ERICSSON

# MAINTENANCE MANUAL
# CLOCK/VU METER
# 344A4758P1

## TABLE OF CONTENTS



## SPECIFICATIONS*

| | |
|---|---|
| Input Voltage | 13.8 VDC, nominal<br>9.0 VDC, minimum<br>18.0 VDC, maximum |
| Current Drain | |
| High Intensity (typical) | 130 mA |
| Low Intensity (typical) | 25 mA |
| Maximum | 200 mA |
| Temperature Range | 0° to +60°C |
| Display Color | |
| Clock | Green LED |
| VU | 3 Green/4 Yellow/3 Red LED |
| Display Type | |
| Clock | Four digit 7 segment LED<br>Displays hours and minutes, 12/24 hour selectable<br>Flashing seconds colon<br>PM indicator for 12 hour operation<br>Loss of calibration indicator for battery failure |
| VU Meter | Ten bar LED bar graph<br>Lower right decimal point of clock indicates calibration required |
| Battery Back-Up Power | 3.0 VDC, 165 mAh lithium battery to maintain clock operation for up to 10 years (typically) without external power--no display |

* These specifications are typical and are intended for use during servicing.

# DESCRIPTION

The 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 associated circuitry. The option board connects to the desk top station system board via a single four-wire cable.

The unit is powered by 13.8 VDC through P203-1 and ground through P203-2. The DC voltage is passed through power diode D1 and regulated by voltage regulator U9 and filter capacitor C4 to 5 VDC. U9 supplies voltage to the 8-bit RISC microcontroller U3, high impedance, non-inverting inputs of op-amps U1A and U1B. as a stable voltage reference and through diode D4 to the timekeeping module U2. The input voltage is passed through divider network R13 and R14 to U3-7 (RA1) to provide a loss of power indicator to U3.

# CIRCUIT ANALYSIS

## Digital Electronic Clock

The timekeeping function is performed by U2 and a 32.768 kHz crystal XTL1. The clock output of U2 is connected to U3 which provides the driver output for the 7-segment displays U4-U7 through data lines D0-D7 and bipolar transistors Q3-Q6. Data line D4 and D7 are also connected to normally open momentary pushbutton switches SW1 and SW2. These switches are used for setting the time in the displays and also for calibration of the VU meter bar graph display.

In addition to the timekeeping function, U2 provides non-volatile RAM when connected to the 3.0 VDC battery through diode D5. The timekeeping function can be sustained for up to ten years when the specified battery is installed. When the option board is normally powered through P203-1, diode D5 is reversed biased and there is no current drain. The RAM is used to store calibration information for the VU portion of the option board, in addition to storing the seven segment display and bar graph intensity levels.

The clock display is provided by the four 7-segment displays U4-U7 and is active upon power up. A flashing seconds colon along with a PM indicator (upper left corner of U4) for the 12 hour clock function is displayed.

Battery failure or loss of calibration data is indicated by an indicator in the lower right corner of U7.

## VU Meter

The VU meter consists of a full wave rectifier/DC-gain block (U1A, U1B, R1-R5, R12, C2, C8-C9 and D2-D3). C2 controls the attack time of the VU meter while the decay time is software controlled. Capacitor C1 is used to DC couple the microphone input. U3 performs a single slope integrating A/D conversion using R12, R6, C3 and U3 (RA0). The converter self calibrates by using U3 (RA2) to force a +5 V input to the converter as a reference. The bar graph display/driver circuitry consists of Q1, Q2, U8 and U3. The VU meter provides an audio transmit metering function that permits the user to monitor the microphone output level during transmission.

The VU meter is operational only when the microphone is keyed, causing the PTT line (P203-4) to be active (low). This low level is detected through U3 (RA3) and activates the 10-segment bar graph display. The full wave rectifier/DC-gain block rectifies the microphone input (P203-3) with respect to +5 volts and provides a fixed DC gain of 10. U3 then converts the DC output of this stage via RC network (R6 & C3) to a digital representation, which is used by U3 to drive the appropriate bar graph segments. U3 provides a VU decay time of about 400 mS.

The VU meter display provides an indication that varies according to the input level on P203-3. 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 level should be adjusted accordingly.

# ADJUSTMENTS

The following procedures should be performed to set the digital electronic clock time and mode and to calibrate the VU meter 10-segment display. Normally open, momentary pushbutton switches SW1 and SW2 are used for setting the time and for the calibration of the VU meter.

## Digital Electronic Clock

1. To set the clock mode for either 12 or 24 hour format, press SW1 for 0.5 seconds. The display will show the current mode ("12xx" or "24xx"). Press SW2 to toggle between modes.

**NOTE**

The VU meter bar graph is inactive during the set mode.

2. Press SW1 again for 0.5 seconds to set the hour. The hours will be displayed in high intensity and the minutes in low intensity. Press SW2 to increment the hour by one. Pressing SW2 continually will increment the hour 3 times a second until SW2 is released.

3. Press SW1 again for 0.5 seconds to set the minutes. The minutes will be displayed in high intensity and hour in low intensity. Press SW2 to increment the minutes by one. Pressing SW2 continually will increment the minute 3 times a second until SW2 is released.

4. Press SW1 again for 0.5 seconds to set the intensity of the display. There are four intensity settings: low, medium low, medium and high. Press SW2 to increment the current intensity setting, going from low to high and wrapping back around to low.

5. Press SW1 again for 0.5 seconds to activate the timekeeping. The time will begin at 0 second of the time which was set in the preceding steps.

VU Meter

The VU meter 10-segment display must be properly calibrated before use or whenever the loss of calibration indicator is displayed in the lower right corner of the clock display.

1. Remove power from the option board.

2. Press SW1 while restoring power to the option board.

3. Clock display will display a three digit integer ranging from 065 to 207.

4. Connect a 1 kHz, 107 mV signal to microphone input (P203-3).

5. Press SW1 and SW2 to move the integer value up and down until the first red bar graph segment is lit, then increase the integer value until that red segment goes out.

**NOTE**

If power is removed from the option board before Step 6 is is performed, the calibration data will not be stored in RAM U2.

6. Press either SW1 or SW2 continuously for 5 seconds to save the calibration data and return to normal operating mode.

## HANDLING

Since this option board is powered by a backup battery, care must be taken to prevent shorting of the circuitry when handling or shipping. Do not place in anti-static bags without insulating the circuitry.

## BATTERY REPLACEMENT

Should the lithium battery require replacement, disconnect the option board to remove the 13.8 VDC input and carefully unsolder the battery tabs from the solder side of the board. Install replacement battery as specified in Parts List in same location, observing the polarity of the battery tabs. Dispose of defective battery as required by state or local regulations.

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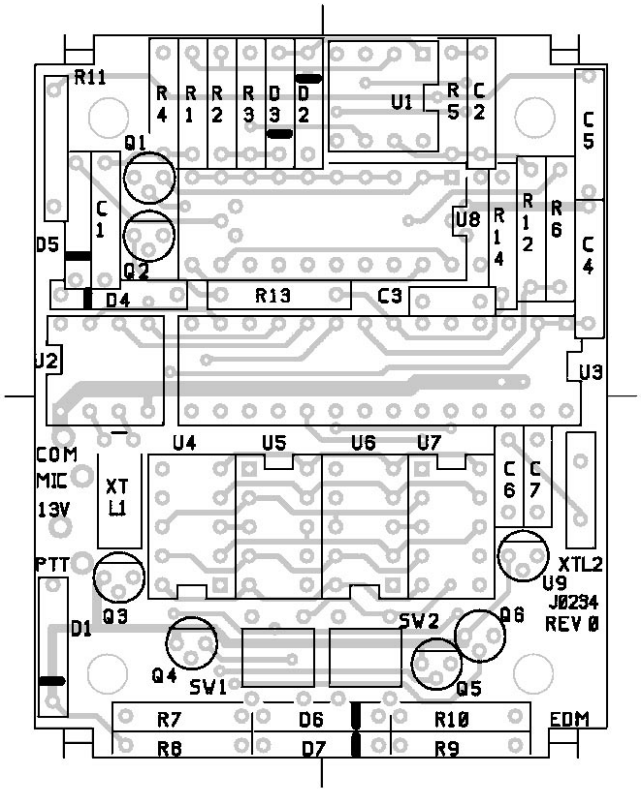
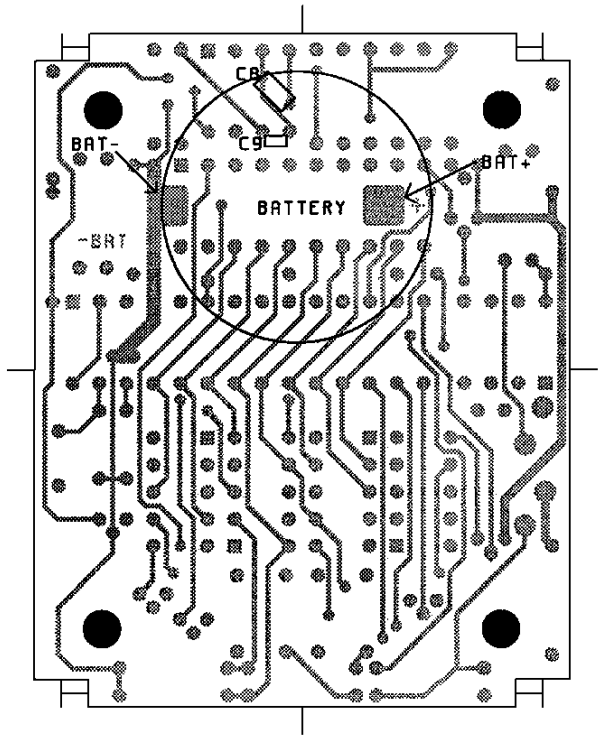
COMPONENT SIDE




SOLDER SIDE

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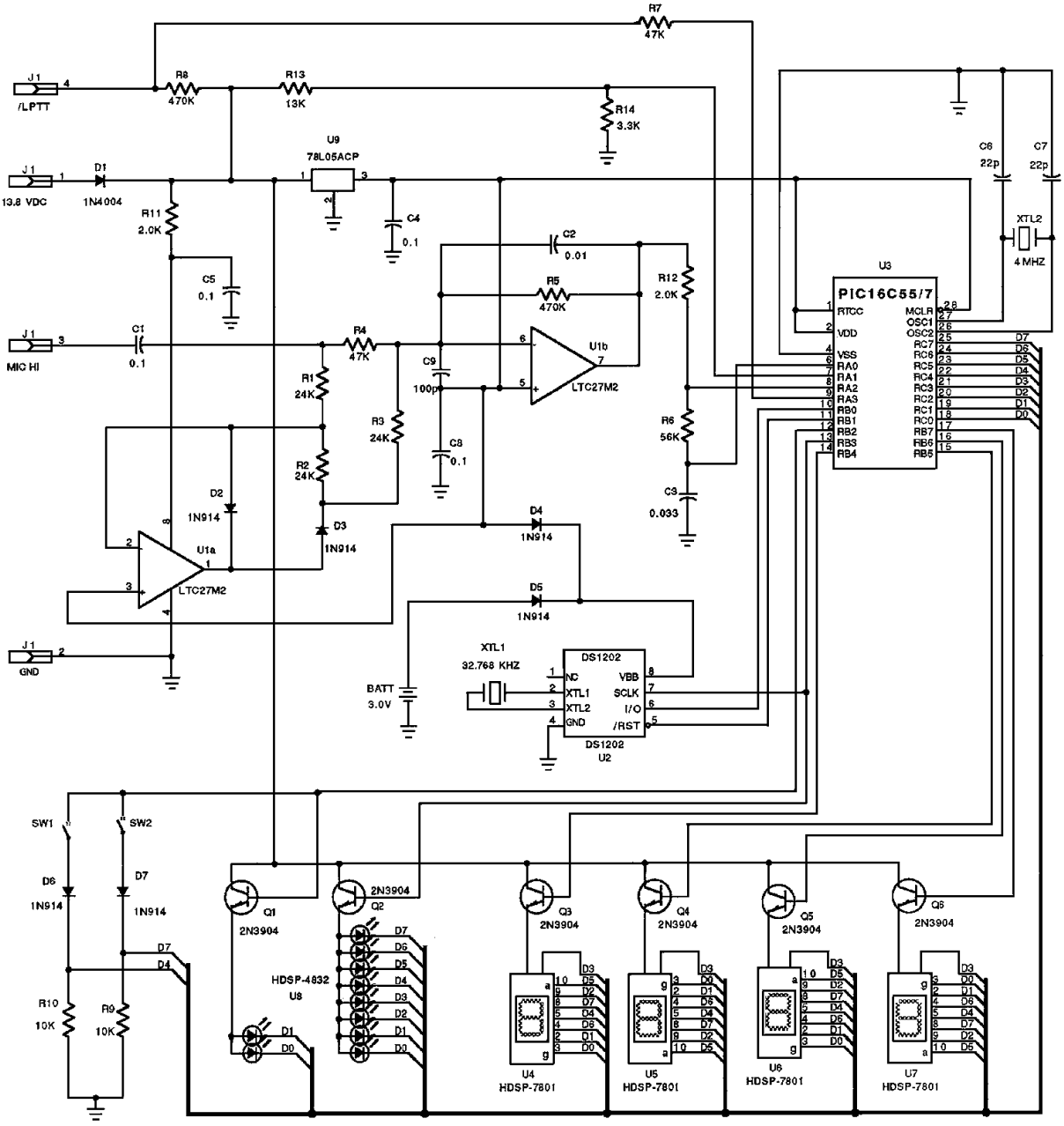


**CLOCK/VU METER**

344A4758P1

(A 0234-00 100, Rev. 0)

## CLOCK/VU METER
## 344A4758P1
## ISSUE 1

| SYMBOL | PART NUMBER | DESCRIPTION |
|---|---|---|
| | | - - - - - - - -CAPACITORS - - - - - - - - |
| C1 | | Ceramic, Axial: 0.1 µF, to AVX SA105E104MMA. |
| C2 | | Ceramic, Axial: 0.01 µF; sim to AVX SA105E103MMA. |
| C3 | | Mylar, Stacked: 0.033 µF, 50 VDCW; sim to Panasonic ECQ-V1H333JL. |
| C4 and C5 | | Ceramic, Axial: 0.1 µF, 50 VDCW; sim to AVX SA105E104MMA. |
| C6 and C7 | | Ceramic, Disk: 22 pF, 100 VDCW; sim to Panasonic ECC-F2A22OJE. |
| C8 | | Chip: 0.1 pF, 50 VDCW. |
| C9 | | Chip: 100 pF; sim to Panasonic ECU-V1H101JC. |
| | | - - - - - - - - - - DIODE - - - - - - - - |
| D1 | | 1N4004 |
| D2 thru D7 | | 1N914 |
| | | - - - - - - -TRANSISTORS - - - - - - - |
| Q1 thru Q6 | | NPN: 2N3904 |
| | | - - - - - - - RESISTORS - - - - - - - |
| R1 thru R3 | | 24 Kohms, ±5% 1/4W. |
| R4 | | 47 Kohms, ±5% 1/4W. |
| R5 | | 470 Kohms, ±5% 1/4W. |
| R6 | | 56 Kohms, ±5%1/4W. |
| R7 | | 47 Kohms, ±5%1/4W . |
| R8 | | 470 Kohms, ±5% 1/4W. |
| R9 and R10 | | 10 Kohms, ±5%1/4W. |
| R11 and R12 | | 2.0 Kohms, ±5%1/4W. |
| R13 | | 13 Kohms, ±5%1/4W . |
| R14 | | 3.3 Kohms, ± 5% 1/4W. |

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

| SYMBOL | PART NUMBER | DESCRIPTION |
|---|---|---|
| | | - - - - - - - - SWITCHES - - - - - - - - |
| SW1 and SW2 | | Normally open, momentary pushbutton; sim to Panasonic EVQPAC07K. |
| | | - - - INTEGRATED CIRCUITS - - - |
| U1 | | Dual Op Amp; sim to TI TLC27M2CP. |
| U2 | | Clock Chip; sim to Dallas Semi DS1202. |
| U3 | | Microcontroller; sim to Microchip PIC 16C57-XT/SP. |
| U4 thru U7 | | 7-Segment Display; sim to HP HDSP-7802. |
| U8 | | 10-Segment Bar Graph; sim to HP HDSP-4832. |
| U9 | | Regulator; sim to 78L05ACP. |
| | | - - - - - - - - -CRYSTAL - - - - - - - - |
| XTL1 | | Crystal: 32.768 kHz; sim to KDS DT26S. |
| XTL2 | | Crystal: 4 MHz; sim to KDS AT49S. |
| | | - - - - - MISCELLANEOUS - - - - - |
| BATT | | Battery, Lithium: 3 VDC, 165 mAh; sim to Panasonic BR2325-1HC. |