# MAINTENANCE MANUAL
# CLOCK/VU METER OPTION
# 19D438330G1

## TABLE OF CONTENTS



## TYPICAL SPECIFICATIONS

| | |
|---|---|
| INPUT VOLTAGE | +13.8 VDC |
| CURRENT DRAIN: | |
| Clock | 180 Ma |
| Clock and VU | 220 Ma |
| TEMPERATURE RANGE | 0 to +60 C |
| DISPLAY COLOR: | |
| Clock | Yellow LED |
| VU | 7 Green/3 Red LED |
| DISPLAY TYPE: | |
| Clock | Four digit 7 segment .03" LED |
| | Displays hours and minutes 12/24 hour operation |
| | Flashing seconds colon |
| | PM indicator for 12 hour operation |
| VU METER | Ten bar LED bar graph |

## DESCRIPTION

The General Electric electronic digital clock/VU meter option is designed to operate with the desk top station to provide a real time of day clock function, and an audio transmit VU meter function. The option consists of a completely assembled board featuring a four digit display, ten element bar graph display and all supporting circuitry. The option board interconnects to the desk top station system board via a single cable assembly. The cable couples J1 of the option board to J14 of the station system board.

Power is supplied to the board on J1 pin 1 and ground on J1 pin 2. Negative supply converter U3, D3, and D4 provide a negative voltage for integrated circuit U1. A nine volt battery, which mounts on the board, provides memory backup for the clock should the power be interrupted.

## CIRCUIT ANALYSIS

### DIGITAL ELECTRONIC CLOCK

The clock portion of the option board displays either 12 hour or 24 hour readout. Selecting the mode of operation is accomplished by moving the jumper on J2. Plug P2 should be on pins 2 and 3 for 12 hour operation and on pins 1 and 2 for 24 hour operation. The clock operates whenever power is applied to the station. If a battery is not installed on the board, the clock will flash when power is removed.

The readout consists of four digit positions, each composed of a seven segment LED display. A flashing seconds colon is also displayed along with a PM indicator for the 12 hour clock function. Two time setting switches are provided on the clock: FAST SET (S1) and SLOW SET (S3). A SET ALLOW (S2) switch is also provided and should be depressed in conjunction with S1 or S3. This allows the time displayed to be changed.

The FAST SET switch (S1) allows setting of the time at a rapid rate. The SLOW SET switch (S3) sets the time at a slower rate. It is used as a "fine tune" when setting the time displayed.

The clock frequency is controlled by crystal Y1 and associated circuitry consisting of C11, C12, and R16. Voltage divider network R19, and R21 control the intensity of the seven segment displays. To decrease the intensity of the clock, insert a 3.3K ohm resistor between HL3 and HL4.

The circuitry consisting of Q2, R17, R18, C13, and D5 supply sufficient current to integrated circuit U4 to drive the seven segment displays. Resistor R17 is a dropping resistor which provides the correct bias for Q2.

The circuit consisting of D6, D7, D11, C14, and R22 is used to regulate voltage supplied to U4. The voltage is held constant at 9 volts by zener diode D6. Regulated 9 volts is supplied to pin 18 of U4 and also to pin 2 except when plug P2 is positioned for 24 hour clock operation.

### VU METER

The VU meter section of the option board consists of: amplifier, U1D, R2, and C2; DC amplifier U1B, R6, and C4; full wave rectifier D1, D2, and U1C; display control switch Q1; negative supply converter U3, D3, and D4; and the VU display. The VU meter provides an audio transmit metering function that allows the user to monitor mic output level during transmission.

The VU meter is operational only when the mic is keyed causing the PTT line to be active (low). The low level is coupled through D9 to the base of display control switch Q1 causing it to turn off. This allows any audio present at the output of DC amplifier U1B to reach the VU display. When the PTT line is at a high level, Q1 clamps any audio present to ground preventing the VU display from being activated when not actually transmitting.

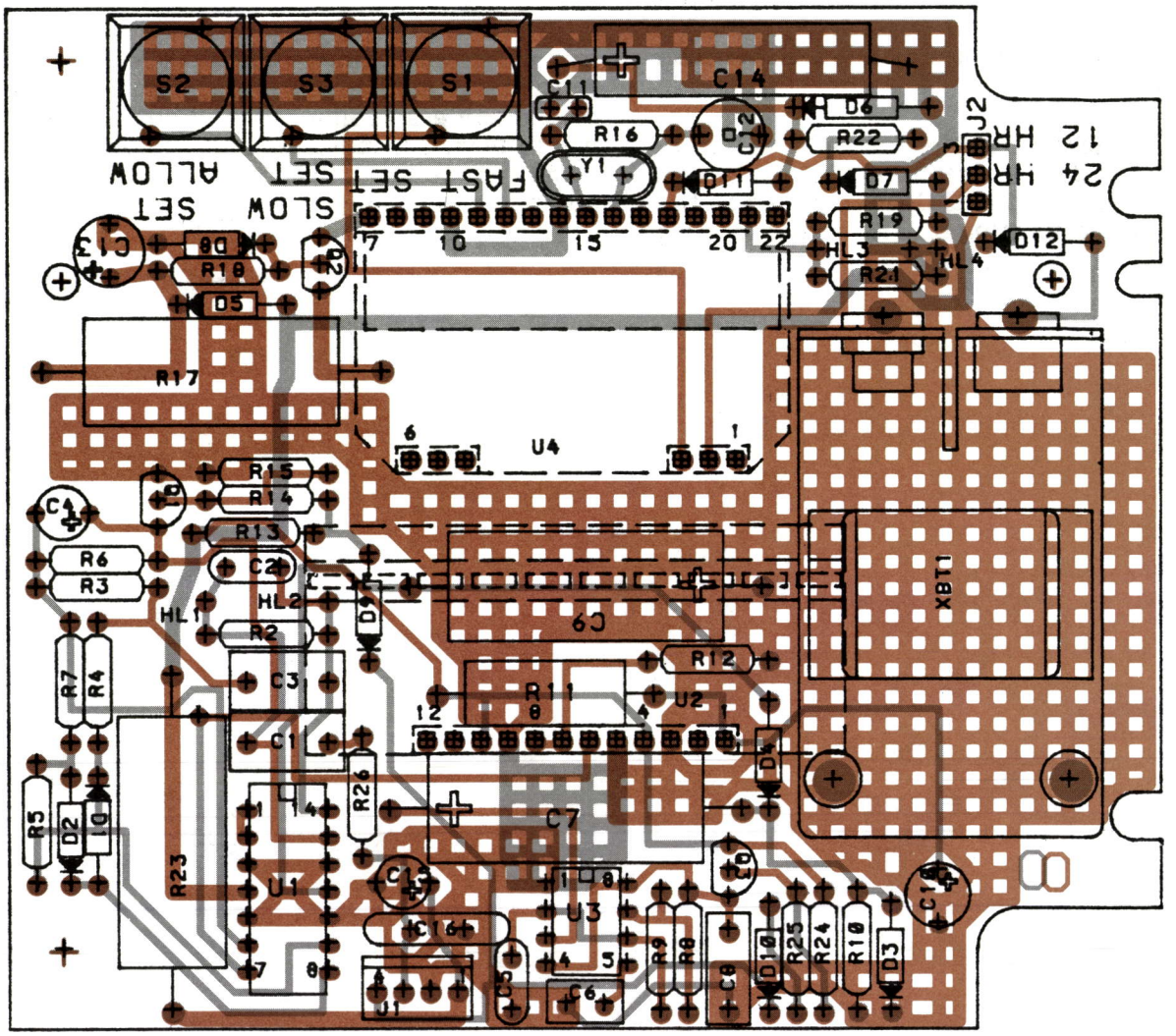
When transmit mic audio is applied to the MIC HI line, the signal is coupled to amplifier circuit U1D. Resistor R2 determines the sensitivity of the VU meter. To decrease the sensitivity of the VU meter, a 68K ohm resistor may be added between HL1 and HL2.

The output of the amplifier is coupled to the full wave rectifier circuit consisting of D1, D2, and U1C. The rectified signal is then amplified by the op amp circuit consisting of U1B and associated circuitry. The signal is then applied to the VU meter display.

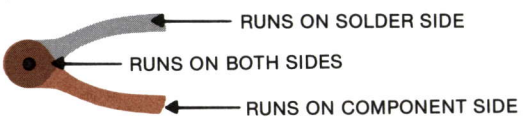
The VU meter display provides an indication that varies according to the input level on pin 6. As the signal applied gets stronger, more segments on the bar graph illuminate. When the red segments glow, this indicates that audio distortion is being approached and the input signal should be adjusted accordingly.

GE Mobile Communications

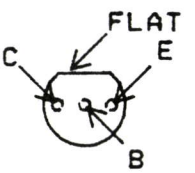
General Electric Company
Lynchburg, Virginia 24502




(19D438328, Sh. 1, Rev. 0)
(19A705373, Sh. 1, Rev. 0)
(19A705373, Sh. 2, Rev. 0)




LEAD IDENTIFICATION
FOR Q1-Q3

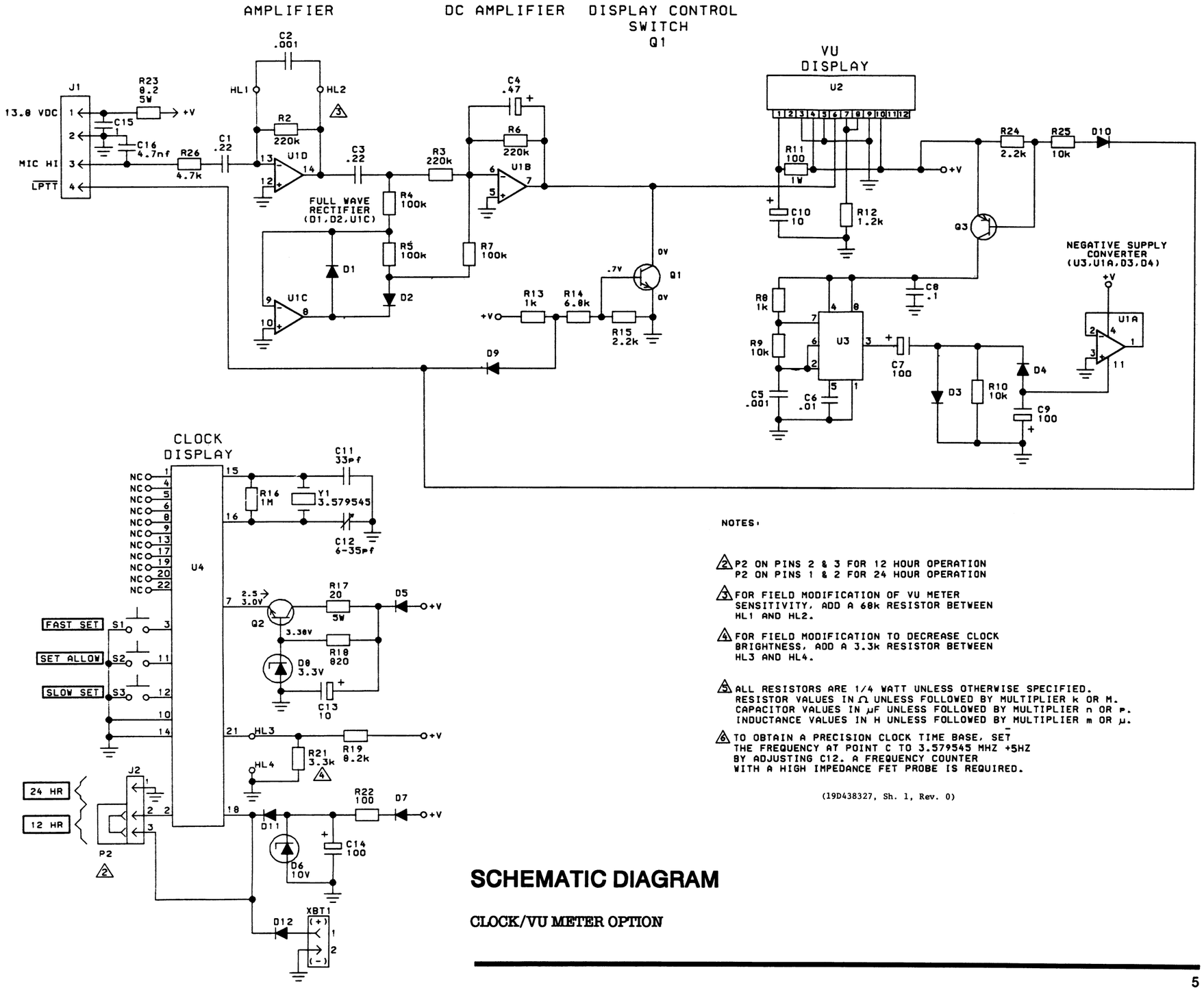



IN-LINE
TOP VIEW

NOTE: CASE SHAPE IS DETERMINING FACTOR FOR LEAD IDENTIFICATION.

# OUTLINE DIAGRAM

CLOCK/VU METER OPTION




NOTES:

2. P2 ON PINS 2 & 3 FOR 12 HOUR OPERATION
   P2 ON PINS 1 & 2 FOR 24 HOUR OPERATION

3. FOR FIELD MODIFICATION OF VU METER SENSITIVITY, ADD A 68k RESISTOR BETWEEN HL1 AND HL2.

4. FOR FIELD MODIFICATION TO DECREASE CLOCK BRIGHTNESS, ADD A 3.3k RESISTOR BETWEEN HL3 AND HL4.

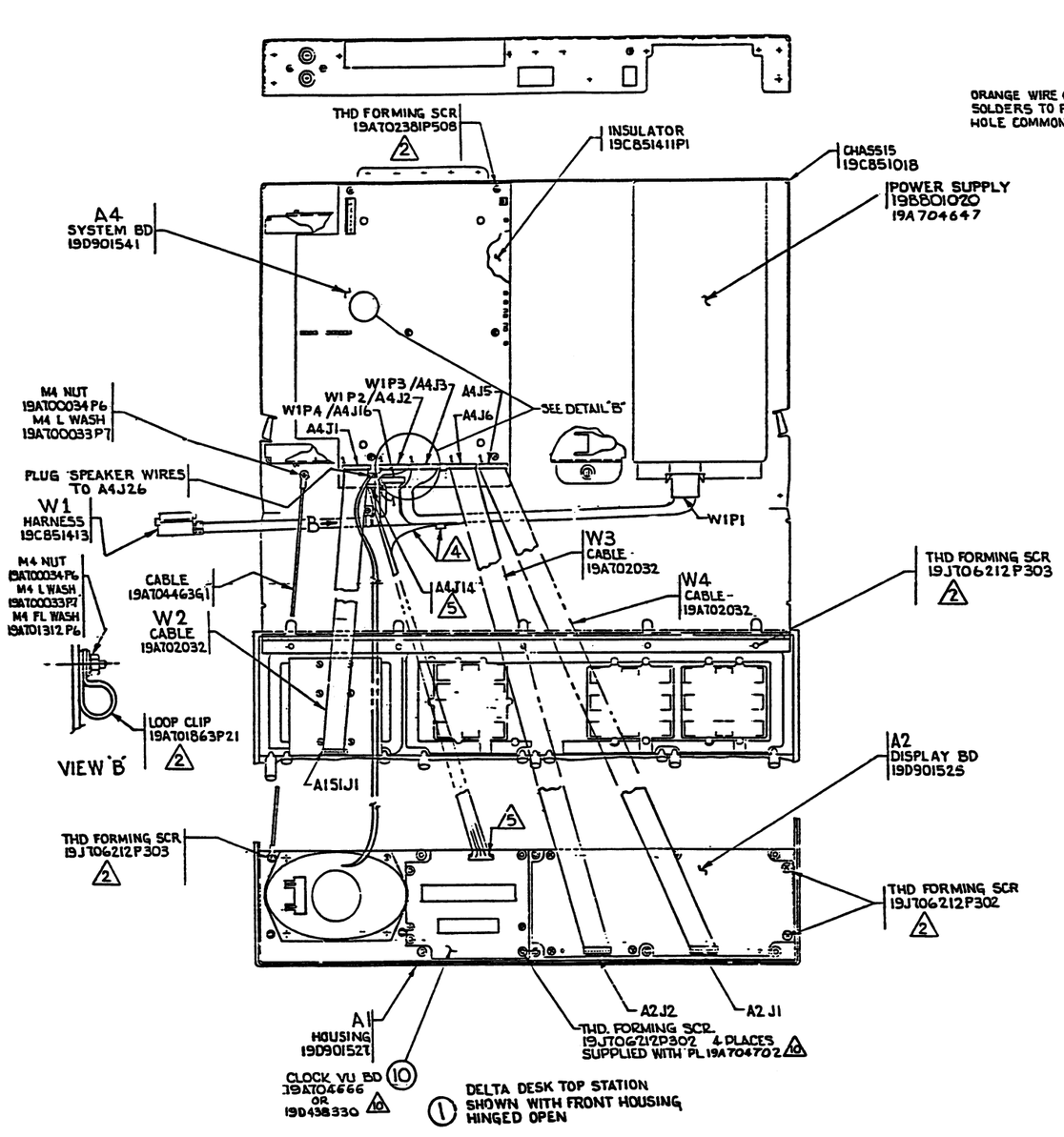
5. ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED. RESISTOR VALUES IN Ω UNLESS FOLLOWED BY MULTIPLIER k OR M. CAPACITOR VALUES IN μF UNLESS FOLLOWED BY MULTIPLIER n OR p. INDUCTANCE VALUES IN H UNLESS FOLLOWED BY MULTIPLIER m OR μ.

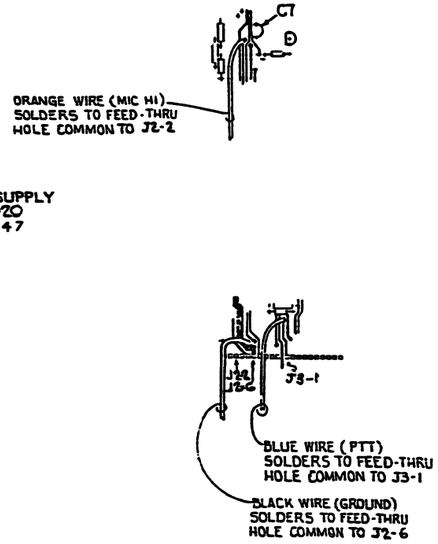
6. TO OBTAIN A PRECISION CLOCK TIME BASE, SET THE FREQUENCY AT POINT C TO 3.579545 MHZ +5HZ BY ADJUSTING C12. A FREQUENCY COUNTER WITH A HIGH IMPEDANCE FET PROBE IS REQUIRED.

(19D438327, Sh. 1, Rev. 0)

# SCHEMATIC DIAGRAM

## CLOCK/VU METER OPTION




INSTALLATION INSTRUCTIONS
DELTA DESK TOP STATION
CLOCK/VU METER BD. OPTION

1. MAKE SURE POWER SWITCH IS OFF.
2. MOUNT CLOCK/VU METER BOARD BESIDE DISPLAY BOARD OR FOLD OUT FRONT PANEL USING FOUR THREAD FORMING SCREWS. 19J706212P302.
3. PLUG 4 PIN PLUG ONTO J1 OF CLOCK/VU METER BD.
4. APPLY WIRE SPLICE 19A116849P11 ONTO WIRE FROM P1-3 (POWER SUPPLY PLUG). AND WIRE 1 (RED) FROM CLOCK/VU METER CABLE. PART OF PL19A704702.
5. PLUG 3 PIN PLUG ONTO J14 OF STATION SYSTEM BD. (REVISION "A" OR HIGHER).
6. IF SYSTEM BD IS EARLIER THAN REV "A" , REPLACE STEP (5) ABOVE WITH THE FOLLOWING:
   - 6A CUT BLACK, BLUE & ORANGE WIRES CLOSE TO 3 PIN PLUG & DISCARD PLUG. CUT EACH WIRE TO APPROPRIATE LENGTH AS DICTATED BY PROPER WIRE DRESS PER LOCATION OF ENDS DISCRIBED BELOW.
   - 6B SOLDER WIRES INTO FEED THRU HOLES OR SYSTEM BOARD AS SHOWN IN DETAIL "B".

(19D901594 SH. 1A REV 4)

# INSTALLATION INSTRUCTIONS

CLOCK/VU METER OPTION

# PARTS LIST

## PARTS LIST

CLOCK/VU METER
19D438330G1
ISSUE 1

| SYMBOL | GE PART NO. | DESCRIPTION |
|---|---|---|
| | | - - - - - - - - - - CAPACITORS - - - - - - - - - - |
| C1 | 19A700004P4 | Metallized polyester: 0.22 uF + or - 10%, 63 VDCW. |
| C2 | 19A700001P7 | Ceramic: 1000 pF + or -20%, 50 VDCW. |
| C3 | 19A700004P4 | Metallized polyester: 0.22 uF + or - 10%, 63 VDCW. |
| C4 | 19A701534P3 | Tantalum: 0.47 uF + or - 20%, 35 VDCW. |
| C5 | 19A700001P7 | Ceramic: 1000 pF + or -20%, 50 VDCW. |
| C6 | 19A700005P7 | Polyester: 0.01 uF + or -10%, 50 VDCW. |
| C7 | 19A700064P4 | Electrolytic: 100 uF, -10+150%, 250 VDCW. |
| C8 | 19A700004P2 | Metallized polyester: 0.1 uF + or - 10%, 63 VDCW. |
| C9 | 19A700064P4 | Electrolytic: 100 uF, -10+150%, 250 VDCW. |
| C10 | 19A701534P7 | Tantalum: 10 uF + or -20%, 16 VDCW. |
| C11 | 19A700219P47 | Ceramic: 33 pF + or - 5%, 100 VDCW, temp coef 0 PPM. |
| C12 | 19A134457P3 | Variable, Ceramic: sim to Johanson 9410-3PC. |
| C13 | 19A700003P7 | Tantalum: 10 uF + or -20%, 16 VDCW. |
| C14 | 19A700064P4 | Electrolytic: 100 uF, -10+150%, 250 VDCW. |
| C15 | 19A701534P4 | Tantalum: 1 uF + or - 20%, 35 VDCW. |
| C16 | 19A700001P11 | Ceramic: 4700 pF + or - 20%, 50 VDCW. |
| | | - - - - - - - - - - DIODES - - - - - - - - - - |
| D1 thru D5 | 19A700028P1 | Silicon, fast recovery: fwd current 75 mA, 75 PIV; sim to Type 1N4148. |
| D6 | 19A700025P10 | Silicon, zener: 400 mA max; sim to BZX55-C10. |
| D7 | 19A700028P1 | Silicon, fast recovery: fwd current 75 mA, 75 PIV; sim to Type 1N4148. |
| D8 | 19A700025P3 | Silicon, zener: 400 mW max; sim to BZX55-C3V3. |
| D9 thru D12 | 19A700028P1 | Silicon, fast recovery: fwd current 75 mA, 75 PIV; sim to Type 1N4148. |
| | | - - - - - - - - - - JACKS - - - - - - - - - - |
| J1 | 19A700072P30 | Printed wire: 4 contacts rated at 2.5 amps; sim to Molex 22-27-2041. |
| J2 | 19A700072P52 | Connector, Printed Wiring: 3 circuits, sim to Molex 640098-3. |
| | | - - - - - - - - - - PLUGS - - - - - - - - - - |
| P2 | 19A702104P1 | Receptacle: 2 position, shorting, rated at 3 amps; sim to Berg 65474-002. |
| | | - - - - - - - - - - TRANSISTORS - - - - - - - - - - |
| Q1 | 19A116774P1 | Silicon, NPN; sim to Type 2N5210. |
| Q2 | 19A700023P1 | Silicon, NPN; sim to Type 2N3904. |
| Q3 | 19A700022P1 | Silicon, PNP; sim to Type 2N3906. |
| | | - - - - - - - - - - RESISTORS - - - - - - - - - - |
| R1 | H212CRP368C | Deposited carbon: 68K ohms + or -5%, 1/4 w (optional, see schematic). |
| R2 and R3 | H212CRP422C | Deposited carbon: 0.22M ohms + or -5%, 1/4 w. |
| R4 and R5 | H212CRP410C | Deposited carbon: 0.1M ohms + or -5%, 1/4 w. |
| R6 | H212CRP422C | Deposited carbon: 0.22M ohms + or -5%, 1/4 w. |
| R7 | H212CRP410C | Deposited carbon: 0.1M ohms + or -5%, 1/4 w. |
| R8 | H212CRP210C | Deposited carbon: 1K ohms + or -5%, 1/4 w. |
| R9 and R10 | H212CRP310C | Deposited carbon: 10K ohms + or -5%, 1/4 w. |
| R11 | 19A700112P39 | Composition: 100 ohms + or - 5%, 1 w. |
| R12 | H212CRP212C | Deposited carbon: 1.2K ohms + or -5%, 1/4 w. |
| R13 | H212CRP210C | Deposited carbon: 1K ohms + or -5%, 1/4 w. |
| R14 | H212CRP268C | Deposited carbon: 6.8K ohms + or -5%, 1/4 w. |
| R15 | H212CRP222C | Deposited carbon: 2.2K ohms + or -5%, 1/4 w. |
| R16 | H212CRP510C | Deposited carbon: 1M ohms + or -5%, 1/4 w. |
| R17 | 5493035P55 | Wirewound: 20 ohms + or -5%, 5 w; sim to Hamilton Hall Type HR. |
| R18 | H212CRP182C | Deposited carbon: 820 ohms + or -5%, 1/4 w. |
| R19 | H212CRP282C | Deposited carbon: 8.2K ohms + or -5%, 1/4 w. |
| R20 | H212CRP233C | Deposited carbon: 3.3K ohms + or - 5%, 1/4 w (optional, see schematic). |
| R21 | H212CRP233C | Deposited carbon: 3.3K ohms + or -5%, 1/4 w. |
| R22 | H212CRP110C | Deposited carbon: 100 ohms + or -5%, 1/4 w. |
| R23 | 5493035P52 | Wirewound: 8.2 ohms + or -10%, 5 w; sim to Hamilton Hall Type HR-5 |
| R24 | H212CRP222C | Deposited carbon: 2.2K ohms + or -5%, 1/4 w. |
| R25 | H212CRP310C | Deposited carbon: 10K ohms + or -5%, 1/4 w. |
| R26 | H212CRP247C | Deposited carbon: 4.7K ohms + or -5%, 1/4 w. |
| | | - - - - - - - - - - SWITCHES - - - - - - - - - - |
| S1 thru S3 | 19A701324P1 | Push: contacts rated 1 mA at 10 volts; sim to IEE/Schadown 210091. |
| | | - - - - - - - - INTEGRATED CIRCUITS - - - - - - - - |
| U1 | 19A701789P1 | Linear, Low Power OP AMP; sim to LM324N. |
| U2 | | Sim to CAT. NSM39169. |
| U3 | 19A701865P1 | Linear: 555 Timer, sim to Signetics NE555N. |
| U4 | | Sim to CAT. MA1136YZW. |
| | | - - - - - - - - - - BATTERY HOLDERS - - - - - - - - |
| XBT1 | 19A703247P1 | Battery Holder. |
| | | - - - - - - - - - - CRYSTALS - - - - - - - - - - |
| Y1 | 19A702511G1 | Quartz: Frequency 3.579545 MHz. |
| | | - - - - - - - - - - MISCELLANEOUS - - - - - - - - - - |
| | 19A700072P65 | Printed Wire: 12 contacts, sim to Molex 1-640098-2. |
| | 19A700072P52 | Printed Wire: 3 contacts, sim to Molex 640098-3. |
| | 19A700072P69 | Printed Wire: 16 contacts rated at 2.5 amps; sim to AMP 1-640098-6. |
| | N330P1205P22 | Eyelet, metallic. |

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES