

**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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| | 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

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.

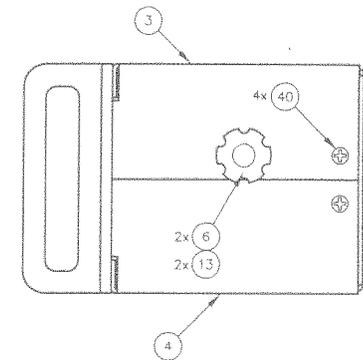
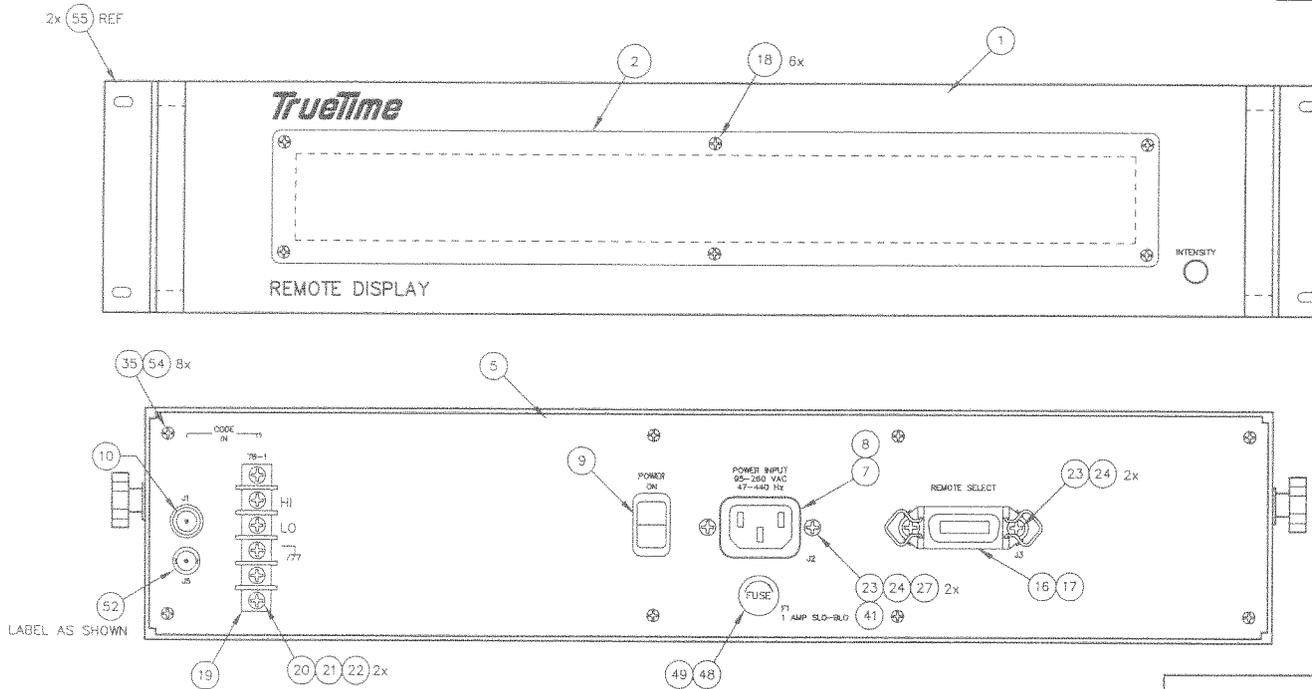
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REVISIONS

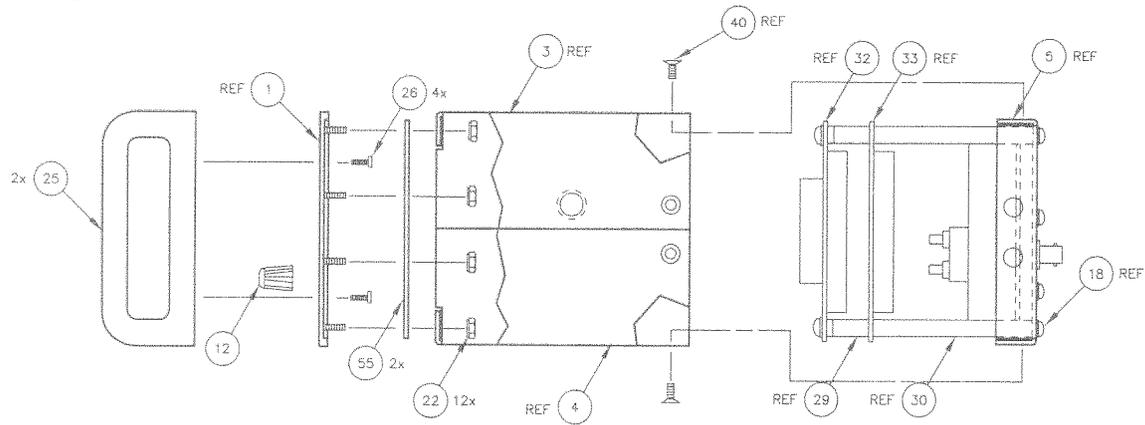
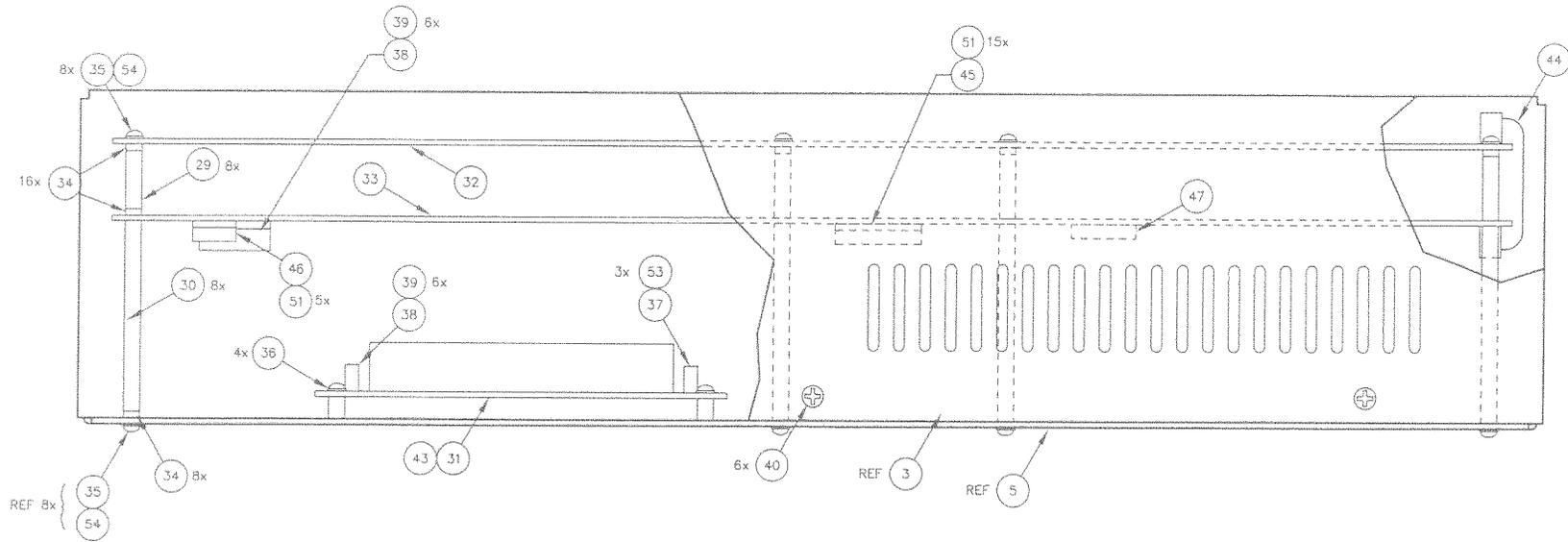
| REV | DESCRIPTION | DATE | APPROVED |
|-----|--|----------|----------|
| A | UPDATED PER ECO 565 | 7-9-91 | PLE |
| B | ITEM 18 WAS 249-001; ITEM 28 WAS 800-1021; ADDED ITEMS 13 & 33 | 9-6-91 | PLE |
| C | CHANGED COMPANY LOGO | 4-8-92 | MT |
| D | CHANGED POWER SUPPLY ORIENTATION; ADDED ITEM 53 | 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 | RB |



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

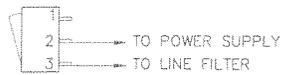
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DATE: 04-11-00

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

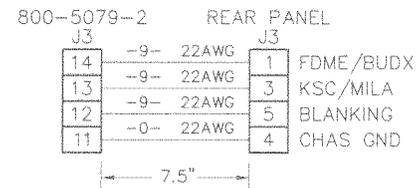
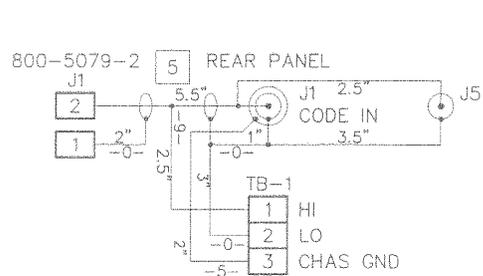
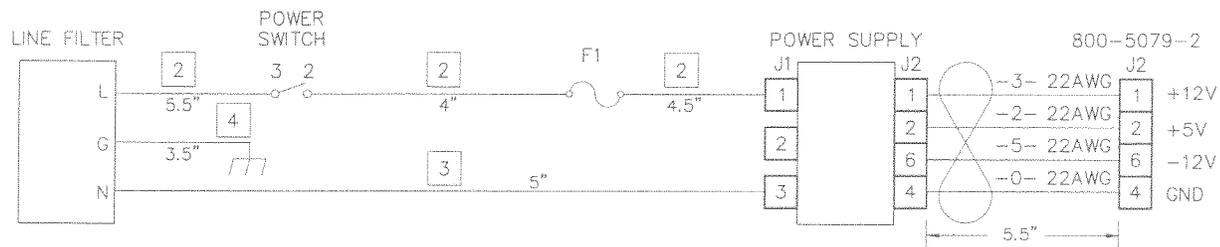


| | | | |
|--|----------------|--------------|-----|
| TrueTime [®] | | | |
| <small>"Where Customer Satisfaction is our Highest Priority"</small> | | | |
| <small>2835 Duke Ct. Santa Rosa, CA 95407</small> | | | |
| SIZE | CODE IDENT NO. | DRAWING NO. | REV |
| B | | 820-210 | K |
| SCALE NONE | | SHEET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

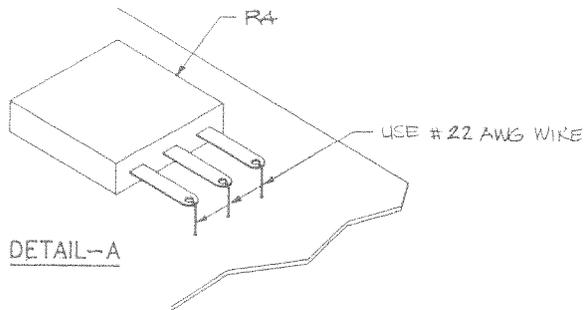
| PART IDENTIFIER | DESCRIPTION 1 | DESCRIPTION 2 | EFF DATE | ECN # | QTY/ASSY | REV UOM LVL | REFERENCE DESCRIPTION |
|-----------------|---------------------------|---------------------------|----------|-------|----------|-------------|------------------------|
| 820-210 | TCU RD-1 DISPLAY | | | | | EA | |
| 0000-APPROVAL | PARTS LIST APPROVAL | | 000000 | | 1.0000 | EA | |
| 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 |

RB 5-12-00

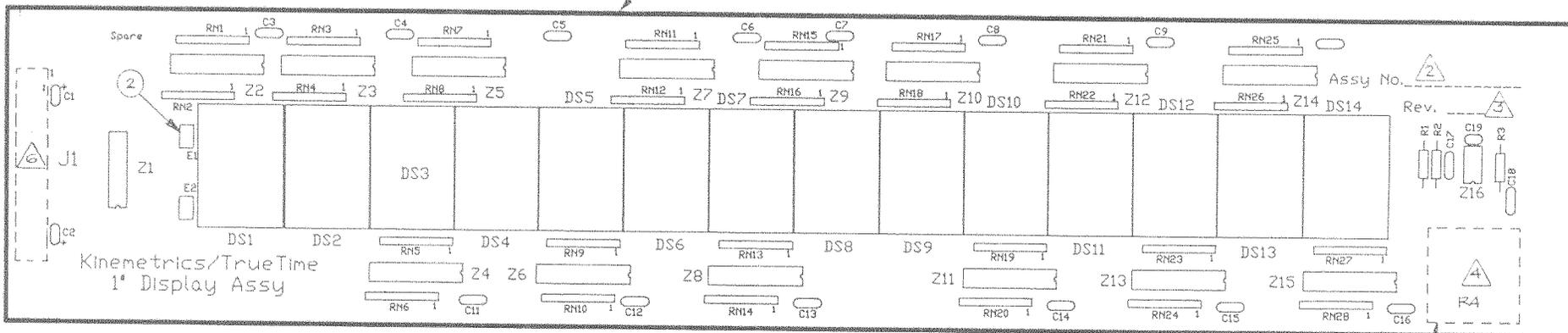
MAX * BILL OF MATERIALS * SINGLE-LEVEL EXPLOSION BY PART IDENTIFIER W/REFERENCE

| 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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 TO OTHERS FOR ANY PURPOSES EXCEPT THAT WHEN IT IS LOANED
 AND IT SHALL BE RETURNED UPON DEMAND.



| 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 DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES XX ± .XXX ± ° | | 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 TOL APPLY FIN TREAT | | APPROVALS DATE | | | |
| MATERIAL | | DRAWN BY <i>PRZ</i> 2-91 | | ASSY 1" DISPLAY | |
| FINISH | | CHECKED <i>PRZ</i> 2-91 | | | |
| NEXT ASSY | | APPROVED <i>PRZ</i> 4-91 | | NEXT ASSY | |
| APPLICATION | | DO NOT SCALE DRAWING | | SIZE | CODE/IDENT NO |
| | | | | B | 800-5027 |
| | | | | SCALE NONE | DRAWING NO. |
| | | | | | E |
| | | | | SHEET 1 | OF 1 |

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

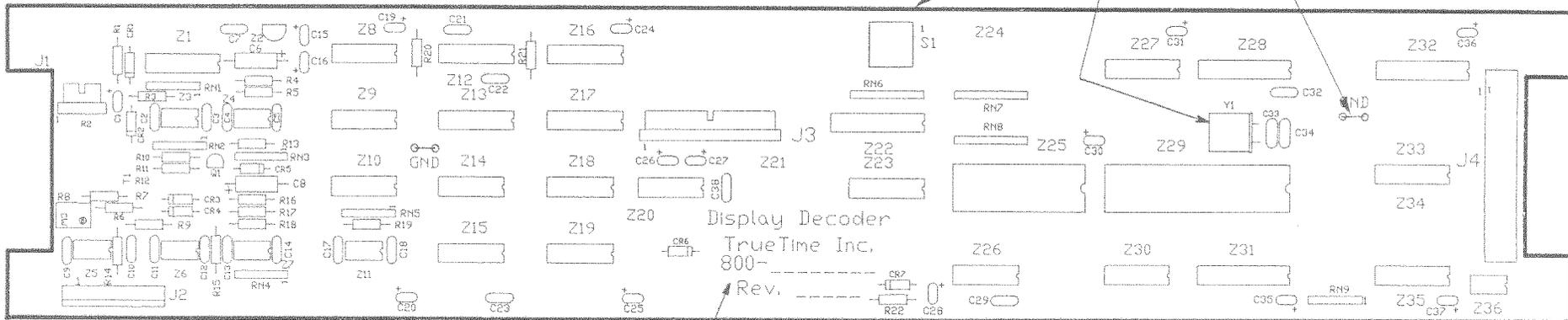
| PART IDENTIFIER | DESCRIPTION 1 | DESCRIPTION 2 | EFF DATE | ECN # | QTY/ASSY | REV UOM LVL | REFERENCE DESCRIPTION |
|-----------------|---|---------------------------|----------|-------|----------|-------------|-----------------------|
| 800-5027 | ASSY RD-1 DISPLAY | | | | | EA | |
| 0000-APPROVAL | 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 604 | 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 DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGLES ± .010 ± .005 ± .010 | CONTRACT NO | KINEMATICS/TRUETIME SANTA ROSA, CA | |
| | | ALL THREADS TO BE CLASS 2 PER ANSI Y14.6 MACH COR -- .005 TO .015 R 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 B |
| APPLICATION | | DO NOT SCALE DRAWING | NEXT ASSY | | CODE IDENT NO |
| | | | | | 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 | 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 | |