CONN 34-P ML PC MT HDR	THOMAS & BETTS 609-3427	0000		1.0000	EA	J4
401-01-01-06	CONN 6-P PC MT STRGHT	MOLEX 26-60-4060	0000		1.0000	EA	J2
401-02-01-05	CONN 5-P PC MT RT ANGLE	MOLEX 22-05-3051	0000		1.0000	EA	J1
401-02-01-15	CONN 15-P PC MT RT ANGLE	MOLEX 22-05-3151	0000		1.0000	EA	J3
800-2026	PCB, DISPLAY DECODER		0000		1.0000	EA	01
LA	LABOR ASSEMBLY COST HRS		0000		0	EA	
LT	LABOR TEST COST HOURS		0000		0	EA	
OSV800-5079	OUTSIDE LABOR 800-5079		0000		1.0000	EA	

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3

2

1

D

C

B

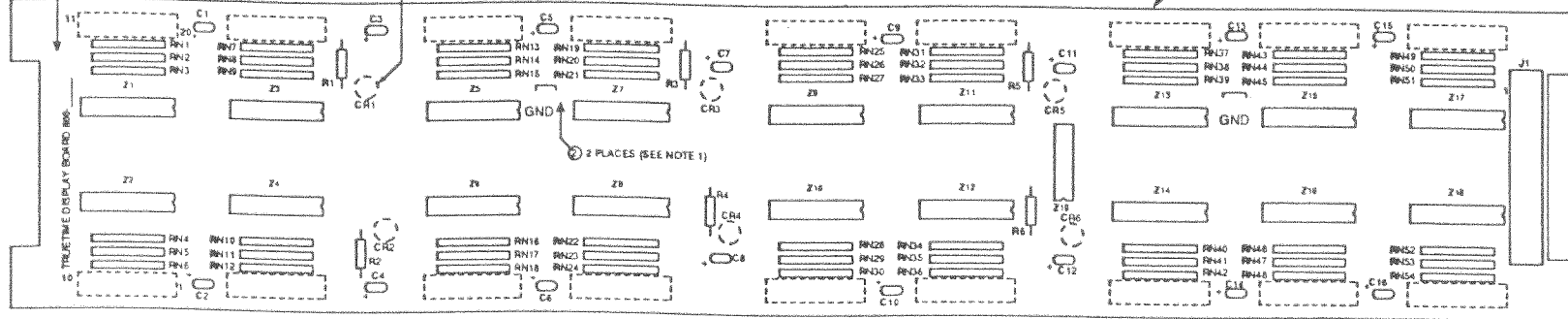
A

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	A	ADDED DETAIL-A AND ITEM 2	9-14-90	P.L.E.
	B	ADDED ITEMS 3 AND 5	12-17-90	P.L.E.
	C	CHANGE PER PCB REV A	11-18-91	<i>[Signature]</i>
	D	DELETED DETAIL-A, NOTES 2 & 3, & ITEMS 3 & 6	04-02-92	<i>[Signature]</i>

1. INSTALL GND (2 PLACES)

2. STAMP PART NUMBER AND REVISION LEVEL

CATHODE



		UNLESS OTHERWISE SPECIFIED		CONTRACT NO.		KINEMATICS/TRUETIME SANTA ROSA, CA	
		DIMENSIONS ARE IN INCHES		APPROVALS			
		TOLERANCES ARE		DRAWN BY <i>RJC</i>		<i>11/91</i>	
		FRACTIONS    DECIMALS    ANGLES		CHECKED		APPROVED	
		"                    XXX                    "		APPROVED <i>[Signature]</i>			
		ALL THREADS TO BE CLASS 2 PER ANSI Y14.6		NEXT ASSY		SIZE	
		MACH COR - .005 TO .015 R OR CHAM				CODE IDENT NO	
		SH MATL - BREAK EDGES .015 MAX R				DRAWING NO	
		DIM AND TOL APPLY FIN TREAT				800-5030	
		MATERIAL				REV	
		FINISH				D	
800-1025		RO-2				SCALE	
NEXT ASSY		USED ON				SHEET 1 OF 3	
APPLICATION		DO NOT SCALE DRAWING					

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2

1

## MAX \* BILL OF MATERIALS \* SINGLE-LEVEL EXPLOSION BY PART IDENTIFIER W/REFERENCE

PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF DATE	ECN #	QTY/ASSY	REV UDM LVL	REFERENCE DESCRIPTION
800-5030	ASSY DISPLAY	800-5030				EA	
0000-PL	PARTS LIST REV LEVEL		641		1.00	EA	REV D (04-02-92)
0000-PRINT	REFERENCE PRINT		641		1.00	EA	800-5030 REV D
0000-REV	PCB REV LEVEL HERE >>>>		641		1.00	EA	800-2009 REV A
002-068	RES 620 OHM 1/4W 5%				6.00	EA	R1-6
011-047-085	RESNET 47 OHM B-P ISL				54.00	EA	RN1-54
037-033	CAP TANT 2.2UF 35V R	PANASONIC ECS-FIVE-225K			16.00	EA	C1-16
058-005	LED RED, LG DIFFUSED LENS	HP #HLMP3002			6.00	EA	CR1-6
176-8310	DP8310N OCTAL LATCH	NATL DP8310N			18.00	EA	Z1-18
178-74HC138	MC74HC138 1 OF 8 DECODER	MC74HC138			1.00	EA	Z19
273-009	TERMINAL TEST POINT				2.00	EA	02
386-341	CONN 34-P ML PC MT HDR ^	ANSLEY 609-3427			1.00	EA	J1
800-1045	ASSY DISPLAY MODULE RD-2	800-5059			9.00	EA	04
800-2009	PCB 2 IN. DISPLAY BD				1.00	EA	01
LA	LABOR ASSEMBLY COST HRS				0.17	EA	
LT	LABOR TEST COST HOURS				0.25	EA	
DSV800-5030	OUTSIDE LABOR 800-5030				1.00	EA	



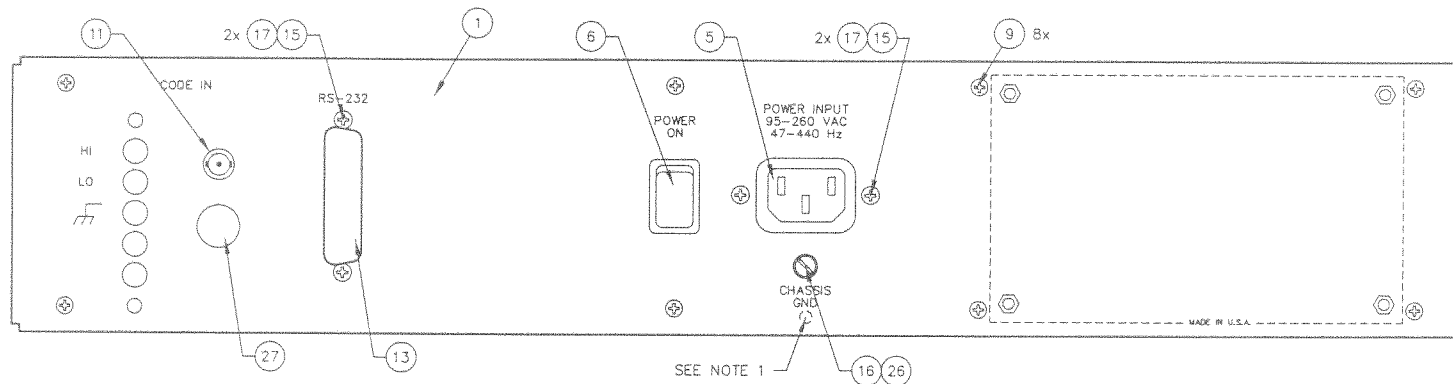
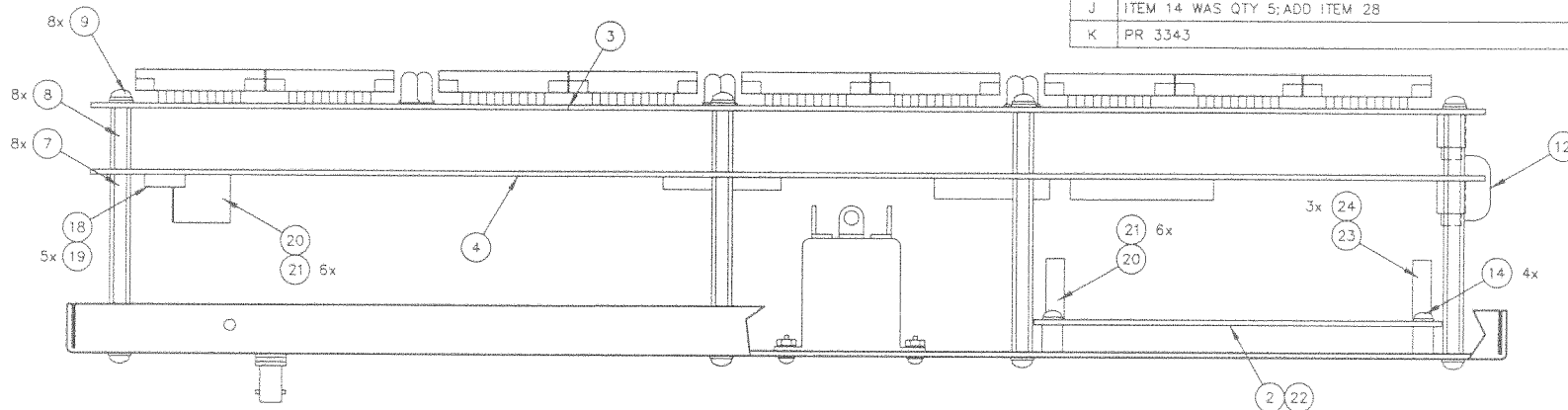
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REVISIONS

REV	DESCRIPTION	DATE	APPROVED
G	REDRAWN: MODIFIED PER ITEM 1 (REAR PANEL) REV	11-20-91	
H	UPDATED PER 800-5030 REV D; BOM CHANGED	04-02-92	
I	ADDED ITEMS 24,26&27 AND NOTE 1; DELETED ITEM 10	06-25-92	PLE
J	ITEM 14 WAS QTY 5; ADD ITEM 28	06-11-97	
K	PR 3343	10-21-99	



1. USING ITEM 28 & 25 CONNECT AC GROUND PEM PROVIDED INSIDE THE REAR PANEL

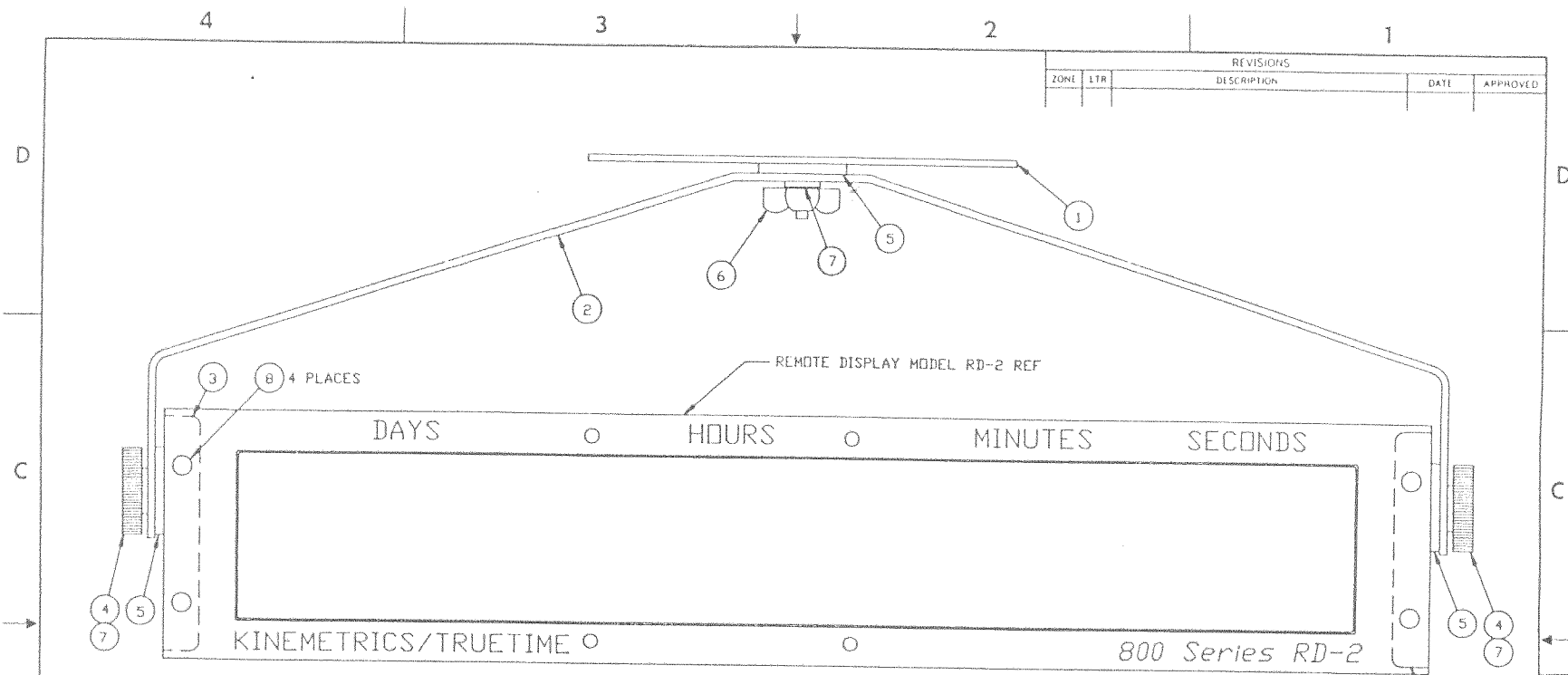
NOTES: UNLESS OTHERWISE SPECIFIED

CONTRACT NO.		 2835 DUKE CT. SANTA ROSA CA 95407	
APPROVALS	DATE		
DRAWN BY D. EDILLOR	04-94		
CHECKED BY			
APPROVED BY CK	6/97	<b>TCU TOP ASSEMBLY MODEL RD-2</b>	
NEXT ASSY			
SIZE	CODE IDENT NO.	DRAWING NO.	REV
B		800-1025	K
SCALE NONE	SHEET 1 OF 1		

FILENAME: \800\1025  
DATE: 10-21-99

MAX \* BILL OF MATERIALS \* SINGLE-LEVEL EXPLOSION BY PART IDENTIFIER W/REFERENCE

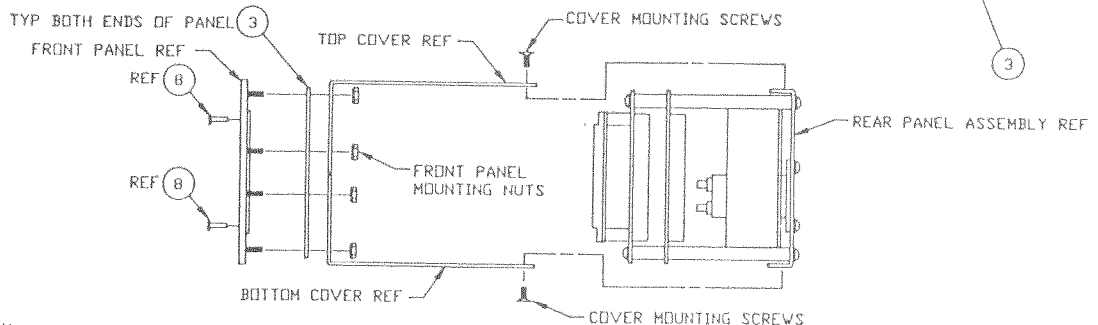
PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF DATE	ECN #	QTY/ASSY	REV UOM LVL	REFERENCE DESCRIPTION
800-1025	ASSY RD-2 REAR PNL/CHASSI					EA	
0000-APPROVAL	PARTS LIST APPROVAL		000000		1.0000	EA	<i>De 10/99</i>
0000-PL	PARTS LIST REV LEVEL		000000		1.0000	EA	REV K (10-22-99)
0000-PRINT	REFERENCE PRINT		000000		1.0000	EA	800-1025 REV K
0001-PRINT	REFERENCE PRINT		000000		1.0000	EA	820-7202
064-012	SWITCH POWER DOUBLE POLE	ALCO XRM210N00	000000		1.0000	EA	06
088-80017	PWR SUPPLY +5, +/-12V 4A	COMPUTER PROD NFS40-7628	000000		1.0000	EA	02
206-205-001	PLATE COVER D-HOLE 25-P	TT/206-205-1	000000		1.0000	EA	13
238-004-002	SCREW PH PN SEP 4-40X1/4	SCREW SEP	000000		1.0000	EA	28
238-004-003	SCREW PH PN SEP 4-40X3/8		000000		4.0000	EA	14
238-006-002	SCREW PH PN SEP 6-32X1/4	INT SEPI(STAINLESS STEEL)	000000		16.0000	EA	09
240-004-003	SCREW PH PN SS 4-40X3/8	SCREW PAN	000000		4.0000	EA	15
240-010-003	SCREW PH BH SS 10-32X3/8	AROW SBM-10F06-S-0 (NAV)	000000		1.0000	EA	16
251-004	NUT KEP SS 4-40	AROW KN-04C-S-0-M	000000		4.0000	EA	17
254-010	WSHR SPLIT SS 10	AROW LW-10N-S-0-M	000000		1.0000	EA	26
255-006-017	SPCR AL HX F-F 6-32X2-1/8	AMATOM 8234-A-0632-1B	000000		8.0000	EA	07
255-6F-6M-08	SPCR AL HX M-F 6-32 X 1	HH SMITH 8001Q	000000		8.0000	EA	08
256-004	LUG SOLDER BR 4	HH SMITH 1412-4	000000		1.0000	EA	25
274-008	PLUG HOLE NY .437 DIA.	TROMPETER HP-437	000000		1.0000	EA	27
315-016-189UL	WIRE 16 AWG GR/YLW UL1015	BELDEN 8917-189	000000		0.6700	FT	LNTH=8 IN. CHASSIS GND
315-024-001UL	WIRE 24 AWG BROWN UL1015	BELDEN 9924-1	000000		3.0000	FT	LENGTH = 36 IN. LOAD
315-024-006UL	WIRE 24 AWG BLUE UL1015	BELDEN 9924-6	000000		3.0000	FT	LENGTH = 36 IN. NEUTRAL
342-001	SOCKET POWER & LINE FLTR	CORCOM 6EF1	000000		1.0000	EA	05
375-013	CONN BNC FM BULKHD INSUL	AMPHENOL 31-10	000000		1.0000	EA	11
400-009	CAUTION DANGEROUS VOLTAGE	2.5 X .75 YLW VINYL/BLKTX	000000		1.0000	EA	22 AFFIX TO POWER SUPPLY
402-001	PIN 22-30 AWG MINI-KK	MOLEX 08-65-0805	000000		5.0000	EA	19
402-006	PIN 22-26 AWG STD-KK	MOLEX 08-50-0108	000000		12.0000	EA	21
402-007	PIN 18-24 AWG STD-KK	MOLEX 08-50-0106	000000		3.0000	EA	24
403-003	CONN 3-P CBL MT LCK .156	MOLEX 09-50-3031	000000		1.0000	EA	23
403-006	CONN 6-P CBL MT LCK .156	MOLEX 09-50-3061	000000		2.0000	EA	20
403-01-01-05	CONN 5-P CABLE MOUNT LCK	MOLEX 22-01-3057	000000		1.0000	EA	18
800-1018	REAR PANEL	800-1018	000000		1.0000	EA	01
800-5030	ASSY DISPLAY	800-5030	000000		1.0000	EA	03
800-5079	ASSY DECODER		000000		1.0000	EA	04
900-1020	ASSY CABLE 34-P 2-CONN	SEE PART NOTES (BCM NAV)	000000		1.0000	EA	12
LA	LABOR ASSEMBLY COST HRS		000000		1.1700	EA	
LT	LABOR TEST COST HOURS		000000		0	EA	
OSV800-1025	OUTSIDE LABOR 800-1025		000000		1.0000	EA	



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

**KIT ASSEMBLY PROCEDURE:**

1. REMOVE THE TWELVE MOUNTING SCREWS FROM THE TOP AND BOTTOM COVERS. THEN PULL OUT THE REAR PANEL AND SET IT ASIDE.
2. REMOVE THE TWELVE FRONT PANEL MOUNTING NUTS. THEN REMOVE THE TOP AND BOTTOM COVERS FROM THE FRONT PANEL ASSEMBLY, SET THEM ASIDE.
3. REMOVE THE PANEL MOUNTING BRACKETS & HANDLES FROM BOTH ENDS OF THE FRONT PANEL, REPLACE THEM WITH PANEL SHIMS (ITEM 3). INSTALL THE PLASTIC RIVETS (ITEM 8) IN THE HANDLE MOUNTING HOLES. REASSEMBLE THE COVERS & REAR PANEL ASSEMBLY TO THE FRONT PANEL.
4. INSTALL THE MOUNTING BRACKET (ITEM 2) ON THE TOP COVER BY PLACING THE FIBER WASHER (ITEM 5) BETWEEN THE BRACKET AND THE TOP COVER. THEN PLACE THE FLAT-WASHER (ITEM 7) ON THE CLAMPING KNOB (ITEM 4) AND PLACING THEM THROUGH THE HOLES IN THE MOUNTING BRACKET AND FIBER WASHER, SCREW THE KNOB INTO THE SIDE OF THE TOP COVER (TYPICAL BOTH ENDS).
5. USE THE SAME PROCEDURE TO SECURE THE MOUNTING PLATE (ITEM 1) TO THE MOUNTING BRACKET (ITEM 2), USING THE WING NUT (ITEM 6).
6. THE MOUNTING PLATE MAY BE SECURED TO THE WALL OR CEILING USING # 10 SCREWS OR BOLTS.



A

UNLESS OTHERWISE SPECIFIED		CONTRACT NO.		KINEMATRICS/TRUETIME SANTA ROSA, CA	
DIMENSIONS ARE IN INCHES FRACTIONS DECIMALS ANGLES XX.X .1 .1 .1		APPROVALS		DATE	
ALL THREADS TO BE CLASS 2 PER ANSI Y14.6 MATCH COB = ISO TO OSHA OR CHINA SH MATL - BLEAR EDGES O15 MAX R DW AND FOR APPLY TO TREAT		DRAWN BY JOHNSON		5-89	
MATERIAL		CHECKED		8-89	
FINISH		APPROVED		[Signature]	
NEXT ASSY		NEXT ASSY		SIZE CODE IDENT NO DRAWING NO	
USED ON		NEXT ASSY		c 56738 800-1026	
APPLICATION		DO NOT SCALE DRAWING		SCALE FULL SHEET 1 of 1	

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## MAX \* BILL OF MATERIALS \* SINGLE-LEVEL EXPLOSION BY PART IDENTIFIER W/REFERENCE

PART IDENTIFIER	DESCRIPTION	EFF		QTY/ASSY	UOM	REFERENCE DESCRIPTION
		DATE	ECN #			
800-1026	KIT REMOTE MOUNTING OPT				EA	
0000-PL	PARTS LIST REV LEVEL			1.0000	EA	REV A
0000-PRINT	REFERENCE PRINT			1.0000	EA	800-1026 REV A
234-002	RIVET #6			4.0000	EA	08
252-.250WN	NUT WING 1/4-20			1.0000	EA	06
253-.250	FLTWHR #4 SM PATTERN SS			3.0000	EA	07
257-.250	WASHER FIBER 1/4IDX1.125			3.0000	EA	05
380-006	KNOB CLAMP TYPE PLSTC BLK			2.0000	EA	04
800-1022	PLATE			1.0000	EA	01
800-1023	BRACKET			1.0000	EA	02
800-1024	SPACER RD-2 FRONT			2.0000	EA	03
LA	LABOR ASSEMBLY COST HRS			0.3100	EA	
LT	LABOR TEST COST HOURS			0	EA	