

INSTRUCTION MANUAL
MODEL 9100A
TIME CODE GENERATOR
PART NUMBER 9100-100A

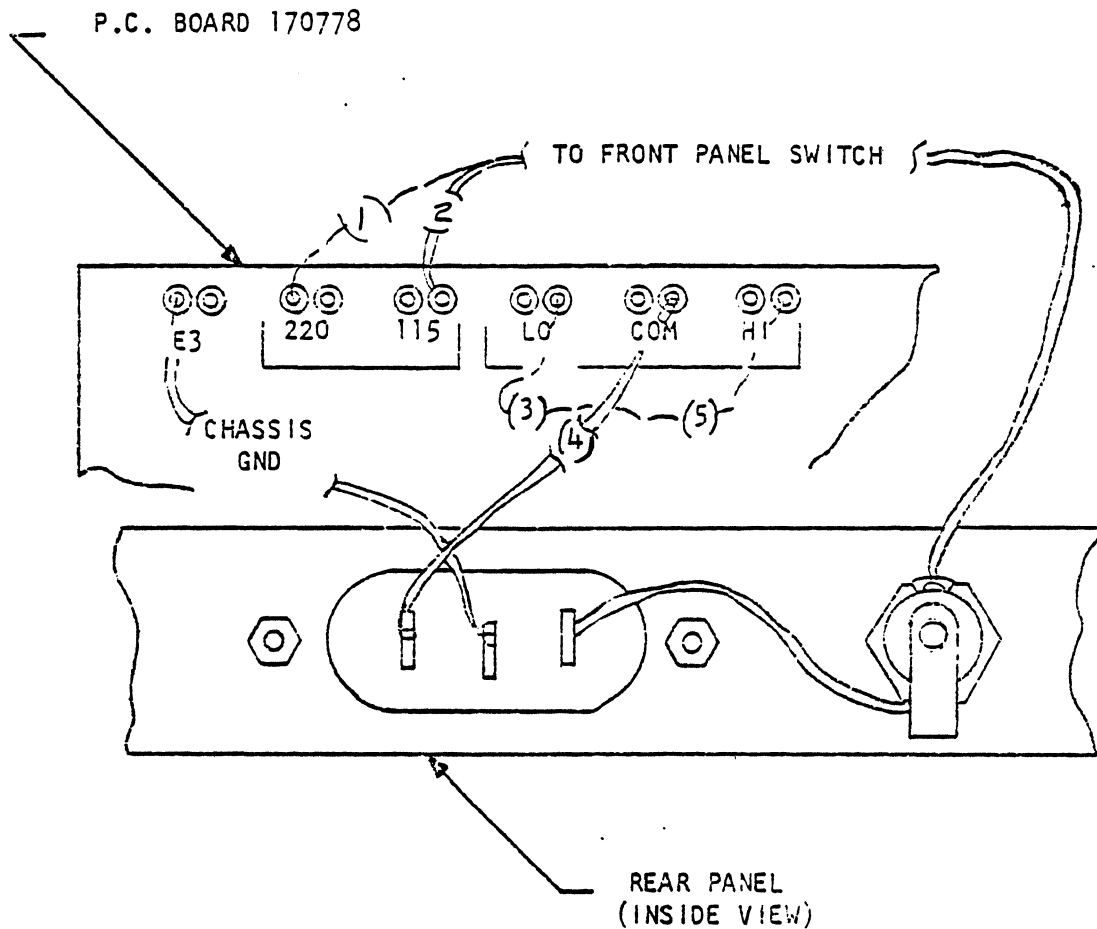
datum inc.



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NOTE:

1. The Model 9100 is shipped for use with 115V AC operation unless identified for 220/230 VAC at AC power connector. See next page for changes to 220 VAC operation.



1. Jumper #1 For 220 VAC Operation
2. Jumper #2 For 115 VAC Operation
3. Jumper #3 For Lo Line Voltage
4. Jumper #4 For Normal Line Voltage
5. Jumper #5 For Hi Line Voltage

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SECTION ONE GENERAL DESCRIPTION

1.1 GENERAL

The DATUM 9100 consists of printed circuit logic boards and a power supply housed in a 1-3/4 inch package. It uses as a time base either an internal 1-MHz oscillator or an optional external 1-MHz oscillator and by frequency division divides the 1-MHz signal down to 1 pps. The terms generated by this frequency divider are used to encode and format an IRIG B serial time code. The 1 pps is permuted and divided to represent in BCD form, seconds, minutes, hours and days time of year. This information is decoded and presented on the front panel as a time display. It is also scanned by the IRIG B encoder to provide the time of year information in the output serial time code. A means is provided to stop and start the TCG. There is a thumbwheel switch located on the front panel and 9 push-buttons provided to allow presetting the time of year into the time code generator. Pulse rates 1K pps, 100 pps, 10 pps, and 1 pps are provided on the rear panel. The time code generator requires 1-3/4 inch panel height and is suitable for standard 19-inch rack mounting with a chassis depth of 18 inches. Mounting dimensions and mounting holes are the standard RETMA configuration.

SECTION TWO SPECIFICATIONS

2.1 INPUTS

2.1.1 EXTERNAL OSCILLATOR INPUT (Optional)

- a. Frequency: 1 MHz
- b. Form Factor: Sinewave
- c. Amplitude: 1 to 4 volts peak to peak
- d. Input Impedance: Approximately 50 ohms

2.1.2 J6 AC POWER INPUT

- a. Amplitude: 115V AC or 220V AC (NOTE: Jumpers are provided internally on the power supply to allow selection of input voltage.)
- b. Input Regulation: $\pm 10\%$
- c. Input Frequency: 48-420 Hz
- d. Power: Less than 25 watts

2.2 OUTPUTS

2.2.1 J2 AC CODE

- a. Format: IRIG B, Seconds-Days (B122)
- b. Carrier Frequency: 1 kHz sinewave
- c. Amplitude: Adjustable 0-10V peak to peak
- d. Modulation Ratio: Adjustable over a range of 2:1 to 4:1
- e. External Load: ≥ 600 ohms

2.2.2 J3 STANDARD PULSE RATES

- a. Rates:
 - Pin 1 1K pps
 - Pin 2 100 pps
 - Pin 3 10 pps
 - Pin 4 1 pps
 - Pin 6 GND
- b. Duty Cycle: 80/20%

- c. On Time Edge: Negative
- d. Output Levels: Logic "0" $\leq 0.4\text{VDC}$
Logic "1" $\geq 2.4\text{VDC}$
- e. Source Impedance: DTL/TTL Compatible

2.2.3 PARALLEL OUTPUTS (Optional)

- a. (J4) 44 bit BCD time of year (milliseconds, S, M, H, D)
- b. (J5) 32 bit BCD time of year (S, M, H, D)
- c. Output Levels: Logic "0" $\leq 0.4\text{VDC}$
Logic "1" $\geq 2.4\text{VDC}$
- d. Source Impedance: DTL/TTL Compatible
- e. Sample Time Pulse: Waveform - pulse approximately 2 micro-seconds at zero level - normally in a logic "1" state - goes to ground during update of parallel outputs.

2.2.4 J3 - BI-LEVEL FIVE RATE SLOW CODE (Optional)

- a. Format: DATUM Slow Code
- b. Amplitude: Adjustable (10V maximum on the "mark" pulse)
- c. Source Impedance: 100 ohms
- d. Pin 5 - Slow Code Output

2.2.5 TIME BASE (Standard)

- a. Type: Crystal Controlled Oscillator
- b. Frequency: 1 MHz
- c. Stability: $\pm 5 \times 10^{-6}$

2.2.6 ENVIRONMENT

- a. Temperature: 0°C to $+50^{\circ}\text{C}$
- b. Humidity: Up to 95% relative

2.2.7 PHYSICAL

- a. Panel Height: 1-3/4 inches
- b. Chassis Width: 17 inches
- c. Chassis Depth: 18 inches

Table 1. Pin Assignments

J4 Parallel Outputs (Optional)

| <u>Pin</u> | <u>Term</u> | <u>Pin</u> | <u>Term</u> |
|------------|-------------|------------|-------------|
| 1 | mS1 | 26 | M40 |
| 2 | mS2 | 27 | H1 |
| 3 | mS4 | 28 | H2 |
| 4 | mS8 | 29 | H4 |
| 5 | mS10 | 30 | H8 |
| 6 | mS20 | 31 | H10 |
| 7 | mS40 | 32 | H20 |
| 8 | mS80 | 33 | D1 |
| 9 | mS100 | 34 | D2 |
| 10 | mS200 | 35 | D4 |
| 11 | mS400 | 36 | D8 |
| 12 | mS800 | 37 | D10 |
| 13 | S1 | 38 | D20 |
| 14 | S2 | 39 | D40 |
| 15 | S4 | 40 | D80 |
| 16 | S8 | 41 | D100 |
| 17 | S10 | 42 | D200 |
| 18 | S20 | 43 | D400 |
| 19 | S40 | 44 | D800 |
| 20 | M1 | 45 | NOT USED |
| 21 | M2 | 46 | NOT USED |
| 22 | M4 | 47 | NOT USED |
| 23 | M8 | 48 | SAMPLE TIME |
| 24 | M10 | 49 | NOT USED |
| 25 | M20 | 50 | GROUND |

Table 2. Pin Assignments

J5 Parallel Outputs (Optional)

| <u>Pin</u> | <u>Term</u> | <u>Pin</u> | <u>Term</u> |
|------------|-------------|------------|-------------|
| 1 | S1 | 19 | H10 |
| 2 | S2 | 20 | H20 |
| 3 | S4 | 21 | D1 |
| 4 | S8 | 22 | D2 |
| 5 | S10 | 23 | D4 |
| 6 | S20 | 24 | D8 |
| 7 | S40 | 25 | D10 |
| 8 | M1 | 26 | D20 |
| 9 | M2 | 27 | D40 |
| 10 | M2 | 28 | D80 |
| 11 | M8 | 29 | D100 |
| 12 | M10 | 30 | D200 |
| 13 | M20 | 31 | D400 |
| 14 | M40 | 32 | D800 |
| 15 | H1 | 33 | NOT USED |
| 16 | H2 | 34 | SAMPLE TIME |
| 17 | H4 | 35 | GROUND |
| 18 | H8 | 36 | GROUND |

SECTION THREE INSTALLATION

1. Refer to specifications for proper signal interface.
2. Connect AC power to J6 using the AC power cord provided with the instrument. Connect outputs as required. Place the power ON/OFF switch located on the front panel to the ON position. The 9100 is now operational.

SECTION FOUR CONTROLS AND ADJUSTMENTS

The following is a list of adjustments which are basic to the 9100 Time Code Generator/Reader and includes those assemblies which are basic options. In the case of "Potentiometers," they are set at the factory to a nominal setting as indicated in (). However, the user should refer to the top assembly drawing for the location of these variables and adjust them for his specific requirements.

1. SINEWAVE SHAPER/MODULATOR ASSEMBLY
 - a. R17 Level Adjustment. Range 0 to 10V peak to peak on the mark amplitude of the output code (3V p-p).
 - b. R15 Modulation Ratio Adjustment. Range 2:1 -4:1 mark to space ratio on the output code (3:1).
 - c. R7 Phase Adjustment. Sets the phase of the carrier frequency so there is no discontinuity when amplitude modulation takes place.
2. POWER SUPPLY ASSEMBLY
 - a. R10 adjusts the output level of the +5 volt regulator. Should be set to +5V +2%.
3. SLOW CODE ASSEMBLY (Optional)
 - a. R12 adjusts the output level (+6V mark amplitude).

The following standard controls are located on the front panels:

1. POWER Switch - Applies or removes AC power from the 9100 TCG.
2. STOP - When pressed, stops the TCG.
3. START - When pressed, starts the TCG.
4. SET Pushbuttons - Used to enter time of day in the TCG.
5. PRESET Switch - Used to select the desired number to be entered in the TCG.

SECTION FIVE OPERATING PROCEDURES

After following the installation procedures and familiarizing yourself with the Controls and Adjustments, the following procedure may be used to set the 9100 Time Code Generator into operation:

1. Set the POWER switch to the ON position.
2. Press the STOP pushbutton. The visual time display should not be updating.
3. Set the time of day into the major time accumulator by the following procedure:
 - a. Set the number desired in the unit seconds position on the TIME set switch, then press the SET button located directly under the unit seconds display, then proceed to set the time desired in the tens of seconds position, pressing the tens of seconds SET button. Once again set the time desired for unit minutes in the PRESET set switch, pressing the SET button under unit minutes. Follow this procedure proceeding from the least significant digit, that is seconds, and working towards the most significant digit of the days display.

NOTE

It is generally good procedure to preset a time about a minutes ahead of the actual time. This is to allow for the operator to set up the controls and be ready to start the generator on time.

4. Observe the external time reference. Approximately 1 second or less prior to the time that is preset in the Time Code Generator display, press the START button. The Time Code Generator should now start updating at a 1 pps rate.
5. Set the modulation ratio and output amplitude of the AC code to the desired levels. (Reference adjustment procedures.)
6. The Time Code Generator is now **operational and ready for service.**

5-RATE SLOW CODE (Optional)

The PRESET thumbwheel switch serves a dual function when the Slow Code option is installed. In addition to serving in the PRESET function, positions "1" through "5" select the desired frame period (see Slow Code drawing in Section Seven). Position "0" deactivates the Slow Code circuitry.

ADVANCE/RETARD (Optional)

1. Preset and start the generator as described above.
2. Sync an oscilloscope to the "on-time" edge of an external reference pulse (1PPS).
3. Observe the "on-time" edge of the equivalent local pulse rate. If the local pulse appears to the right of the reference, the 9100 is "late". If the local pulse occurs to the left, the 9100 is "early".
4. Select the greatest Advance/Retard rate (refer to SWITCH & CONTROL LOGIC (11) drawing for rate identification) which will not overcorrect for the offset in one second. For example: for an offset of 5 milliseconds, the proper rate would be 1 millisecond/second, as 10 milliseconds/sec would overcorrect.
5. If the local pulse is "early", press the RET pushbutton. If the local pulse is "late", press the ADV pushbutton. Observe that the local pulse appears to move toward the reference pulse.
6. When the local pulse is within one division of the selected Advance/Retard correction capability, select the next slowest correction rate.
7. Continue in this manner until the local pulse is aligned to within the maximum resolution of the Advance/Retard circuit.

EXTERNAL START (Optional)

1. Connect the external start pulse (1 PPS) to the INPUT BNC on the front panel. Place the WWV/DC switch in the appropriate position in accordance with the type signal to be used. To cause the unit to be started on the positive-going edge of the DC pulse, place the box pin jumper (located on the TICK shaper assembly) between E3 and E5. For starting on the negative-going edge, place the jumper between E3 and E6.
2. IF a WWV "tick" is being used, rotate the LEVEL control to the maximum counter-clockwise position. Adjust this potentiometer clockwise to obtain a steady blinking of the TICK indicator. Setting the control more clockwise than required to obtain a reliable indication may result in an unreliable start.
3. Preset the generator as described above.
4. After the "tick" which occurs one second prior to the preset start time, press the ARM pushbutton, the ARMED indicator will light.
5. The next "Tick Pulse" will start the generator.

SECTION SIX LOGIC DESCRIPTION AND USE

The 9100 is depicted by several drawings. One of these is the top assembly drawing which shows the physical location of the integrated circuits that are contained within the instrument. Also shown on the top assembly drawing is the assembly number of the logic cards contained within, and all of the J reference numbers for input and output connectors. This print should be used to locate connectors on the rear panel and for quick reference to the physical location of any of the integrated circuits utilized within the logics.

In the title block of each logic print is a circled number (parenthesis are used in this text). For instance, the IRIG basic print (Minor Time) has circled number (8) in the title block. The IRIG basic print (Major Time) has circled number (9). The LED display has circled (12) in the title block. Except for terms originating within the drawing being studied, this reference number will precede each term, showing the sheet of logic upon which it originated. To use these numbers, simply observe the term, look at the term reference number in front of the term, then select the print that has this reference number in the title block. This print will show the point of origin of the term you are trying to find. This provides a convenient means of getting back and forth from various pages of these logics.

Each time a term reference number will refer you back to the source of that signal. In each of the logics there will be a number such as A4, A8, A11, etc. These numbers refer to the physical location on this assembly for that particular integrated-circuit element. In order to determine a physical location of an integrated circuit, one would merely refer to the top assembly drawing. In the lower left-hand corner of this drawing, each assembly contained within the instrument is listed, prefixed with a code letter, ((A)(B)(C) etc) then, by referencing the mechanical view of the top of the instrument, look for the board labeled with that code letter. Examine the board until the desired integrated circuit is located.

All references in this discussion will be based on the circled term reference numbers located in the title blocks of all logic prints. The reader should be familiar with the above before proceeding.

SECTION SEVEN THEORY OF OPERATION

7.1 LOGIC DESCRIPTION

This description will be referenced only to the term reference numbers that are contained within the title block of each individual logic print.

(7) TIME BASE

This logic provides the 1MHz time base for the generator. Several time bases are available: Two different 1MHz crystal oscillators, a 10MHz crystal and a divide-by-ten element, or an optional external 1MHz sinewave input with a level converter. The output is a TTL 1MHz pulse (MCC).

(8) MINOR TIME

This logic consists of a series of decade counting units (DCU's) which accept the 1MHz clock from (7) and divides it to 100 KPPS (usc8), 10 KPPS (hmsc8), 1 KPPS (tmsc8), 100 PPS (mSC8), 10 PPS (hSC8) and 1 PPS (tSC8). The term HOLD prevents the minor time counter from updating and holds each decade reset when in the HOLD mode. Also contained on this logic are four buffers which isolate the four standard pulse rate outputs.

(9) MAJOR TIME

This logic consists of a series of nine decade dividers which permutes the 1PPS clock (tSC8) from the Minor Time Counter to 1 pulse per 10 seconds on the output of B10, 1 pulse per minutes on the output of B9, 1 pulse per 10 minutes on the output of B8, 1 pulse per hour on the output of B7, 1 pulse per 10 hours on the output of B6 and 1 pulse per 24 hours on the output of B5. B9 and B7 are internally permuted to divide by 6 to form the tens of seconds and tens of minutes counters. The 24-hour radix control is accomplished by the term RHC (Reset Hours Counter). This is a one-shot which generates a reset pulse for both the units and tens of hours counters after reaching a count of 23 hours, 59 minutes, and 59 seconds. The false state of this one-shot (RCH) is used to clock the days dividers, consisting of B2, B3, and B4.

Time preset into the major time counter via terms SF1, SF2, SF4, and SF8. These are bussed common to the D inputs of each decade of the major time counter. The terms are generated from logic print (11) and are the BCD outputs of the preset thumbwheel switch. Whenever one of the time SET pushbuttons is pressed, a logic "0" is applied to the preset input (pin 1) of the associated decade divider. This will enter the content of the PRESET switch into the decade counter.

(10) DISPLAY DRIVERS

This logic consists of a series of four-to-seven line decoders which converts the four-line BCD output of the major time counter (9) to the seven-line format required by the L.E.D. Display (12).

(11) SWITCH & CONTROL LOGIC

This print serves as an interface drawing used to indicate interconnections between the various assemblies within the unit as well as illustrating the various input and output connectors, with the exception of special optional outputs which are described in a separate logic description. (See Appendix B)

(12) LED DISPLAY

This logic consists of nine seven-segment Light Emitting Diode (LED) display units. Each converts the seven-segment outputs from (10) to a visible display for interface to the user.

(32) IRIG B ENCODER

Terms from the minor time counter are used to sequence multiplexer chips A9 through A14. The output of the major time counter is then scanned and grouped into ten-bit serial words, X0 through X4. X0 contains the serial time information of units of seconds and tens of seconds. X1 contain the serial time information of units of minutes and tens of minutes; X2, units of hours and tens of hours; X3, units days and tens of days and X4, hundreds of days. The terms X0 through X4 are again serially selected bit by bit by means of IC A15 and outputted as the term \overline{D} on pin 6 of A15. \overline{D} now represents the time of year information in a serial form.

Although the data at this point is serial, it is still not in an IRIG B format. The IRIG B format is generated by the output term DCSC and the collection of gates that control the reset line on pin 4 of A7. DCSC is enabled at a 100 pps rate and clocked true by the 1K pps clock applied to pin 12 of A7. The reset occurs whenever the enable term at pin 4 of A7 is set to a "one" state. This occurs at 2 milliseconds if neither a position identifier is contained at that particular period or a binary "1" is not present in the code. However, if a binary "1" is present in the serial time information being generated at A15, pin 6, the reset of DCSC is delayed until the count of 5, or 5 milliseconds.

At a 10 pps rate, at a count of 9, the DCSC reset enable is delayed for 8 counts, thus generating an 8 millisecond wide position identifier. Once per second, at T-zero time, A7 pin 5 (X0Y0) is set true. This generates the frame reference pulse of the IRIG B time code and prevents the first pulse of each frame period from being reset until a count of 8 milliseconds. The output of DCSC is buffered and presented as a DC shift code output.

On (32A) the output of A8 pin 6 is a 1 KC squarewave. Operational amplifier A18 filters the odd harmonics from the squarewave to produce a 1 kHz sinewave. The sinewave is amplitude modulated by the DC code envelope (DCSC) by means of FET Q1 and IC A17. The output of A17, pin 1, is attenuated by a potentiometer, R17, which is used to set the level of the IRIG B modulated serial time code. The output amplifier consists of A17, Q2 and Q3. The gain is set by resistors R18 and R20 and is set to be a fixed gain of 10. The modulated output is available on E6.

(49) POWER SUPPLY

The Power Supply furnishes regulated +/- 15V DC and +5V DC to the unit. The +/- 15V DC regulators are integrated circuit regulators with internal fault protection. The +5V DC regulator employs an LM305 voltage regulator and is of the switching type.

The LM305 is essentially an operational amplifier with a built-in Zener reference. When the voltage on pin 6 falls a few millivolts below that of the internal reference, Q1 and Q2 are turned on and the voltage on the 5 volt line begins to rise. Q1 and Q2 turn off as the voltage on A1-6 rises above the reference level. L1 tries to maintain constant current flow and current begins to flow through CR2. This continues until Q1 and Q2 are again turned on and the cycle is repeated.

The switching regulator is thus an efficient method of obtaining constant 5V DC from an unregulated source, since power is dissipated in Q1 only when it is on or changing states.

For 5 volts from a 23V source, Q1 is on approximately 25 percent of the time. Q3 and Q4 provide short circuit protection by forcing the regulator to decrease the output voltage when the current through R7 becomes excessive. When the output voltage becomes too high, CR5 conducts and CR6 is turned on. The current limit circuit then shuts down the regulator.

7.2 OPTIONAL FEATURES (Also see Appendix B)

Described in the following paragraphs are some (but not all) of the options and capabilities which are available. For instance, Control Functions and/or Binary seconds may be encoded and inserted into serial code format or translated from the input code. These particular capabilities, although not listed would most likely be used in conjunction with one or more of the other options. Refer to the Addendum at the beginning of this manual for applicability to this particular model.

(20) ADVANCE/RETARD (Option)

When in the generator mode of operation this assembly, in conjunction with front panel switches, allows the operator to slew the internally generated update clock in order to align it with an external reference signal.

(25) EXTERNAL START (Option)

Allows the unit to be started "on time" from an external WWV TICK signal or a DC pulse.

(27) 17 BIT BINARY CONVERTER (Option)

Provides parallel buffered 17 bit binary outputs (seconds, minutes, hours) of the major time counter. 10 bits of binary milliseconds can also be provided.

(29) SLOW CODE (Option)

Converts parallel BCD information (major time), in conjunction with a front panel switch, to a bi-level 5 rate serial Slow Code format.

(30) PARALLEL OUTPUTS (Option)

Provides parallel buffered BCD outputs of the major and or minor time counter contents. Also provides for other output timing signals.

(31) IRIG A ENCODER (Option)

This option provides for the generation of IRIG A Time Code Format (A132). The operation of this assembly is the same as for IRIG B (32). However, since the code rate is 1000 PPS the input timing terms are different and the pulse widths mentioned are decreased by a factor of ten.

(35) IRIG E ENCODER (Option)

This option provides for the generation of an IRIG E Time Code Format (E112). The operation of this assembly is the same as for IRIG B (32). However, since the code rate is 10 PPS the input timing terms are different and the pulse widths are increased by a factor of ten.

TYPICAL TIME CODE GENERATOR

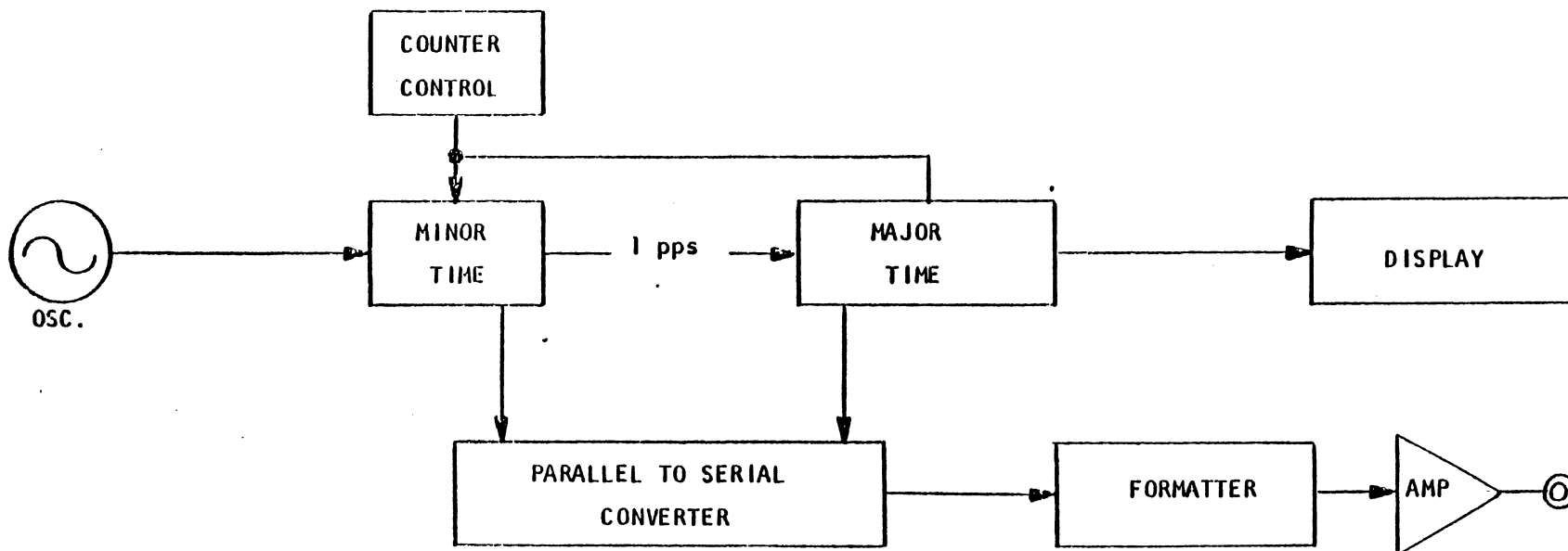
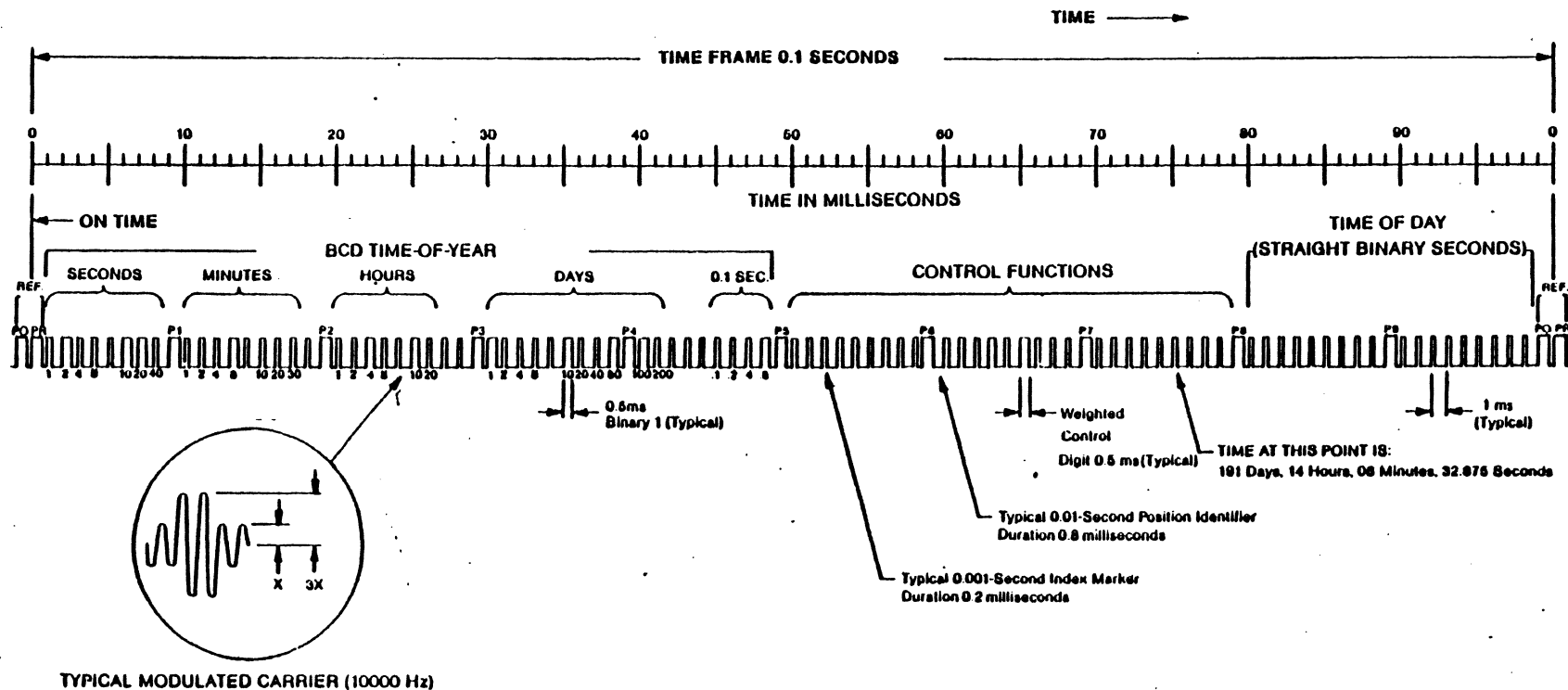


FIGURE 1



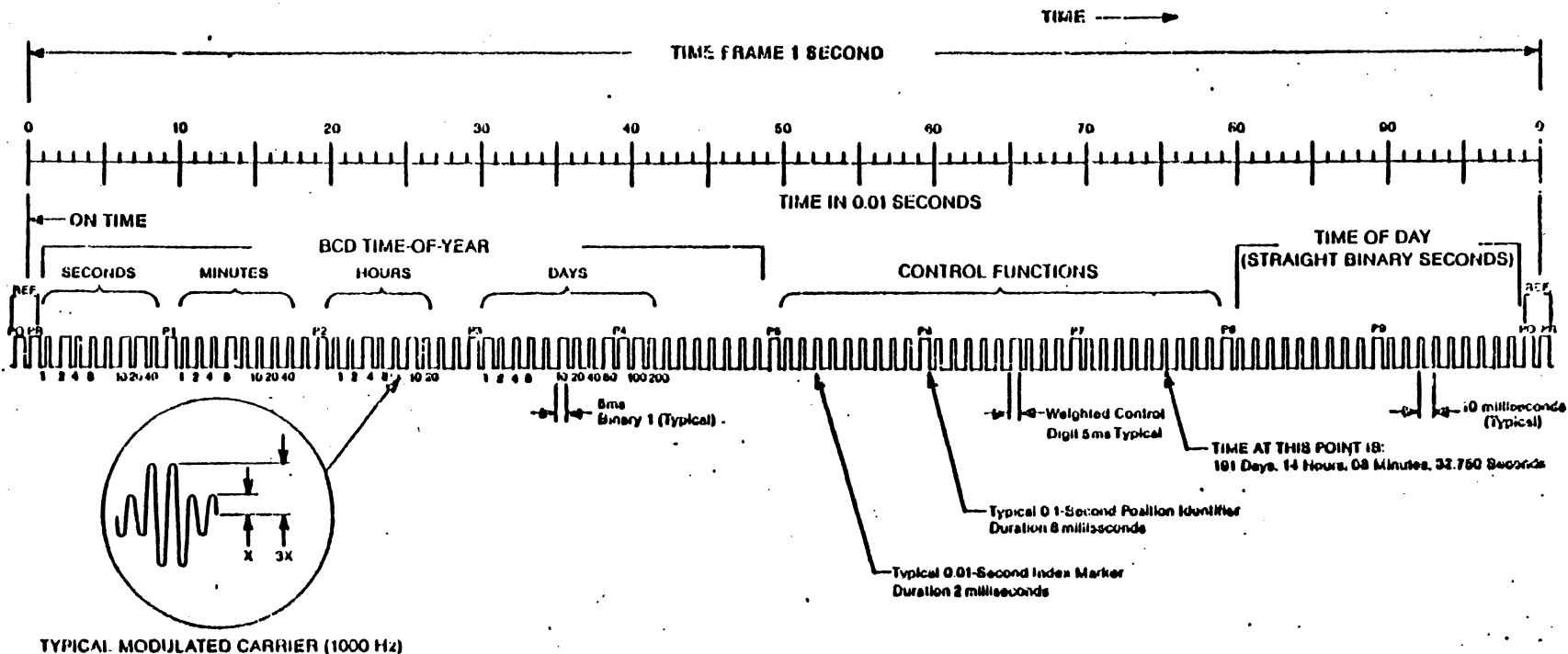
TYPICAL MODULATED CARRIER (10000 Hz)

IRIG FORMAT 'A' - GENERAL

1. **TIME FRAME:** 0.1 second
2. **CODE DIGIT WEIGHTING OPTIONS:** BCD, SB or both:
 - a. Binary Coded Decimal Time-of-Year CODE WORD - 34 binary digits.
 - (1) Seconds, minutes, hours, days and 0.1 seconds. Recycles yearly.
 - b. Straight Binary Time-of-Day CODE WORD - 17 binary digits.
 - (1) Seconds only. Recycles each 24 hours. (86399)
3. **CODE WORD STRUCTURE:**
 - a. BCD. Word begins at INDEX COUNT 1. Binary-coded elements occur between POSITION IDENTIFIER ELEMENTS (seven for seconds; seven for minutes; six for hours; ten for days; four for 0.1 seconds) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
 - b. SB. Word begins at INDEX COUNT 80. Seventeen binary-coded elements occur, with a POSITION IDENTIFIER between the 9th and 10th binary-coded elements.

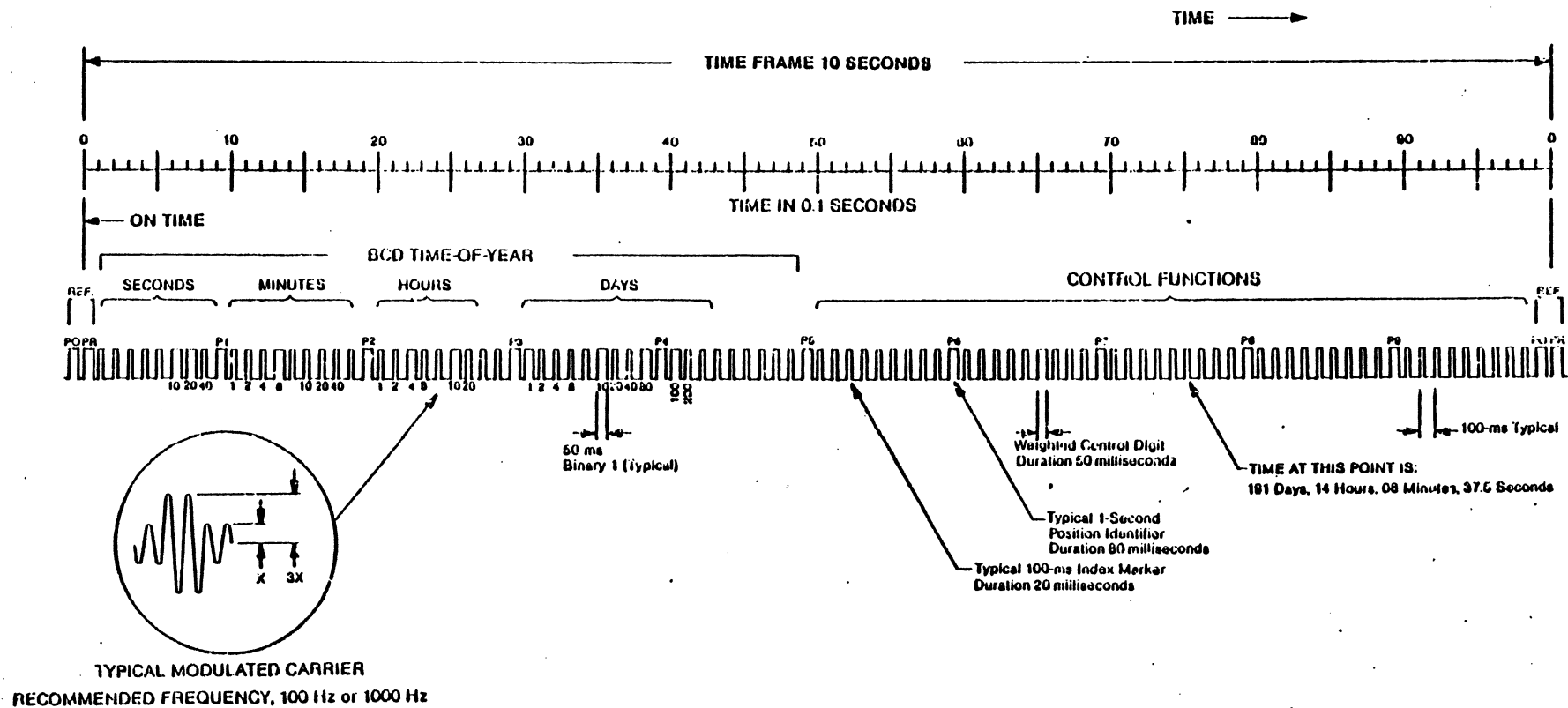
4. **LEAST SIGNIFICANT DIGIT:** Occurs first, except for fractional seconds information, which occurs following the day-of-year information.
5. **ELEMENT RATES AVAILABLE:**
 - a. 1000 per second (basic Element rate)
 - b. 100 per second (POSITION IDENTIFIER rate)
 - c. 10 per second (Frame rate)
6. **ELEMENT IDENTIFICATION:**
 - a. "On-Time" reference point for each Element is its leading edge.
 - b. INDEX MARKER duration: 0.2 milliseconds (Binary Zero or uncoded Element)
 - c. CODE DIGIT duration: 0.5 milliseconds (Binary one)
 - d. POSITION IDENTIFIER: 0.8 milliseconds
 - e. REFERENCE MARKER: Two consecutive POSITION IDENTIFIERS.
(The "on-time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. **RESOLUTION:** 1 millisecond (unmodulated); 0.1 millisecond (modulated).
8. **CARRIER FREQUENCY:** 10 kHz when modulated.

IRIG STANDARD FORMAT A
SIGNAL A00
1000 PPS CODE
REFERENCE IRIG DOCUMENT 104-70



IRIG FORMAT 'B' - GENERAL

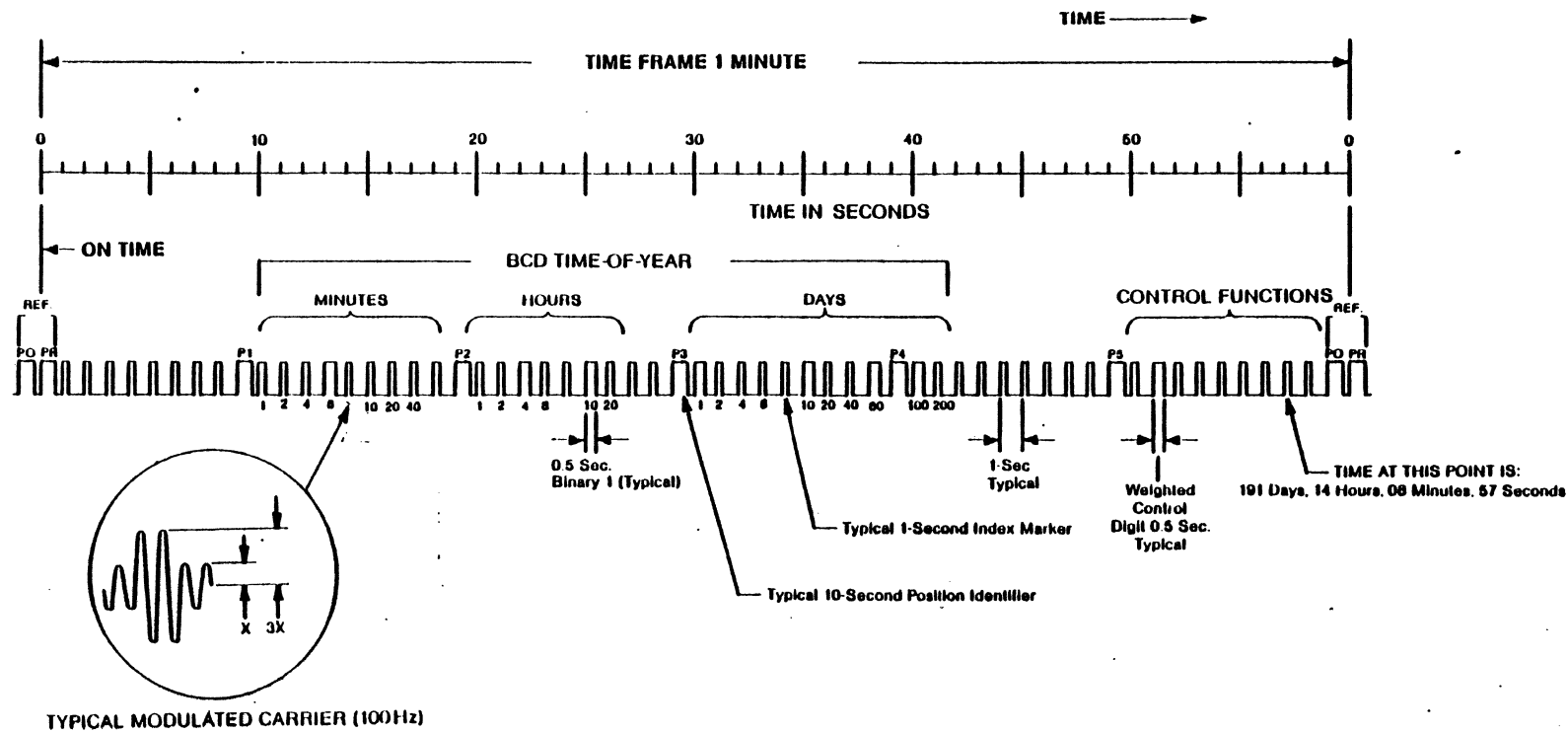
1. TIME FRAME: 1.0 second.
2. CODE DIGIT WEIGHTING OPTIONS: BCD, SB or both:
 - a. Binary Coded Decimal Time-of-Year CODE WORD - 30 binary digits.
 - (1) Seconds, minutes, hours and days. Recycles yearly.
 - b. Straight Binary Time-of-Day CODE WORD - 17 binary digits.
 - (1) Seconds only. Recycles each 24 hours. (86399)
3. CODE WORD STRUCTURE:
 - a. BCD: Word begins at INDEX COUNT 1. Binary-coded elements occur between POSITION IDENTIFIER ELEMENTS (seven for seconds, seven for minutes; six for hours; ten for days) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
 - b. SB: Word begins at INDEX COUNT 80. Seventeen binary-coded elements occur with a POSITION IDENTIFIER between the 9th and 10th binary-coded elements.
4. LEAST SIGNIFICANT DIGIT: occurs first.
5. ELEMENT RATES AVAILABLE:
 - a. 100 per second (basic Element rate)
 - b. 10 per second (POSITIVE IDENTIFIER Rate)
 - c. 1 per second (Frame Rate)
6. ELEMENT IDENTIFICATION:
 - a. "On-Time" reference point for each Element is its leading edge.
 - b. INDEX MARKER duration: 2 milliseconds (Binary zero or uncoded Element)
 - c. CODE DIGIT duration: 5 milliseconds (Binary one)
 - d. POSITION IDENTIFIER duration: 8 milliseconds
 - e. REFERENCE MARKER - one per second: Two consecutive POSITION IDENTIFIERS. (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. RESOLUTION: 10 milliseconds (unmodulated); 1 millisecond (modulated).
8. CARRIER FREQUENCY: 1 kHz when modulated



IRIG FORMAT 'E' - GENERAL

1. TIME FRAME: 10 seconds
2. CODE DIGIT WEIGHTING: BCD: Time-of-Year CODE WORD - 26 Binary Digits. Seconds, minutes, hours and days; recycles yearly.
3. CODE WORD STRUCTURE:
BCD: Word begins at INDEX COUNT 6. Binary-coded Elements occur between POSITION IDENTIFIER ELEMENTS (three for seconds, seven for minutes; six for hours, ten for days) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
4. LEAST SIGNIFICANT DIGIT: Occurs first.
5. ELEMENT RATES AVAILABLE:
 - a. 10 per second (basic Element rate)
 - b. 1 per second (POSITION IDENTIFIER Rate)
 - c. 0.1 per second (Frame Rate)
6. ELEMENT IDENTIFICATION:
 - a. "On-Time" reference point for each Element is its leading edge.
 - b. INDEX MARKER duration: 20 milliseconds (Binary zero or uncoded Element)
 - c. CODE DIGIT duration: 50 milliseconds (Binary one)
 - d. POSITION IDENTIFIER duration: 80 milliseconds (Refers to the leading edge of the succeeding Element).
 - e. REFERENCE MARKER (one per 10 seconds): Two consecutive POSITION IDENTIFIERS.
(The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. RESOLUTION: 100 milliseconds (unmodulated); 1 millisecond (modulated).
8. CARRIER FREQUENCY: 1 kHz or 100 Hz when

IRIG STANDARD FORMAT E
SIGNAL E00
10 PPS CODE



1. TIME FRAME: 1 minute

2. CODE DIGIT WEIGHTING: BCD Time-of-Year CODE WORD — 23 binary digits. Minutes, hours and days; recycles yearly.

3. CODE WORD STRUCTURE: BCD word begins at INDEX COUNT 10. Binary-Coded Elements occur between POSITION IDENTIFIER ELEMENTS (seven for minutes; six for hours; ten for days) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.

4. LEAST SIGNIFICANT DIGIT: Occurs first.

5. ELEMENT RATES AVAILABLE:

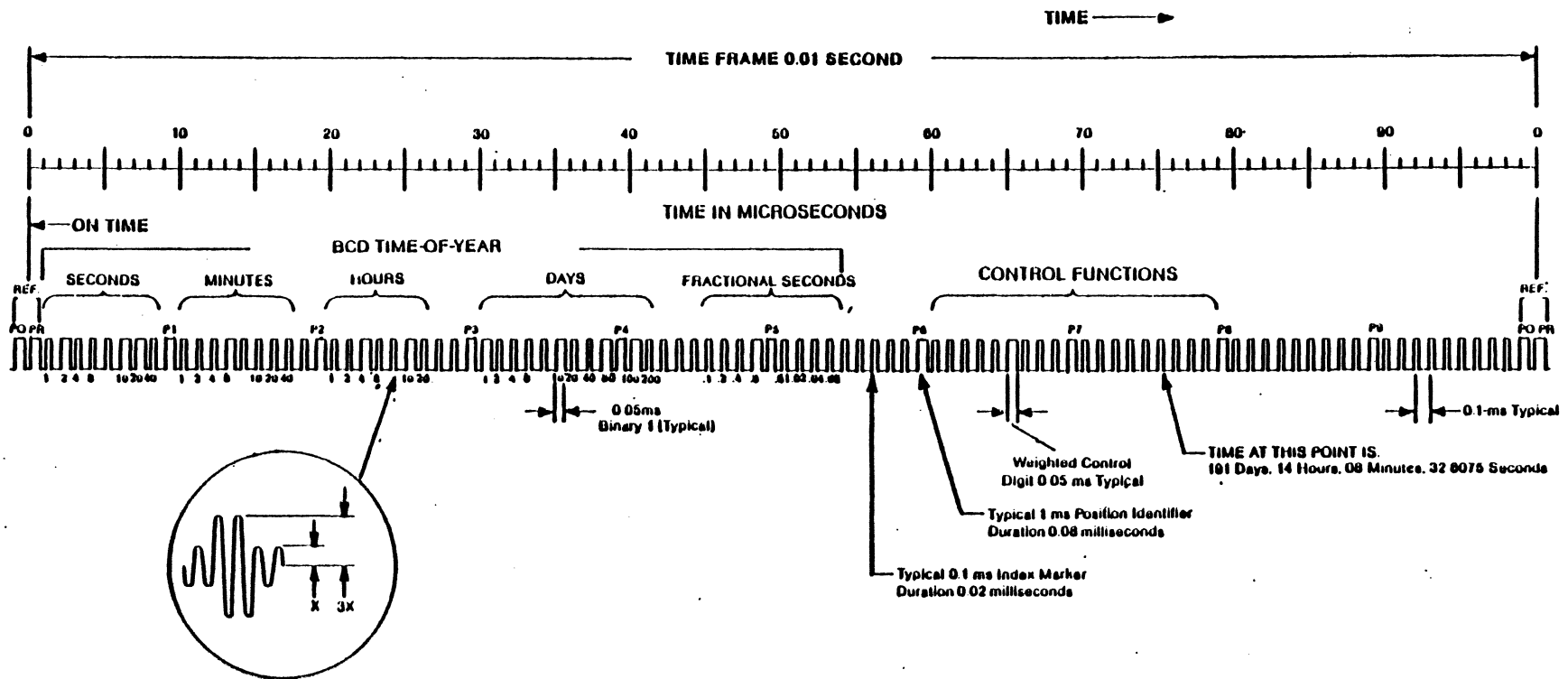
- a. 1 per second (basic Element Rate)
- b. 1 per ten seconds (POSITION IDENTIFIER Rate)
- c. 1 per minute (Frame Rate)

6. ELEMENT IDENTIFICATION:

- a. "On-Time" reference point for each element is its leading edge.
- b. INDEX MARKER duration: 0.2 seconds (Binary zero or uncoded Element)
- c. CODE DIGIT duration: 0.5 seconds (Binary one)
- d. POSITION IDENTIFIER duration: 0.8 seconds
- e. REFERENCE MARKER: 1 per minute. Two consecutive POSITION IDENTIFIERS. (The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)

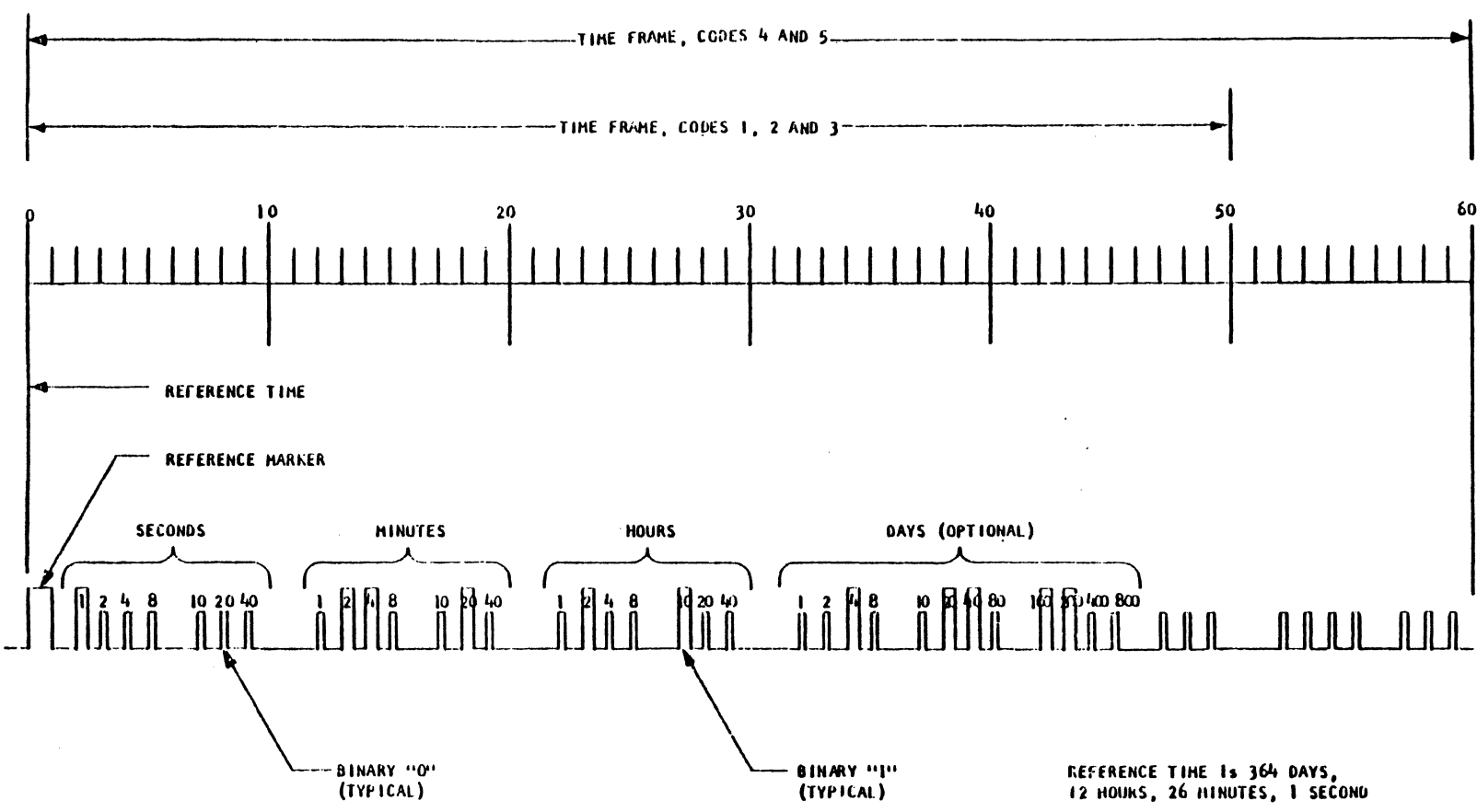
7. RESOLUTION: 1 second (unmodulated); 0.01 seconds (modulated 100 Hz); 0.001 seconds (modulated 100 Hz).

8. CARRIER FREQUENCY: 1 kHz or 100 Hz where modulated.



1. TIME FRAME: 0.01 second.
2. CODE DIGIT WEIGHTING: BCD Time-of-Year CODE WORD - 38 binary digits.
 - a. Seconds, minutes, hours, days, 0.1 seconds and 0.01 seconds; recycles yearly.
3. CODE WORD STRUCTURE: BCD Word begins at INDEX COUNT 1. Binary Coded Elements occur between POSITION IDENTIFIER ELEMENTS (seven for seconds; seven for minutes; six for hours; ten for days; four for 0.1 seconds; four for 0.01 seconds) until the CODE WORD is complete. A POSITION IDENTIFIER occurs between decimal digits in each group to provide separation for visual resolution.
4. LEAST SIGNIFICANT DIGIT: Occurs first, except for fractional seconds information, which occurs following the Day-of-Year information.
5. ELEMENT RATES AVAILABLE:
 - a. 10000 per second (basic Element Rate)
 - b. 1000 per second (POSITION IDENTIFIER Rate)
 - c. 100 per second (Frame Rate)

6. ELEMENT IDENTIFICATION:
 - a. "On-Time" reference point for each element is its leading edge.
 - b. INDEX MARKER duration: 0.02 milliseconds (Binary zero or uncoded Element)
 - c. CODE DIGIT duration: 0.05 milliseconds (Binary one)
 - d. POSITION IDENTIFIER duration: 0.08 milliseconds
 - e. REFERENCE MARKER: Two consecutive POSITION IDENTIFIERS.
(The "On-Time" point, to which the CODE WORD refers, is the leading edge of the second POSITION IDENTIFIER.)
7. RESOLUTION: 0.10 milliseconds (unmodulated); 0.01 milliseconds (modulated).
8. CARRIER FREQUENCY: 100 kHz when modulated.



REFERENCE TIME is 364 DAYS,
12 HOURS, 26 MINUTES, 1 SECOND

| CODE | PULSE RATE | FRAME PERIOD | BINARY ZERO | BINARY ONE | FRAME REFERENCE PULSE |
|------|------------|--------------|-------------|------------|-----------------------|
| 1 | 50 PPS | 1 SEC | 4 MS | 10 MS | 20 MS |
| 2 | 10 PPS | 5 SEC | 20 MS | 50 MS | 100 MS |
| 3 | 5 PPS | 10 SEC | 40 MS | 160 MS | 200 MS |
| 4 | 1 PPS | 60 SEC | 200 MS | 500 MS | 1,000 MS |
| 5 | 1 PPS 10S | 10 MIN | 2 SEC | 5 SEC | 10 SEC |

 datum inc.
BI-LEVEL SLOW CODE REV. A

SECTION EIGHT MAINTENANCE

This instrument's logic is comprised of integrated circuits. There are no moving parts or parts with limited life. There is no periodic maintenance required for the unit under normal conditions. If the unit is exposed to unusual operating conditions such as high dust or high humidity environments, or if the unit is dropped or otherwise damaged, it may be necessary to perform certain inspections and/or repairs.

If it is necessary to inspect the unit, the following should be considered:

1. Always disconnect AC power before removing the instrument's top or bottom cover. To remove the cover, simply remove the screw at the rear panel and slide the cover off the rear.
2. Make a thorough visual inspection of all circuitry and wiring.
3. Check for physical integrity of all components. Look for burned or cracked components, loose physical damage, leakage of insulation compounds or general physical damage. To aid in overall maintenance and repair, each integrated circuit is mounted in an individual modular socket. Removal or replacement is therefore convenient and easy.

It should rarely be necessary to replace an integrated circuit; however, if replacement is attempted, be sure that all component leads enter the socket and that no leads are bent under the component or extended out from the socket.

Check to see that all IC's are firmly mounted in the socket so that good electrical contact is made.

4. Check all switches and connectors for loose or broken wires.

5. If the internal component surfaces and components have an excessive amount of dust deposited on them, use a soft brush and a low pressure stream of air to remove any foreign material.

CAUTION

Do not clean PC boards or small internal components with a stiff brush or solvents since damage to the circuits may result. A high-powered vacuum cleaner device should not be used on small internal components.

6. Wipe the external surfaces of the instrument with a soft, damp cloth to remove dirt, fingerprints and other foreign material.
7. Replace the cover(s) and reconnect the AC power and input connector. Check operation. If performance does not match or exceed the specifications listed, corrective maintenance is in order.

Printed Circuit Board Repair

Removal and insertion of IC components can be easily made as described above. Should it be necessary to replace conventional components which are soldered to the circuit board, cut the leads of the part near the lead holes. Using a low power (50 watts or less) soldering iron, apply heat sparingly to each cut lead. As soon as the solder melts, slip the lead from the hole and clean the hole with a toothpick. Clean the board surfaces with isopropyl alcohol. Form the tinned leads of the replacement part and insert in cleaned holes, trimming the leads to extend 1/16 inch beyond the back surface of the board. Only 63/37 solder with a maximum diameter of 1/16 inch should be used. Solder the leads to the board and use a hemostat, long-nosed pliers, or other heat sink on the leads of all semi-conductor devices and quarter-watt resistors. Allow the soldered junction to cool before removing the heat sink.

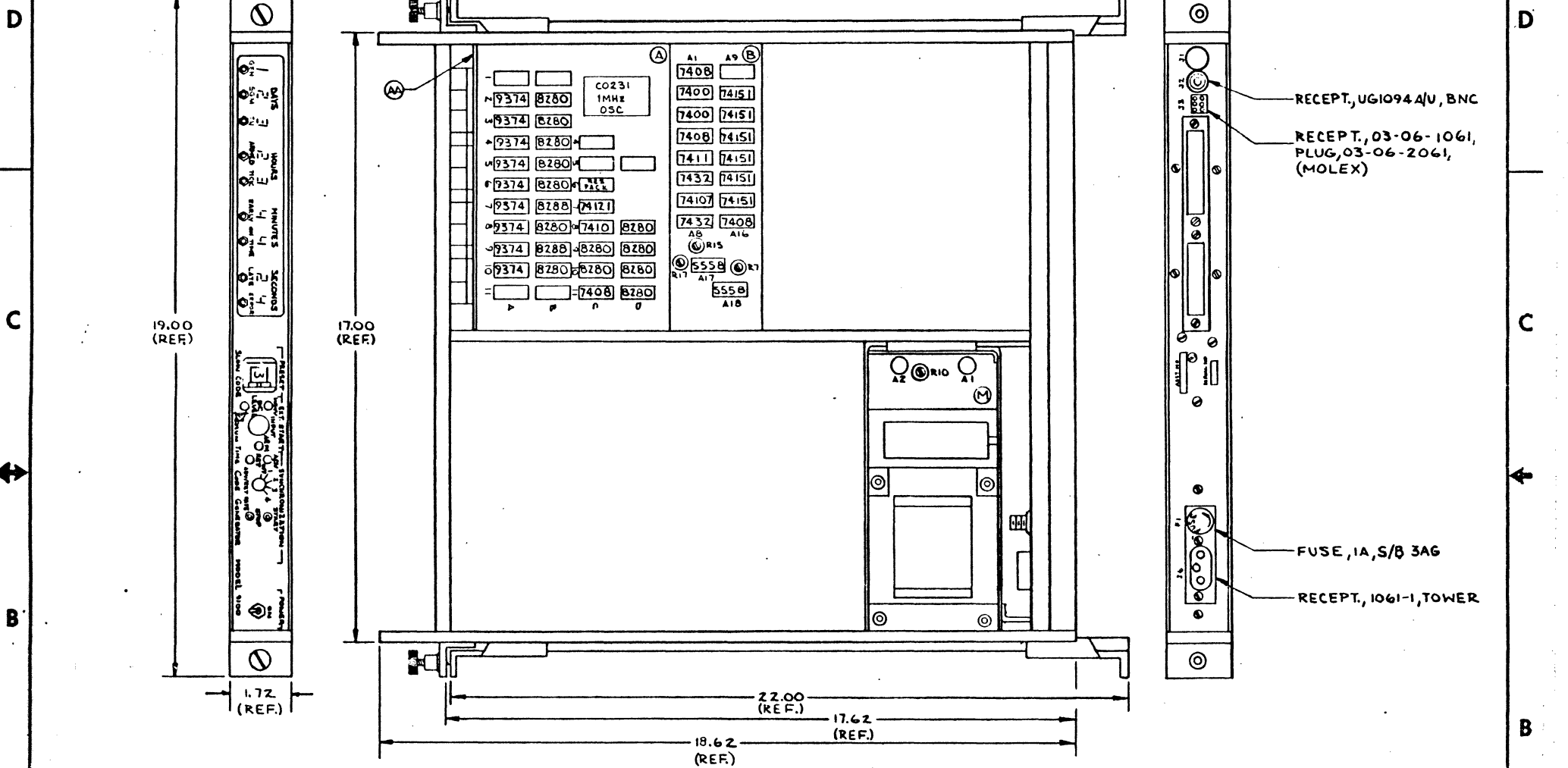
WARNING

Potentially lethal voltages are present in the instrument. Use caution at all times when the protective covers are removed.

SECTION IX
LIST OF DRAWINGS

| | | |
|---------------------------|------------------|------------------|
| 1. Top Assembly | | 9100-100A |
| 2. Basic Generator (TCG) | (7) (8) (9) (10) | 16624 |
| 3. Switch & Control Logic | (11) | 9100-8058 |
| 4. LED Display | (12) | 16549 |
| 5. IRIG B Encoder | (32) | 16062 |
| 6. Power Supply | (49) | 16280 |
| 7. Wiring Diagram | | 803579 (Sheet 1) |

| REVISIONS | | | |
|-----------|-------------|------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |
| | | | |



RECEPT, UG1094 A/U, BNC
 RECEPT, 03-06-1061,
 PLUG, 03-06-2061,
 (MOLEX)

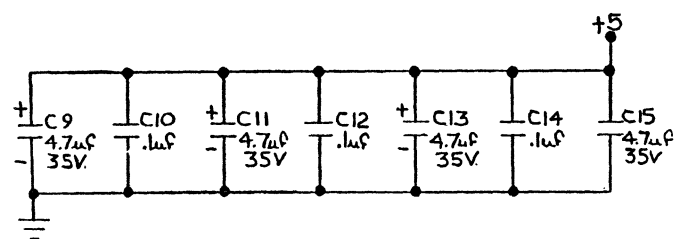
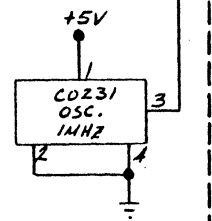
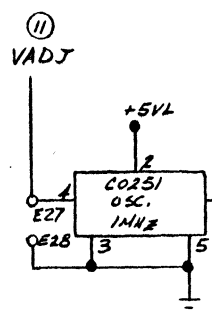
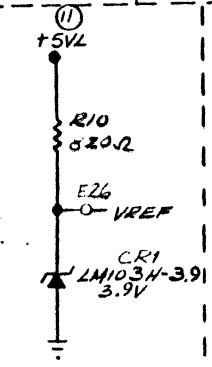
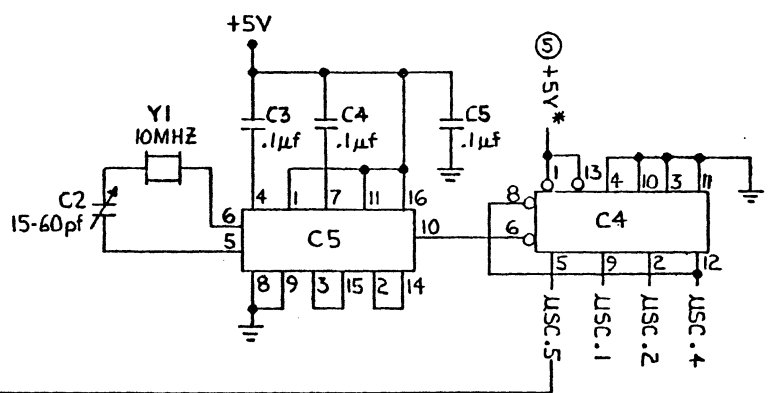
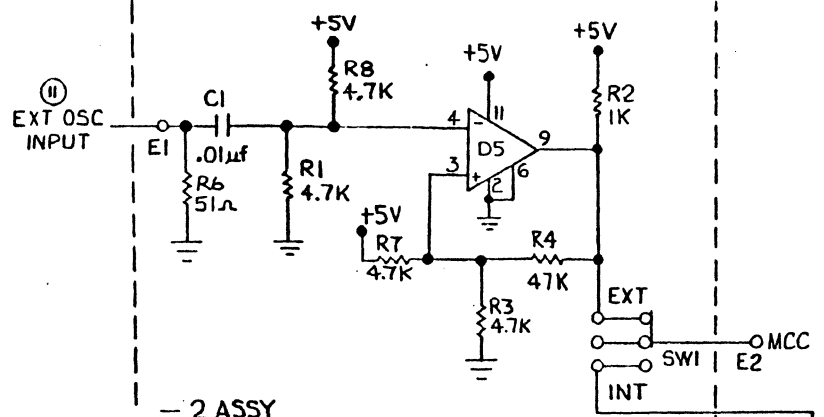
FUSE, 1A, S/B 3AG
 RECEPT, 1061-1, TOWER

7. SWITCH & CONTROL LOGIC 9100-8058
 6. WIRELIST 803579, 803580 (IRIG B)
 5. WIRING DIAGRAM
 J6- AC POWER INPUT
 J5-
 J4-
 J3- PULSE RATES
 J2- IRIG B OUTPUT
 J1-
 3. SLIDES & REAR MTG. BRKTS ARE OPTIONAL

- (M) 16280-3 POWER SUPPLY
 (B) 16062-1 IRIG B ENCODER
 (A) 16624-13TCG
 2. (AA) 16549-1 DISPLAY
 1. TOP COVER REMOVED FOR CLARITY
 NOTES: UNLESS OTHERWISE SPECIFIED

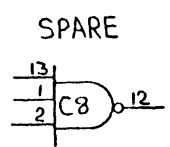
| THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT. | | | |
|---|---------------------|--|-----------|
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES UNLESS OTHERWISE SPECIFIED | | TITLE TIME CODE GENERATOR | |
| DWR SMITH | DES [Signature] | Datum inc. 1363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92805 | |
| CHK [Signature] | ENGR [Signature] | C | 9100-100A |
| SCALE NONE | FIG 31160 | SIZE 8 1/2 X 11 | REV 1 |

| REVISIONS | | | |
|-----------|-------------|------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |
| | SEE SHEET 2 | | |



| | | |
|-----------|-----------|--------------------|
| 899-1-R2K | BECKMAN | C6 |
| MC12061P | MOT | C5 |
| LM311D | NATIONAL | D5 |
| N7408A | SIGNETICS | C11 |
| N7410A | SIGNETICS | C8 |
| SN74121N | T.I. | C7 |
| N8280A | SIGNETICS | B2-68,0C49,1QD8-11 |
| 9374DC | FAIRCHILD | A2-10 |
| N8288A | SIGNETICS | B7,9 |
| PART NO | MFR. | REF NO. |

| | |
|----|---------------|
| -6 | 923051 OSC. |
| -5 | 10MHZ CRYSTAL |
| -4 | CO251 OSC |
| -3 | CO231 OSC |
| -2 | EXT OSC |
| -1 | S-M-H-D |
| - | BASIC S-M-H |

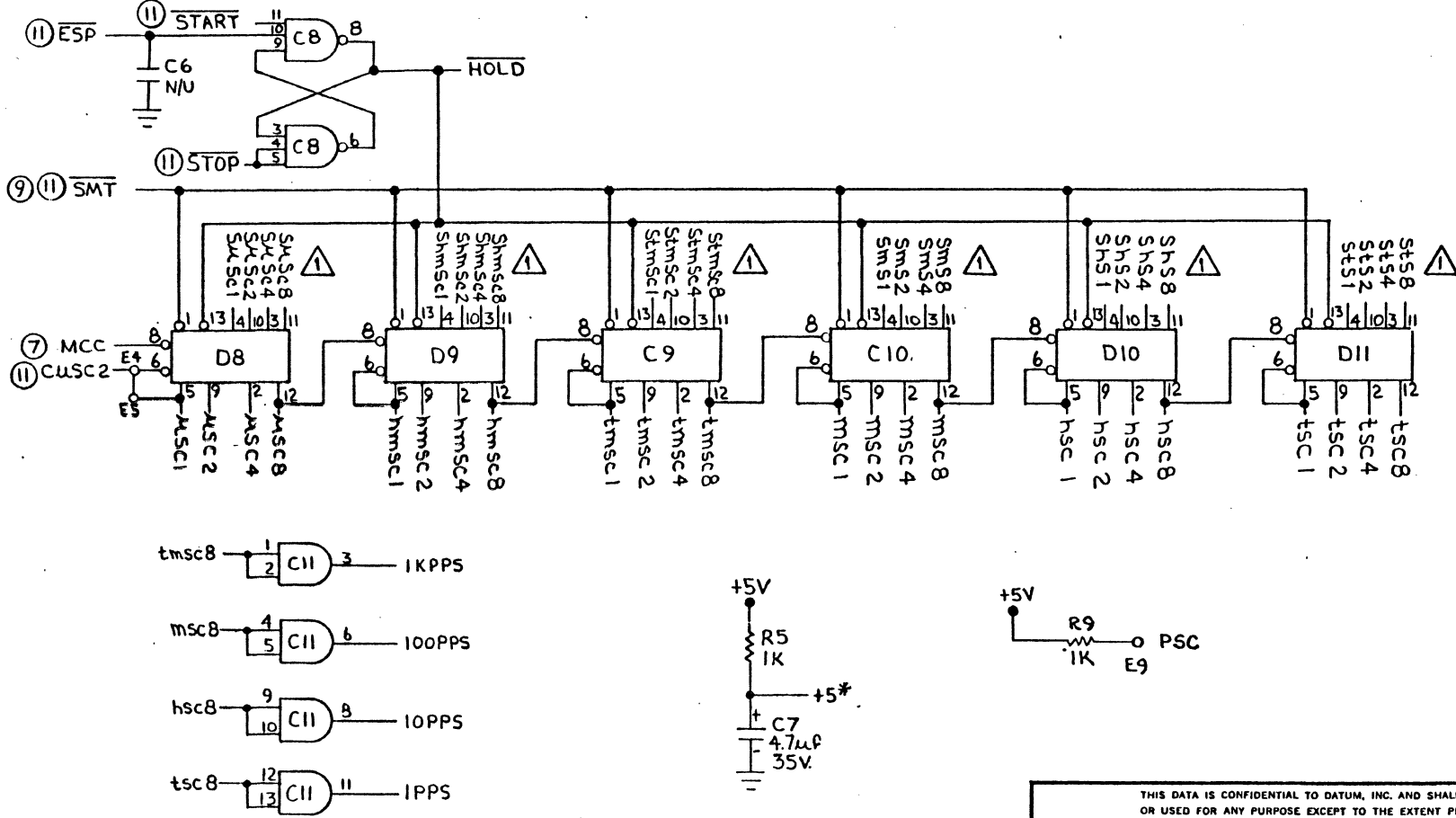


NOTES: UNLESS OTHERWISE SPECIFIED

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| | | | |
|---------------------------------|------------------|--|-----------------|
| TITLE TCG (TIME BASE) | | 1393 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92708 | |
| DESIGNED BY SMITH | DATE 10/22/74 | CHKD BY [Signature] | DATE 11/4/74 |
| SCALE NONE | FIG 31100 | SIZE SMT | OF 4 |

| REVISIONS | | | |
|-----------|-------------------------|----------|------------|
| LTR | DESCRIPTION | DATE | APPROVED |
| A | ADDED NOTE Δ | 7/20/77 | <i>RLK</i> |
| B | REVISED PER E.C.O. 1051 | 11/30/77 | SV/KH |

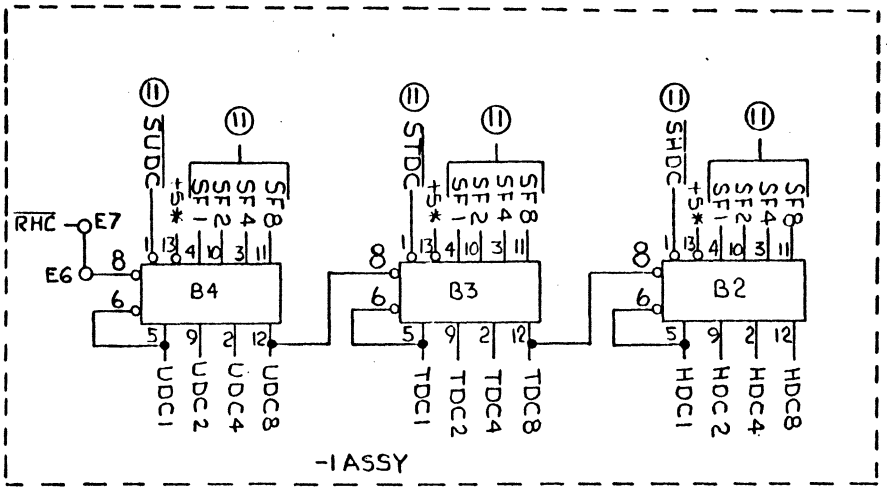
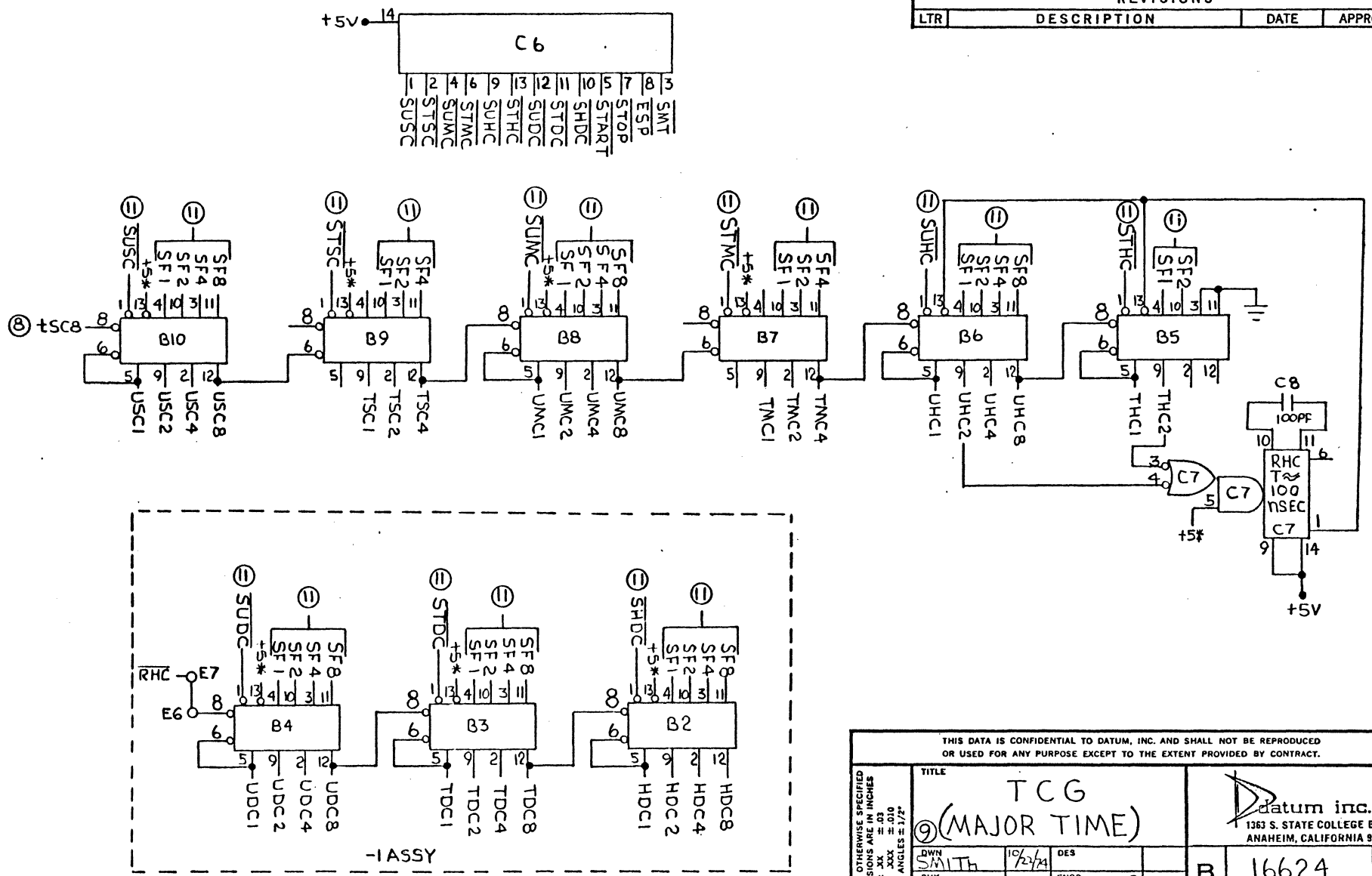


- Δ -6 ASSY, CUT ETCH BETWEEN E27 & E28, JUMPER VADJ TO E27.
- ∇ SIDE LOAD TERMS, IF USED; ORIGINATE ON (II)

NOTES: UNLESS OTHERWISE SPECIFIED

| | | | |
|---|----------------------------------|--------------|--|
| THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT. | | | |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL: .XX ±.03 XXX ±.010 ANGLES ± 1/2° | TITLE TCG (MINOR TIME) | | datum inc. 1363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92806 |
| | DES SMITH | 10/22/74 | |
| | CHK | | ENGR <i>[Signature]</i> |
| | SCALE NONE | FSC 31160 | SIZE SHT 2 of 4 |

| REVISIONS | | | |
|-----------|-------------|------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |
| | | | |



NOTES: UNLESS OTHERWISE SPECIFIED

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|---|---|---------------------|--|---------------------|
| THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT. | | | | |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL. .XX .XXX .XXX ± .010 ANGLES ± 1/2° | TITLE TCG ⑨(MAJOR TIME) | | datum inc. 1363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92806 | |
| | DESIGNED BY SMITH | DATE 10/24/74 | | DESIGN NO. 16624 |
| | CHK CHK | ENGR [Signature] | REV B | REV B |
| | SCALE NONE | FSC 31160 | SIZE SHT 3 OF 4 | REV REV |

5

4

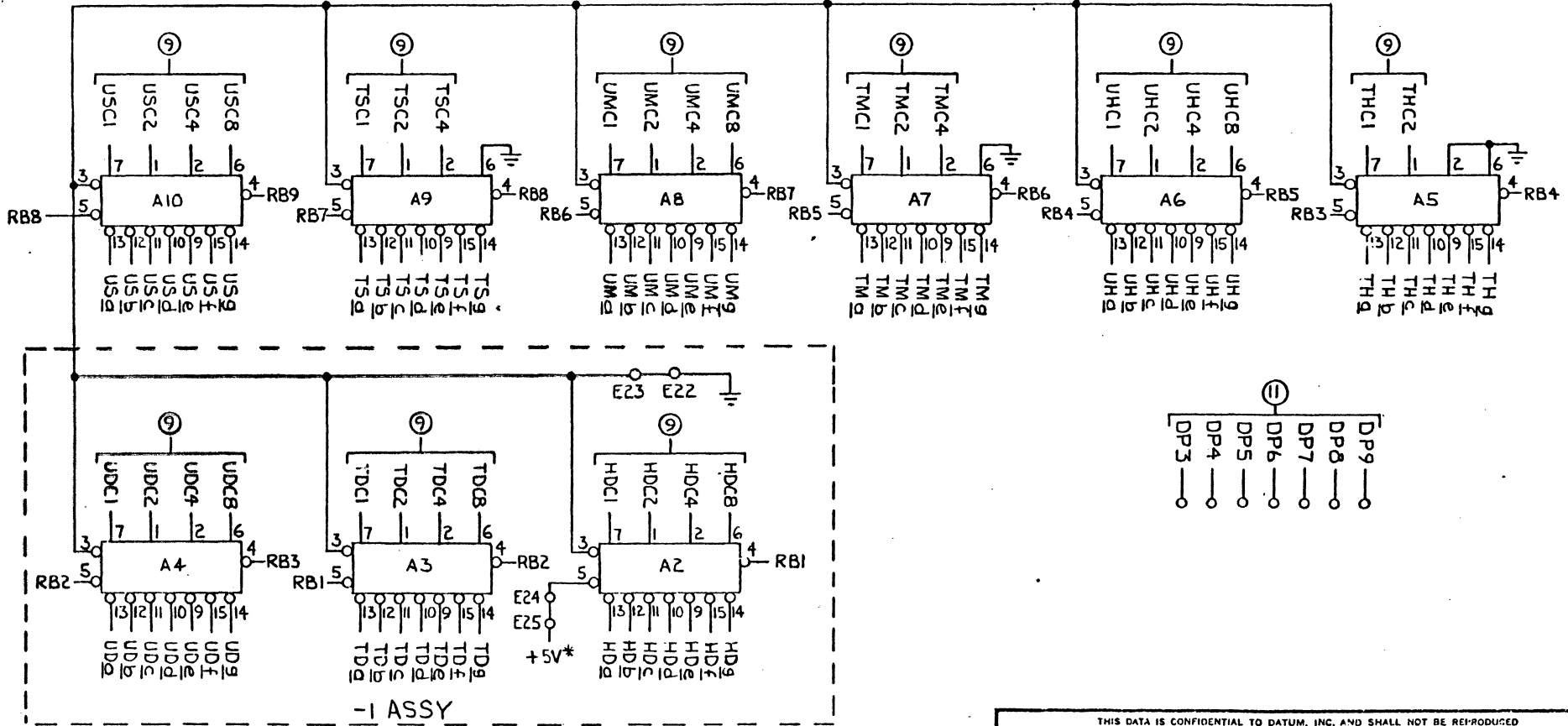
3

2

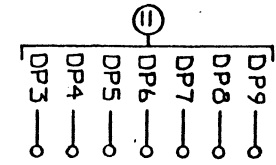
1

REVISIONS

| LTR | DESCRIPTION | DATE | APPROVED |
|-----|-------------|------|----------|
| | | | |



-1 ASSY



NOTES: UNLESS OTHERWISE SPECIFIED

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|---|----------------|--|----------------|
| THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT. | | | |
| TITLE TCG (DISPLAY DRIVERS) | | Datum inc. 1363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92801 | |
| DWG EC | DES EES | SIZE B | REV 16624 B |
| CHK | DATE 1/1/67 | SCALE NONE | QTY 4 OF 4 |
| FSC 31150 | | SIZE | REV |

5

4

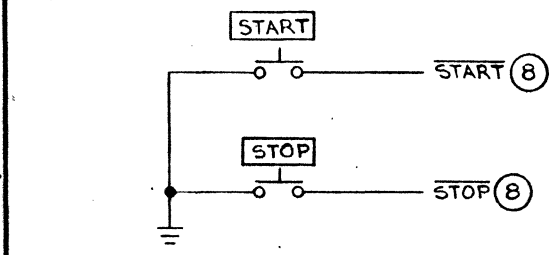
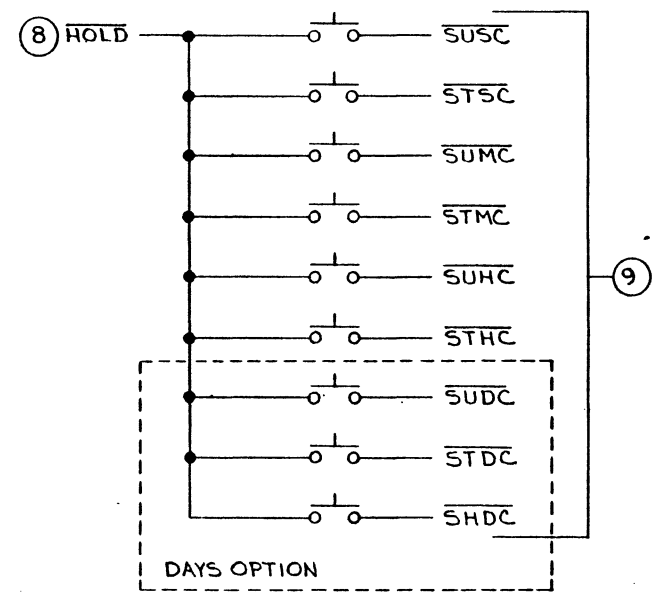
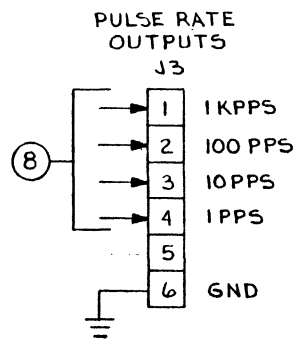
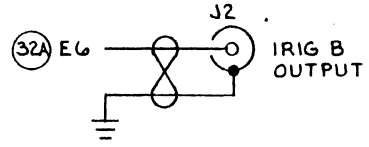
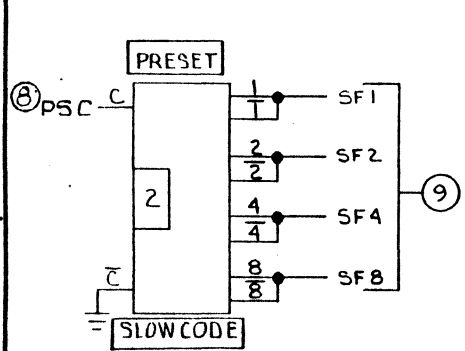
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5 4 3 2 1

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| LTR | DESCRIPTION | DATE | APPROVED |

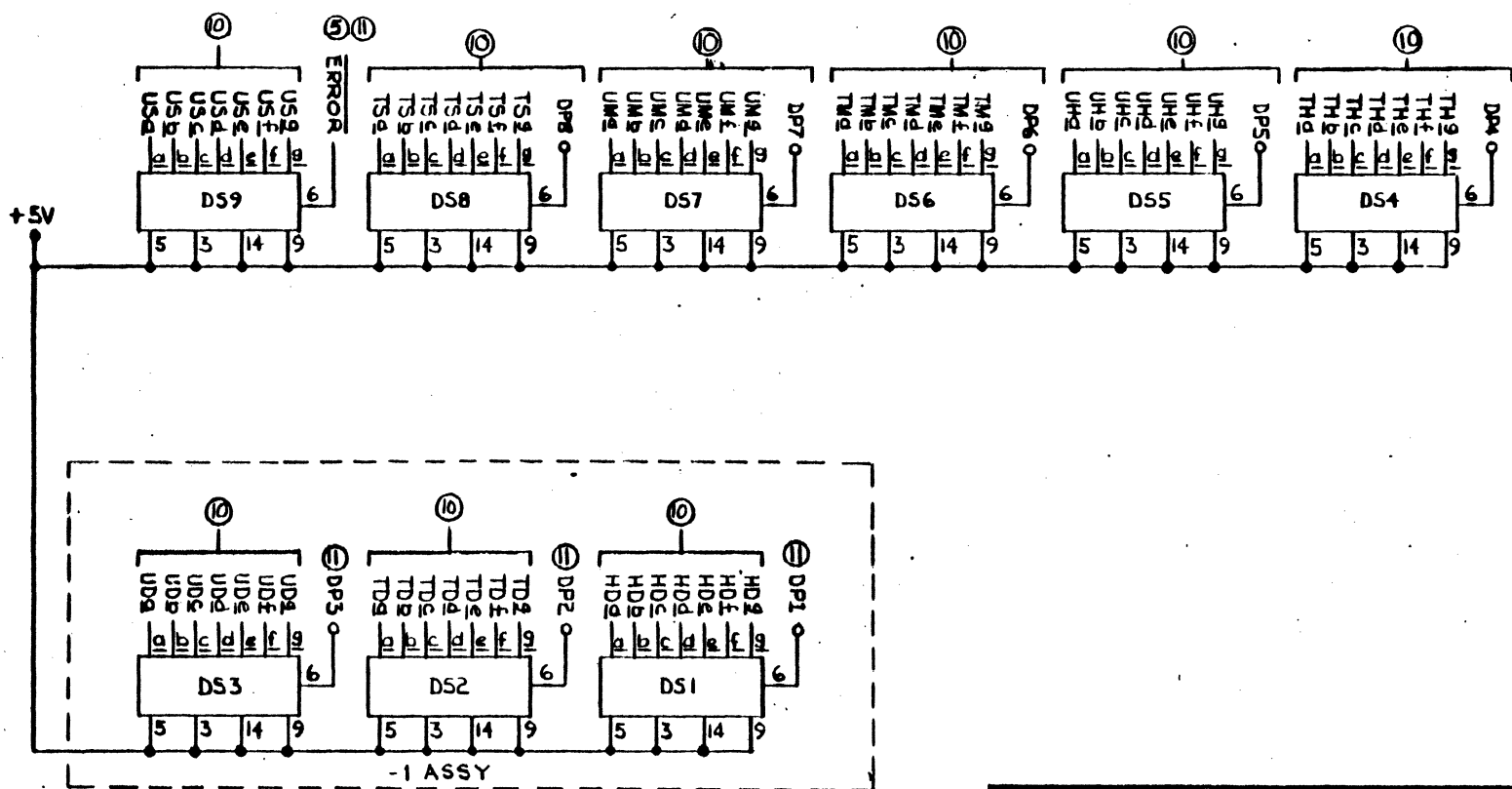


TERMS (11) REFERENCED TO THIS PRINT AND NOT SHOWN ARE FOR INTERNAL REFERENCE ONLY. NOTES: UNLESS OTHERWISE SPECIFIED

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|---|--|---------------|--|-------------|
| THIS DATA IS CONFIDENTIAL TO DATUM, INC. AND SHALL NOT BE REPRODUCED OR USED FOR ANY PURPOSE EXCEPT TO THE EXTENT PROVIDED BY CONTRACT. | | | | |
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL .XX XXX .010 ANGLES ± 1/2° | TITLE SWITCH & CONTROL LOGIC (9100-100) | | Datum inc. 1353 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92808 | |
| | DWN KAIN | DES | | B 9100-8058 |
| | CHK | ENGR <i>h</i> | | |
| | SCALE NONE | FSC 31160 | | |
| SIZE | | SHT | OF | REV |

DIETZON 196M-10 5 4 3 2 1

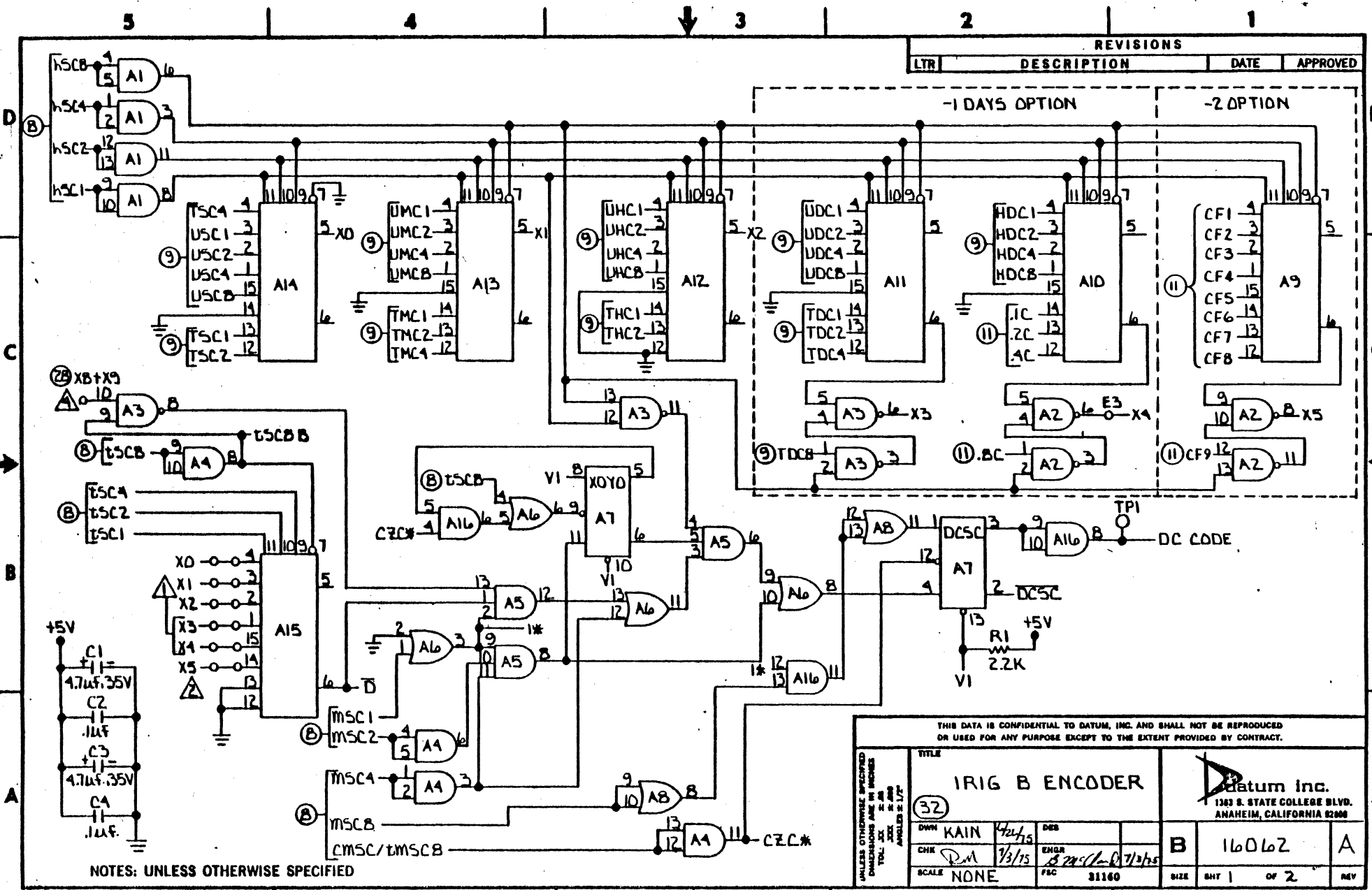
| REVISIONS | | | |
|-----------|---------------|----------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |
| - | ADD'D -4 f -5 | 10-21-77 | CC/ |



- 5 LEDS ARE YELLOW, H/P 5082-7660
- 4 LEDS ARE GREEN, H/P 5082-7670
- 3 LEDS ARE FAIRCHILD FND-507
- 2 LEDS ARE MONSANTO MANGA
- 1. LEDS ARE W/P 5082-7650

NOTES: UNLESS OTHERWISE SPECIFIED

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|---|-------------|--------------------------------|--|
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| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL. SEE XXX ANGLES ± 1/2° | TITLE | | Datum Inc. 1363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92806 |
| | LED DISPLAY | | |
| | DWN IC | 6/26/79 DES | |
| | CHK RM | 4/22/78 ENGR 3 200 (C) 12/4/78 | |
| SCALE NONE | FSC 31160 | SIZE BHT OF | 16549 |



| REVISIONS | | | |
|-----------|-------------|------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |

-1 DAYS OPTION

-2 OPTION

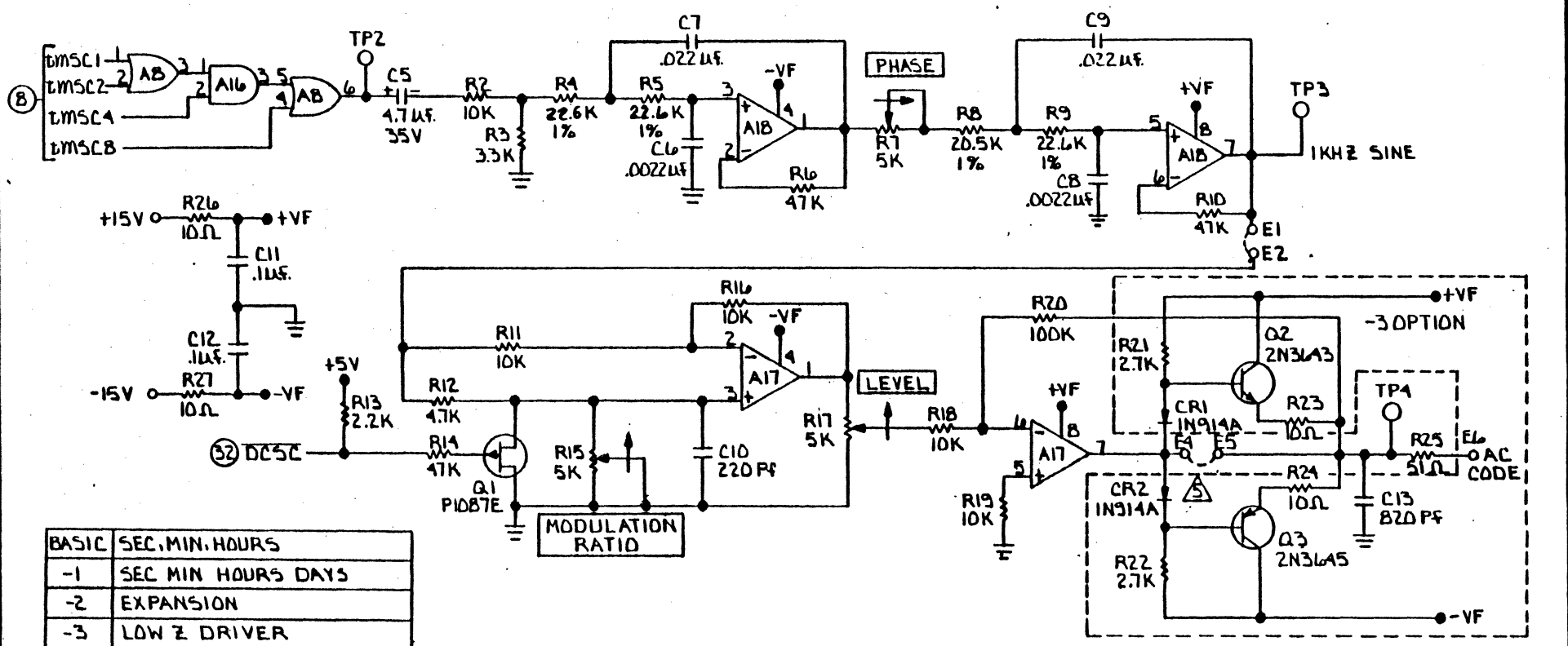
DC CODE

NOTES: UNLESS OTHERWISE SPECIFIED

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| | | | |
|--------------------------------|----------------------------|--|---|
| TITLE IRIG B ENCODER | | Datum Inc. 1383 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92808 | |
| 32 | DWN KAIN 4/21/75 | DES | |
| CHK D.M. 7/3/75 | ENGR B.225 (L-8) 7/3/75 | SIZE | B |
| SCALE NONE | FPC 31160 | REV | A |

| REVISIONS | | | |
|-----------|-------------------------------|----------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |
| A | R4 WAS 20.5K PER CO# 2759 | 2-3-77 | Rm |
| - | ADDED (U) REF.'S CF1-CF9 ON-2 | 11-14-77 | CC/RM |



| BASIC | SEC. | MIN. | HOURS |
|-------|--------------|------|------------|
| -1 | SEC | MIN | HOURS DAYS |
| -2 | EXPANSION | | |
| -3 | LOW Z DRIVER | | |

| | | |
|----------|-----------|-------------|
| N5558V | SIGNETICS | A17, A18 |
| N74151N | T.I. | A9-15 |
| N74107A | NATIONAL | A7 |
| N7432A | | A6, B |
| N7411A | | A5 |
| N7408A | | A1, A4, A16 |
| N7400A | NATIONAL | A2, A3 |
| PART NO. | MFR | REF. DES. |

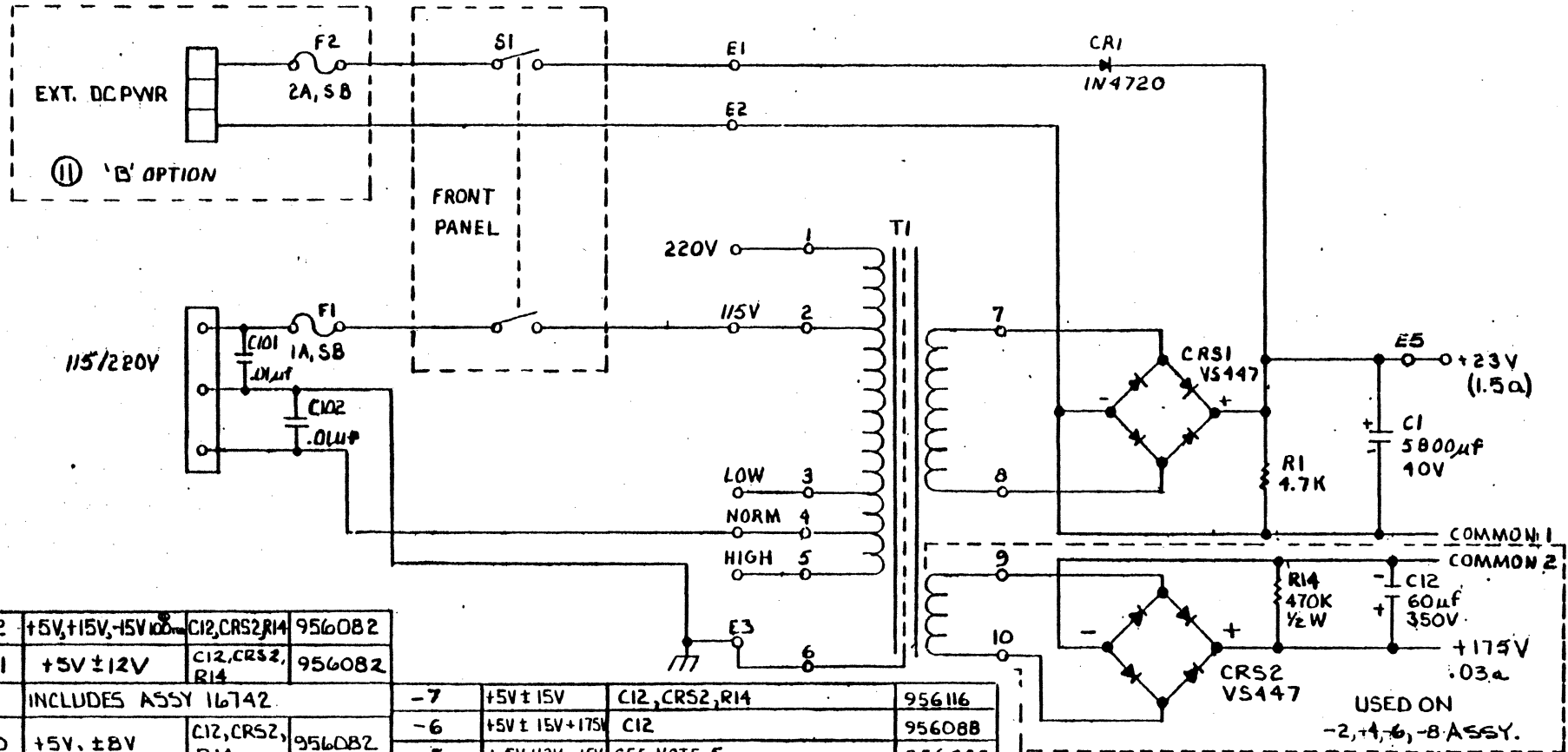
- ⚠ REMOVE JUMPER FROM E4-E5 WHEN -3 OPTION IS USED.
- ⚠ GROUND WHEN 17 BIT BINARY NOT USED.
- ⚠ GROUND PIN1A WHEN -2 OPTION IS NOT USED.
- ⚠ CUT ETCH AND GROUND PINS 12 & 15 WHEN DAYS OPTION IS NOT USED.

NOTES: UNLESS OTHERWISE SPECIFIED

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| | | | |
|---|--|--|----------|
| TITLE IRIG B ENCODER | | Datum Inc. 1363 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92806 | |
| DWN KAIN 4/24/75 CHK RM 7/5/75 SCALE NONE | DES 7/5/75 ENGR 7/5/75 FBC 81160 | B 16062 SIZE SHT 2 OF 2 | A REV |

| REVISIONS | | | |
|-----------|-----------------------------------|---------|----------|
| LTR | DESCRIPTION | DATE | APPROVED |
| A | C4 WAS 948901 SELECTED 47 μ F | 6-26-73 | RM |
| B | CHANGED A2 PER CO 3576 | 6-24-77 | RM |



| | | | |
|---------|--------------------------------------|----------------|--------------|
| -12 | +5V, +15V, -15V | C12, CRS2, R14 | 956082 |
| -11 | +5V \pm 12V | C12, CRS2, R14 | 956082 |
| A | INCLUDES ASSY 16742 | | |
| -10 | +5V, \pm 8V | C12, CRS2, R14 | 956082 |
| -9 | -1, -3, -5, OR -7 USED WITH 16742 | | |
| -8 | +5V, +12, -15, +175 | C12 | 956088 |
| DASH NO | | COMP. NOT USED | XFORMER USED |

| | | | |
|----|----------------------|--|--------|
| -7 | +5V \pm 15V | C12, CRS2, R14 | 956116 |
| -6 | +5V \pm 15V + 175V | C12 | 956088 |
| -5 | +5V, +12V, -15V | SEE NOTE 5. | 956082 |
| -4 | +5V, +15V, +175V | | 956088 |
| -3 | +5V, \pm 15V | C12, CRS2, R14 | 956082 |
| -2 | +5V, +175V | A2, A3, C8, C9, C10, C11, CR7, CR8 | 956088 |
| -1 | +5 ONLY | A2, A3, C8, C9, C10, C11, C12, CR7, CRS2, R14, CR8 | 956082 |

NOTES: 1. SEE SPECIFIED. DASH NO. COMP'S NOT USED XFORMER USED

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOL. DEC. = 10 MILS ANGLES = 1/7"

TITLE: POWER SUPPLY

49

DATE: 3/2/73

ENG: JHP

SCALE: NONE

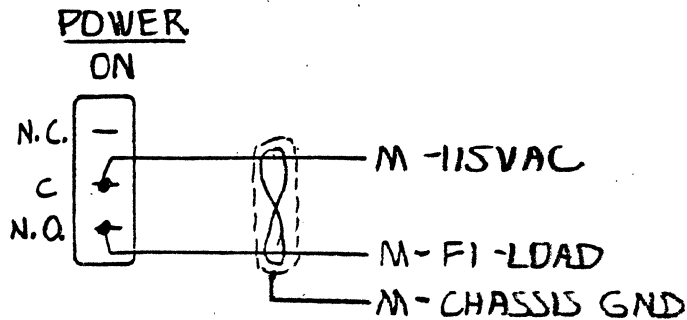
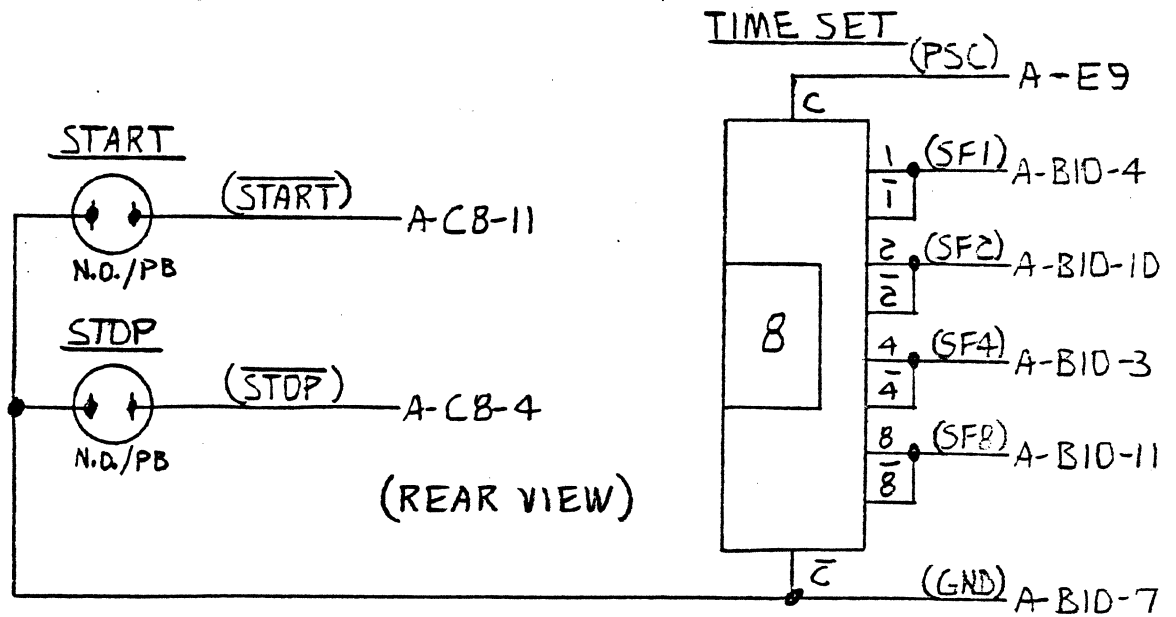
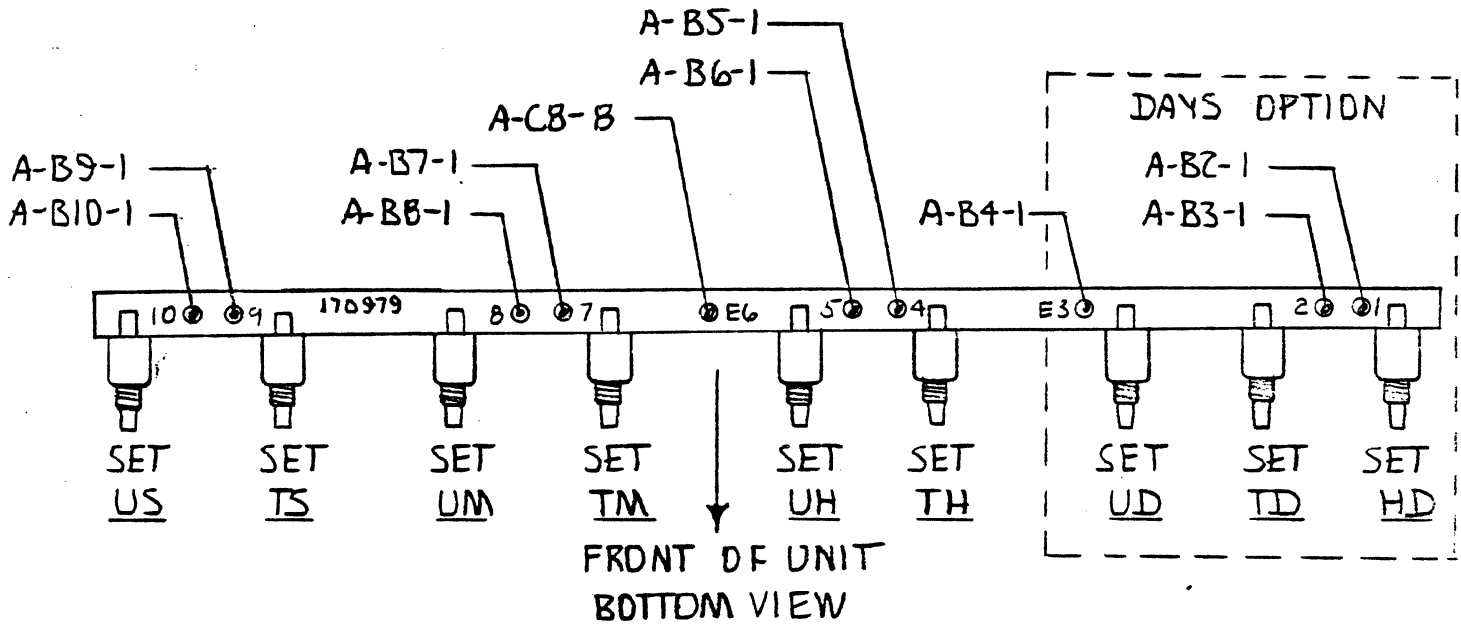
REV: 1

SIZE: B

SHT: 1 OF 2

Partum Inc. 1383 S. STATE COLLEGE BLVD. ANAHEIM, CALIFORNIA 92808

16280



SECTION X
LIST OF MATERIALS

| | |
|--------------------------|-----------|
| 1. Time Code Generator | 9100-100A |
| 2. Time Code Generator | 9100-001 |
| 3. Basic Generator (TCG) | 16624-13 |
| 4. LED Display | 16549-1 |
| 5. IRIG B Encoder | 16062-1 |
| 6. Power Supply | 16280-3 |


DATE: 6-13-75

DRAWN: R. FLOCK

CHK: _____

MATERIAL LIST

TITLE: TIME CODE GENERATOR


 datum inc. JOB NO: _____ QUANTITY: _____

REV

A

ASS'Y NO: 9100-100

SHT / OF 1

| ITEM | STOCK/PART NO. | DESCRIPTION | MFR/SPEC | QTY. | | | | | REF. DES. | UNIT COST | LOT TOTAL |
|------|----------------|-----------------|----------|------|--|--|--|---|-----------|-----------|-----------|
| 1 | 9100-001 | TCG BASIC | DATUM | 1 | | | | | | | |
| 2 | SK9100-100 | SHIPPING KIT | " | 1 | | | | | | | |
| 3 | | | | | | | | | | | |
| 4 | 703335-1 | BUTCH PLATE STK | " | 1 | | | | | | | |
| 5 | 703335-2 | " " STK | " | 1 | | | | | | | |
| 6 | 703336 | CONN PLATE STK | " | 1 | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | 16624-13 | BASIC | " | 1 | | | | △ | | | |
| | | | | | | | | | | | |
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NOTES: △ MODIFY 16624-1 IN BASIC ASSY (9100-001)

DATE: 12-13-77DRAWN: R. Flock

CHK: _____

MATERIAL LIST

TITLE: TIME CODE GENERATOR BASICJOB NO: _____
datum inc. QUANTITY _____ASS'Y NO: 9100-001

REV

C

SHT 1 OF 2

| ITEM | STOCK/PART NO. | DESCRIPTION | MFR/SPEC | QTY. | | | | REF. | DES. | UNIT COST | LOT TOTAL |
|------|----------------|-----------------|----------|------|--|--|--|------|------|-----------|-----------|
| 1 | 1202-0102 | SWITCH SPDT | DATUM | 1 | | | | | | | |
| 2 | 1204-3903 | " P/B | " | 11 | | | | | | | |
| 3 | 1212-7606 | " T/W | " | 1 | | | | | | | |
| 4 | 1299-76SG-1 | BAND HDWE | " | 1 | | | | | | | |
| 5 | 1704-1002 | RECEPT BNC | " | 1 | | | | | | | |
| 6 | "-1625-6R | " 6P | " | 1 | | | | | | | |
| 7 | 1792-1561 | SKT | " | 6 | | | | | | | |
| 8 | 1795-0001 | WASHER | " | 1 | | | | | | | |
| 9 | "-0002 | " | " | 1 | | | | | | | |
| 10 | 2325-2005 | FASTENER | " | 2 | | | | | | | |
| 11 | | | | | | | | | | | |
| 12 | 170979 N/c | P.C. BD. STK | " | 1 | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | 700362 | CTR SUPPORT STK | " | 1 | | | | | | | |
| 15 | 700364-2 | COVER STK | " | 2 | | | | | | | |
| 16 | 700546 | STIFFENER STK | " | 2 | | | | | | | |
| 17 | 703995 | MT6 BKT STK | " | 2 | | | | | | | |
| 18 | 704757-2 | SIDE GUSSET STK | " | 2 | | | | | | | |
| 19 | 704899-1 | REAR PANEL STK | " | 1 | | | | | | | |
| 20 | 705850 | FRONT " STK | " | 1 | | | | | | | |
| 21 | 705851 | COVER PLATE STK | " | 1 | | | | | | | |
| 22 | 705866-3 | LENS STK | " | 1 | | | | | | | |
| 23 | 707349-1 | BUTCH PLATE STK | " | 1 | | | | | | | |
| 24 | 931500 | HANDLE STK | " | 2 | | | | | | | |

NOTES:

DATE: 12-13-77

DRAWN: R. FLOCK

CHK: _____

MATERIAL LIST



JOB NO: _____

QUANTITY: _____

REV

C

TITLE: TIME CODE GENERATOR BASIC

ASS'Y NO: 9100-001

SHT 2 OF 2


| ITEM | STOCK/PART NO. | DESCRIPTION | MFR/SPEC | QTY. | REF. | DES. | UNIT COST | LOT TOTAL |
|------|----------------|--------------|----------|------|------|------|-----------|-----------|
| 27 | 16062-1 | IRIG ENCODER | DATUM | 1 | | | | |
| 28 | 16280-3 | POWER SUPPLY | STK | 1 | | | | |
| 29 | 16549-1 | DISPLAY | STK | 1 | | | | |
| 30 | 16624-1 | BASIC | " | 1 | | | | |
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NOTES:

DATE: 10-28-74DRAWN: QAE

CHK: _____

MATERIAL LIST


 JOB NO: _____
 Datum inc. QUANTITY: _____

REV

B

TITLE: TCG BASICASS'Y NO: 16624-13

SHT / OF 2

| ITEM | STOCK/PART NO. | DESCRIPTION | MFR/SPEC | QTY. | REF. DES. | UNIT COST | LOT TOTAL |
|------|----------------|---------------------|----------|------|-----------------------|-----------|-----------|
| 1 | 0102-0102 | RESISTOR 1K 1/4W 5% | DATUM | 2 | R5,9 | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | 0126-R2K0 | " CHIP 2K | " | 1 | C6 | | |
| 6 | | | | | | | |
| 7 | 0220-0475 | CAPACITOR 4.7UF 35V | " | 5 | C7,9,11,13,15 | | |
| 8 | 0225-0101 | " 100PF | " | 1 | C8 | | |
| 9 | | | | | | | |
| 10 | 0226-0104 | " .1UF 10V | " | 3 | C10,12,14 | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | 0301-7121 | IC SN74121N | " | 1 | C7 | | |
| 15 | " -7408 | " N7408A | " | 1 | C11 | | |
| 16 | " -7410 | " N7410A | " | 1 | C8 | | |
| 17 | " -8280 | " N8280A | " | 12 | B2-6,8,10,C9,10,D8-11 | | |
| 18 | " -8288 | " N8288A | " | 2 | B7,9 | | |
| 19 | | | | | | | |
| 20 | " -9374 | " 9374DC | " | 9 | *A2-10 | | |
| 21 | | | | | | | |
| 22 | | | | | | | |
| 23 | | | | | | | |
| 24 | 1301-0001 | OSCILLATOR 1MHZ | " | 1 | Y1 | | |
| 25 | | | | | | | |
| 26 | | | | | | | |

NOTES:

DATE: 10-20-75DRAWN: RAC

CHK: _____

MATERIAL LIST

TITLE: IRIG ENCODER

JOB NO: _____

Datum inc. QUANTITY: _____

REV

A

ASS'Y NO: 16062-1

SHT / OF 2

| ITEM | STOCK/PART NO. | DESCRIPTION | MFR/SPEC | QTY. | | | | REF. DES. | UNIT COST | LOT TOTAL |
|------|----------------|----------------------|----------|------|--|--|--|----------------|-----------|-----------|
| 1 | 0102-0100 | RESISTOR 10~ 1/4W 5% | DATUM | 2 | | | | R26,27 | | |
| 2 | " -0510 | " 51 Ω " " | " | 1 | | | | R25 | | |
| 3 | " -0222 | " 2.2K " " | " | 2 | | | | R1,13 | | |
| 4 | | | | | | | | | | |
| 5 | " -0332 | " 3.3K " " | " | 1 | | | | R3 | | |
| 6 | " -0472 | " 4.7K " " | " | 1 | | | | R12 | | |
| 7 | " -0103 | " 10K " " | " | 5 | | | | R2,11,16,18,19 | | |
| 8 | " -0473 | " 47K " " | " | 3 | | | | R6,10,14 | | |
| 9 | " -0104 | " 100K " " | " | 1 | | | | R20 | | |
| 10 | 0115-2052 | " 20.5K " 1% | " | 1 | | | | RB | | |
| 11 | " -2262 | " 22.6K " " | " | 3 | | | | R4,5,9 | | |
| 12 | 0154-5001 | " POT 5K | " | 3 | | | | R7,15,17 | | |
| 13 | | | | | | | | | | |
| 14 | 0201-0221 | CAPACITOR 220PF | " | 1 | | | | C10 | | |
| 15 | 0212-0222 | " .0022 μ F 100V | " | 2 | | | | C6,8 | | |
| 16 | " -0223 | " .022 μ F " | " | 2 | | | | C7,9 | | |
| 17 | 0220-0475 | " 4.7 μ F 35V | " | 3 | | | | C1,3,5 | | |
| 18 | | | | | | | | | | |
| 19 | 0226-0104 | " .1 μ F 10V | " | 2 | | | | C2,4 | | |
| 20 | " -0104-1 | " .1 μ F 100V | " | 2 | | | | C11,12 | | |
| 21 | | MC1458N | | | | | | | | |
| 22 | 0301-5558 | IC N5558V | " | 2 | | | | A17,18 | | |
| 23 | " -7107 | " SN74107N | " | 1 | | | | A7 | | |
| 24 | " -7151 | " SN74151N | " | 6 | | | | * A10-15 | | |
| 25 | " -7400 | " N7400A | " | 2 | | | | A2,3 | | |
| 26 | " -7408 | " N7408A | " | 3 | | | | A14,16 | | |

NOTES:

DATE: 10-20-75DRAWN: QNE

CHK: _____

MATERIAL LIST

JOB NO: _____
QUANTITY: _____TITLE: IRIG ENCODERASS'Y NO: 16062-1

REV

A

SHT 2 OF 2

| ITEM | STOCK/PART NO. | DESCRIPTION | MFR/SPEC | QTY. | | | REF. DES. | UNIT COST | LOT TOTAL |
|------|----------------|-------------------|----------|------|--|--|-----------|-----------|-----------|
| 27 | 0301-7411 | IC N7411A | DATUM | 1 | | | A5 | | |
| 28 | " - 7432 | " SN7432N | " | 2 | | | A6, 8 | | |
| 29 | | | | | | | | | |
| 30 | | | | | | | | | |
| 31 | | | | | | | | | |
| 32 | | | | | | | | | |
| 33 | | | | | | | | | |
| 34 | 0570-1087 | TRANSISTOR P1087E | " | 1 | | | Q1 | | |
| 35 | | | | | | | | | |
| 36 | 1706-2010 | TERMINAL | " | 4 | | | TPI-4 | | |
| 37 | 1708-2034 | SOCKET 8P | " | 2 | | | | | |
| 38 | " - 3897 | " 14P W/W | " | 9 | | | | | |
| 39 | " - 3898 | " 16P " | " | 6 | | | * | | |
| 40 | | | | | | | | | |
| 41 | 170518A | PC BOARD | STK | 1 | | | | | |

NOTES:

DATE: 11-14-74DRAWN: QAE

CHK: _____

MATERIAL LIST

JOB NO: _____
datum inc. QUANTITY: _____

REV

0

TITLE: POWER SUPPLY +5V ±15VASS'Y NO: 16280-3

SHT 1 OF 3

| ITEM | STOCK/PART NO. | DESCRIPTION | MFR/SPEC | QTY. | | | | REF. DES. | UNIT COST | LOT TOTAL |
|------|----------------|-----------------------|----------|------|--|--|--|-----------|-----------|-----------|
| 1 | 0102-0220 | RESISTOR 22Ω 1/4W 5% | DATUM | 1 | | | | R4 | | |
| 2 | " -0680 | " 68Ω " " | " | 2 | | | | R2,12 | | |
| 3 | " -0101 | " 100Ω " " | " | 1 | | | | R13 | | |
| 4 | " -0332 | " 3.3K " " | " | 1 | | | | R11 | | |
| 5 | " -0472 | " 4.7K " " | " | 1 | | | | R1 | | |
| 6 | " -0682 | " 6.8K " " | " | 1 | | | | R9 | | |
| 7 | " -0473 | " 47K " " | " | 2 | | | | R5,6 | | |
| 8 | " -0754 | " 750K " " | " | 1 | | | | R3 | | |
| 9 | 0125-OR10 | " .1Ω 3W | " | 1 | | | | R7 | | |
| 10 | 0154-1001 | " POT 1K | " | 1 | | | | R10 | | |
| 11 | | | | | | | | | | |
| 12 | 0212-0223 | CAPACITOR .022μF 100V | " | 1 | | | | C6 | | |
| 13 | 0219-0588 | " 5800μF 40V | " | 1 | | | | C1 | | |
| 14 | 0220-0475 | " 4.7μF 35V | " | 3 | | | | C8,10,11 | | |
| 15 | " -0476 | " 47μF 35V | " | 2 | | | | C9,4 | | |
| 16 | | | | | | | | | | |
| 17 | 0226-0103 | " .01μF 1000V | " | 2 | | | | C101,102 | | |
| 18 | " -0104 | " .1μF 10V | " | 2 | | | | C5,7 | | |
| 19 | | | | | | | | | | |
| 20 | 0301-7815 | IC U6H7815393 | " | 1 | | | | A3 | | |
| 21 | " -9305 | " LM305 | " | 1 | | | | A1 | | |
| 22 | " -7915 | " MC7915CP | " | 1 | | | | A2 | | |
| 23 | | | | | | | | | | |
| 24 | 0500-0306 | DIODE 1N914A | " | 1 | | | | CR3 | | |
| 25 | 0515-0752-1 | " 1N752A | " | 1 | | | | CR5 | | |
| 26 | 0540-0106-1 | " MCR106-1 | " | 1 | | | | CR6 | | |

NOTES:

DATE: 11-14-74

DRAWN: QAE

CHK: _____

MATERIAL LIST

datum inc. QUANTITY: _____

JOB NO: _____

REV

C

TITLE: POWER SUPPLY +5V, ±15V

ASS'Y NO: 16280-3

SHT 2 OF 3

| ITEM | STOCK/PART NO. | DESCRIPTION | MFR/SPEC | QTY. | | | | REF. DES. | UNIT COST | LOT TOTAL |
|------|----------------|--------------------|----------|------|--|--|--|-----------|-----------|-----------|
| 27 | 0540-0447 | BRIDGE RECT VS447 | DATUM | 1 | | | | CR51 | | |
| 28 | " - 0820 | DIODE MR820 | " | 1 | | | | CR2 | | |
| 29 | " - 4720-1 | " 1N4720 | " | 1 | | | | CR1 | | |
| 30 | " - 4934 | " 1N4934 | " | 2 | | | | CR2,8 | | |
| 31 | | | | | | | | | | |
| 32 | 0550-035A | TRANSISTOR TIP-35A | " | 1 | | | | Q1 | | |
| 33 | " - 7705 | " 2N3565 | " | 1 | | | | Q4 | | |
| 34 | 0555-6005 | " 2N2905A | " | 1 | | | | Q2 | | |
| 35 | " - 6600 | " 2N3645 | " | 1 | | | | Q3 | | |
| 36 | | | | | | | | | | |
| 37 | 0601-6045 | CHOKER | " | 1 | | | | L1 | | |
| 38 | " - 6082 | TRANSFORMER | " | 1 | | | | T1 | | |
| 39 | | | | | | | | | | |
| 40 | 0702-0010 | FUSE 1A S/B 3AG | " | 1 | | | | F1 | | |
| 41 | | | | | | | | | | |
| 42 | 0750-0200 | " HOLDER | " | 1 | | | | XF1 | | |
| 43 | | | | | | | | | | |
| 44 | 1704-1061-1 | CONNECTOR AC | " | 1 | | | | | | |
| 45 | | | | | | | | | | |
| 46 | 1706-0033 | EYELET | " | 2 | | | | (L1) | | |
| 47 | 1708-3897 | SOCKET 14P W/W | " | 1 | | | | | | |
| 48 | " - 8000 | " 8P | " | 1 | | | | XA1 | | |
| 49 | | | | | | | | | | |
| 50 | | | | | | | | | | |
| 51 | 2310-1247-09 | STANDOFF | " | 1 | | | | (L1) | | |
| 52 | 2325-1004 | TOROID RETAINER | " | 2 | | | | (L1) | | |

NOTES:

APPENDIX B
OPTIONAL FEATURES

datum inc.

1363 S. State College Boulevard, Anaheim, California 92806 • (714) 533-6333 • TWX (910) 592-1289