

**Model 820-210
RD-1
Remote Time Display**

SERIAL NUMBER _____
September 27, 2000
Revision H

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

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	820-210	Top Assembly
	800-5027	1-Inch Display Assembly
	800-5079	1-Inch Decoder Assembly
	800-5079-2	Decoder Mod. Parts List

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 a TrueTime model RD-1 Remote 1 Inch Time Display.

1.2 PURPOSE OF EQUIPMENT

The RD-1 Remote Time Display is designed around a versatile microprocessor. This instrument is used to translate and display time codes.

1.3 PHYSICAL SPECIFICATIONS

The physical specifications of the RD-1 are:

Height	3.47" (8.81 cm)
Width	17.00" (43.18 cm) without mounting knobs.
Depth	3.88" (9.84 cm) plus handles and connectors
Weight	Approximately 5 pounds (2.25 Kg)
Finish	FED-STD-595A GRAY, (26492)

1.4 ENVIRONMENTAL SPECIFICATIONS

The RD-1 is designed to operate over a wide ambient temperature range. The temperature specifications are:

Operating	0 to +50 degrees C (+32 to +122 degrees F)
Storage	-40 to +70 degrees C (-40 to +158 degrees F)
Humidity	0 to 95% relative, non-condensing
Cooling	convection

1.5 POWER REQUIREMENTS

The input power specifications are:

Voltage	95 to 260 VAC
Frequency	47 Hz to 440 Hz
Power	Approximately 20 Watts
Fuse	3AG 1 Amp slow blow

1.6 SIGNAL SPECIFICATIONS

Code Formats	IRIG-B120, FDME/BUDX, KSC/MILA
Bandwidth	100Hz to 2KHz
Amplitude	0.3 to 12vpp
Ratio	2:1 to 6:1
Impedance	600 Ohm
Direction	Forward only
Polarity	Positive or negative
Connector (J1)	Twinax - TRB 3-lug, Trompeter BJ-77 Mate - PI-75
Connector (TB-1)	5 contact barrier strip Contact 1 - Signal Contact 2 - Signal return Contact 3 - Chassis ground
Connector (J5)	Female Insulated BNC

1.7 DISPLAY SPECIFICATIONS

Display Digits	7-segment LED
Number of Digits	12
Digit Size	1 inch
Lens	Red Filter
Format	See Table 1-1

Table 1-1

Character Position >>>	12	11	10	9	8	7	6	5	4	3	2	1
IRIG B	D	D	D		H	H		M	M		S	S
MILA-KSC (Normal)	-	D	D		H	H		M	M		S	S
MILA-KSC (Accum Sec)	-		S	S	S	S	S	S	S			
FDME-BUDX (Normal)	-			M	M	M		S	S			
FDME-BUDX (Accum Sec)	-				S	S	S	S	S			

Automatic Code Translation

The RD-1 automatically recognizes and displays IRIG B, MILA-KSC and FDME-BUDX codes.

Automatic Display Blanking

The RD-1 display will automatically blank when the input signal amplitude is less than 0.3 volts peak-to-peak.

Display Intensity

The display intensity is continuously adjustable via the front panel adjustment pot.

Manual Display Blanking

The user may blank the display via a contact closure on the rear panel connector (see Remote Control Interface description, section 1.8).

Count Down Code Processing

The count codes (MILA/BUDX) exhibit the following characteristics:

Counting - The count normally counts up (becomes more positive) or may be in a hold (no change).

Count Recycle - A count may be recycled to a new value. Verification of the new value is required by the reception of a minimum of two coherent frames of code.

Short Count Frame - The RD-1 display will accept truncated frames when reading FDME/BUDX code. A new frame may be accepted on or after the fiftieth carrier cycle of the previous count frame.

First Motion - When the count is within plus or minus 10 seconds of zero, the RD-1 will accept a "jammed" count of zero time.

Display Freeze - When a non-continuous time frame is received the last time accepted by the RD-1 will remain displayed ("frozen"). Each new frame of time will be processed to determine if it is a valid value. A time frame is considered valid if it meets the following criteria.

1. The time frame received is the same as or 1 count in advance of the last frame received.
2. The frame received is equal to the last valid frame or any value that could be expected depending on the number of bad frames that have been received. This means that if two invalid frames were received the next frame is valid if it is any value between the last valid time and the last valid time plus three.

1.8 REMOTE CONTROL INTERFACE

This unit provides for the remote selection of the following:

FDME/BUDX time format

Contact open	minutes and seconds
closed	straight seconds

KSC/MILA time format

Contact open	days, hours, minutes, seconds
closed	straight seconds

Display blanking when contact closed

Selection is made by switching the appropriate pin to common.

Connector (J3)	14-pin (Amphenol 57-40140) (Mate - Amphenol 57-30140)
Pinout	
Pin 1	ETR FDME/BUDX
Pin 2	N.U.
Pin 3	KSC/MILA
Pin 4	Common
Pin 5	Display Blanking
Pins 6 through 14	N.U.

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.

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

2.3 OPERATION, GENERAL INFORMATION

Connect input code to either the rear-panel twinax connector or the rear-panel barrier strip. Press the top of the rear-panel mounted POWER switch. The numeric display will first illuminate all display segments. At the end of the initialization sequence, the display shows time translated from the input code. If no input code is present, the display will blank.

2.4 OPERATION, DETAILED INFORMATION

The RD-1 will automatically determine the time code format (IRIG-B120, FDME/BUDX or KSC/MILA). If the time code is unreadable, the display will show all eights.

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 drawings found in SECTION FIVE.

CIRCUIT BOARD DESCRIPTION

800-5027

1.0 General_Description

The 800-5027 Assembly stores and displays the LED segment-driver data that the Processor generates.

2.0 Detailed_Description

Reference drawing 800-5027, sheets 2 and 3. The processor converts the number that is to be displayed into the segments that must be illuminated to form that number. For example, to display a "7" in the units-of-seconds position segments A, B and C are written into Z15. Latches Z2 through Z15 have high current outputs. Decoder Z1 enables the appropriate latch.

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

800-5079-1

1.0 General Description

The 800-5079-1 Assembly is an 800-5079 Decoder Assembly modified to permit daisy chaining of the RS-232 input.

2.0 Detailed Description

Reference drawing 800-5079-1, sheet 1. The input RXD is tied to the output TXD on the TTL side of the RS-232 Interface IC.

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 preventative 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 cards 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 drawings provided 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 countersunk screws from the case which hold the spacers to the case. Lift the circuit card and its spacers from the case. Reinstall the circuit cards in the same position 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.

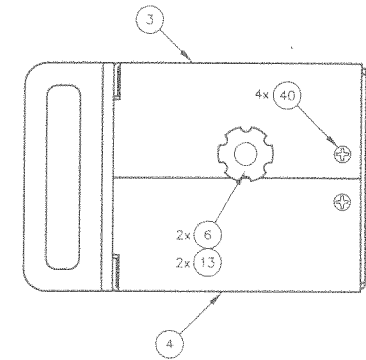
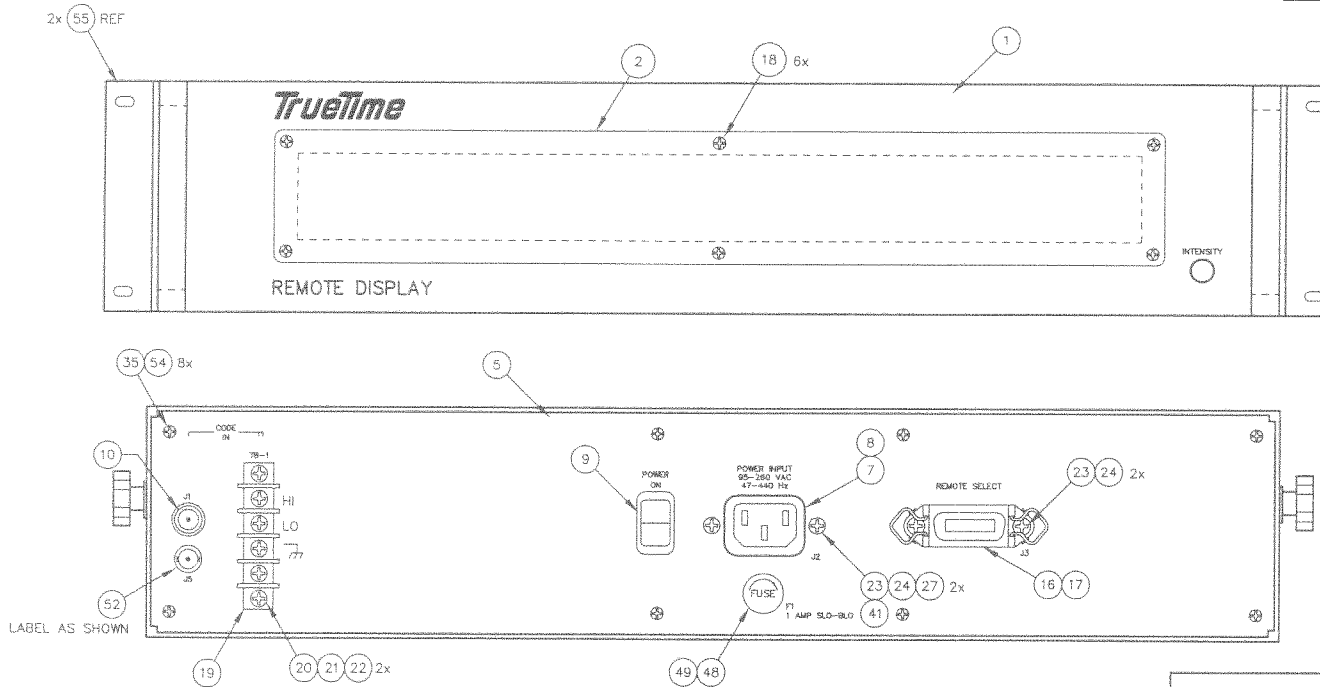
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REVISIONS

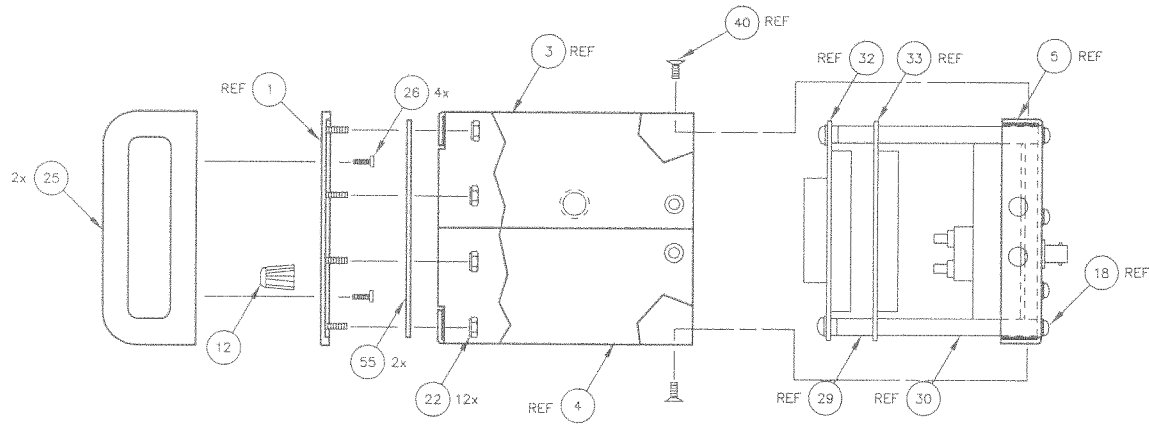
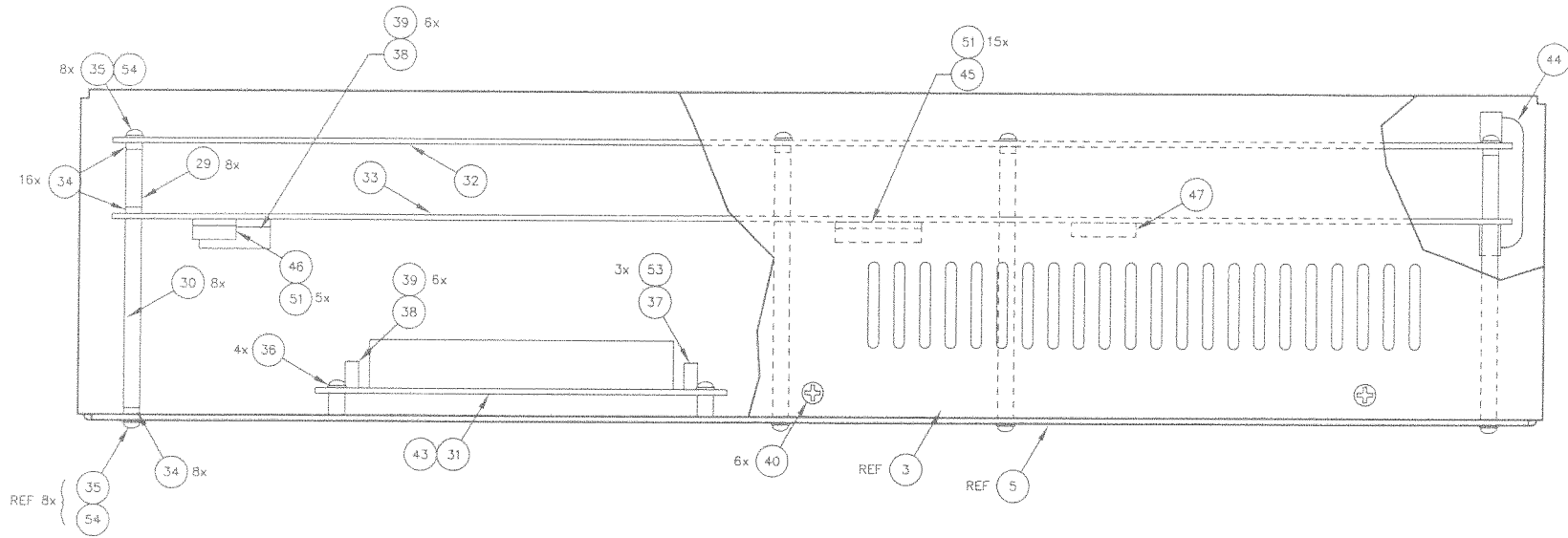
REV	DESCRIPTION	DATE	APPROVED
A	UPDATED PER ECO 565	7-9-91	PLE
B	ITEM 18 WAS 249-001; ITEM 28 WAS 800-1021; ADDED ITEMS 13 & 33	9-6-91	PLE
C	CHANGED COMPANY LOGO	4-8-92	MT
D	CHANGED POWER SUPPLY ORIENTATION; ADDED ITEM 53	3-1-93	MT
E	REDRAWN & ADDED ITEM 54	4-18-95	DR
F	ADDED BNC J5	3-19-96	
G	CAR 1023	10-8-98	RB
H	ADD SHEET 3; ADD WIRE TO B.O.M.	03-22-99	SK/DR
J	CAR 1404; CAR 1530; PR 3799	11-16-99	DR
K	ECO 1326, PR 4740 & PR 4763	04-11-00	PLE



1. WIRE PER WIRING DIAGRAM ON SHEET 3.
NOTES: UNLESS OTHERWISE SPECIFIED.

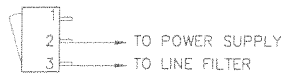
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DATE: 04-11-00

APPROVALS		DATE	 <small>"Where Customer Satisfaction is our Highest Priority" 2835 Duke Ct. Santa Rosa, CA 95407</small>	
DRAWN BY D.EDILLOR		4-91		
CHECKED BY				
APPROVED BY RB		10-98		
NEXT ASSY			SIZE B	CODE IDENT NO. 820-210
			DRAWING NO.	REV K
			SCALE NONE	SHEET 1 OF 3

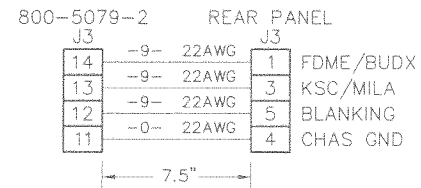
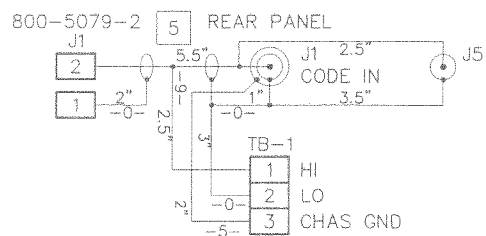
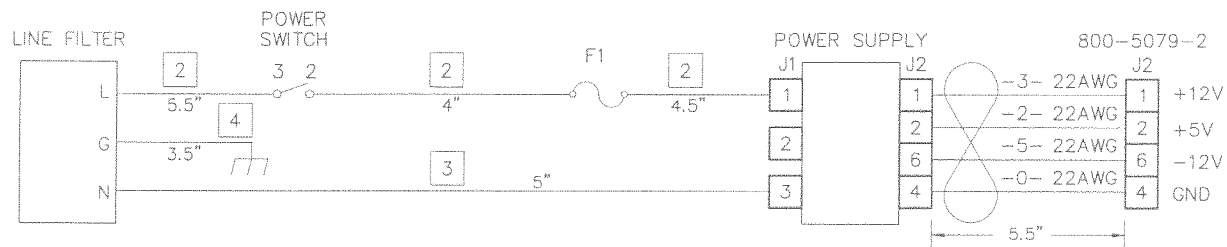


TrueTime [®]			
<small>"Where Customer Satisfaction is our Highest Priority"</small>			
<small>2835 Duke Ct. Santa Rosa, CA 95407</small>			
SIZE	CODE IDENT NO.	DRAWING NO.	REV
B		820-210	K
SCALE NONE		SHEET 2 OF 3	

FILENAME: \820\210B
 DATE: 04-11-00



WIRE SWITCH AS SHOWN



5 USE #337-004

4 USE #315-016-189UL

3 USE #315-024-006UL

2 USE #315-024-001UL

NOTES: (CONTD)

FILENAME: \820\210C
DATE: 04-11-00

TrueTime <small>"Where Customer Satisfaction is our Highest Priority" 2835 Duke Ct. Santa Rosa, CA 95407</small>			
SIZE	CODE IDENT NO.	DRAWING NO.	REV
B		820-210	K
SCALE NONE		SHEET 3 OF 3	

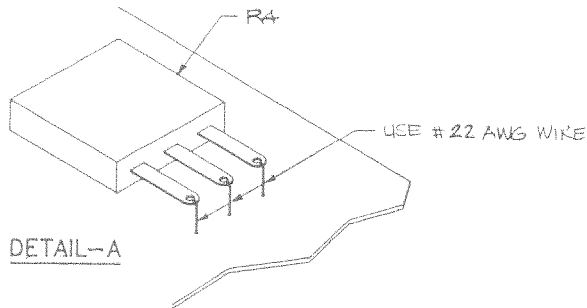
MAX * BILL OF MATERIALS * SINGLE-LEVEL EXPLOSION BY PART IDENTIFIER W/REFERENCE

PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF DATE	ECN #	QTY/ASSY	UOM	REV LVL	REFERENCE DESCRIPTION
820-210	TCU RD-1 DISPLAY						EA	
0000-APPROVAL	PARTS LIST APPROVAL		000000		1.0000	EA		RB 5-12-00
0000-PL	PARTS LIST REV LEVEL		000000		1.0000	EA		REV K (05-11-00)
0000-PRINT	REFERENCE PRINT		000000		1.0000	EA		820-210 REV K
064-012	SWITCH POWER DOUBLE POLE	ALCO XRM210N00	000000		1.0000	EA		09
088-80017	PWR SUPPLY +5, +/-12V 4A	ARTESYN NFS40-7628	000000		1.0000	EA		31
238-004-002	SCREW PH PN SEP 4-40X1/4	SCREW SEP	000000		4.0000	EA		36
240-004-004	SCREW PH PN SS 4-40X1/2	SCREW PAN	000000		4.0000	EA		23
240-006-003	SCREW PH PN SS 6-32X3/8	SCREW PAN	000000		4.0000	EA		26
240-006-004	SCRW PAN PH SS 6-32X1/2IN	SCREW PAN	000000		16.0000	EA		35
240-006-006	SCREW PH PN SS 6-32X3/4	SCREW PAN	000000		2.0000	EA		20
241-006-002	SCREW PH FH SS 6-32X1/4	BUY/USE ONLY 100 DEGREE	000000		10.0000	EA		40
243-004-.312	SCREW PH OH 4-40X.312		000000		6.0000	EA		18
251-004	NUT KEP SS 4-40	AROW KN-04C-S-0-M	000000		4.0000	EA		24
251-006	NUT KEP SS 6-32 .250 HEX	KEPNUT SMALL PATTERN	000000		14.0000	EA		22
253-006	WSHR, FLAT #6 SS .267 OD	SMALL PATTERN	000000		2.0000	EA		21
255-006-018	SPCR HEX ALU 6-32X2-1/4	RAF# 2130-632-A-0	000000		8.0000	EA		30
255-6F-6M-06	SPCR HEX ALU M-F 6-32X3/4		000000		8.0000	EA		29
256-004	LUG SOLDER BR 4	HH SMITH 1412-4	000000		1.0000	EA		41
257-.250	WASHER FIBER 1/4IDX1.125	SEASTROM 5602-41-12S	000000		2.0000	EA		13
265-004	WSHR STAR SS 4 IT	STARWASHER	000000		2.0000	EA		27
265-006	WSHR STAR SS 6 IT	STARWASHER	000000		16.0000	EA		54
289-006	WSHR FLT NYL 6 1/16 .310D	AROW NFW-06-062	000000		24.0000	EA		34
315-016-189UL	WIRE 16 AWG GR/YLW UL1015	BELDEN 8917-189	000000		0.5000	FT		SEE WIRING
315-022-002	WIRE 22AWG PVC INS RED	UL1429-22/7-2	000000		0.5000	FT		SEE WIRING
315-022-003	WIRE 22AWG PVC INS ORANGE	UL1429-22/7-3	000000		0.5000	FT		SEE WIRING
315-022-005	WIRE 22AWG PVC INS GREEN	UL1429-22/7-5	000000		0.7500	FT		SEE WIRING
315-022-009	WIRE 22AWG PVC INS WHITE	UL1429-22/7-9	000000		2.2500	FT		SEE WIRING
315-022-010	WIRE 22AWG PVC INS BLACK	UL1429-22/7-0	000000		2.0000	FT		SEE WIRING
315-024-001UL	WIRE 24 AWG BROWN UL1015	BELDEN 9924-1	000000		1.2500	FT		SEE WIRING
315-024-006UL	WIRE 24 AWG BLUE UL1015	BELDEN 9924-6	000000		0.5000	FT		SEE WIRING
332-002	CORD POWER	BELDEN 17250	000000		1.0000	EA		08 SHIPPING KIT
337-004	COAX WHITE RG188	RG188 A/U	000000		0.7500	FT		SEE WIRING
342-001	SOCKET POWER & LINE FLTR	CORCOM 6EF1	000000		1.0000	EA		07
363-1.0SB	FUSE 3AG 1A SB #313001	LITTELFUSE 313001	000000		1.0000	EA		48
365-001	HOLDER FUSE	LITTELFUSE 342-014	000000		1.0000	EA		49
372-14P	CONN 14-P ML RIBBON	AMPHENOL #57-30140	000000		1.0000	EA		16 SHIPPING KIT
372-14S	CONN 14-P FM RIBBN S/TAIL	AMPHENOL #57-40140	000000		1.0000	EA		17
373-004	BARRIER STRIP 4 TERM	BEAU VERNITRON 72204	000000		1.0000	EA		19
375-014	CONN FM BULKHD RECP INSUL	KINGS KC-79-302-M06	000000		1.0000	EA		52
375-BJ77	CONN TWINAX BULKHD 3 LUG	TROMPETER BJ77	000000		1.0000	EA		10
375-PL75	CONN CABLE PLUG MATE	TROMPETER PL75-8	000000		0	EA		REF FOR CUSTOMER ONLY
380-006	KNOB CLAMP TYPE PLSTC	ASM #63378-R-8L	000000		2.0000	EA		06
380-007	KNOB .5 OD .25 HOLE	ALCOKNOB #KLN-500A-1/4	000000		1.0000	EA		12
400-009	CAUTION DANGEROUS VOLTAGE	2.5 X .75 YLW VINYL/BLKTX	000000		1.0000	EA		43 AFFIX TO PWR SUPPLY
402-001	PIN 22-30 AWG MINI-KK	MOLEX 08-65-0905	000000		20.0000	EA		51

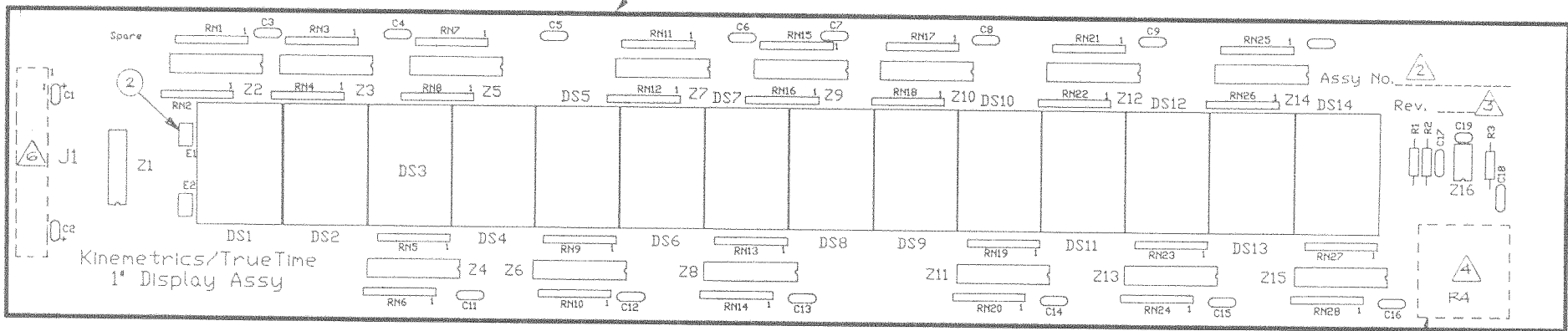
MAX * BILL OF MATERIALS * SINGLE-LEVEL EXPLOSION BY PART IDENTIFIER W/REFERENCE

PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF	ECN #	QTY/ASSY	REV		REFERENCE DESCRIPTION
			DATE			UOM	LVL	
402-006	PIN 22-26 AWG STD-KK	MOLEX 08-50-0108	000000		12.0000	EA	39	
402-007	PIN 18-24 AWG STD-KK	MOLEX 08-50-0106	000000		3.0000	EA	53	
403-003	CONN 3-P CBL MT LCK .156	MOLEX 09-50-3031	000000		1.0000	EA	37	
403-006	CONN 6-P CBL MT LCK .156	MOLEX 09-50-3061	000000		2.0000	EA	38	
403-01-01-05	CONN 5-P CABLE MOUNT LCK	MOLEX 22-01-3057	000000		1.0000	EA	46	
403-01-01-15	CONN 15-P CABLE MOUNT LCK	MOLEX 22-01-3157	000000		1.0000	EA	45	
560-3026	EPROM PROGRAMMING		000000		1.0000	EA	47	
800-1057	FRONT PANEL RD-1		000000		1.0000	EA	01	
800-1058	REAR PANEL RD-1		000000		1.0000	EA	05	
800-1059-001	COVER TOP RD-1		000000		1.0000	EA	03	
800-1059-002	COVER BOTTOM RD-1		000000		1.0000	EA	04	
800-1060	LENS 1 IN, DISPLAY	CUSTOM PROF. PLASTICS	000000		1.0000	EA	02	
800-1061	BRKT RACK MT EARS RD-1	FAB	000000		2.0000	EA	55	
800-5027	ASSY RD-1 DISPLAY		000000		1.0000	EA	32	
800-5079-2	ASSY DECODER + XFRMR	MOD TO 800-5079	000000		1.0000	EA	33	
900-1020	ASSY CABLE 34-P 2-CONN		000000		1.0000	EA	44	
900-1026	HANDLE ALUMINUM (RD-2)		000000		2.0000	EA	25	
LA	LABOR ASSEMBLY COST HRS		000000		0	EA		
LT	LABOR TEST COST HOURS		000000		0	EA		

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REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
A		ADDED NOTE G; ADDED Z16	5/15/91	PRZ
B		ADDED DETAIL-A	7/09/91	PRZ
C		DELETED DS1 & DS14 FROM BOM	03/16/92	PRZ
D		UPDATED PRINT PER 800-5027 REV B	06/30/93	PRZ
E		CAR 1114	12/14/98	RB



SEE DETAIL-A

- ④ INSTALL J1 ON SOLDER SIDE OF THE BOARD.
 - ⑤ INSTALL JUMPER (ITEM 2) ON E1 FOR RED DISPLAY. (MOVE ITEM 2 TO E2 FOR GREEN DISPLAY)
 - ④ INSTALL R4 ON SOLDER SIDE OF THE BOARD.
 - ③ STAMP ASSY REVISION LEVEL.
 - ② STAMP ASSY PART NUMBER.
 - 1. VALUES OF RESISTORS ARE IN OHMS AND CAPACITORS ARE IN μ f.
- NOTES: UNLESS OTHERWISE SPECIFIED

		UNLESS OTHERWISE SPECIFIED		CONTRACT NO.		KINEMATICS/TRUETIME SANTA ROSA, CA	
		DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES XX ± .XX ± °		APPROVALS			
		ALL THREADS TO BE CLASS 2 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 <i>PRZ</i>		2-91	
		MATERIAL		CHECKED <i>PRZ</i>		3-91	
		FINISH		APPROVED <i>PRZ</i>		4-91	
NEXT ASSY		USED ON		NEXT ASSY		SIZE	
APPLICATION		DO NOT SCALE DRAWING				CODE/IDENT NO	
						DRAWING NO.	
						800-5027	
						REV.	
						E	
				SCALE NONE		SHEET 1 OF 1	

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

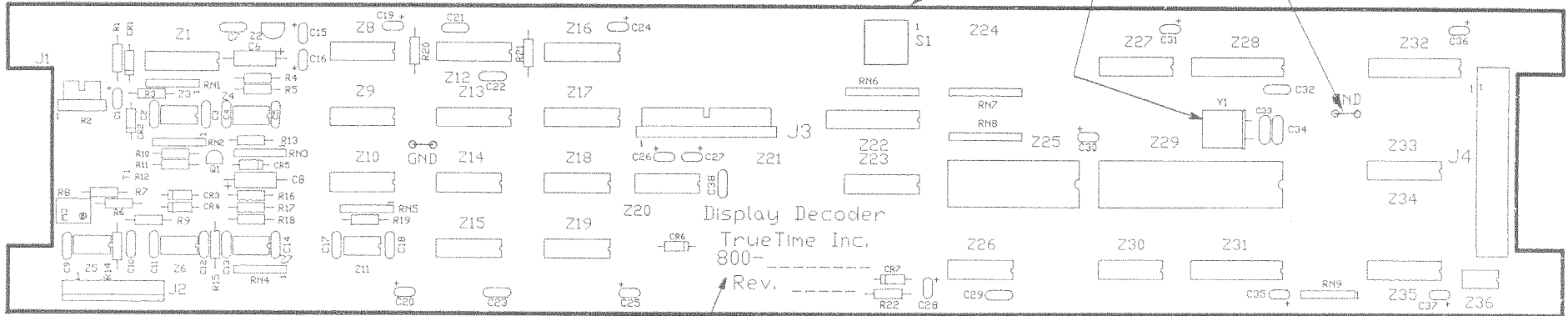
PART IDENTIFIER	DESCRIPTION 1	DESCRIPTION 2	EFF DATE	ECN #	QTY/ASSY	REV UOM LVL	REFERENCE DESCRIPTION
800-5027	ASSY RD-1 DISPLAY					EA	
0000-APPROVAL	PARTS LIST APPROVAL		000000		1.0000	EA	<i>RB 12-98</i>
0000-PL	PARTS LIST REV LEVEL		000000		1.0000	EA	REV E (12-15-98)
0000-PRINT	REFERENCE PRINT		000000		1.0000	EA	800-5027 REV E
0000-REV	PCB REV LEVEL HERE >>>>		000000		1.0000	EA	800-2027 REV B
002-090	RES 5.1K OHM 1/4W 5%	R25J512	000000		3.0000	EA	R1,2,3
011-150-08S	RESNET 150 OHM 8-P ISL	BOURNS 4608X-102-151	000000		28.0000	EA	RN1-28
020-014	POT 100K 1 TURN T ADJ	BOURNS PCW1J-B24-CEB-104	000000		1.0000	EA	R4
036-083	CAP MONO 0.01UF 50V R	MURATA RPE110X7R103K50V	000000		1.0000	EA	C19
036-095	CAP MONO 0.1UF 50V R 20%	MURATA RPE122Z5U104M50V	000000		16.0000	EA	C3-18
037-033	CAP TANT 2.2UF 35V R	NEMCO TB2.2/35 K1	000000		2.0000	EA	C1,2
176-1455	MC1455 TIMING CIRCUIT	MOTOROLA MC1455P1	000000		1.0000	EA	Z16
176-8310	DP8310N OCTAL LATCH	NATL DP8310N	000000		14.0000	EA	Z2-15
178-74HC138	MC74HC138 1 OF 8 DECODER	74HC138	000000		1.0000	EA	Z1
189-019	DISPLAY 7-SEG 1INCH R	STANLEY ELECTRIC #NARG105	000000		12.0000	EA	DS2-13 STRIP SOCKETED
305-022	WIRE 22AWG BUS BAR	BELDEN #8021	000000		0.5000	FT	SEE DETAIL A ON DWG
318-025	SOCKET STRIP 20 CON. DS1-14 USE AS NEEDED, CUT TO FIT.	AUGAT 510-AG91D-20	000000		10.0000	EA	800-5027A
386-341	CONN 34-P ML PC MT HDR	THOMAS & BETTS 609-3427	000000		1.0000	EA	J1
401-01-01-34	CONN 36-P HDR SNGL RW W/W 3M	929834-01-36	000000		1.0000	EA	E1,E2 CUT TO FIT
403-000LP	JUMPER FEMALE LOW PROFILE	SAMTEC SNT-100-BK-T	000000		1.0000	EA	02 INSTALL ON E1
800-2027	PCB DISPLAY 1 IN.		000000		1.0000	EA	01
LA	LABOR ASSEMBLY COST HRS		000000		0	EA	
LT	LABOR TEST COST HOURS		000000		0	EA	
OSV800-5027	OUTSIDE LABOR 800-5027	OSV-RD-1 DISPLAY PCA	000000		1.0000	EA	

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REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVED
C		REDRAWN; UPDATED PER REVISION (VE)	11/13/01	DRB
D		CHG PER ECO 619	12-6-01	DR
E		UPDATED PER ECO 618 (VE)	01/13/02	DR
F		ADD ITEM 3	4-2-02	DR
G		UPDATED YUNT PER ECO 618	07-22-03	DR
H		ECO 902	1-23-95	DR
I		ECO 1148	3-26-98	DR



STAMP PART N^o & REV LEVEL

1. VALUES OF RESISTORS ARE IN Ω AND CAPACITORS ARE IN μF .
 NOTES: UNLESS OTHERWISE SPECIFIED

		UNLESS OTHERWISE SPECIFIED <small>DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES </small>	CONTRACT NO	KINEMATICS/TRUETIME SANTA ROSA, CA	
		ALL THREADS TO BE CLASS 2 PER ANSI Y14.6 MACH COR -- .005 TO .015R OR CHAM SH MATL -- BREAK EDGES .015 MAX R DIM AND IOL APPLY FIN TREAT	APPROVALS	DATE	ASSEMBLY DECODER
		MATERIAL	DRAWN BY <i>DRB</i>	11-01	
		FINISH	CHECKED <i>DRB</i>	11-01	
NEXT ASSY	USED ON		APPROVED <i>DRB</i>		SIZE
APPLICATION		DO NOT SCALE DRAWING	NEXT ASSY		CODE IDENT NO
					800-5079
					DRAWING NO
					J
					REV
					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	UOM	REV LVL	REFERENCE DESCRIPTION
800-5079	ASSY DECODER						EA	
0000-APPROVAL	PARTS LIST APPROVAL		0000		1.0000		EA	<i>Curtis 3-30-9</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 RPE122Z5U104M50V	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 UOW 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	

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
800-5079-2	ASSY DECODER + XFMR	MOD TO 800-5079				EA	
0000-PL	PARTS LIST REV LEVEL				1.0000	EA	REV N/C (10-09-95)
0000-PRINT	REFERENCE PRINT				1.0000	EA	NO DRAWING
0001-PRINT	REFERENCE PRINT				1.0000	EA	SEE 800-5079
054-024	XFORMER COUPLING	MICROTRAN T1104			1.0000	EA	T1
800-5079	ASSY DECODER				0	EA	01
LA	LABOR ASSEMBLY COST HRS				0	EA	
LT	LABOR TEST COST HOURS				0	EA	
OSV800-5079-2	OUTSIDE LABOR 800-5079-2				1.0000	EA	