

268-19208

FINAL ENGINEERING REPORT

FOR

MRIR-PCM TELEMETRY UNIT

CONTRACT NO. NAS5-10215

Prepared for

Systems Engineering Branch, Code 731
National Aeronautics and Space Administration
Goddard Space Flight Center
Greenbelt, Maryland

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SECTION 1

INTRODUCTION

1.1 GENERAL

Fabrication of three Medium Resolution Infrared Radiometer Telemetry Electronics (MRIR-T/ME) units for the NIMBUS B MRIR experiment has been completed, functionally tested, and delivered. The three units consisted of one Prototype and two Flight qualified subassemblies. A final engineering report documenting the history, fabrication, and testing program of these completed subsystems is presented herein. Figure 1-1 indicates the configuration of a MRIR-T/ME unit with the top cover removed.

1.2 SCOPE

This final engineering report contains information applicable to the Prototype and Flight Model MRIR-T/ME subassemblies. Included within this report are electrical, mechanical, and functional testing aspects of these subassemblies as well as sufficient data for operation and maintenance purposes.

1.3 CONTRACT HISTORY

A firm fixed-price contract was awarded to California Computer Products, Inc. by the NASA Goddard Space Flight Center, Greenbelt, Maryland on 16 June 1966 bearing contract number NAS5-10215.

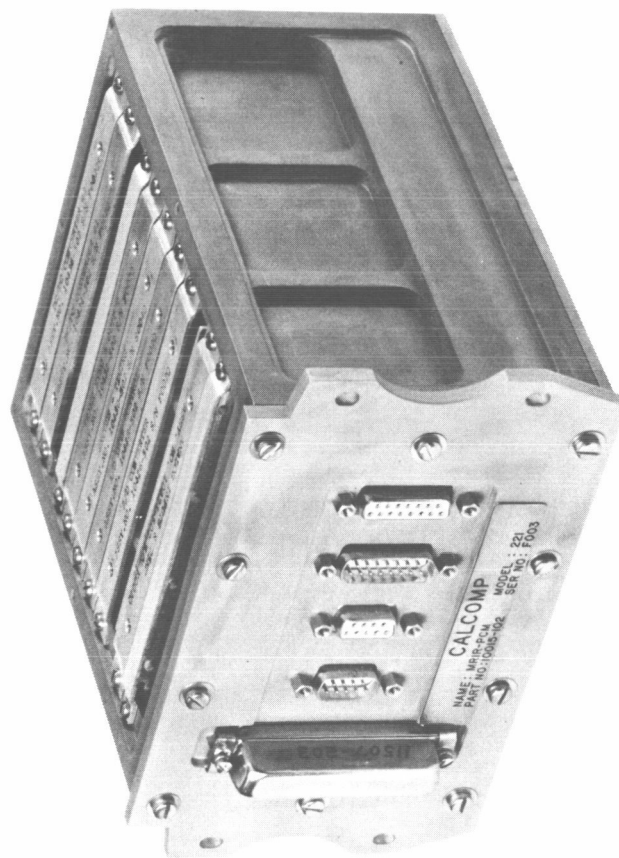


FIGURE 1-1
MRIR Subsystem (Cover Removed)

The purpose of this contract is to fabricate, test and deliver for the NIMBUS B Medium Resolution I. R. experiment one Prototype and two Flight Model MRIR-T/ME units in accordance with NASA/GSFC Specification S-731-P-18A dated 3 May 1966. Three man months of integration support is also included as part of the contractual requirements commencing with delivery of the prototype subassembly.

Delivery of the Prototype Model MRIR-T/ME unit was made with a final functional test sell-off demonstration to the NASA Technical Officer on 17 December 1966, amounting to a 2-day slip in the scheduled delivery. The two Flight models were delivered simultaneously on 26 January 1967 after successfully completing a final functional test demonstration monitored by a duly appointed Government representative. Completion of these two units accelerated the scheduled delivery by approximately 30 days.

Fabrication of the deliverable units adhered to the results and recommendations of the development effort for the Engineering Model MRIR-T/ME unit. Design changes were minimal, involving principally wire harness modifications as a result of minor changes in pin assignments on some printed circuit boards.

1.4 REPORT ORGANIZATION

This report specifically pertains to the documentation of data pertinent to the Prototype and Flight model MRIR-T/ME subsystems.

Section 2 discusses the basic operation of the Telemetry Electronics accompanied by appropriate timing diagrams and schematics where applicable.

Calibration data for the analog inputs and telemetry data outputs are included in Section 3 as a result of System and Operational Tests.

The remainder of the report will contain a bibliography of documents and test specifications applicable to this contract. Also included are schematics, layouts and mechanical drawings to aid in any maintenance required on these units.

1.5 REFERENCES

References directly applicable to the fabrication and testing of the Prototype and Flight Model MRIR-T/ME units are listed as follows:

- NASA/GSFC Specification S-731-P-18A, "Medium Resolution IR (MRIR) Experiment Prototype and Flight Model Digital Electronics Telemetry Units for NIMBUS B," 3 May 1966.
- NASA/GSFC Specification S-653-P-14, "An Environmental Specification for the NIMBUS B Subsystems," 29 June 1965.
- CalComp Test Specification AO401-005, "Environmental Test Specification for NIMBUS B MRIR-T/ME Units."
- CalComp Operator's Manual DO106-003, "MRIR Digital Subsystem Bench Test Equipment for NIMBUS B."
- CalComp Maintenance Manual DO106-004, "MRIR Digital Subsystem Bench Test Equipment for NIMBUS B."

SECTION 2

ELECTRONIC DESIGN

2.1 GENERAL DESCRIPTION MRIR-T/ME SUBSYSTEM

The purpose of the MRIR Telemetry Electronics Subsystem as used in the NIMBUS B spacecraft is to convert analog data received from the Radiometer Electronics to a serialized digital format. Five channels of analog data are available from the Radiometer unit for sequential conversion to the corresponding digital equivalent. The analog signals are gated to an Analog-to-Digital (A/D) converter where 34.7 conversions per second are performed on each input channel including the injection of a synchronizing word or frame at the completion of every fifth sample. Conversion accuracy of the A/D converter is maintained at one part in 256 (8 bits) within a temperature range of -5°C to $+55^{\circ}\text{C}$.

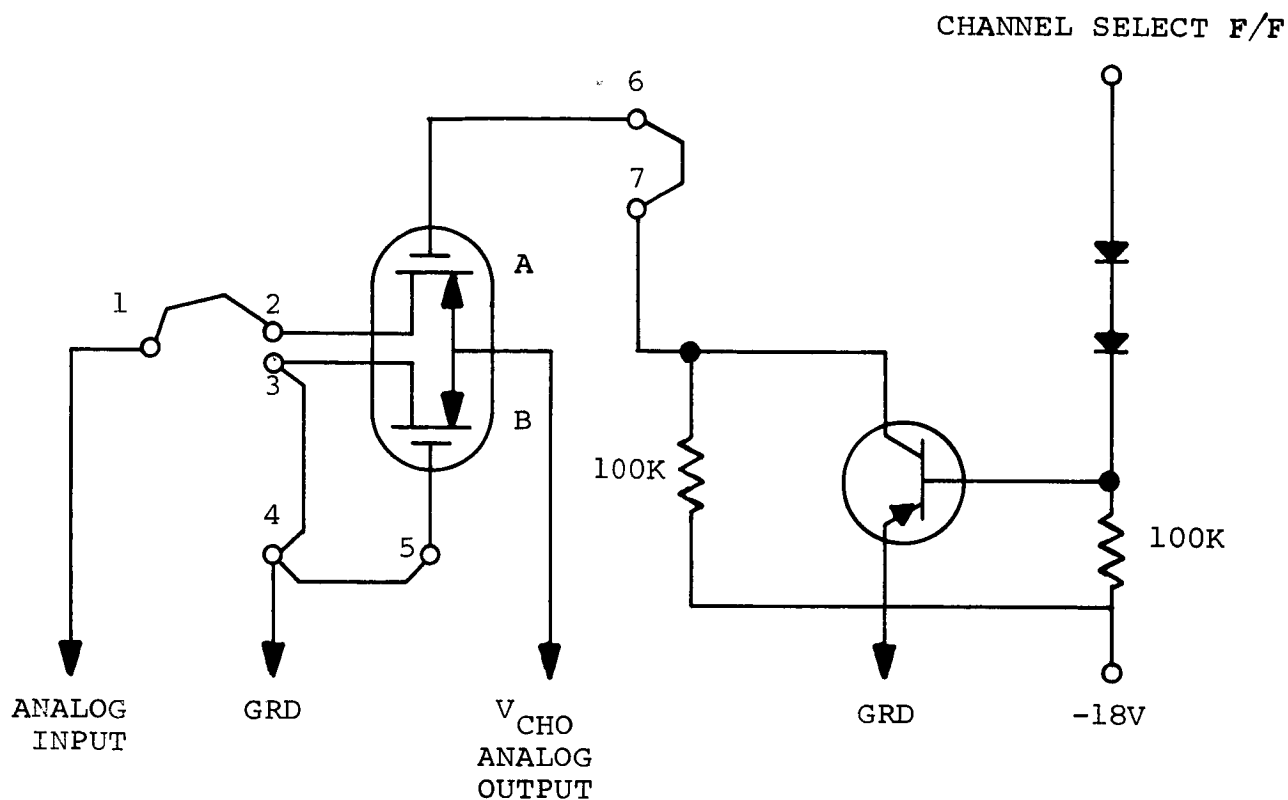
2.1.1 CIRCUIT DESIGN MODIFICATIONS

The circuit configuration employed in the flight and prototype MRIR units are basically identical to that of the engineering model. As a result of fabricating the engineering model, certain problem areas were found principally related to printed circuit board layouts. These problems were corrected for the most part in the engineering model but some recommendations remained to be incorporated into the prototype and flight model hardware.

Before commencing fabrication of the deliverable hardware, the recommendations of the engineering model were incorporated. Each printed circuit board was carefully scrutinized and modified as necessary. The area of paramount concern was to increase the solder pad area where each integrated circuit lead attaches. It was found that the original pad area was too small in relation to the IC lead, thus affording inadequate solder flow.

A second area of concern was the MOS-FET devices used as the analog input switches. Since these devices are easily damaged in the course of handling, due to static electric charges, it was recommended that one FET package containing dual MOS-FET elements be used for each input channel. This recommendation came about after attempting to replace one of these multilead devices that failed on the engineering model. In order to incorporate this redundancy on the Prototype and Flight models, it was necessary to design the circuit board layout to enable the spare half to be easily wired into the circuit. This was accomplished as shown in a typical configuration of Figure 2-1.

The output of the A/D converter is formatted with a frame synchronizing word producing a word length of 28.8 milliseconds. The converted analog signals form a serial bit-stream consisting of one 8-bit frame synchronizing word (10111000) and five 8-bit digitized conversions of the radiometer data, each word corresponding to one input channel. The formatted data from the telemetry electronics unit is routed in split-phase form, least significant bit first, at 1.66-kHz data bit-rate (208-Hz data word rate) to the satellite digital tape storage unit.



- A - MOS-FET SHOWN IN OPERATING MODE
- B - MOS-FET SHOWN IN SPARE CONDITION (GATE/DRAIN GROUNDED)

FIGURE 2-1

Dual MOS-FET Unit for Typical Analog Input Switch

2.2 ELECTRONIC CIRCUIT OPERATION

The MRIR-T/ME unit contains seven printed circuit boards which plug into connectors to form an integral unit for processing and converting analog signals into an equivalent digital format. Two of the circuit boards function together to provide the required secondary power levels which are generated from the negative 24.5-volt primary satellite power source. The remaining five boards contain all the electronics required for the conversion and processing. A brief description of each circuit board is presented in the following sections. Schematic and assembly drawings for all circuit boards are contained in Appendix A.

2.2.1 ANALOG INPUT AND 25-KHZ CLOCK GENERATOR (Figure 2-2)

This circuit board serves a dual purpose within the subsystem. The analog input signals are gated to the converter by means of MOS-FET devices controlled by a commutating ring counter. Five dual MOS-FET's are employed, one for each channel. Only one-half of each dual element is used per channel while the remaining half is jumpered out of the circuit. The purpose of this is to provide a spare gate simply by changing selected jumper wires on the circuit board, thus eliminating undue handling of these MOS devices. The 25-kHz generator is transformer coupled to a 200-kHz input signal originating from the satellite clock subsystem within the spacecraft. The resulting 25-kHz clock is achieved by dividing the 200-kHz input by a 3-stage flip-flop network.

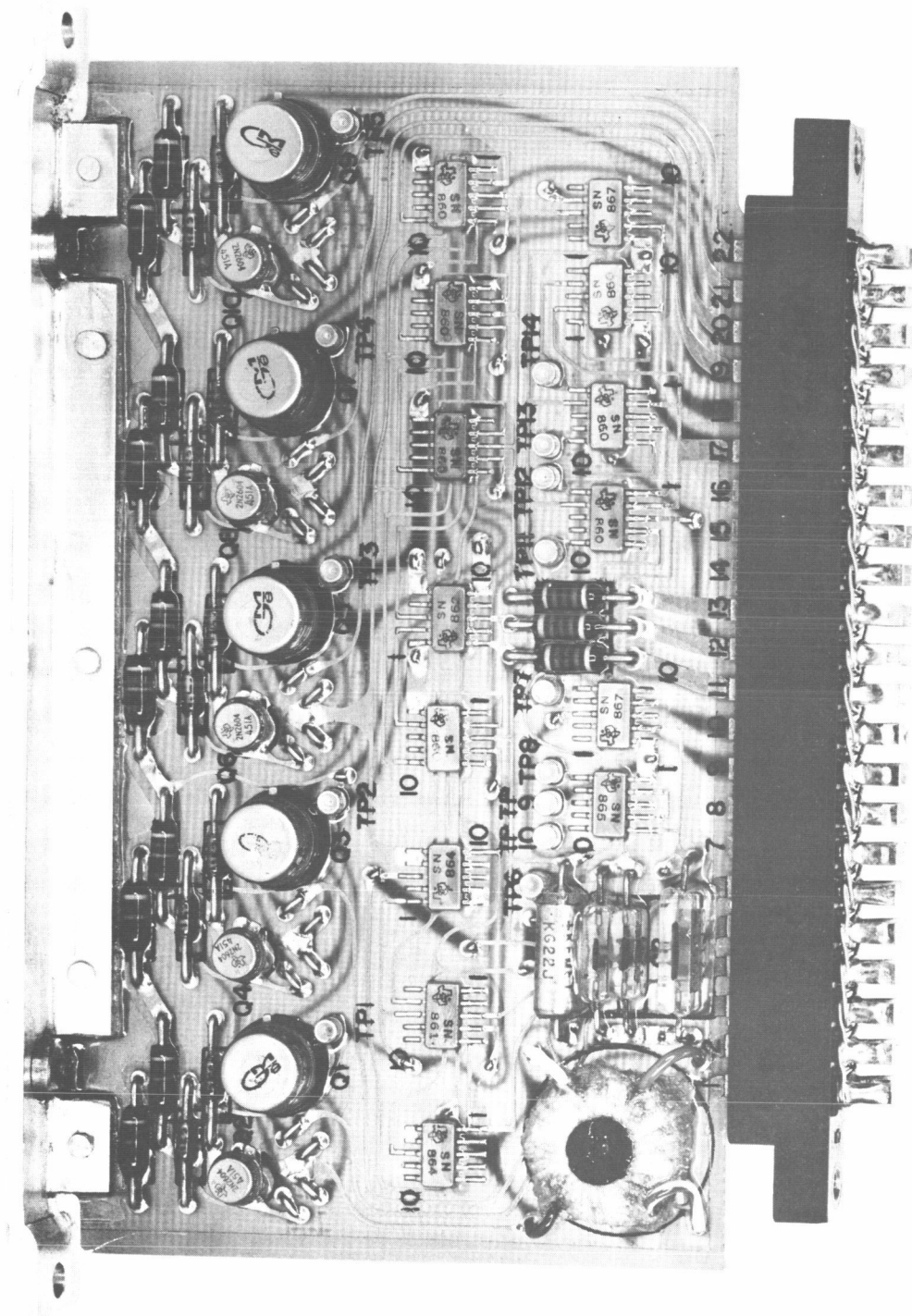


FIGURE 2-2
Analog Input and 25-kHz Generator

2.2.2 A/D CONVERTER (Figure 2-3)

The A/D converter circuit board contains the necessary elements for performing the analog-to-digital conversion. The primary elements are a precision resistor ladder network, a precision voltage reference supply and comparator amplifier. A set of constant current sources and transistor switches corresponding to the 8-bit digital word are also incorporated on this circuit board.

2.2.3 A/D DATA CONTROL (Figure 2-4)

This module contains the control logic required to switch the constant current source switches on the A/D converter circuit board. Two registers each containing eight flip-flops are included on this board. One register serves to produce the control signal to successively turn on each current source depending upon the analog input voltage as compared to the output ladder voltage. The second register serially stores the data representing each bit of the A/D conversion. Also incorporated on this A/D control circuit board is Frame Sync Inhibit logic. This logic forces the least significant bit to a "one" if the analog data converted produced the same bit pattern as the Frame Sync word, thus prohibiting a false frame sync word to be formed.

2.2.4 ENCODE - TIMING GENERATOR (Figure 2-5)

This board contains nine flip-flops used to provide timing control signals. Six flip-flops are used to divide a 10-kHz input signal to 1.66 kHz (one output bit time) and 208 Hz (one word time). A transfer pulse is generated to gate the

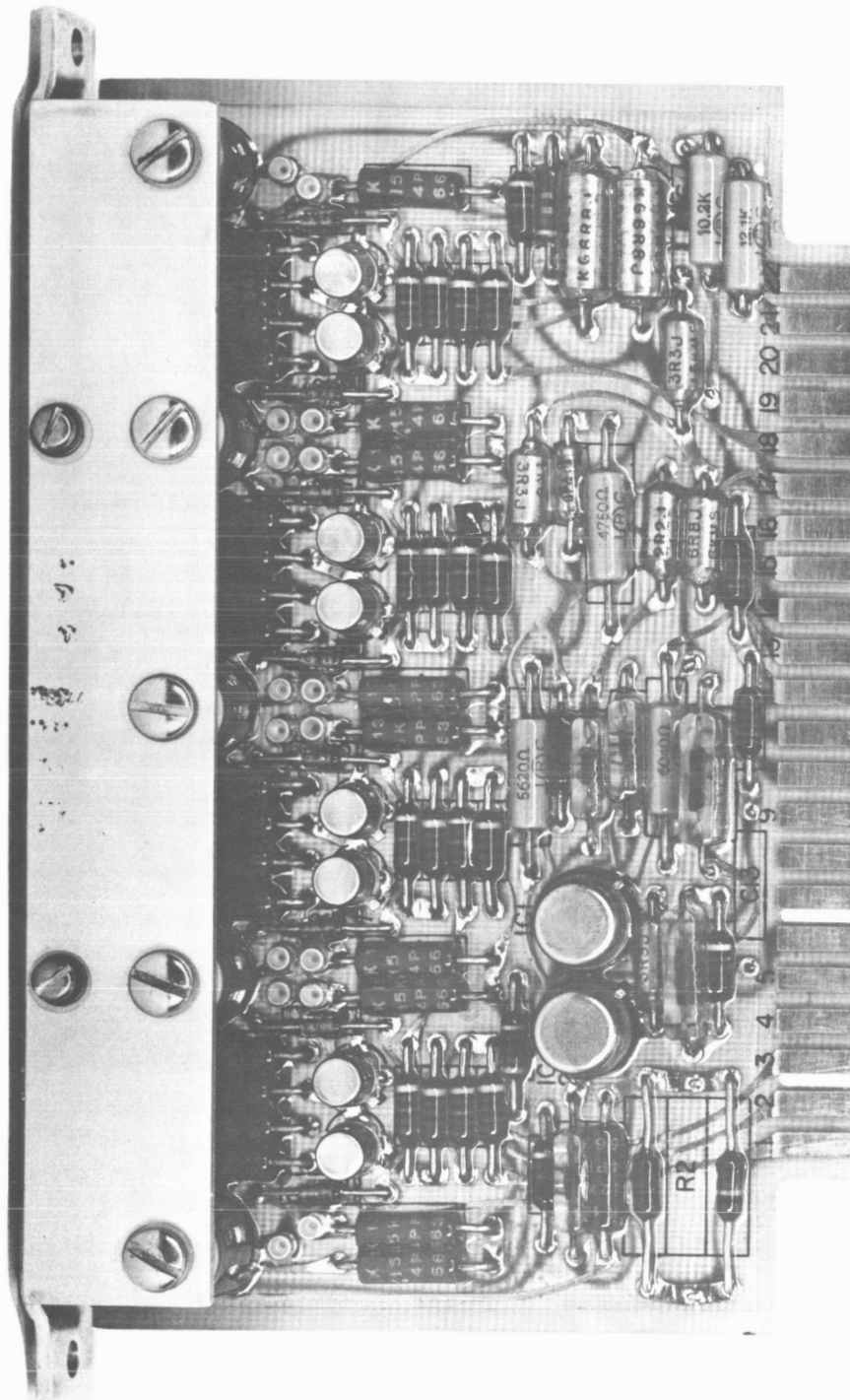


FIGURE 2-3
A/D Converter

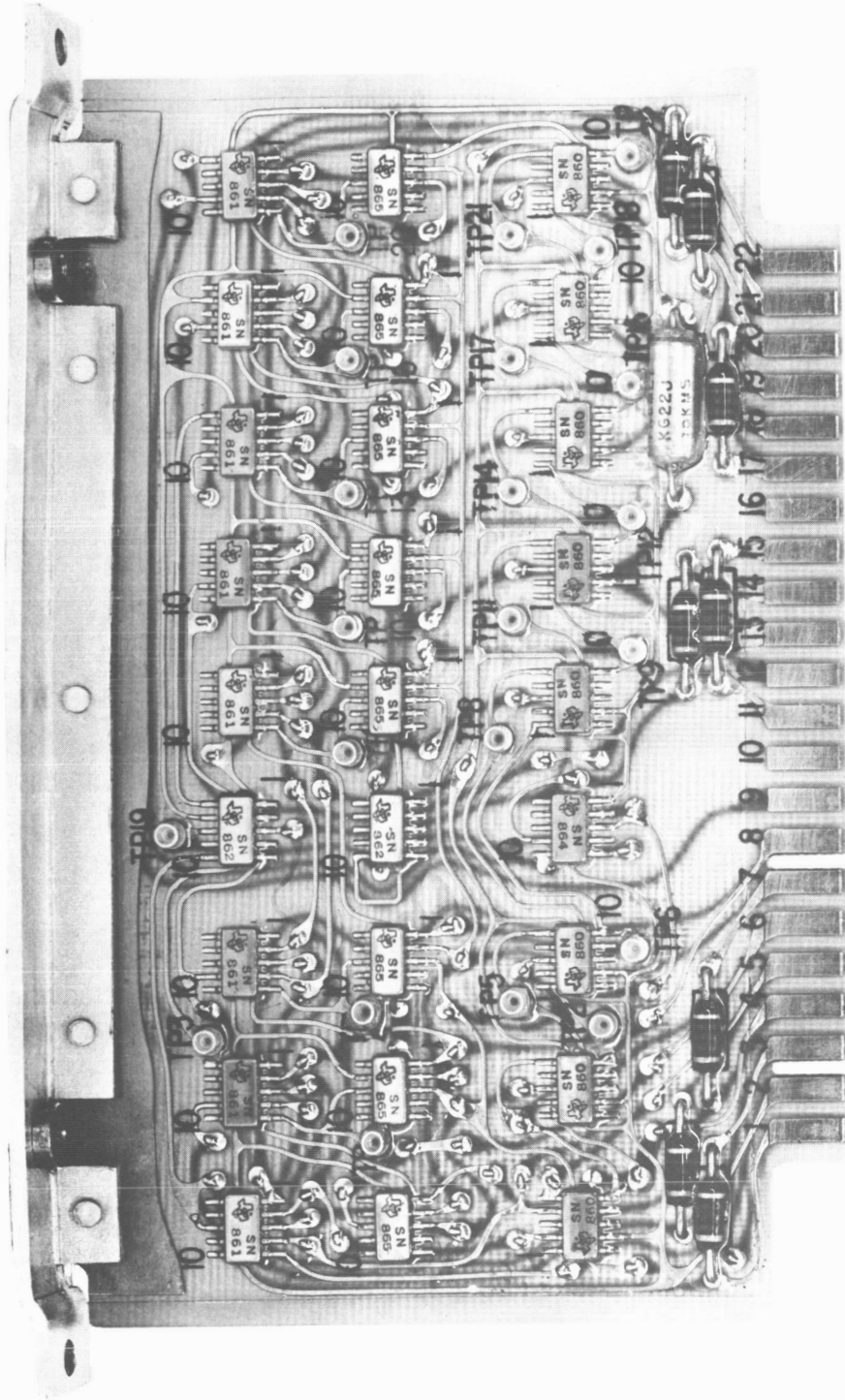


FIGURE 2-4
A/D Data Control

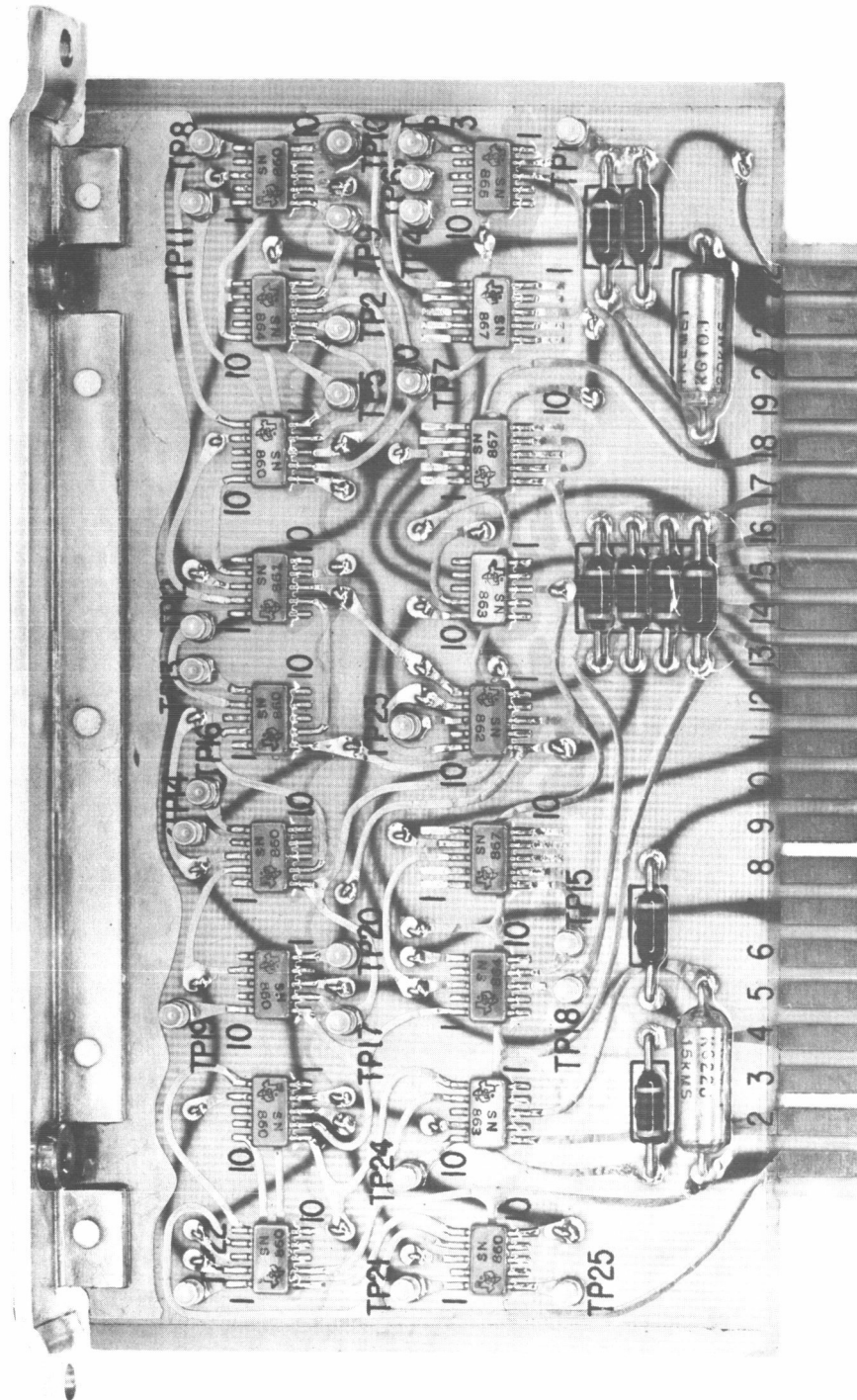


FIGURE 2-5
Encode and Timing Generator

converted information from the data register on the A/D Data Control module to an output data shift register on the Frame Sync-Data Output board. In addition to the transfer pulse, a second timing pulse (ENCODE) is generated. The ENCODE pulse clears the A/D data register, resets the A/D shift register, and starts the conversion sequence of new input data.

2.2.5 FRAME SYNC - DATA OUTPUT (Figure 2-6)

This board furnishes the Frame Sync word (10111000) every sixth word time. The function of the Frame Sync word is to provide a basis for synchronization when decommutating the serial telemetry data transmitted to a ground station. An 8-bit flip-flop shift register is contained on this board to provide the formatted serial data output to two redundant data output buffer drivers. The data is transmitted in a phase modulated (split phase) waveform as shown in Figure 2-7.

2.2.6 DC/DC CONVERTER NO. 1 (Figure 2-8)

This board is one of two power supply boards which provides the secondary voltage levels. The voltage levels used in the MRIR unit are +3.2 volts, +6 volts, -6 volts, -12 volts, and -18 volts. Contained on this board are the primary power relay, DC/DC converter oscillator, power transformer, and secondary voltage diode rectifiers. The DC/DC No. 1 board was designed so that all oscillating signals would be confined primarily to this board and not be coupled into the wiring harness by sending the oscillating signals to another board for conditioning.

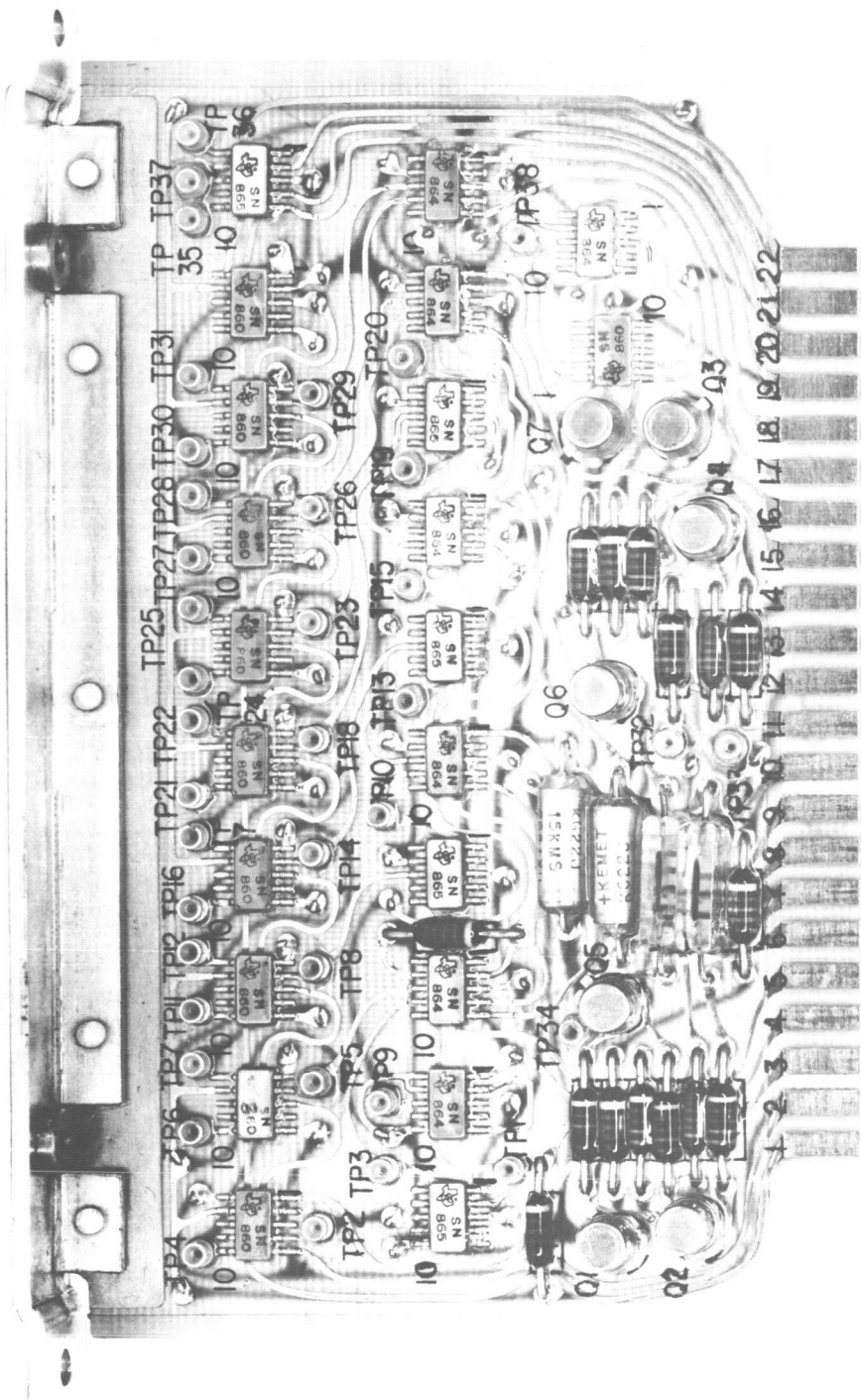


FIGURE 2-6
Frame Sync and Data Output

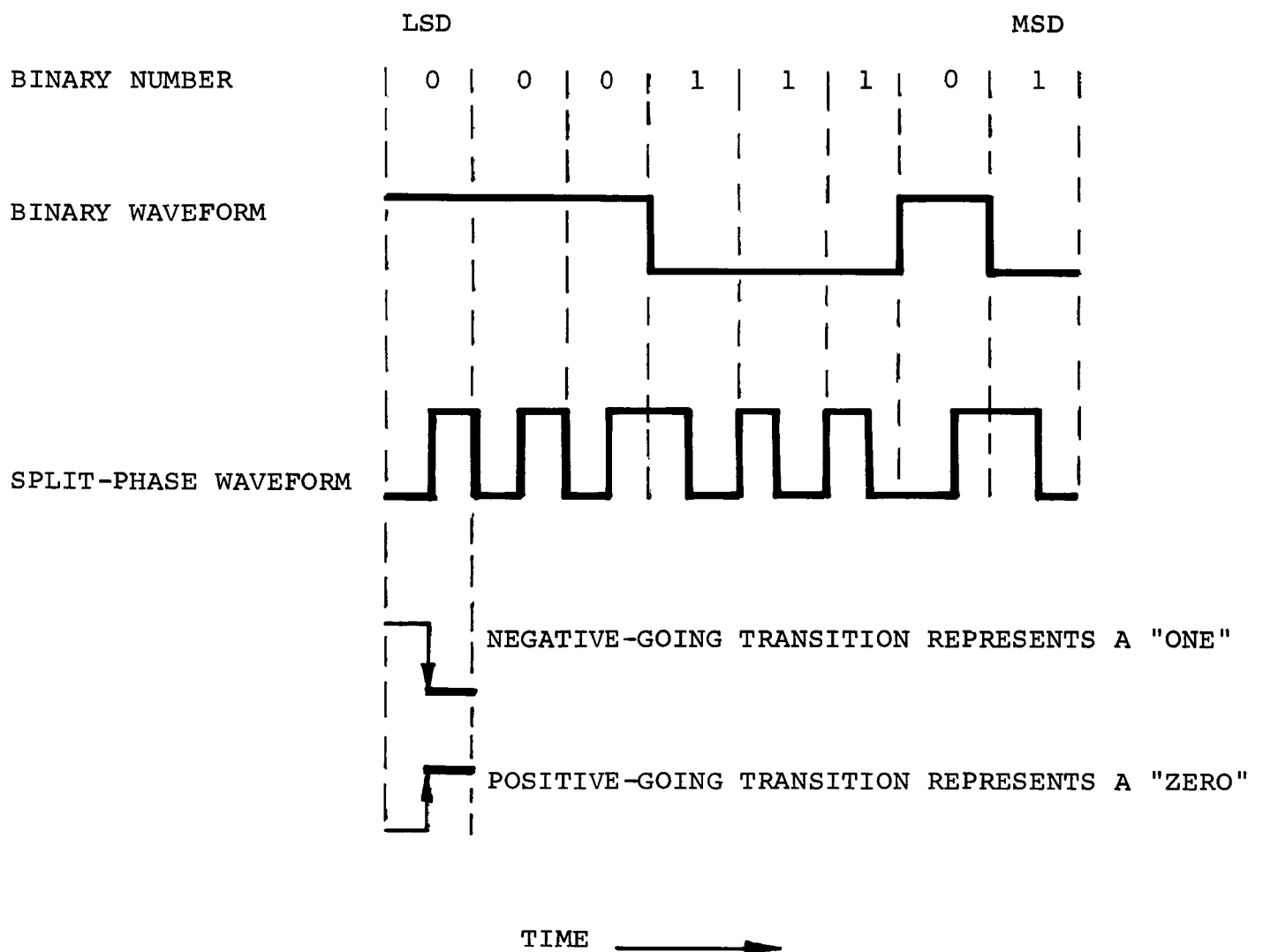


FIGURE 2-7

Phase Modulated (Split-Phase) Waveform

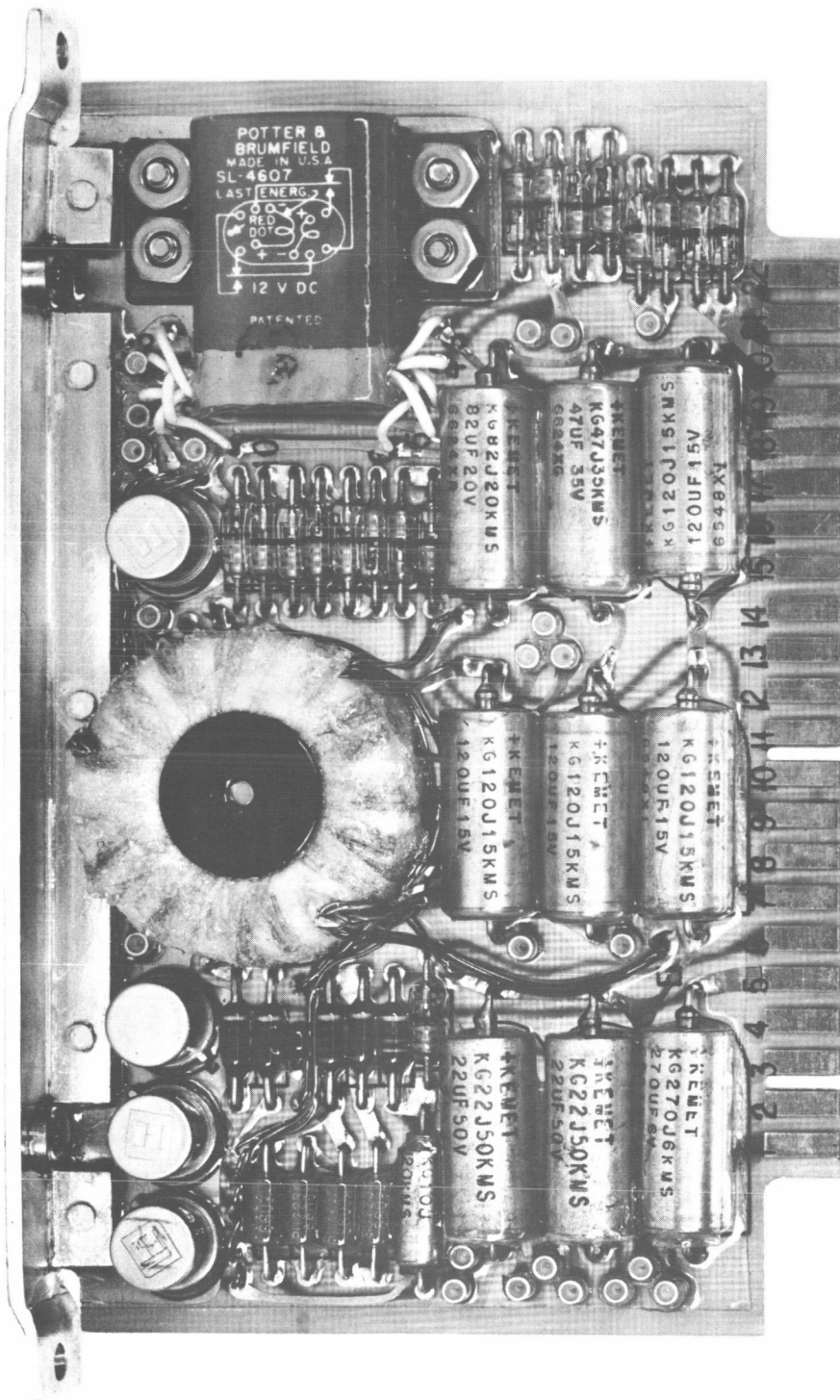


FIGURE 2-8
DC/DC Converter No. 1

2.2.7 DC/DC CONVERTER NO. 2 (Figure 2-9)

The second half of the two power supply boards contains the primary power input filter network, voltage regulator, secondary level output filters, and telemetry monitoring circuits.

2.3 ELECTRONIC COMPONENTS

In order to establish a high degree of operational reliability, all electronic components used in the MRIR Prototype and Flight units were screened according to procedures documented in GSFC Specifications S-450-P3 and S-450-P4.

2.3.1 SELECTION AND QUALIFICATION

All components were selected on the basis of their high reliability classification. Wherever possible, components were procured from the vendor or manufacturer to meet the requirements of the previously mentioned specifications. When this was not feasible, the "hi-rel" components were subjected to the requirements of the previously mentioned specifications for qualification at this contractor's facility. Special components or components difficult to obtain within the allocated time were furnished from NASA stock as GFE. Prequalified components and those received as GFE were selectively sampled to satisfy operational and electrical characteristics.

2.3.2 REPORTS

A complete report on the electrical conditioning of all components at this contractor's facility is documented in CalComp report DO301-016 entitled "Component Burn-In Report for NIMBUS B MRIR Digital Electronics Telemetry Unit."

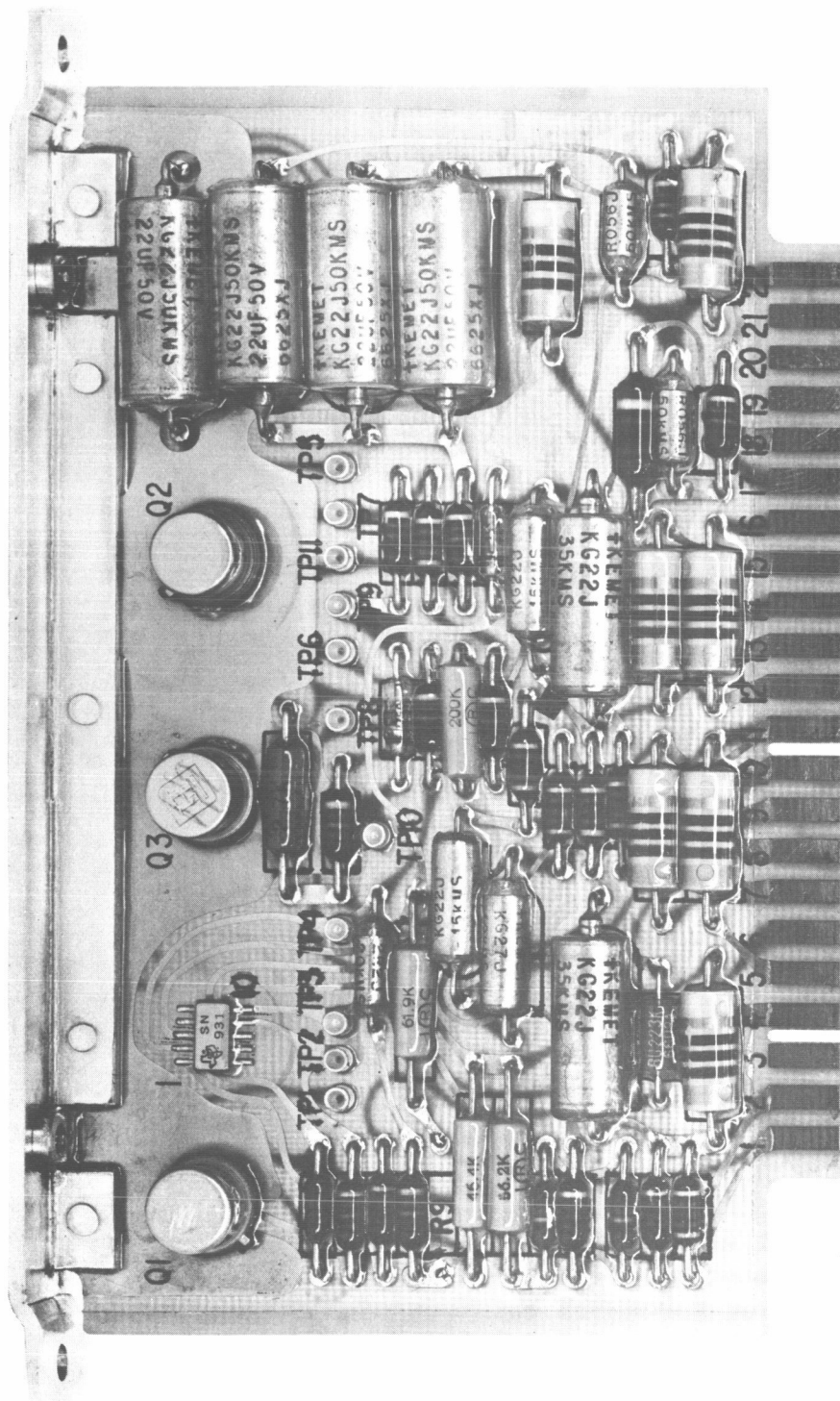


FIGURE 2-9
DC/DC Converter No. 2

SECTION 3

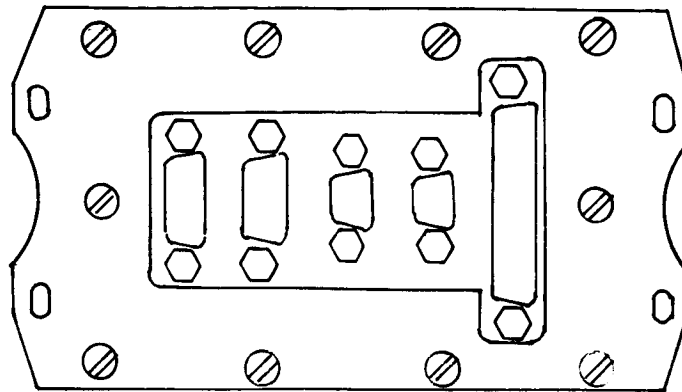
MECHANICAL DESIGN

3.1 PACKAGE CONFIGURATION

The layout of the Prototype and Flight Model MRIR-T/ME units is identical to the design employed in the engineering model, shown in Figure 3-1. This configuration offers a good heat-sink for any heat generating components. This layout also affords shielding capabilities against possible crosstalk and isolates logic modules from the possible stray magnetic fields produced by the DC/DC converter oscillator.

The entire assembly is machined from ZK60A-T5 magnesium alloy. All parts received a coating of Dow 23 Stannate Immersion Treatment for Magnesium to protect the magnesium from corrosion due to high humidity environments. Application of this coating is per Dow Chemical Company, Bulletin 147-22 conforming with the General Electric document issued on this same subject.

Fabrication of the assembly presented no problems and all components fit without modification. The final package size conforms to a standard 2 over 0 which is 6 x 4 x 6.5 inches. Five input/output connectors identified J1 to J5 are provided on the top mounting plate of the assembly. Identification and function of each connector is indicated in Figure 3-1 and accompanied by Table 3-1.



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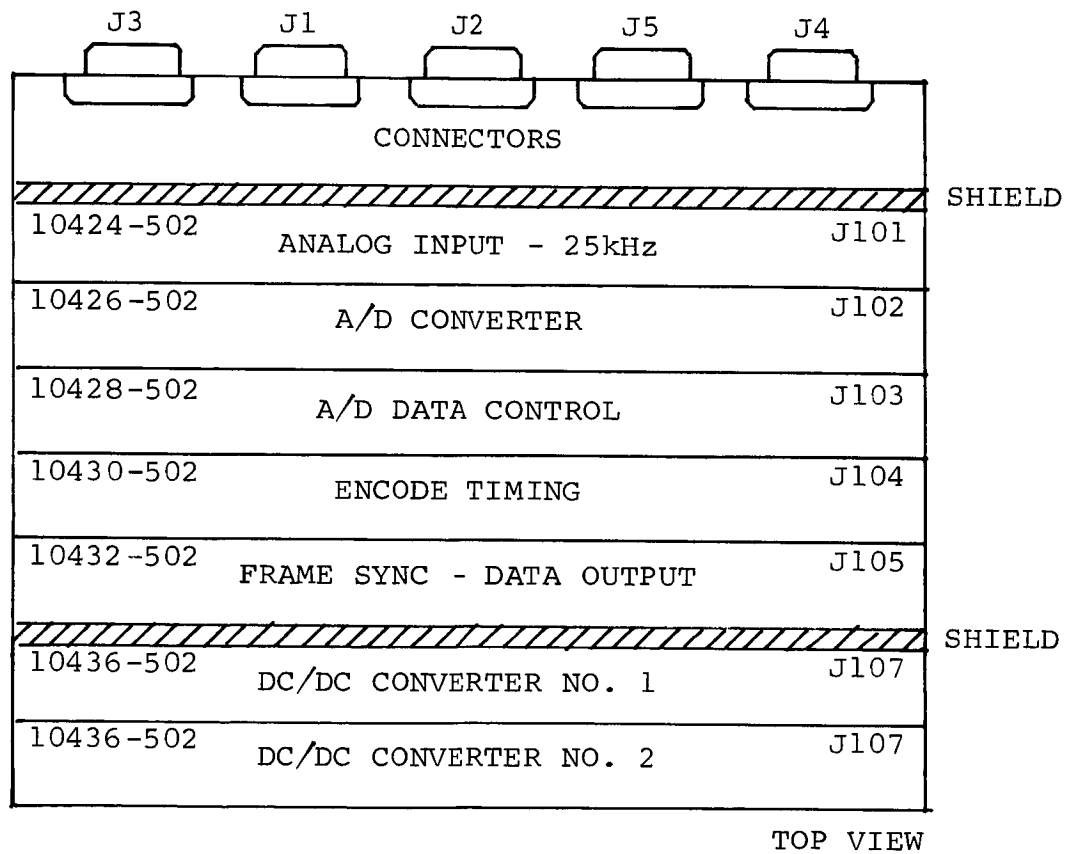


FIGURE 3-1

Connector and Circuit Board Location

A complete set of mechanical and assembly drawings for the delivered units is provided in Appendix B.

3.2 PHYSICAL CHARACTERISTICS

3.2.1 WEIGHT

The weight of the completed Prototype and Flight model MRIR-T/ME units is listed in Table 3-2.

3.2.2 CENTER OF GRAVITY

Table 3-2 indicates the center of gravity of the Prototype and Flight units measured as shown in Figure 3-2.

3.2.3 POWER DISSIPATION

The power dissipated by each unit was monitored during the environmental qualification tests. The maximum power dissipation was found to be at the lowest temperature excursion or -5°C . At this temperature the dissipation of each unit was typically 1.45 watts with -24.5 volts input.

3.3 DESIGN RECOMMENDATIONS

The mechanical design configuration of the MRIR-T/ME unit is satisfactory with the exception of the magnesium protective coating, Dow 23. It was discovered, after subjecting the sub-assemblies to humidity tests, that the Dow 23 coating did not offer sufficient corrosive protection to the magnesium against the specified humidity. Excessive scale and residue built up on surfaces in direct exposure to the environment. No noticeable corrosion was present within enclosed areas of the subassembly.

TABLE 3-1
Input/Output Connectors

Connector	Number of Pins	Signals
J1	15-pin Plug	Power Input and Commands
J2	9-pin Socket	Output Signals
J3	15-pin Socket	Input Signals
J4	37-pin Socket	Telemetry and Bench Test Equipment Test Point
J5	9-pin Plug	Input Clock Signals

TABLE 3-2
Weight and Center of Gravity

Unit Designation	S/N	Weight (pounds)	C.G. Location (inches)		
			X	Y	Z
Prototype	P002	4.77	2.045	2.990	3.192
Flight No. 1	F003	4.65	2.045	2.990	3.192
Flight No. 2	F004	4.62	2.045	2.990	3.192

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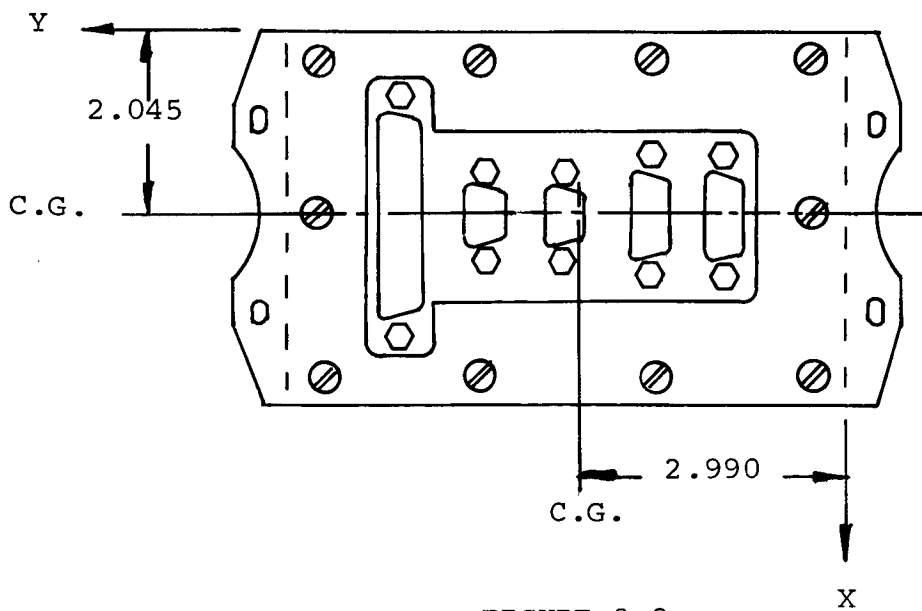
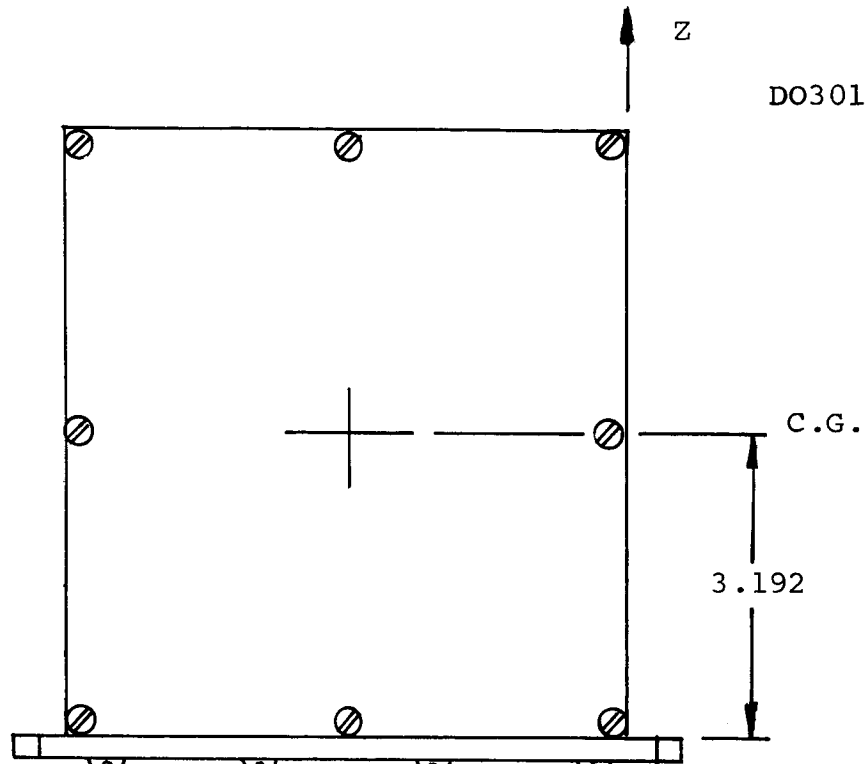


FIGURE 3-2

MRIR Telemetry Unit
Center of Gravity Configuration

In future programs, it is recommended that this type of protective coating be eliminated due to its relatively poor protective qualities and substituted with electrolysis nickel or some other suitable form of protective material.

SECTION 4

QUALIFICATION AND SYSTEM TEST

4.1 GENERAL

Tests required to qualify the Prototype and Flight model MRIR-T/ME units are documented in GSFC Specification S-653-P14 and CalComp document AO401-005. The degree and severity of testing varies for the Prototype and Flight units, the Flight unit being subjected to environments more closely resembling those encountered during launch and orbit. All system testing was performed using Bench Test Equipment identical to that used for the engineering model. Figures 4-1 and 4-2 indicate the configuration of this equipment.

4.2 MRIR-T/ME INTERFACE

The interface list for the Prototype and Flight model sub-assemblies is listed in Appendix C. This list defines the electrical term contained on each connector pin. Voltages and impedances are given where applicable on connection pins which either originate or terminate on the telemetry electronics unit.

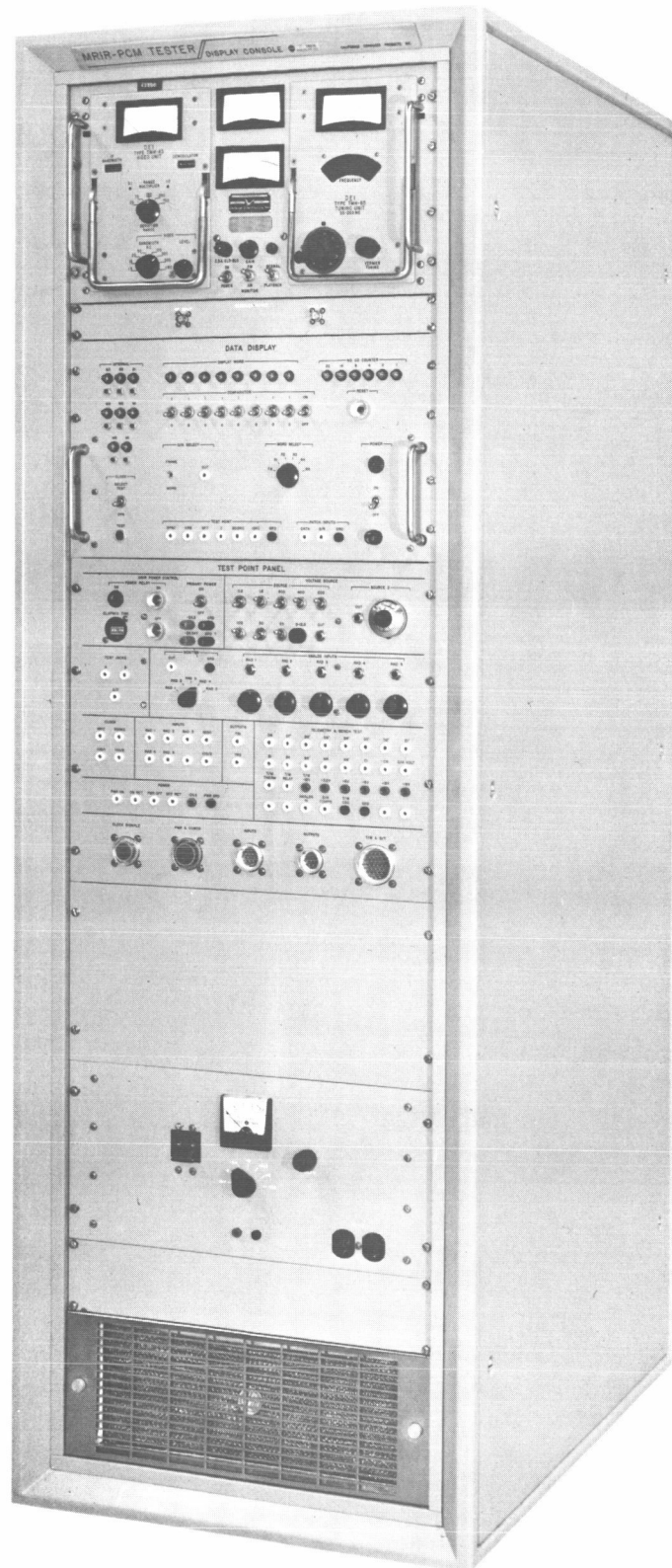


FIGURE 4-1

MRIR Bench Test Equipment Display Console

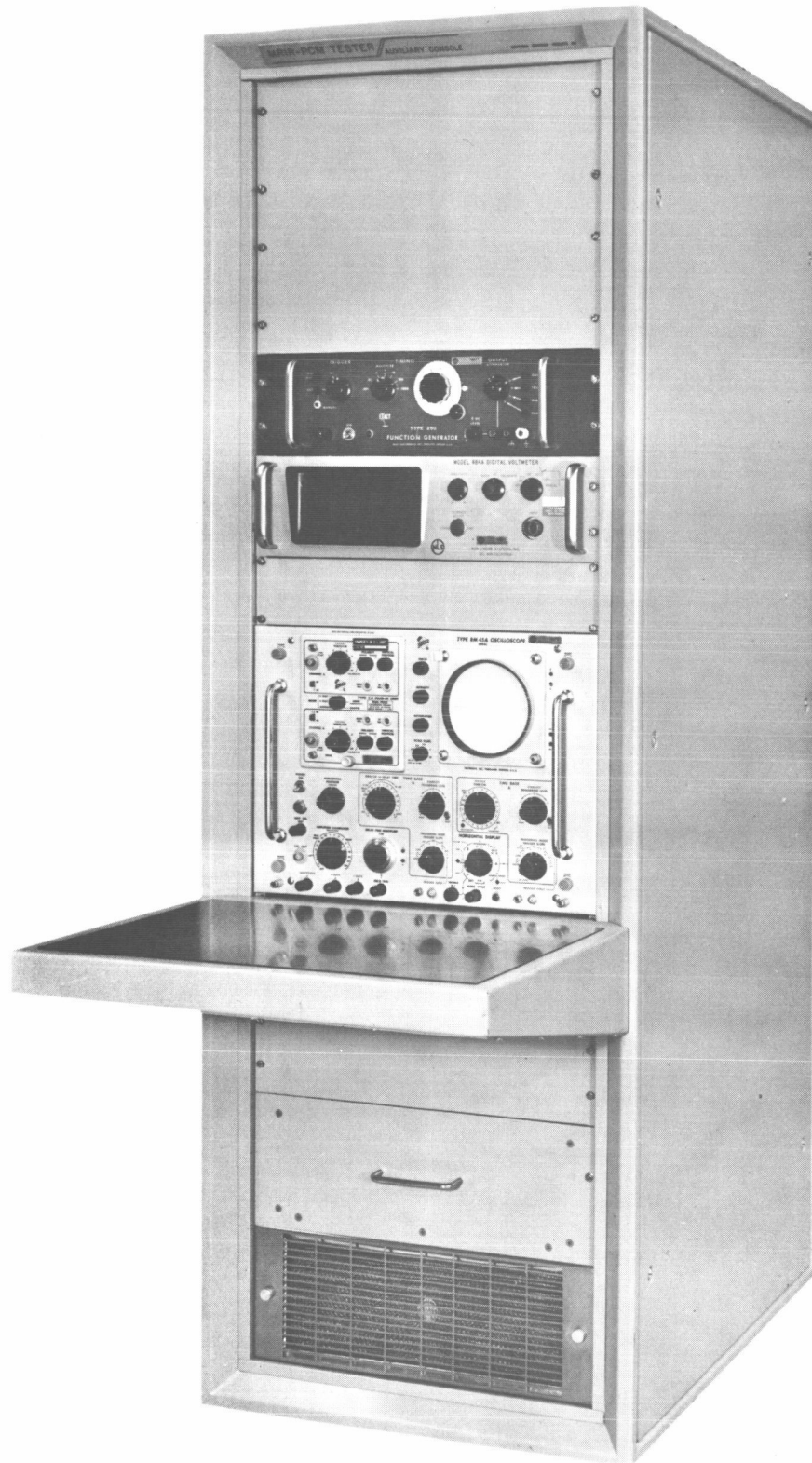


FIGURE 4-2

MRIR Bench Test Equipment Auxiliary Console

4.3 PRINTED CIRCUIT BOARD INTERCONNECTION DIAGRAM

An interconnection diagram or pin chart is included in Appendix D. This chart provides the term designation for each circuit board connection and indicates the routing of this term by connector/pin designation numbers.

4.4 SIGNAL FLOW DIAGRAM

Figure 4-3 shows the signal flow and grounding scheme employed in the MRIR-T/ME unit.

4.5 TIMING CHART

Figure 4-4 indicates the timing of all logical functions of the MRIR-T/ME unit.

4.6 ENVIRONMENTAL QUALIFICATION RESULTS

Data gathered as a result of environmental testing is tabulated in two separate reports. These publications are:

- D0401-024, "Environmental Test Report for Prototype MRIR Digital Electronics Unit," 30 December 1966.
- D0401-026, "Environmental Test Report for Flights No. 1 and No. 2, MRIR Digital Electronics Unit," 30 January 1967.

For convenience, the temperature-telemetry calibration curves and the analog-to-digital calibration charts for each unit are included in Figures 4-5 through 4-7 and Tables 4-1 through 4-6.

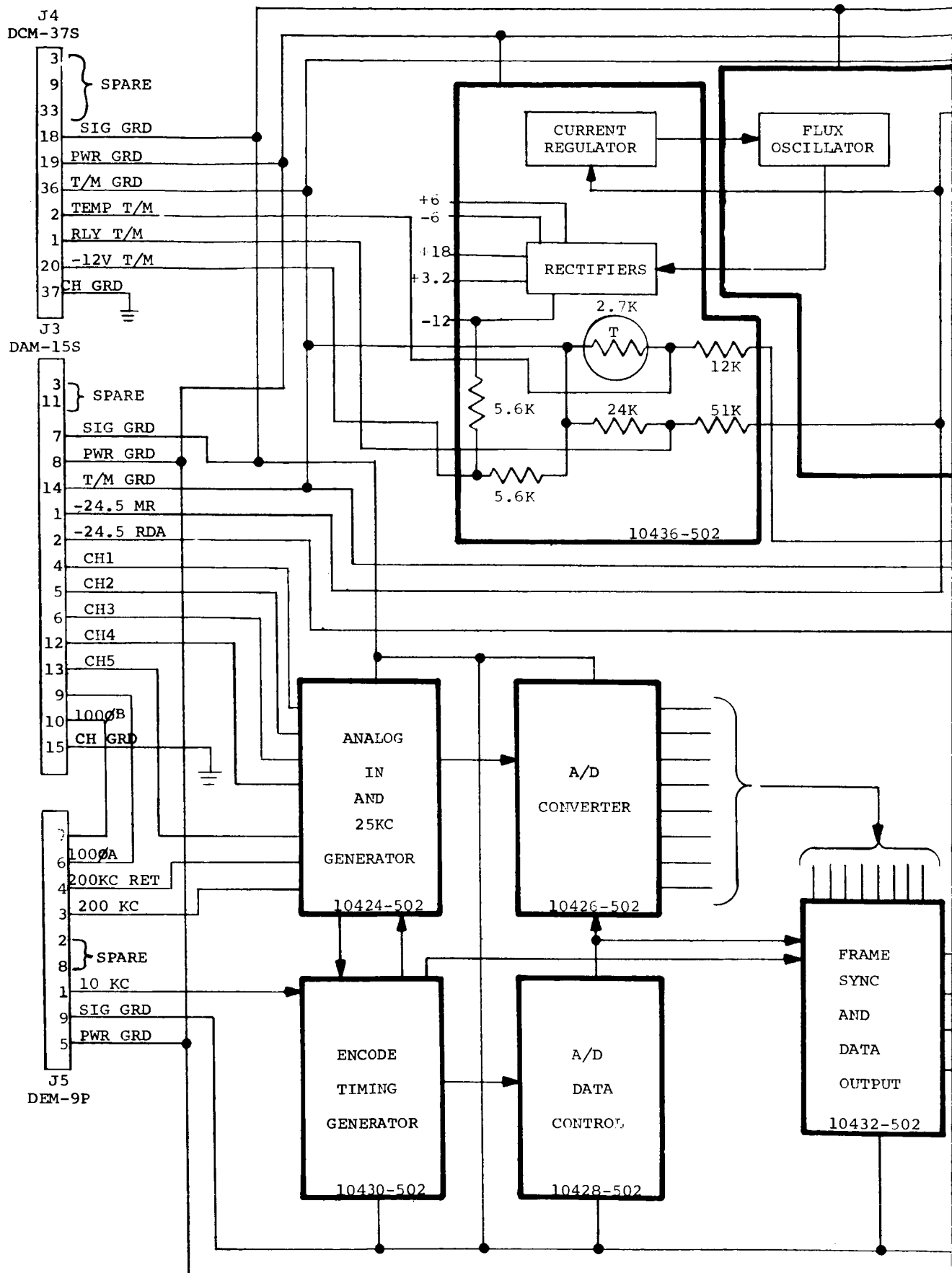
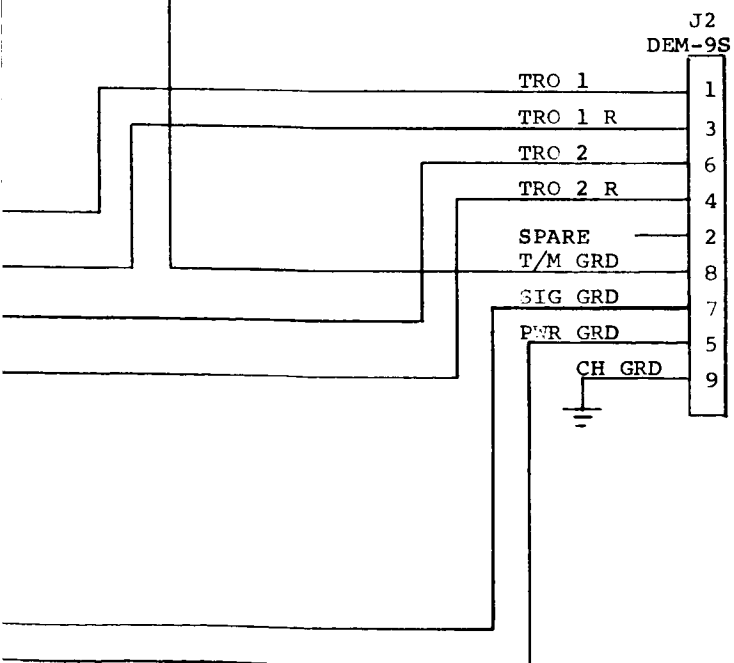
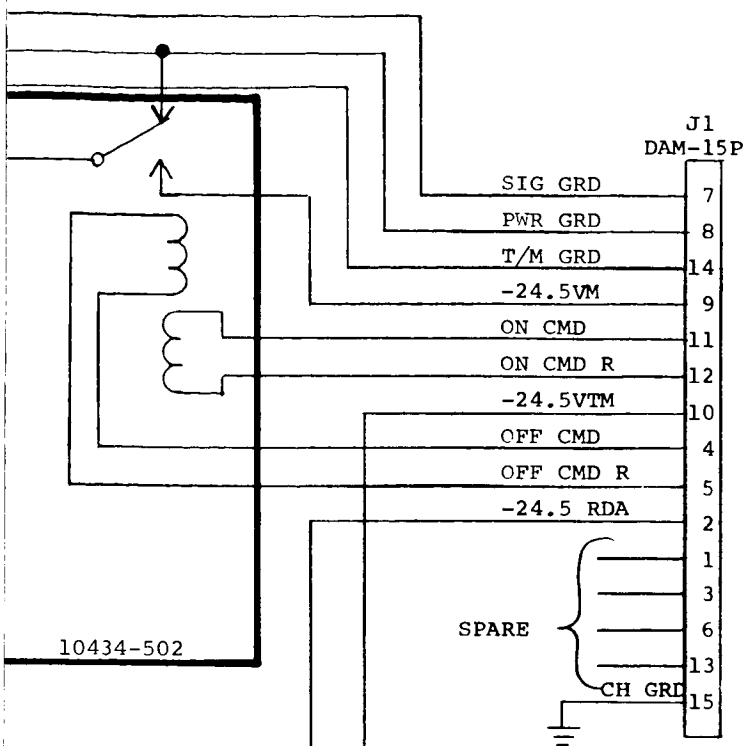
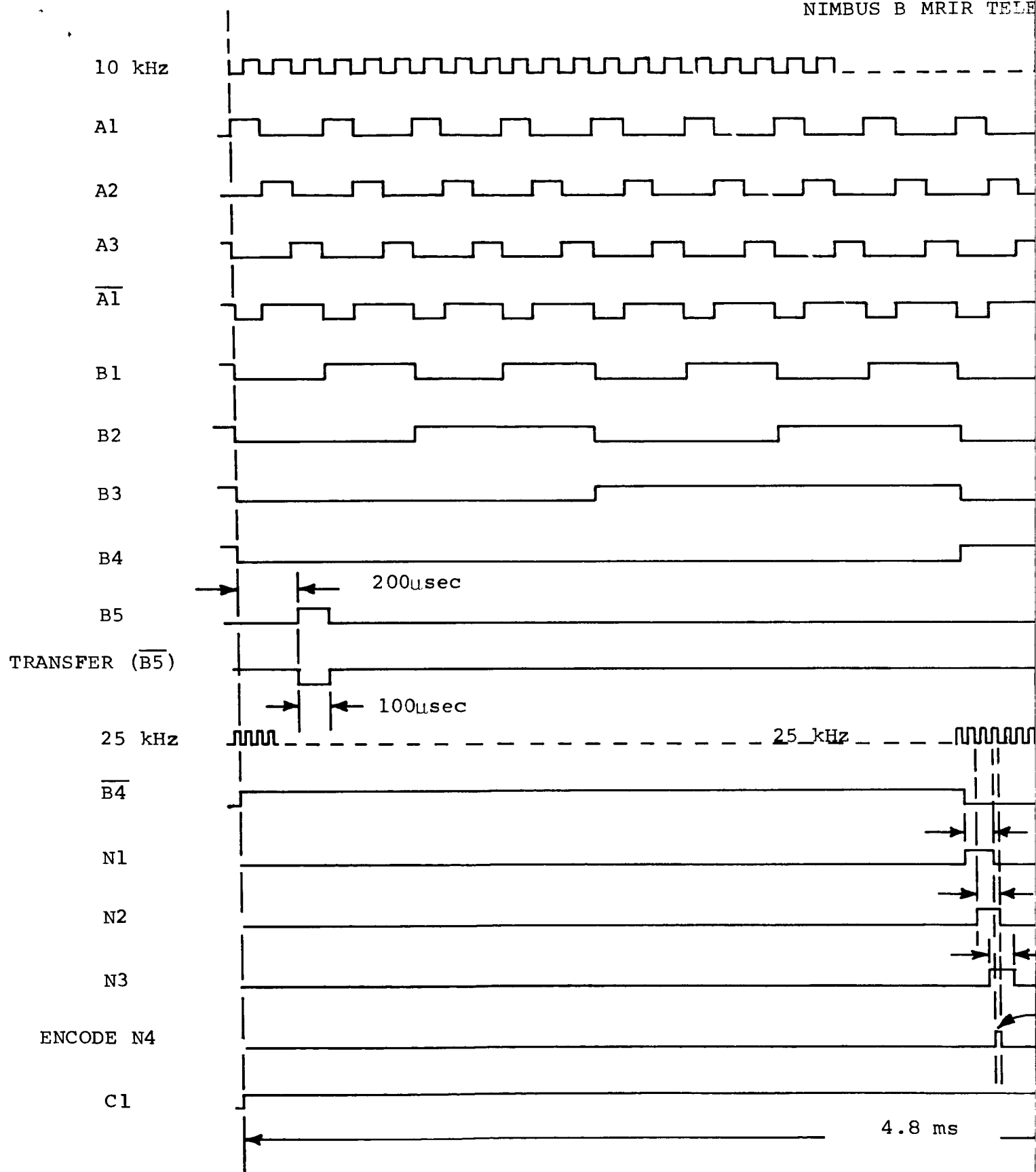


FIGURE 4-3
Signal and Grounding Schematic Diagram
MRIR-PCM Unit

FOLDOUT FRAME





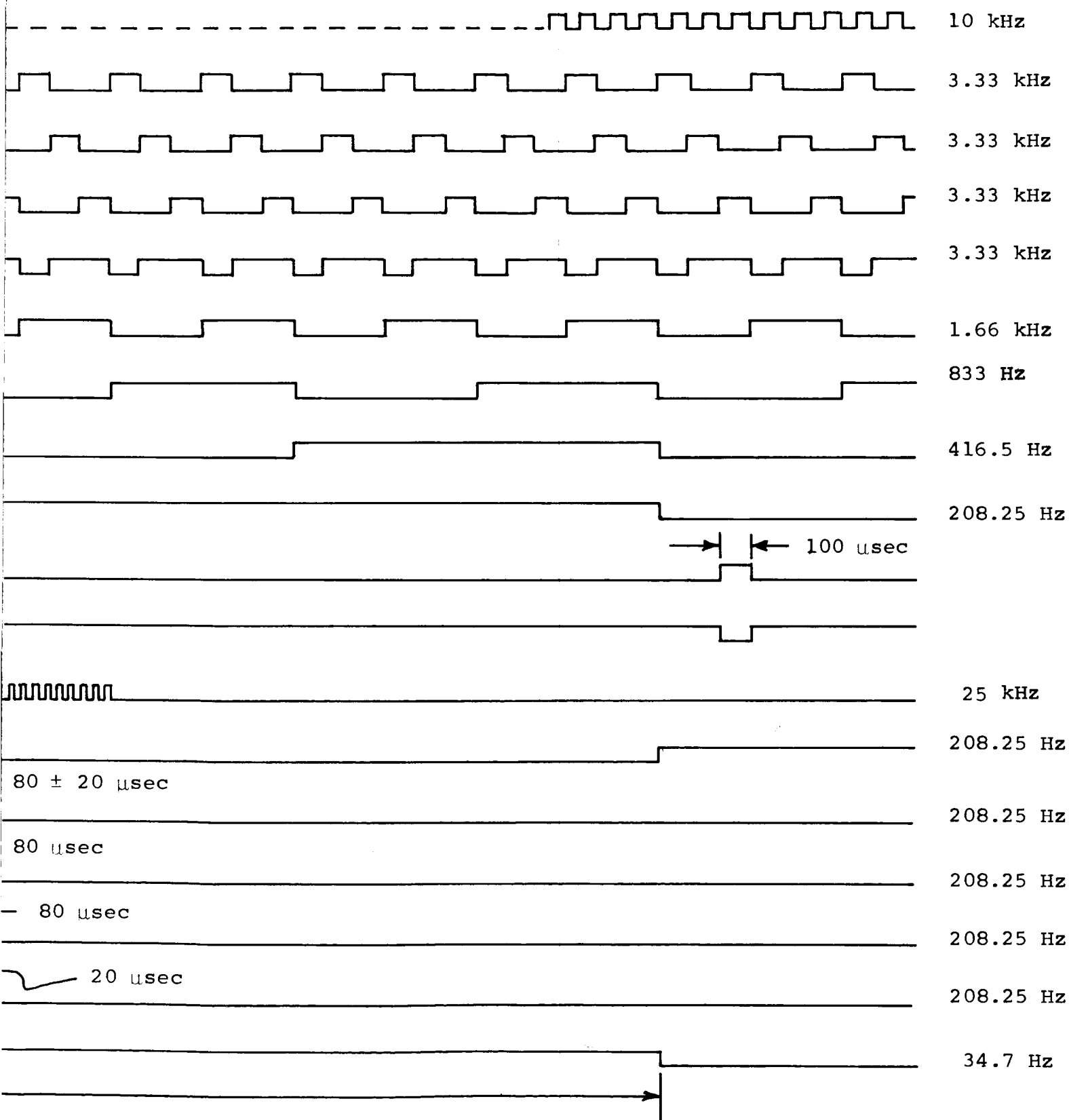
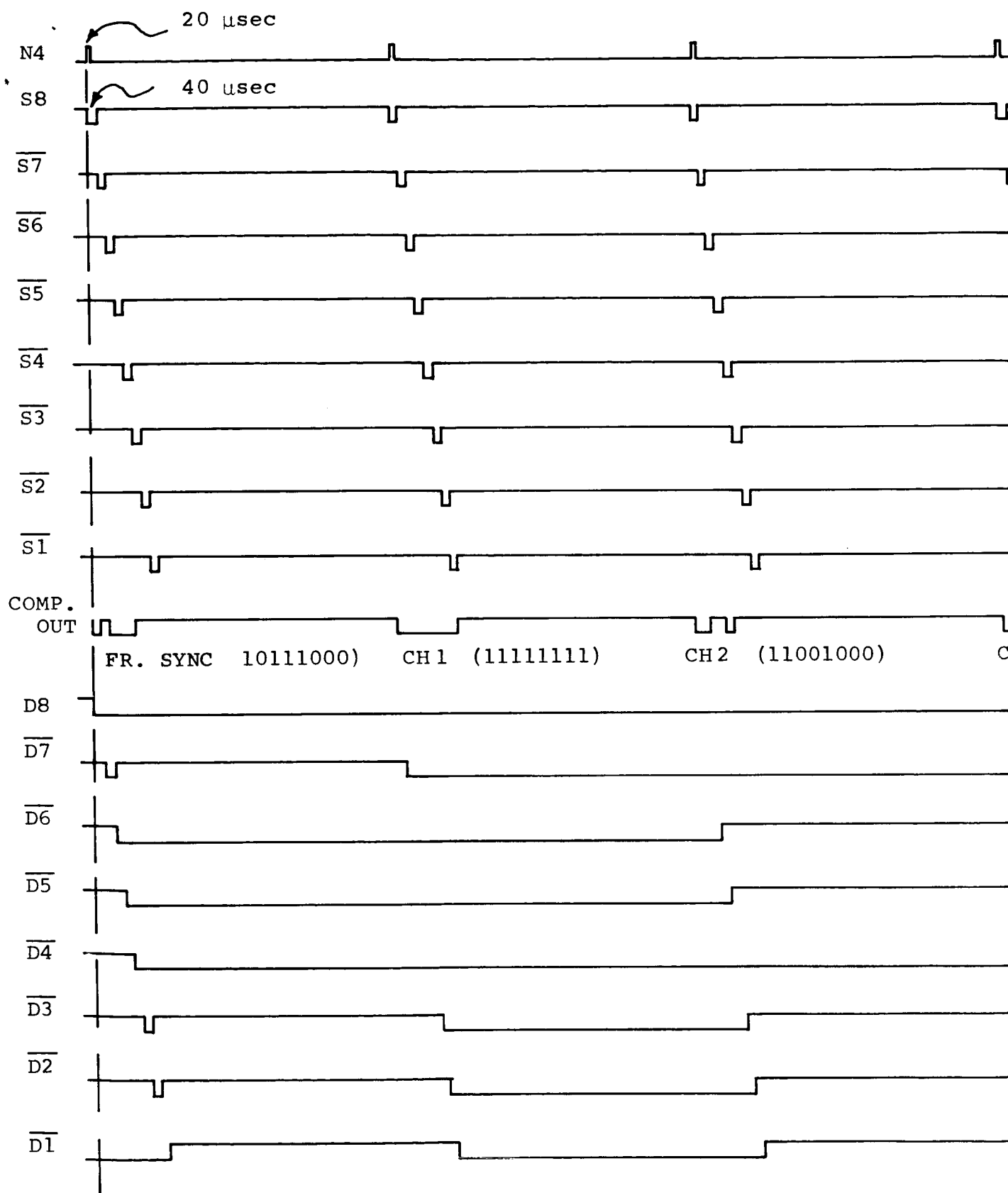


FIGURE 4-4



NOTE: CH1 = 6.375 VOLT, CH2 = 5.0 VOLT, CH3 = 4.0 VOLT, CH4 = 3.0 VOLT,

(Continued)

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208.25 Hz

A/D DATA
CONTROL SHIFT
REGISTER

COMPARATOR OUTPUT

CH3 (10100000)

CH4 (01111000)

CH5 (00000001)

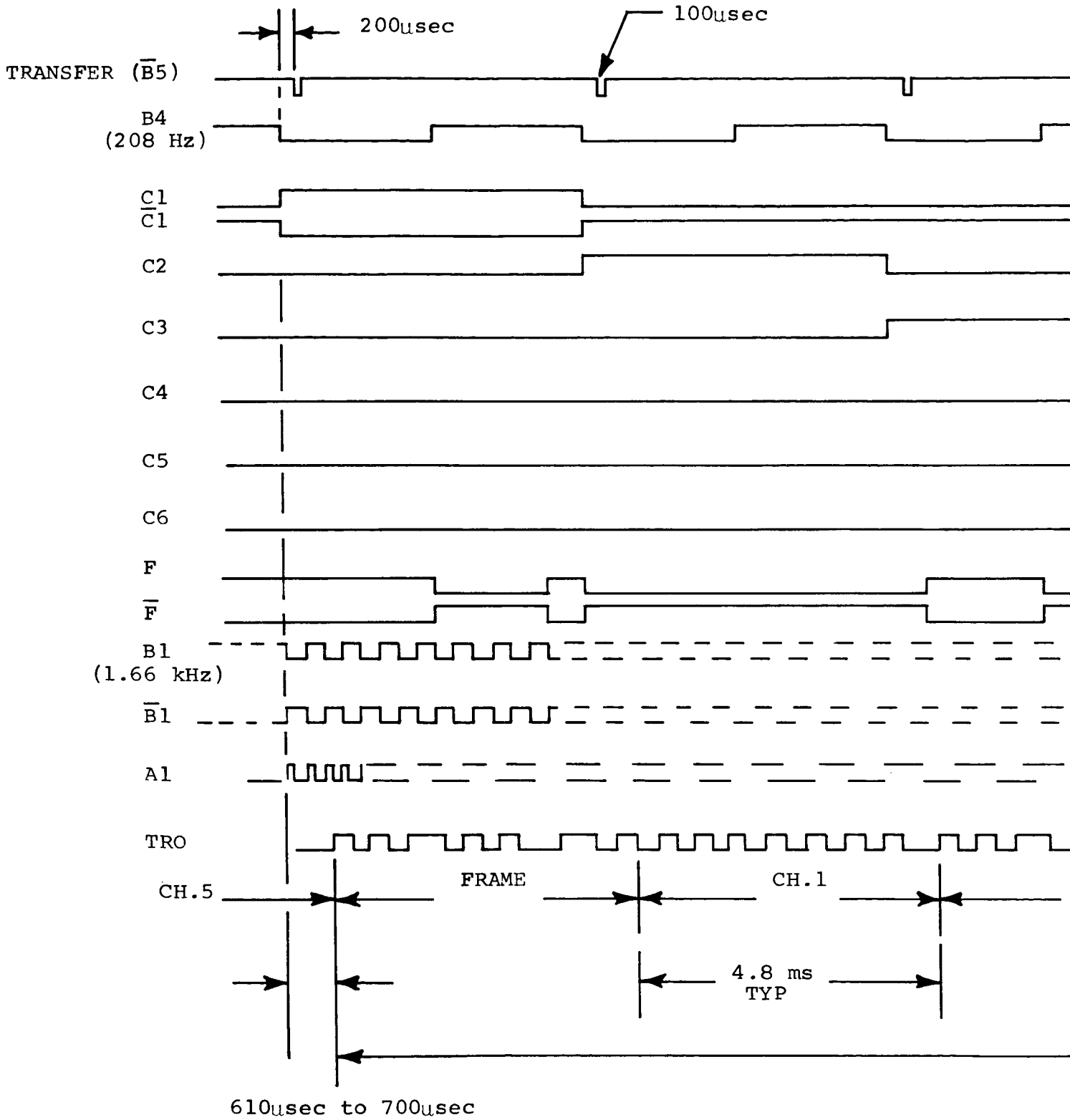
PARALLEL 8-BIT
ANALOG-TO-DIGITAL
CONVERTER OUTPUT

CH5 = 0.025 VOLT

FOLDOUT FRAME

4-6b

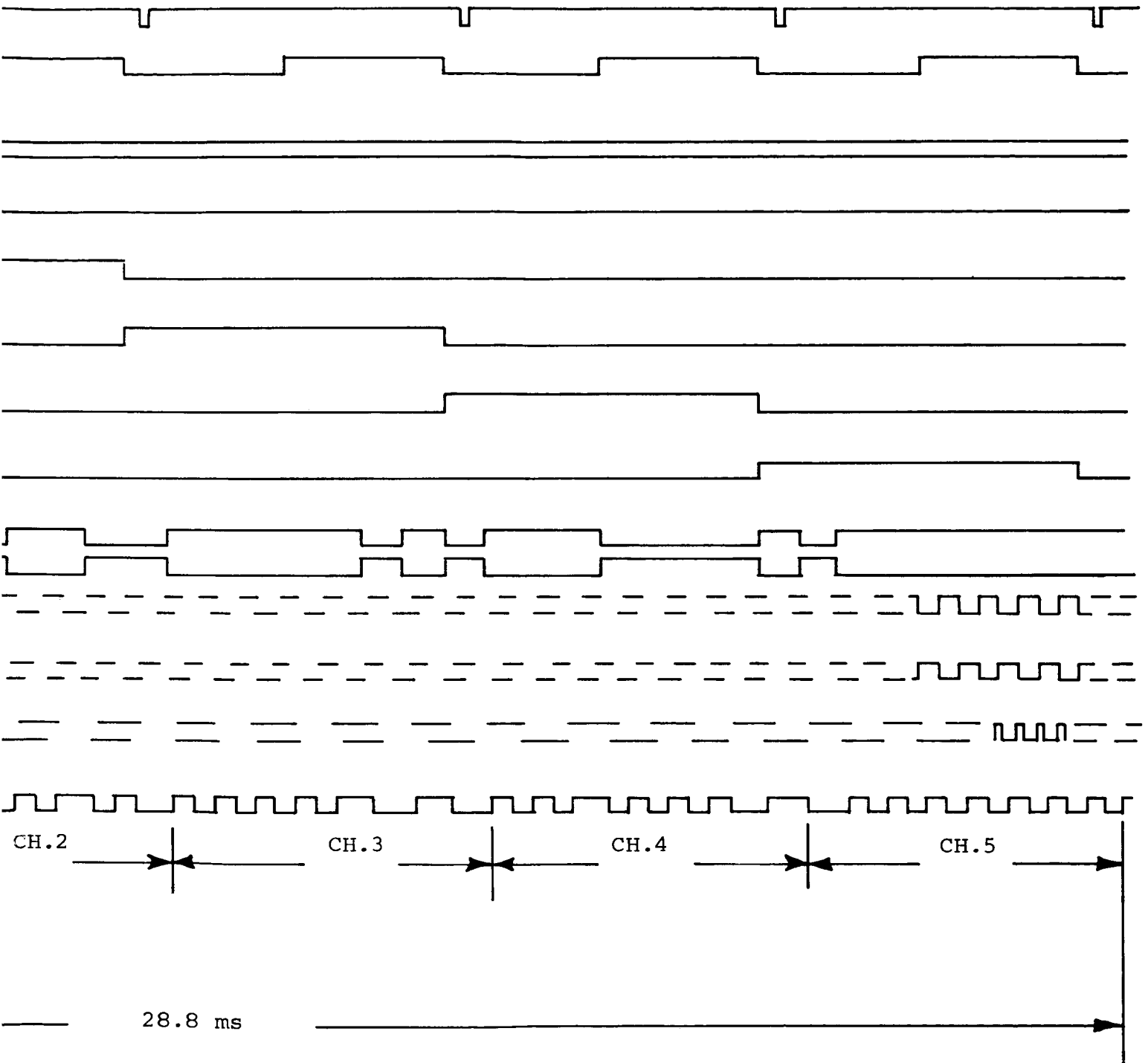
FIGURE 4



F = SERIAL DATA OUTPUT

TRO = SPLIT PHASE SERIAL OUTPUT TO TAPE RECORDER

FOLDOUT FRAME /



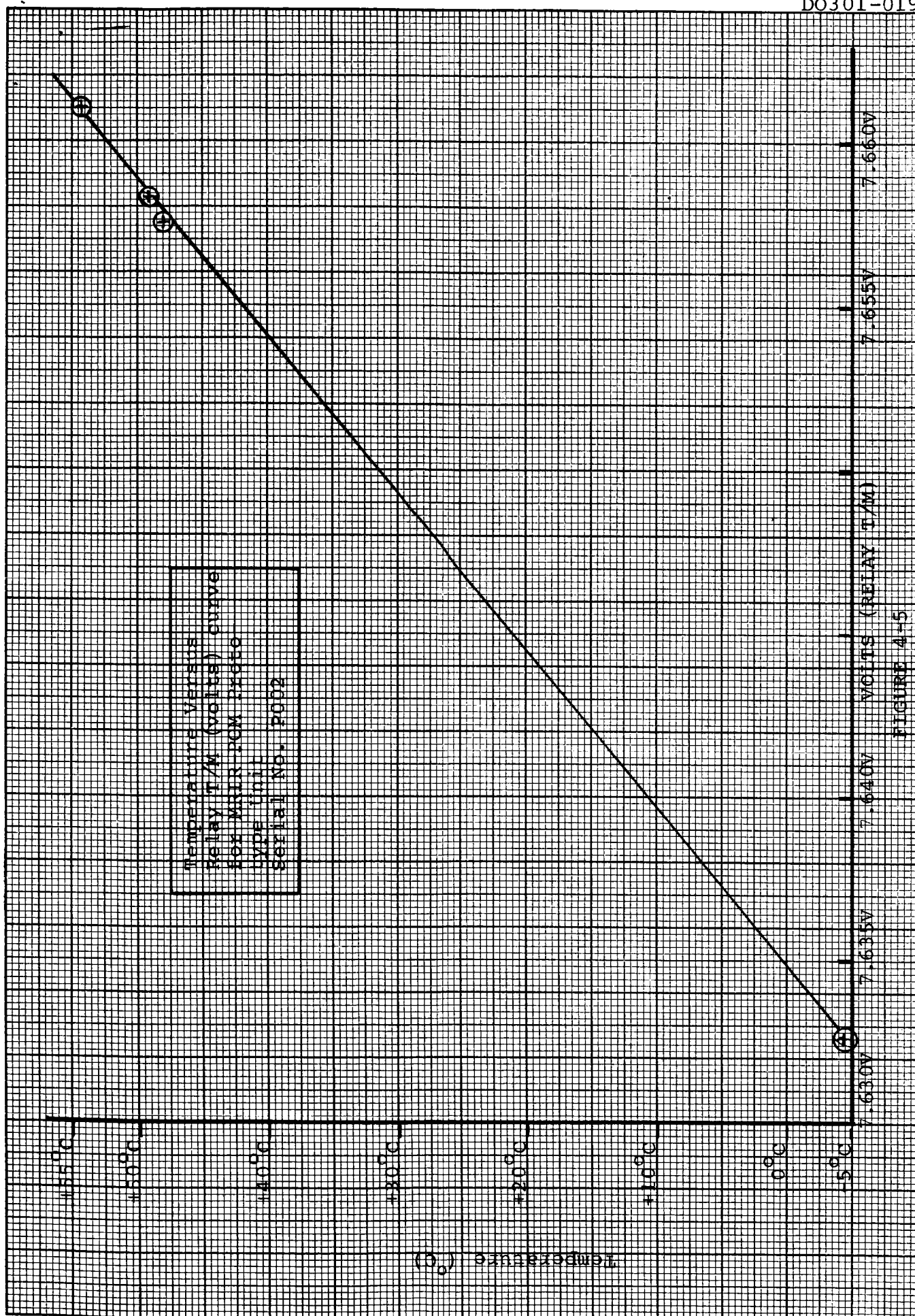
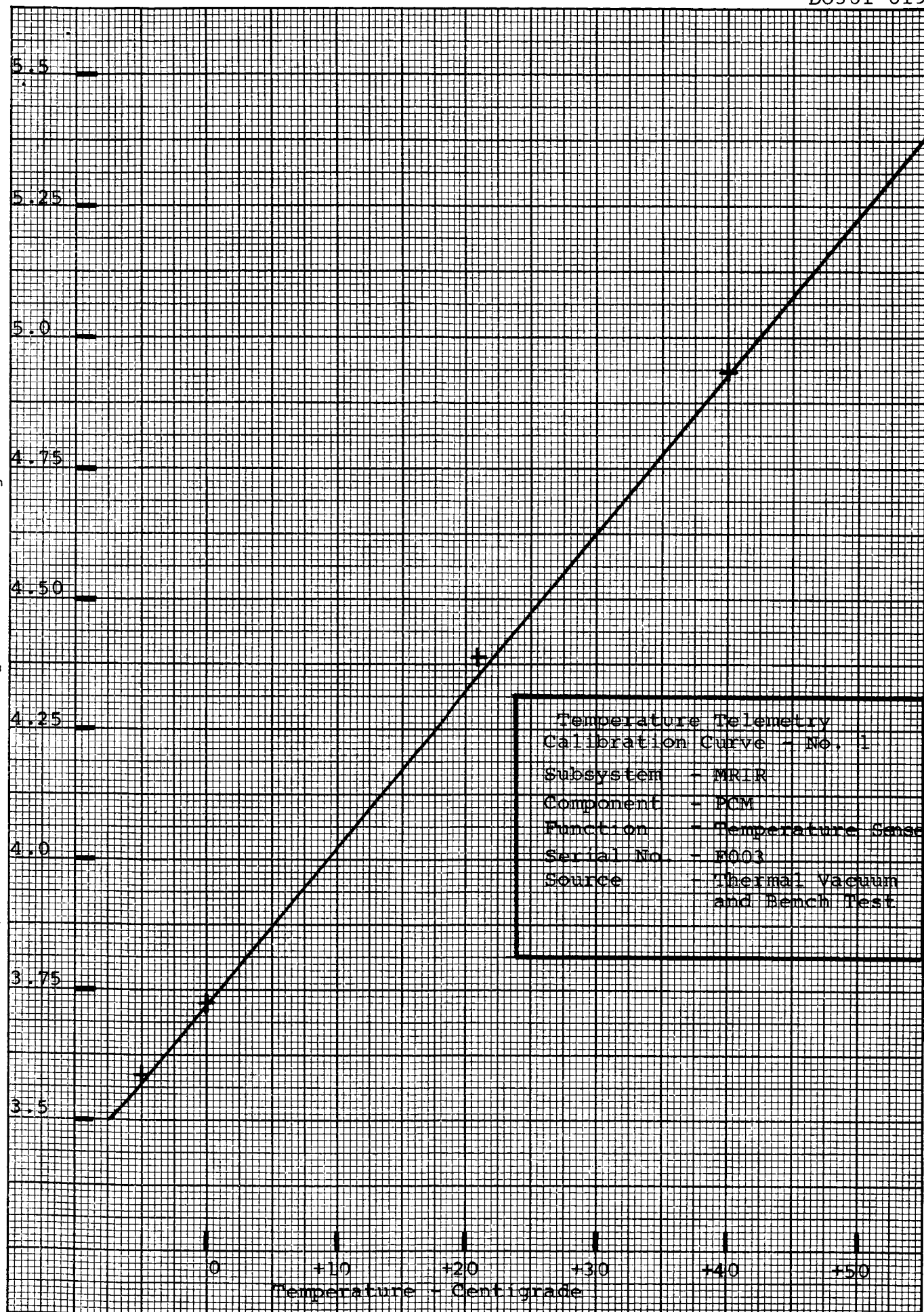


FIGURE 4-5

Temperature Telemetry Output

T/M Temperature Output - Volts Negative

FIGURE 4-6
Temperature Telemetry Output

T/M Temperature Output - Volts Negative

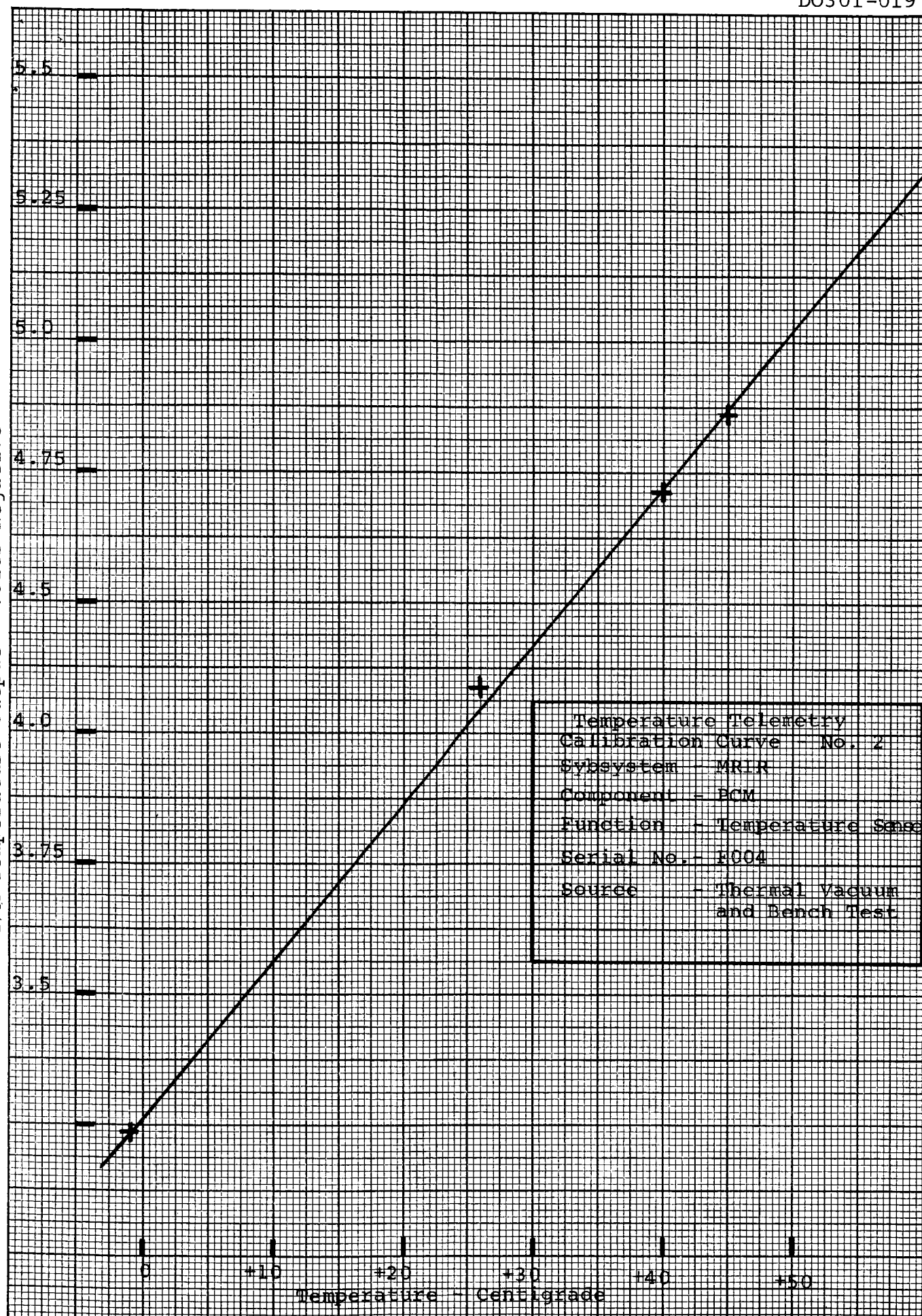


FIGURE 4-7

Temperature Telemetry Output

TABLE 4-1

Prototype Serial No. P002
Analog/Digital Conversion at -5°C

Bit	Voltage Step (mv)	Channel 1 (mv)	Channel 2 (mv)	Channel 3 (mv)	Channel 4 (mv)	Channel 5 (mv)
2^0	25	22	22	22	22	23
2^1	50	48	48	48	48	48
2^2	100	98	98	98	98	98
2^3	200	198	199	199	199	199
2^4	400	399	399	399	399	399
2^5	800	800	800	800	800	800
2^6	1600	1600	1600	1600	1600	1600
2^7	3200	3198	3198	3199	3199	3198
$2^0 + \dots + 2^7$	6375	6375	6376	6375	6375	6375

TABLE 4-2

Prototype Serial No. P002
Analog/Digital Conversion at $+55^{\circ}\text{C}$

Bit	Voltage Step (mv)	Channel 1 (mv)	Channel 2 (mv)	Channel 3 (mv)	Channel 4 (mv)	Channel 5 (mv)
2^0	25	22	23	23	22	23
2^1	50	49	49	49	49	49
2^2	100	99	99	100	99	99
2^3	200	199	199	199	199	199
2^4	400	400	400	399	400	400
2^5	800	801	801	801	801	801
2^6	1600	1601	1601	1601	1601	1601
2^7	3200	3200	3199	3200	3199	3199
$2^0 + \dots + 2^7$	6375	6378	6378	6378	6378	6377

TABLE 4-3

Flight Unit No. 1, Serial No. F003
Analog/Digital Conversion at 0°C

Bit	Voltage Step (mv)	Channel 1 (mv)	Channel 2 (mv)	Channel 3 (mv)	Channel 4 (mv)	Channel 5 (mv)
2^0	25	23	24	24	24	24
2^1	50	48	48	48	48	48
2^2	100	97	98	97	98	98
2^3	200	198	198	198	198	198
2^4	400	398	398	398	398	398
2^5	800	797	797	797	798	797
2^6	1600	1598	1598	1598	1598	1598
2^7	3200	3198	3197	3197	3197	3197
$2^0 + \dots + 2^7$	6375	6375	6375	6375	6375	6375

TABLE 4-4

Flight Unit No. 1, Serial No. F003
Analog/Digital Conversion at +60°C

Bit	Voltage Step (mv)	Channel 1 (mv)	Channel 2 (mv)	Channel 3 (mv)	Channel 4 (mv)	Channel 5 (mv)
2^0	25	23	23	24	23	24
2^1	50	47	47	47	47	47
2^2	100	96	97	97	98	98
2^3	200	198	198	198	198	198
2^4	400	398	398	398	398	398
2^5	800	798	798	798	798	798
2^6	1600	1599	1599	1599	1599	1599
2^7	3200	3197	3197	3197	3197	3197
$2^0 + \dots + 2^7$	6375	6377	6377	6377	6377	6377

TABLE 4-5

Flight Unit No. 2, Serial No. F004
Analog/Digital Conversion at 0°C

Bit	Voltage Step (mv)	Channel 1 (mv)	Channel 2 (mv)	Channel 3 (mv)	Channel 4 (mv)	Channel 5 (mv)
2^0	25	22	24	24	24	24
2^1	50	46	48	48	48	48
2^2	100	95	97	98	98	98
2^3	200	195	197	197	198	198
2^4	400	397	397	397	397	397
2^5	800	798	798	798	798	797
2^6	1600	1600	1600	1600	1600	1600
2^7	3200	3195	3196	3195	3195	3195
$2^0 + \dots + 2^7$	6375	6372	6372	6372	6372	6372

TABLE 4-6

Flight Unit No. 2, Serial No. F004
Analog/Digital Conversion at +60°C

Bit	Voltage Step (mv)	Channel 1 (mv)	Channel 2 (mv)	Channel 3 (mv)	Channel 4 (mv)	Channel 5 (mv)
2^0	25	23	24	24	24	24
2^1	50	47	48	48	48	48
2^2	100	96	98	98	98	98
2^3	200	196	198	198	198	198
2^4	400	398	398	398	398	398
2^5	800	800	799	799	799	799
2^6	1600	1602	1602	1601	1602	1602
$2^0 + \dots + 2^7$	6375	6381	6382	6381	6381	6381

SECTION 5

NEW TECHNOLOGY

No new technology is applicable to the fabrication and testing of the MRIR units under Contract NAS5-10215.

SECTION 6

BIBLIOGRAPHY

The following documents are directly applicable to the fabrication of the Prototype and Flight model MRIR-T/ME units under Contract NAS5-10215.

6.1 TECHNICAL REPORTS

- DO401-024 - 30 December 1966
Environmental Test Report, MRIR Prototype
Unit, NIMBUS B
- DO401-026 - 30 January 1967
Environmental Test Report, MRIR Flight No. 1 and
Flight No. 2, NIMBUS B.

6.2 MONTHLY PROGRESS REPORTS

- DO515-001 - 5 August 1966
Monthly Progress Report No. 1
Medium Resolution Infrared Radiometer (MRIR)
Telemetry Units
- DO515-002 - 7 September 1966
Monthly Progress Report No. 2
Medium Resolution Infrared Radiometer (MRIR)
Telemetry Units

- DO515-003 - 18 October 1966
Monthly Progress Report No. 3
Medium Resolution Infrared Radiometer (MRIR)
Telemetry Units
- DO515-004 - 14 November 1966
Monthly Progress Report No. 4
Medium Resolution Infrared Radiometer (MRIR)
Telemetry Units
- DO515-005 - 14 December 1966
Monthly Progress Report No. 5
Medium Resolution Infrared Radiometer (MRIR)
Telemetry Units
- DO515-006 - 10 January 1967
Monthly Progress Report No. 6
Medium Resolution Infrared Radiometer (MRIR)
Telemetry Units
- DO515-007 - 6 February 1967
Monthly Progress Report No. 7
Medium Resolution Infrared Radiometer (MRIR)
Telemetry Units
- DO515-008 - 13 March 1967
Monthly Progress Report No. 8
Medium Resolution Infrared Radiometer (MRIR)
Telemetry Units

6.3 TELEPHONE DOCUMENTATIONS

1966

- Job 48100-1, dated 26 July 1966
- Job 48100-2, dated 8 September 1966
- Job 48100-3, dated 21 September 1966
- Job 48100-4, dated 28 September 1966
- Job 48100-5, dated 10 October 1966
- Job 48100-6, dated 18 October 1966
- Job 48100-7, dated 24 October 1966
- Job 48100-8, dated 3 November 1966
- Job 48100-9, dated 4 November 1966
- Job 48100-10, dated 5 December 1966
- Job 48100-11, dated 7 December 1966

1967

- Job 48100-12, dated 1 February 1967
- Job 48100-13, dated 21 February 1967

6.4 FUNCTIONAL TEST SPECIFICATIONS

- AO201-019 - 10 March 1966
Functional Test Specification for the MRIR-PCM
Digital Subsystem, NIMBUS B
- AO205-109 - 23 January 1967
Functional Test Specification for Analog Input
and 24-kHz Generator, Part No. 10424-502
- AO205-110 - 5 October 1966
Functional Test Specification for Analog-to-
Digital Converter, Part No. 10426-502

- AO205-111 - 24 January 1967
Functional Test Specification for Analog-to-Digital Data Control, Part No. 10428-502
- AO205-112 - 10 October 1966
Functional Test Specification for Encode Timing Generator, Part No. 10430-502
- AO205-113 - 24 January 1967
Functional Test Specification for Frame Sync and Data Output, Part No. 10432-502
- AO205-114 - 4 October 1966
Functional Test Specification for DC/DC Converter No. 1 and No. 2, Part Nos. 10434-502 and 10436-502.

APPENDIX A

PROTOTYPE AND FLIGHT MRIR-T/ME UNITS

ELECTRICAL SCHEMATICS

AND

PRINTED CIRCUIT BOARD ASSEMBLY DRAWINGS

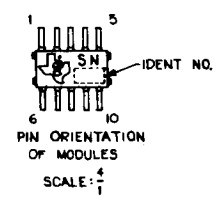
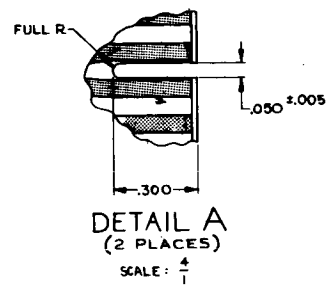
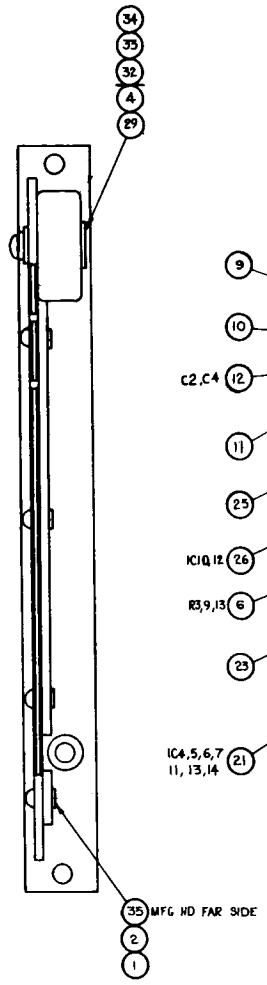
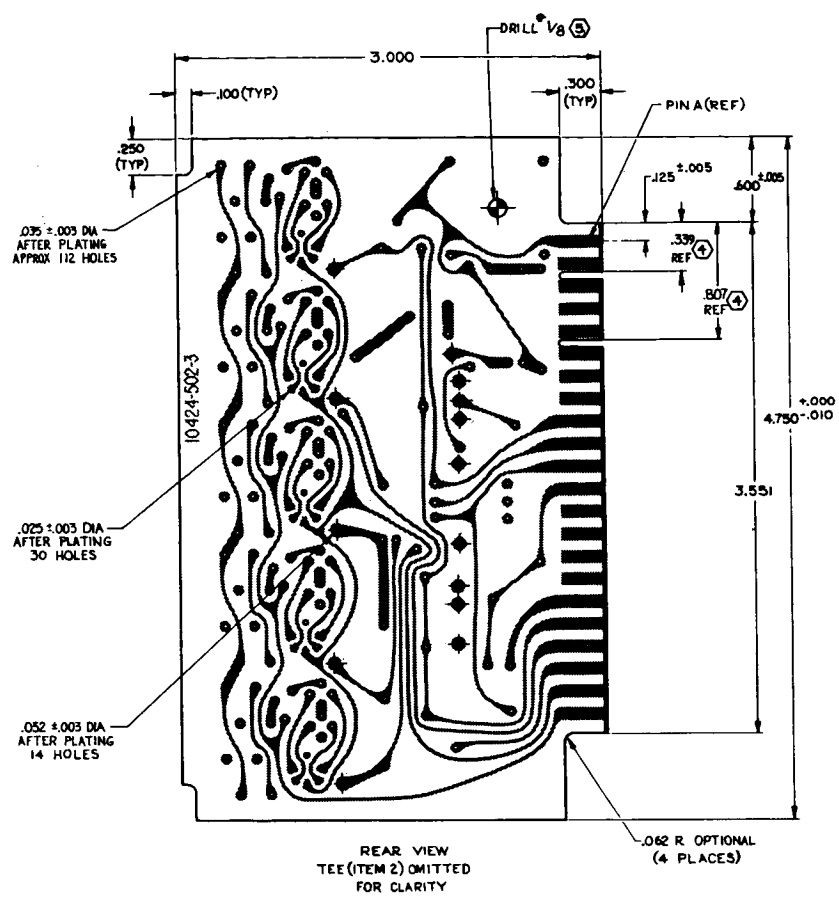
APPENDIX A

PROTOTYPE AND FLIGHT MRIR-T/ME UNITS
ELECTRICAL SCHEMATICS
AND
PRINTED CIRCUIT BOARD ASSEMBLY DRAWINGS

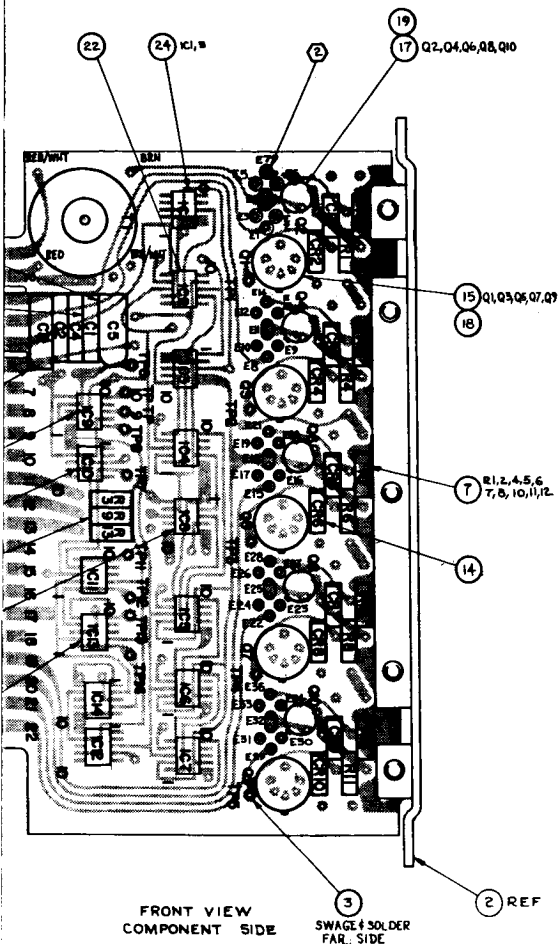
The following section contains the electrical schematics and printed circuit board assembly drawings.

A.1 LIST OF DRAWINGS

10424-502	Analog Inputs and 25-kHz Generator
10425-502	Schematic, Analog Inputs and 25-kHz Generator
10426-502	Analog-to-Digital Converter
10427-502	Schematic, Analog-to-Digital Converter
10428-502	Schematic, Analog-to-Digital Data Converter
10429-502	Schematic, Analog-to-Digital Data Control
10430-502	Encode Timing Generator
10431-502	Schematic, Encode Timing Generator
10432-502	Frame Sync and Data Output
10433-502	Schematic, Frame Sync and Data Output
10434-502	DC/DC Converter No. 1
10435-502	Schematic, DC/DC Converter No. 1
10436-502	DC/DC Converter No. 2
10437-502	Schematic, DC/DC Converter No. 2



FOLDOUT FRAME /

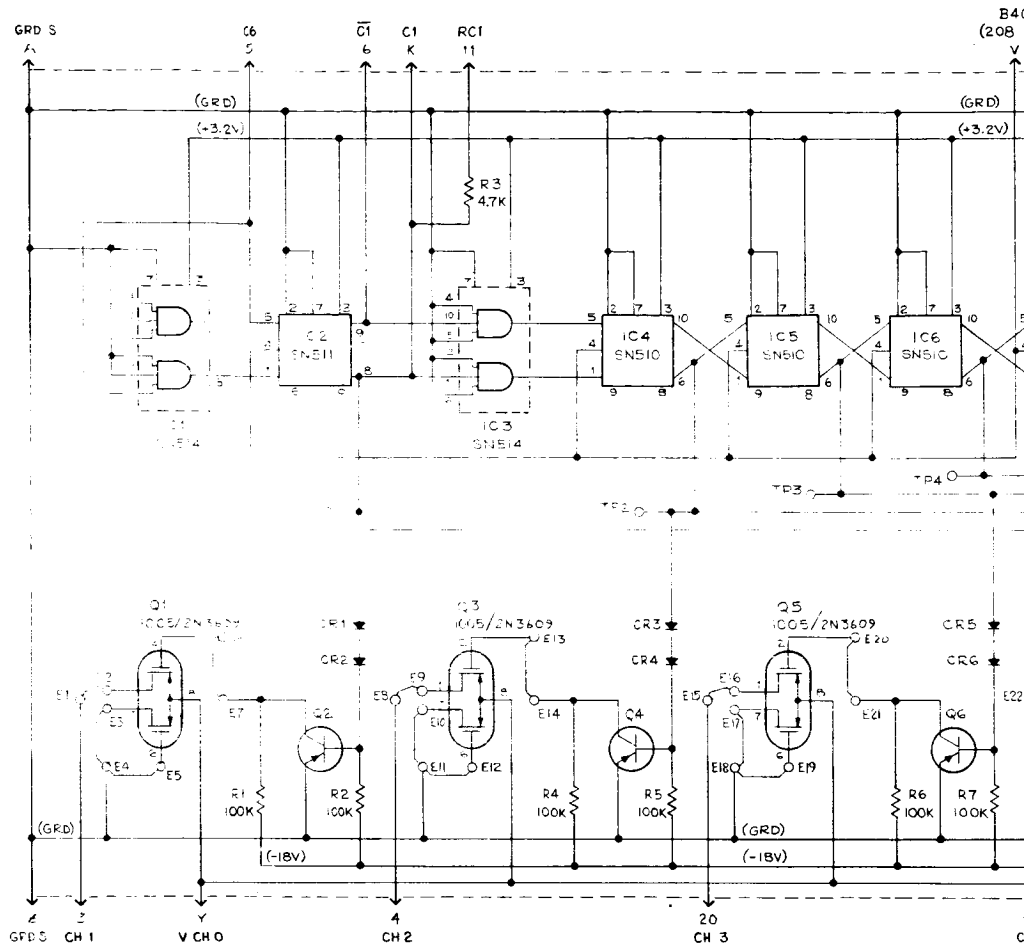


WIRE LIST				
TRANSISTOR NUMBER	PROCEDURE I (2)		PROCEDURE II (1)	
	FROM	TO	FROM	TO
Q1	E1	E2	E1	E3
	E3	E4		
	E4	E5	E5	E7
	E6	E7		
Q3	E8	E9	E8	E10
	E10	E11		
	E11	E12	E12	E14
	E13	E14		
Q5	E15	E16	E15	E17
	E17	E18		
	E18	E19	E19	E21
	E20	E21		
Q7	E22	E23	E22	E24
	E24	E25		
	E25	E26	E26	E28
	E27	E28		
Q9	E29	E30	E29	E31
	E31	E32		
	E32	E33	E33	E35
	E34	E35		

10424-502		REVISIONS		DATE & APPROVAL
REV	DATE	DESCRIPTION	BY	
1	10/17/74	1. IN L/M TRANSISTOR 1005/2N3609 WAS 1005		EO 1774
2	10/17/74	2. IN L/M SOLID STATE MODULES SN517/SN867 WAS SN517, SN515/SN865 WAS SN515, SN514/SN864 WAS SN514, SN512/SN862 WAS SN512, SN511/SN861 WAS SN511, SN510/SN860 WAS SN510		EO 1767
	2/3/67	EFFECT ON: ITEM 1 RECORD ITEM 2 ALL PARTS		Q.F.

15. MILTON ROSS METALS CO, SOUTHAMPTON, PA.
 24. REA MAGNETIC WIRE CO INC, FORT WAYNE, IND
 23. MODULAR ELECTRONICS, INGLEWOOD, CALIF
 22. RAYBESTOS-MANHATTAN, LOS ANGELES, CALIF.
 21. TEXAS INSTRUMENTS INC, DALLAS, TEXAS
 20. GENERAL MICRO-ELECTRONICS INC, SANTA CLARA, CALIF
 19. GENERAL ELECTRIC CO, SEMI-COND DIV, SYRACUSE N.Y.
 18. KEMET DEPT UNION CARBIDE CORP, CLEVELAND, OHIO.
 17. CORNING GLASS WORKS, BRADFORD, PA.
 16. VALUE TO BE DETERMINED AT FUNCTIONAL TEST.
 15. DO NOT PLATE THRU
 14. COAT PCB ASSY PER CCP SPEC AO108-004
 13. REF SCHEMATIC DWG NO. 10425-502
 12. COMPONENT REF DESIGNATIONS ARE FOR LOCATING PURPOSES ONLY AND DO NOT APPEAR ON ACTUAL PART.
 11. KEYSLOT DIMENSIONS ARE FOR REFERENCE ONLY, SLOT SHOULD BE CENTERED BETWEEN PINS AND MUST NOT TOUCH CIRCUITRY.
 10. MATCH DRILL AND RIVET ITEMS 1 AND 2 USING JIG FIXTURE 11430-203
 9. FABRICATE PER CCP SPEC AO105-008
 8. SILK SCREEN USING 35M 10424-502-3
 7. FABRICATE USING PCM 10424-502-3
 6. EPOXY GLASS LAMINATE WITH 2.0Z COPPER BOTH SIDES, MIL-P-13949C, TYPE GE
 5. PLATING TO BE PER CCP SPEC AO105-008
 4. CHAMFER CONNECTOR TIP .020 ± .001 BOTH SIDES.
 3. BOARD THICKNESS AT CONNECTOR TIP NOT TO EXCEED .065 ± .003
 2. INSTALL ITEM 30 AT PLACES INDICATED AS SHOWN, PER PROCEDURE I OF WIRE LIST
 1. IF TRANSISTOR INDICATED IN WIRE LIST FAILS DELETE WIRING OF PROCEDURE I AND ADD WIRES PER PROCEDURE II
 NOTE: UNLESS OTHERWISE SPECIFIED

35	5	MS2040A2-4	RIVET						
34	1	MS32233-13	SCREW						
33	1	MS35333-70	WASHER LK						
32	1	AN960C4L	WASHER FLAT						
30			WIRE	30		ENAMEL COATED	COML		
29	1	100-1	RETAINER TOROID				COML		
26	2	SN517/SN867	SOLID STATE MODULE	WITH MYLAR INSULATOR			COML		
25	1	SN515/SN865							
24	2	SN514/SN864							
23	1	SN512/SN862							
22	1	SN511/SN861							
21	7	SN510/SN860	SOLID STATE MODULE	WITH MYLAR INSULATOR			COML		
19	5	RMA2001	TRANSISTOR MOUNT	TO-18			COML		
18	5	10193	TRANSISTOR MOUNT	TO-5		8 LEADS			
17	5	2N2604	TRANSISTOR						
16	5	1005/2N3609	TRANSISTOR				COML		
14	10	1N4153	DIODE				COML		
12	2		CAPACITOR				COML		
11	1	CYFM15C47G			470pf ±2% 500V				
10	1	CYFM10C101G			100pf ±2% 500V				
9	1	KG22J15KMS	CAPACITOR		22uf ±10% 15V		COML		
7	10	RL07S	RESISTOR		100K ±2% 1/4W		COML		
6	8	RL07S	RESISTOR		4.7K ±2% 1/4W		COML		
4	1	10003-403	TRANSFORMER						
3	14	910443-203	TERMINAL				DSCD		
2	1	11606-203-11	TEE-PCB ASSY						
1	1	10424-502-3	PCB		.062 ± .006 × 4.81				
ITEM NO.	1	10424-502	ANALOG INPUTS 25KC GEN						
NO.	RECD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION						
LIST OF MATERIAL OR PARTS LIST									
UNLESS OTHERWISE SPECIFIED				DRAWN		CALIFORNIA COMPUTER PRODUCTS INC.			
DIMENSIONS ARE IN INCHES				CHECK		300 MILLER, ANAHEIM, CALIFORNIA			
TOLERANCES ON				APPD		ANALOG INPUTS 25KC GENERATOR			
DECIMALS				APPD		SCALE: 2			
X .03				FINISH		SIZE			
X .010				HEAT TREAT		F			
DRILLED HOLES				SURFACE ROUGHNESS		10424-502			
.008 TO .125 ± .002 - .001				PER MIL-STD-10		WEIGHT			
.130 TO .250 ± .004 - .002						SHEET			
.250 TO .375 ± .006 - .003									
.375 TO .500 ± .008 - .005									
.500 TO .750 ± .010 - .007									
.750 TO 1.000 ± .012 - .009									
1.000 TO 2.000 ± .015 - .010									



FOLDOUT FRAME

16-BIT PARALLEL ADDER

PS)

C5 19

RC6 12

C6 L

200 KC GRD 1

200 KC 2

+3.2V N

+3.2V

K4C (25 KC) X

25KC I K4

R13 4.7K

RED

RED/WH

RED/WH

BRN

T1

C2

1

IC8 SN512

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8

7

6

5

4

3

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0

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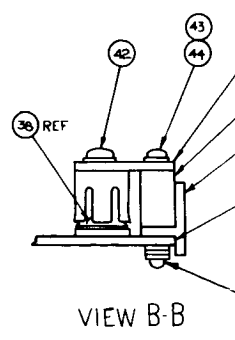
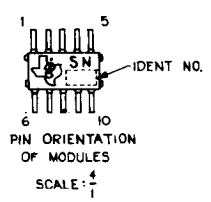
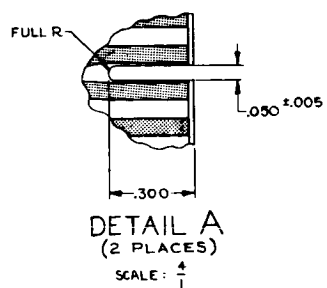
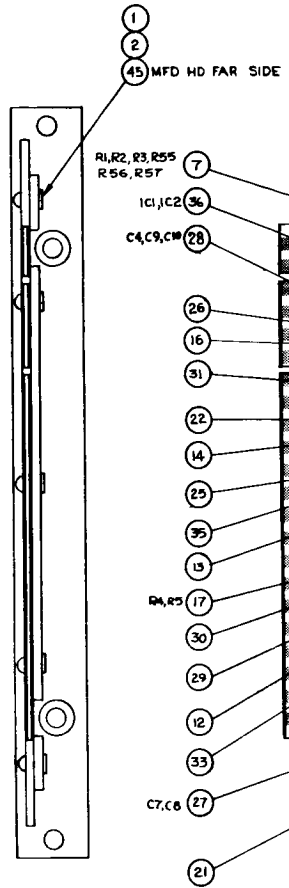
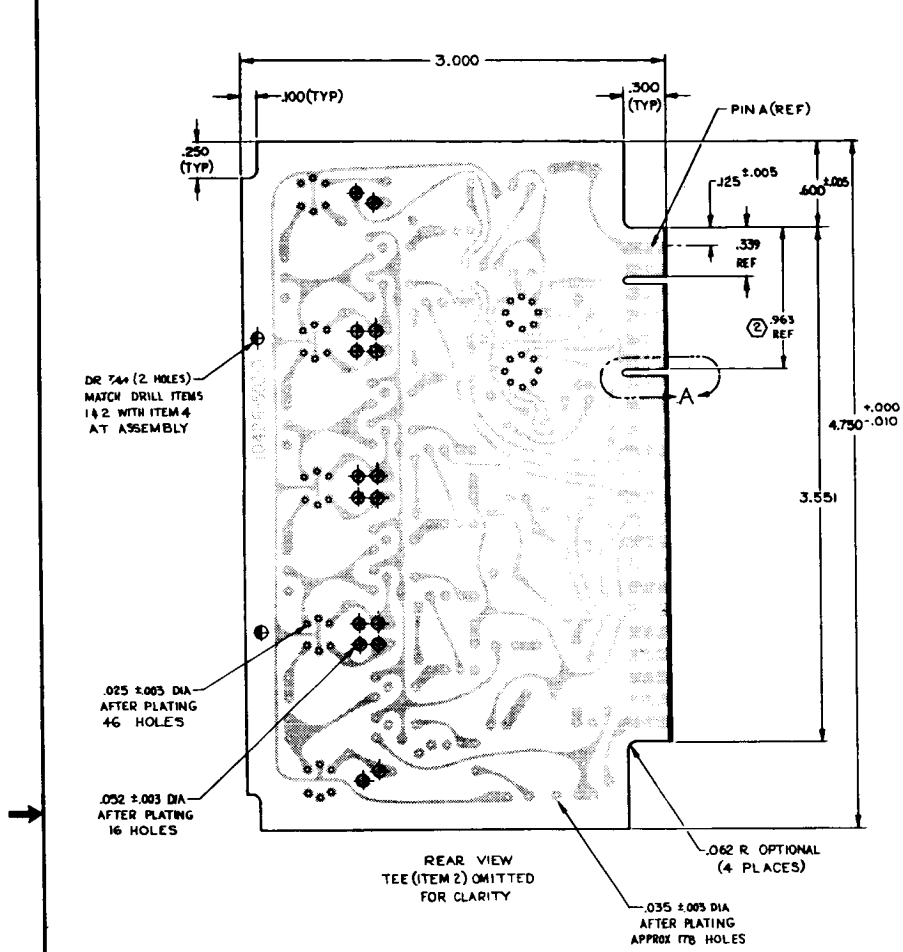
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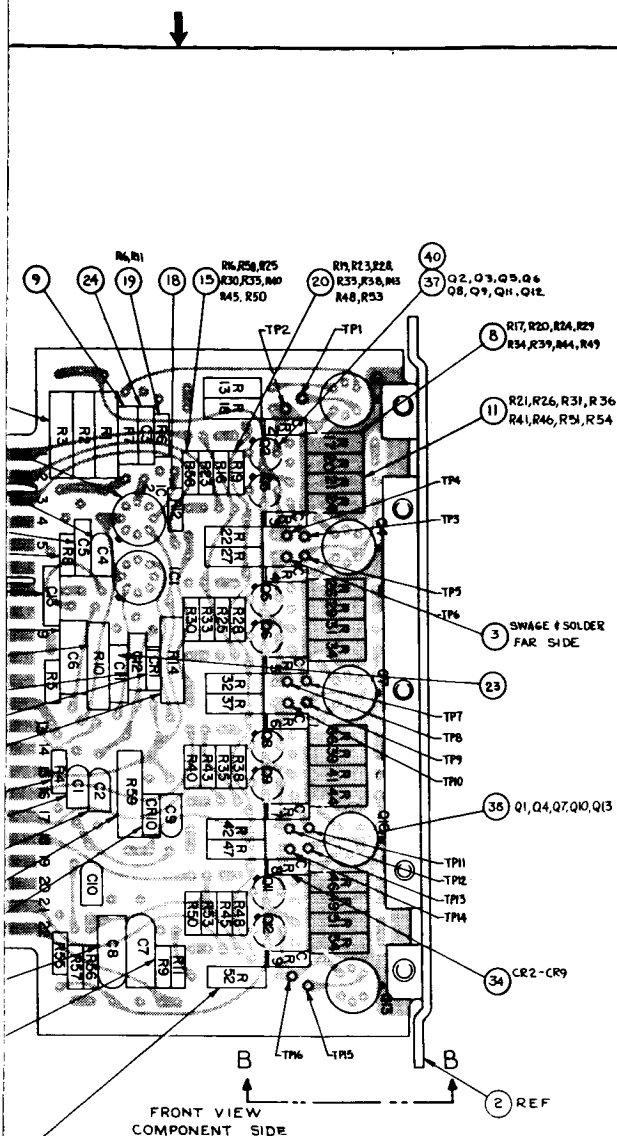
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FOLDOUT FRAME 2



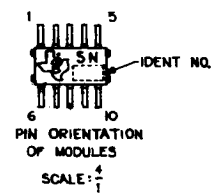
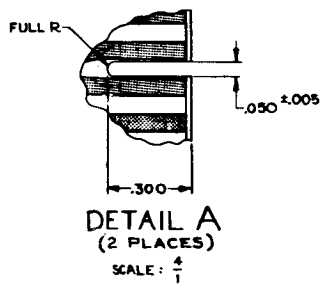
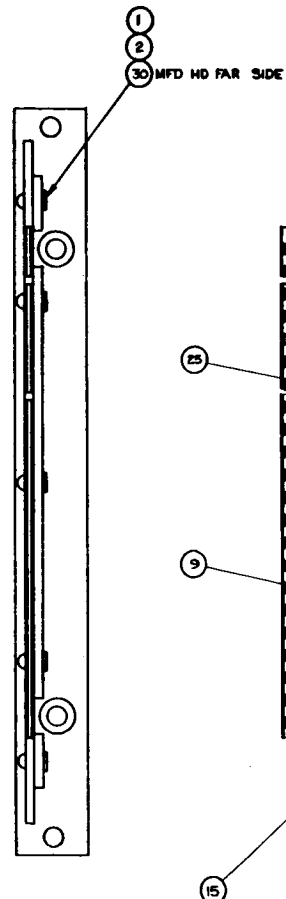
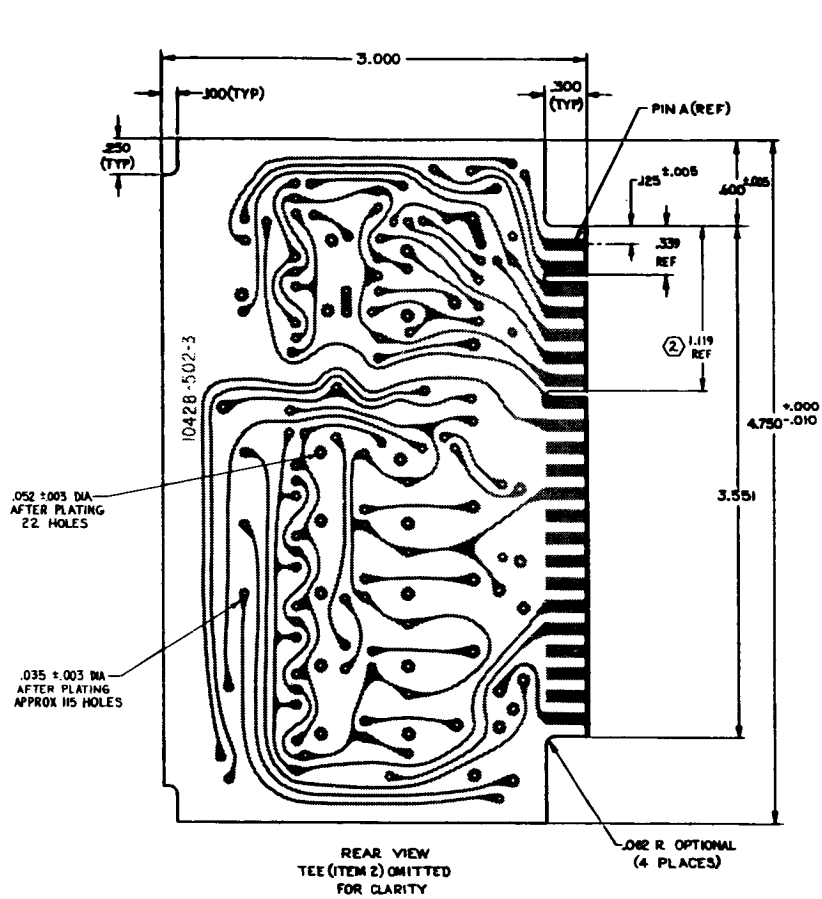


- 10 R13, R16, R22, R27, R32
R37, R42, R47, R52
- 11 R21, R26, R31, R36
R41, R46, R51, R54
- 12 R17, R20, R24, R29
R34, R39, R44, R49
- 13 SWAGE & SOLDER
FAR SIDE
- 14 Q1, Q4, Q7, Q10, Q13
- 15 CR2-CR9
- 16 REF
- 17 28. SEASTROM MFG. CO. GLENDALE CALIF
- 18 27. MILTON ROSS METALS CO., SOUTHAMPTON, PA
- 19 26. COAT PCB ASSY PER CCP SPEC AO10B-004
- 20 23. TEXAS INSTRUMENTS INC., DALLAS, TEXAS
- 21 24. RAYBESTOS-MANHATTAN, LOS ANGELES, CALIF.
- 22 25. ALLEN BRADLEY CO., MILWAUKEE, WISCONSIN
- 23 22. DO NOT PLATE THRU
- 24 21. NATIONAL BERYLLIA CORP., HASKELL, N.J.
- 25 20. FAIRCHILD SEMICONDUCTOR DIV., MOUNTAIN VIEW, CALIF
- 26 19. MOTOROLA SEMICONDUCTOR DIV., PHOENIX, ARIZ.
- 27 18. GENERAL ELECTRIC SEMICONDUCTOR DIV., SYRACUSE, N.Y.
- 28 17. KEMET DEPT UNION CARBIDE CORP., CLEVELAND, OHIO
- 29 16. GENERAL ELECTRIC CO., SCHENECTADY, N.Y.
- 30 15. CORNING GLASS WORKS, BRADFORD, PA.
- 31 14. I.R.C., PHILADELPHIA, PA.
- 32 13. KELVIN VAN NUYS, CALIF
- 33 12. VALUE TO BE DETERMINED AT FUNCTIONAL TEST
- 34 11. REF SCHEMATIC DWG NO. 10427-502
- 35 10. COMPONENT REF DESIGNATIONS ARE FOR LOCATING PURPOSES
ONLY AND DO NOT APPEAR ON ACTUAL PART.
- 36 9. KEY/SLOT DIMENSIONS ARE FOR REFERENCE ONLY, SLOT
SHOULD BE CENTERED BETWEEN PINS AND MUST NOT TOUCH CIRCUITRY.
- 37 8. MATCH DRILL AND RIVET ITEMS 1 AND 2 USING JIG FIXTURE
11430-203
- 38 7. FABRICATE PER CCP SPEC AO105-006
- 39 6. SILK SCREEN USING 55M 10426-502-3
- 40 5. FABRICATE USING PCM 10426-502-3
- 41 4. EPOXY GLASS LAMINATE WITH 2 OZ COPPER BOTH SIDES,
MIL-P-13949C, TYPE GE
- 42 3. PLATING TO BE PER CCP SPEC AO105-008
- 43 2. CHAMFER CONNECTOR TIP 40° ± 30° BOTH SIDES
- 44 1. BOARD THICKNESS AT CONNECTOR TIP NOT TO EXCEED .065 ± .005
- NOTE: UNLESS OTHERWISE SPECIFIED

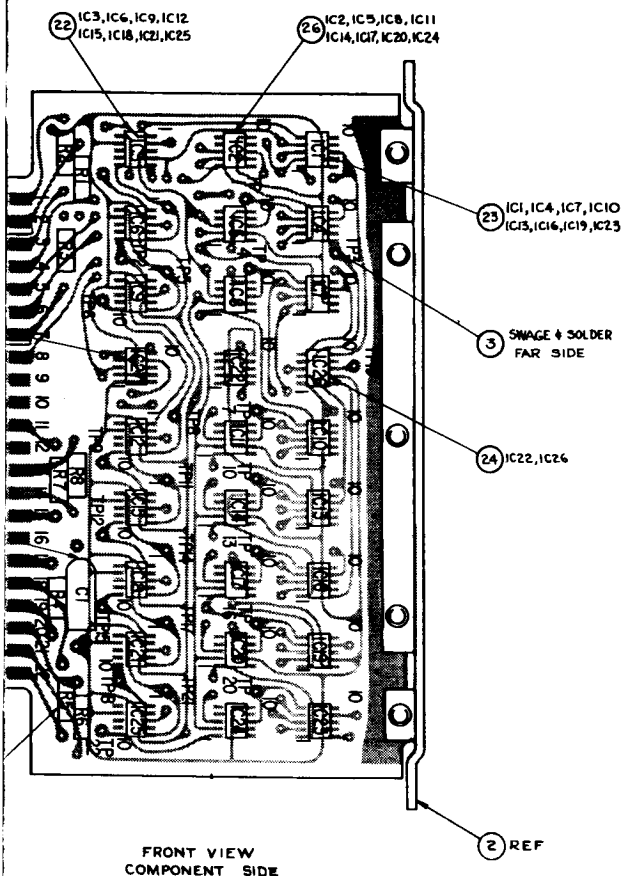
REV	DATE	DESCRIPTION	DATE & APPROVAL
1	1-17-67	1. ADDED ITEM 41, 5610-10-31 WASHER NYLON 2 REQ AND GEN. NOTE 2.8.	D.F.
2		2. ADDED ITEM 32, AN960 C2L WASHER FLAT 2 REQ	
3		3. ITEM 43, 2 REQ WAS 4 REQ	
4		4. ITEM 14 WAS 6K ± 1% 78W	
5		5. ITEM 12 WAS 1.7K ± 1% 78W	
		EFFECT ON: ALL PARTS	

45	5	MS20470A2-4	RIVET				
44	4	MS35233-3	SCREW				
43	2	MS35333-69	WASHER-LOCK				
42	5	30022	RETAINER-TRANSISTOR	TO-5			COML
41	2	5610-10-31	WASHER NYLON				COML
40	8	RMA 2001	MOUNT-TRANSISTOR	TO-18			COML
39	7	10193	MOUNT-TXTOR	TO-5 (8 LEADS)			COML
38	5	2N3680	TRANSISTOR				COML
37	8	2N995	TRANSISTOR				
36	2	uA709	OPR AMPLIFIER				
35	1	1N4574	DIODE				
34	8	1N4153	DIODE				
33	1	1N748A	DIODE				COML
32	2	AN 960 C 2 L	WASHER FLAT				
31	1		CAPACITOR	③			
30	1	KG6RBJ6KMS	CAPACITOR	6.8μf ±10% 6V			COML
29	1	KG2R2J20KMS		2.2μf ±10% 20V			
28	3	KG3R3J15KMS		3.3μf ±10% 15V			
27	2	KG6RBJ35KMS		6.8μf ±10% 35V			
26	1	CYFM15C68IG		680μf ±2% 300V			
25	1	CYFM10C151IG		150μf ±2% 500V			
24	1	CYFM10C680G		68μf ±2% 500V			
23	1	CYFM10C100G		10μf ±2% 500V			
22	1	CYFM15C102G	CAPACITOR	1000μf ±2% 300V			
21	1	CB47G5	RESISTOR	4.7K ±5% 1/4W			
20	8	RL075		27K ±2% 1/4W			
19	2			10K			
18	1			4.7K			
17	2			3.3K			
16	1			1.5K			
15	8	RL075		1.2K ±2% 1/4W			
14	1	MEA-TO		6.04K ±1% 1/8W			
13	1	MEA-TO		5.62K ±1% 1/8W			
12	1	MEA-TO		4.75K ±1% 1/8W			
11	8	1318P		20K ±0.5% 1W			
10	9			15K			
9	1			12K			
8	8	1318P		10K ±0.5% 1W			
7	6		RESISTOR	③			COML
5	2	11519-203	SPACER				
4	1	11435-203	HEAT SINK-TRANSISTOR				
3	16	910443-203	TERMINAL				DSCD
2	1	11606-203-51	TEE-PCB ASSY				
1	1	10426-502-3	PCB	.062 ±.006 ±.4.81	①		
ITEM NO.	1	10426-502	A/D CONV				
REQD		PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL	SIZE, DESCRIPTION & SPECIFICATION	ZONE	
LIST OF MATERIAL OR PARTS LIST							
UNLESS OTHERWISE SPECIFIED			DRAWN 0-11-66	CHECKED 0-11-66	CALIFORNIA COMPUTER PRODUCTS INC.		
DIMENSIONS ARE IN INCHES			APPROVED 0-11-66	FINISH 0-11-66	305 MULLEN, ANAHEIM, CALIFORNIA		
TOLERANCES ON							
DÉCIMALS			ANGLES				
.XX ± .03			± 0° 30'				
.XXX ± .010							
DRILLED HOLES							
.040 TO 1.245 ± .002			.001				
.136 TO 2.28 ± .003			.001				
.234 TO 5.00 ± .004			.001				
.515 TO 7.80 ± .006			.001				
.785 TO 1.000 ± .007			.001				
1.015 TO 2.000 ± .010			.001				
HEAT TREAT							
SURFACE ROUGHNESS PER MIL-STD-10			✓				
SCALE: 2			SIZE: F			10426-502	
DO NOT SCALE THIS DRAWING			WEIGHT			SHEET	

FOLDOUT FRAME 2



REVISED		DATE & APPROVAL
NO.	DATE	
1		BY: [Signature]
2		BY: [Signature]

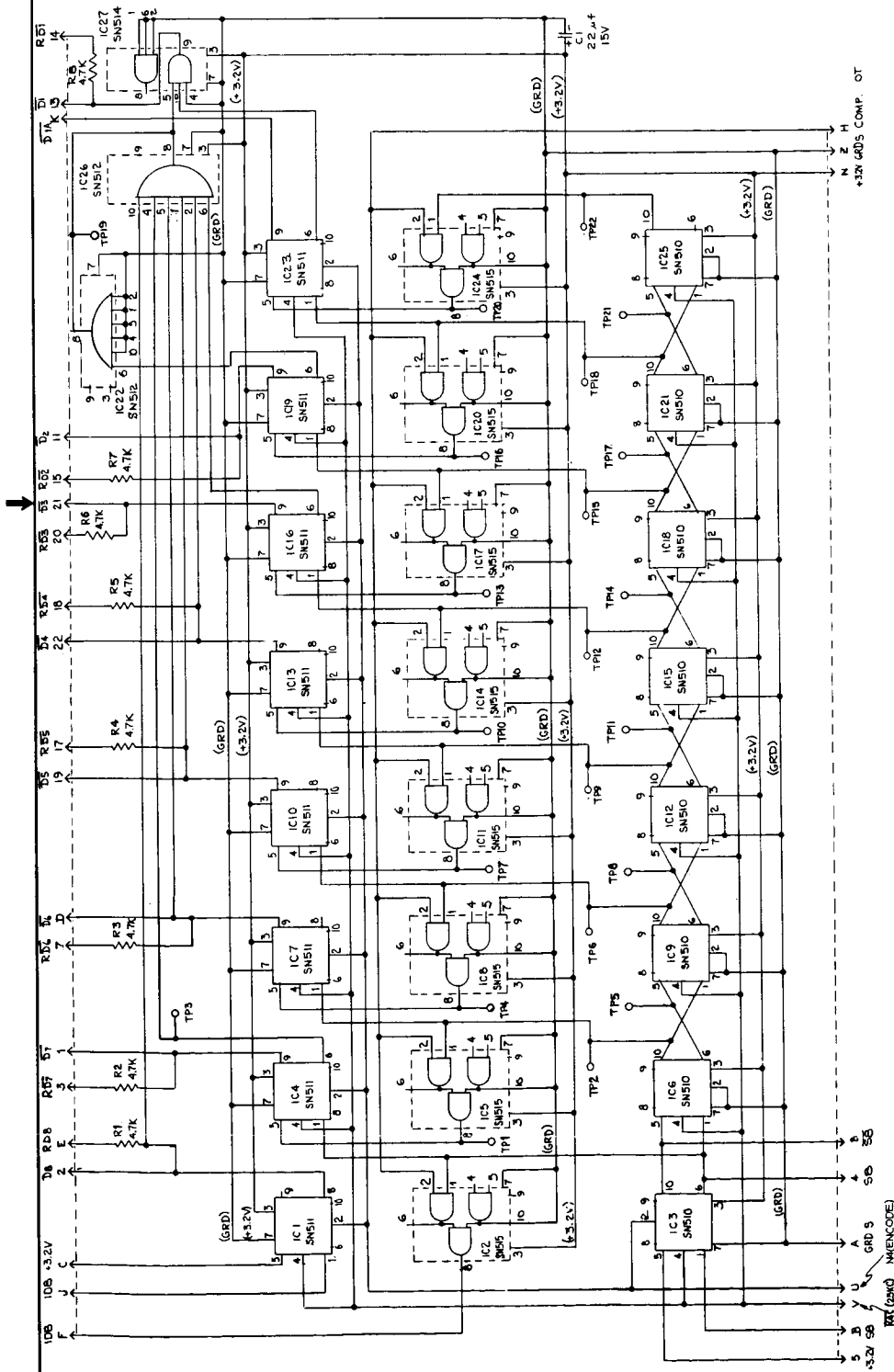


1. COAT PCB ASSY PER CCP SPEC AO108-004
 2. TEXAS INSTRUMENTS INC; DALLAS, TEXAS
 3. CORNING GLASS WORKS; PHILADELPHIA, PA.
 4. KEMET DEPT UNION CARBIDE CORP, CLEVELAND, OHIO
 5. REF SCHEMATIC DWG NO. 10429-502
 6. COMPONENT REF DESIGNATIONS ARE FOR LOCATING PURPOSES ONLY AND DO NOT APPEAR ON ACTUAL PART.
 7. KEYSLOT DIMENSIONS ARE FOR REFERENCE ONLY, SLOT SHOULD BE CENTERED BETWEEN PINS AND MUST NOT TOUCH COUNTRY.
 8. MATCH DRILL AND RIVET ITEMS 1 AND 2 USING JIG FIXTURE 11430-203
 9. FABRICATE PER CCP SPEC AO105-005
 10. SILK SCREEN USING 55M, 10428-502-3
 11. FABRICATE USING PCM 10428-502-3
 12. EPOXY GLASS LAMINATE WITH 2 OZ COPPER BOTH SIDES, MIL-P-13949C, TYPE GE
 13. PLATING TO BE PER CCP SPEC AO105-005
 14. CHAMFER CONNECTOR TIP .020 X 30° BOTH SIDES
 15. BOARD THICKNESS AT CONNECTOR TIP NOT TO EXCEED .065-.065

NOTE: UNLESS OTHERWISE SPECIFIED

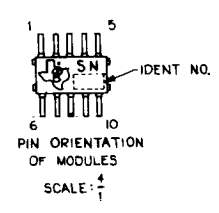
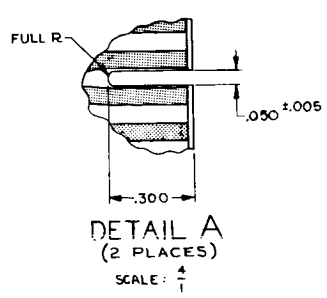
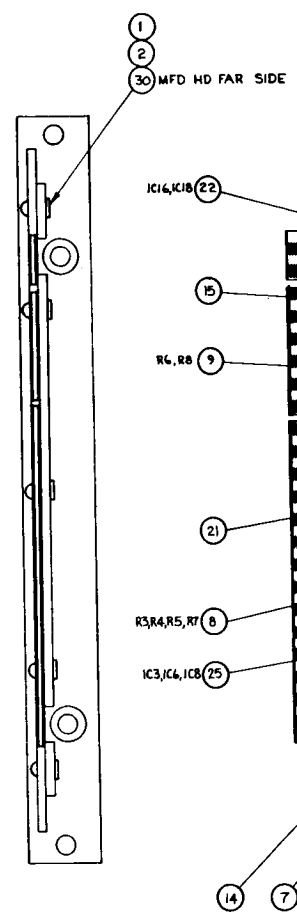
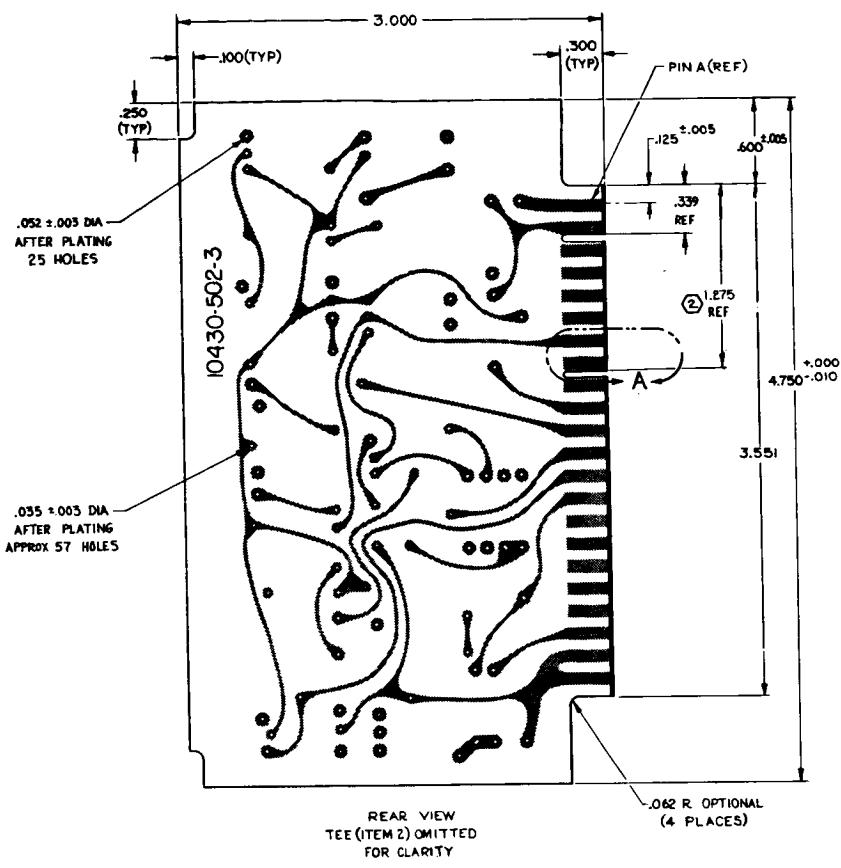
ITEM NO.	QTY	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SIZE, DESCRIPTION & SPECIFICATION	MATERIAL	ZONE																																																																
30	5	MS20470A2-4	RIVET																																																																			
26	8	SN515	SOLID STATE MODULE WITH MYLAR INSULATOR		COML																																																																	
25	1	SN514																																																																				
24	2	SN512																																																																				
23	8	SN511																																																																				
22	8	SN510	SOLID STATE MODULE WITH MYLAR INSULATOR		COML																																																																	
15	8	RL075	RESISTOR	4.7K ±2% 1/4 W	COML																																																																	
9	1	KG22J15KM5	CAPACITOR	22µf ±10% 15V	COML																																																																	
3	22	910443-203	TERMINAL		DSCD																																																																	
2	1	11606-203-41	TEE-PCB ASSY																																																																			
1	1	10428-502-3	PCB	.062 ±.006 × 4.81																																																																		
<table border="1"> <thead> <tr> <th colspan="2">LIST OF MATERIAL OR PARTS LIST</th> <th colspan="2">MATERIAL</th> </tr> <tr> <th>UNLESS OTHERWISE SPECIFIED</th> <th>DRAWN</th> <th>SIZE, DESCRIPTION & SPECIFICATION</th> <th>ZONE</th> </tr> </thead> <tbody> <tr> <td>DIMENSIONS ARE IN INCHES</td> <td>CHECK</td> <td></td> <td></td> </tr> <tr> <td>TOLERANCES ON</td> <td>APPRO</td> <td></td> <td></td> </tr> <tr> <td>DECIMALS</td> <td>APPRO</td> <td></td> <td></td> </tr> <tr> <td>XX ± .03</td> <td>FINISH</td> <td></td> <td></td> </tr> <tr> <td>XXX ± .010</td> <td></td> <td></td> <td></td> </tr> <tr> <td>DRILLED HOLES</td> <td></td> <td></td> <td></td> </tr> <tr> <td>.080 TO .125 ± .002</td> <td></td> <td></td> <td></td> </tr> <tr> <td>.125 TO .250 ± .002</td> <td></td> <td></td> <td></td> </tr> <tr> <td>.250 TO .500 ± .004</td> <td></td> <td></td> <td></td> </tr> <tr> <td>.500 TO .750 ± .005</td> <td></td> <td></td> <td></td> </tr> <tr> <td>.750 TO 1.000 ± .007</td> <td></td> <td></td> <td></td> </tr> <tr> <td>1.000 TO 2.000 ± .008</td> <td></td> <td></td> <td></td> </tr> <tr> <td>HEAT TREAT</td> <td></td> <td></td> <td></td> </tr> <tr> <td>SURFACE ROUGHNESS PER MIL-STD-10</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>							LIST OF MATERIAL OR PARTS LIST		MATERIAL		UNLESS OTHERWISE SPECIFIED	DRAWN	SIZE, DESCRIPTION & SPECIFICATION	ZONE	DIMENSIONS ARE IN INCHES	CHECK			TOLERANCES ON	APPRO			DECIMALS	APPRO			XX ± .03	FINISH			XXX ± .010				DRILLED HOLES				.080 TO .125 ± .002				.125 TO .250 ± .002				.250 TO .500 ± .004				.500 TO .750 ± .005				.750 TO 1.000 ± .007				1.000 TO 2.000 ± .008				HEAT TREAT				SURFACE ROUGHNESS PER MIL-STD-10			
LIST OF MATERIAL OR PARTS LIST		MATERIAL																																																																				
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SURFACE ROUGHNESS PER MIL-STD-10																																																																						
CALIFORNIA COMPUTER PRODUCTS INC. 385 MILLER, ANAHEIM, CALIFORNIA ANALOG/DIGITAL DATA CONTROL				SCALE: 2/1 SIZE: F 10428-502 WEIGHT: SHEET																																																																		

FOLDOUT FRAME 2

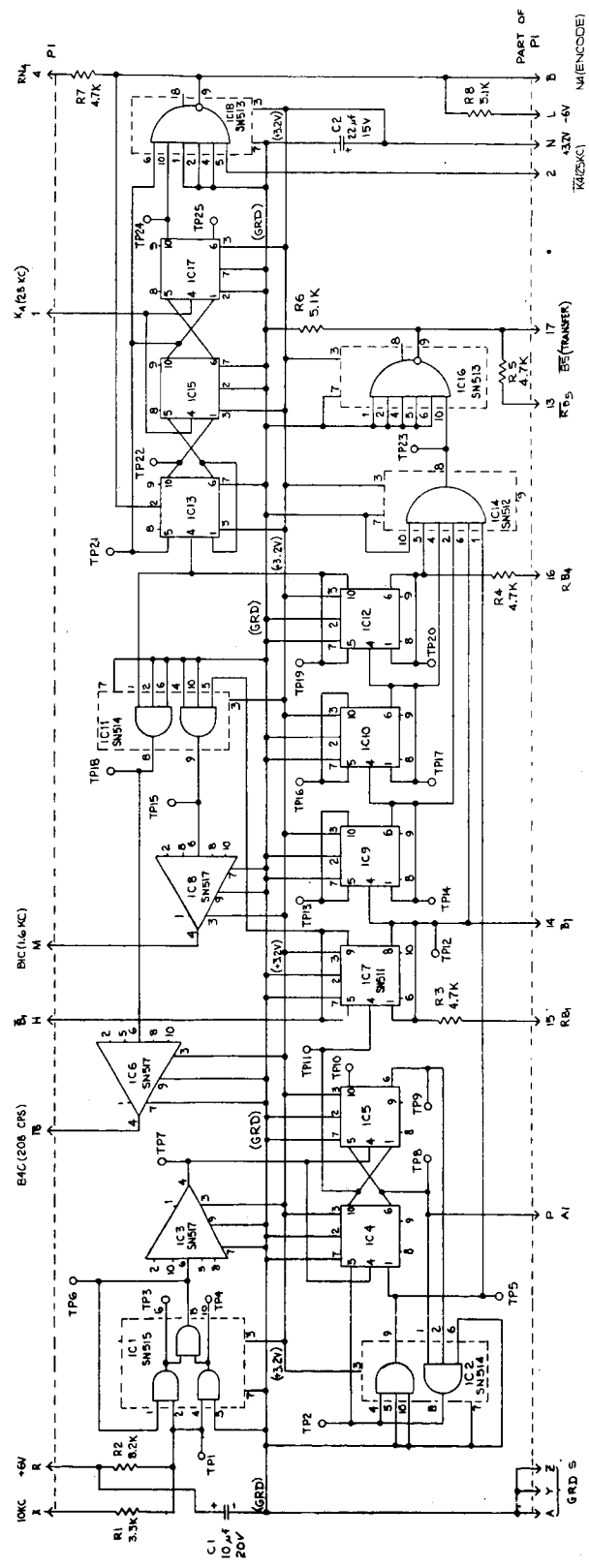


2. REF ASSY DWG NO. 10428 - 502
1. RESISTOR VALUES ARE IN OHMS +2% AND ARE 1/4W
NOTE: UNLESS OTHERWISE SPECIFIED

READ	10429-502	SCHEMATIC PART OR IDENTIFYING NO.	NON-DATE OR DESCRIPTION	LIST OF MATERIAL	OR PARTS LIST	MATERIAL SIZE, DESCRIPTION & SPECIFICATION	ZONE
UNLESS OTHERWISE SPECIFIED							
DIMENSIONS ARE IN INCHES				DRAWN <i>C. J. J.</i>	CALIFORNIA COMPUTER PRODUCTS INC. 300 MILLER, HAWAII, CALIFORNIA		
TOLERANCES ON				APPRO <i>C. J. J.</i>			
DECIMALS				FINISH <i>0.001</i>			
ANGLES				R <i>1/16</i>			
X.XX ± .03				P <i>1/16</i>			
.XX ± .010				F <i>0.001</i>			
DRILLED HOLES							
.100 TO .250							
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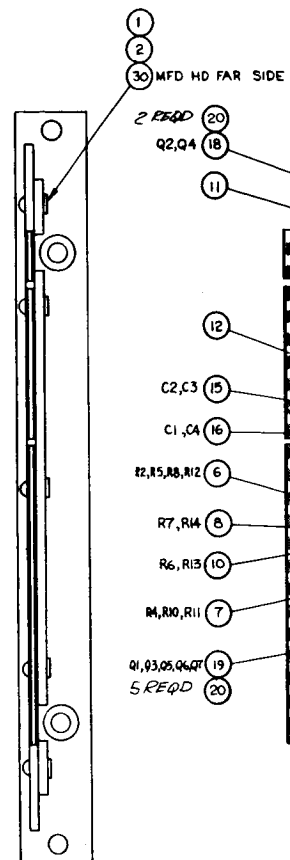
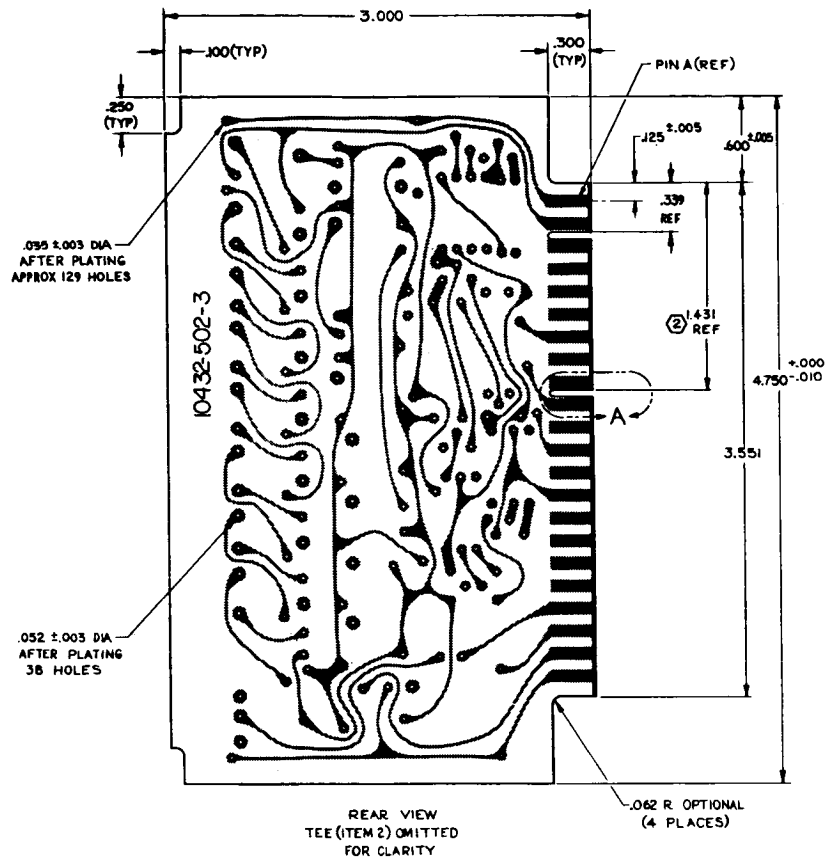
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4	10/431-502	10/431-502	10/431-502
5	10/431-502	10/431-502	10/431-502
6	10/431-502	10/431-502	10/431-502
7	10/431-502	10/431-502	10/431-502
8	10/431-502	10/431-502	10/431-502
9	10/431-502	10/431-502	10/431-502
10	10/431-502	10/431-502	10/431-502



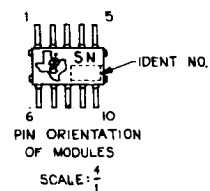
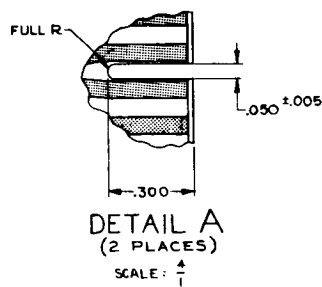
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REV. NO.		DATE & PERSON	
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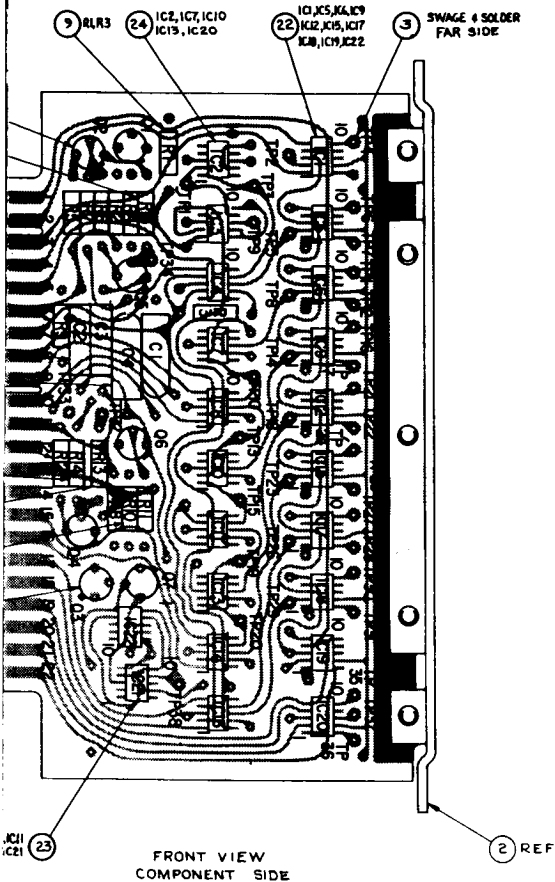
3. REFERENCE ASSY DWG NO. 10430-502.
 2. RESISTOR VALUES ARE IN OHMS, %, AND ARE 1/4W.
 1. ALL INTEGRATED CIRCUITS ARE SN510.
 NOTE: UNLESS OTHERWISE SPECIFIED



IC3, IC4, IC5
IC14, IC16



REVISIONS		DATE & APPROVAL
SYN	ZONE	
1	NOV 22 1966	1
2	NOV 22 1966	2
3	NOV 22 1966	3
4	NOV 22 1966	4
5	NOV 22 1966	5
6	NOV 22 1966	6
7	NOV 22 1966	7
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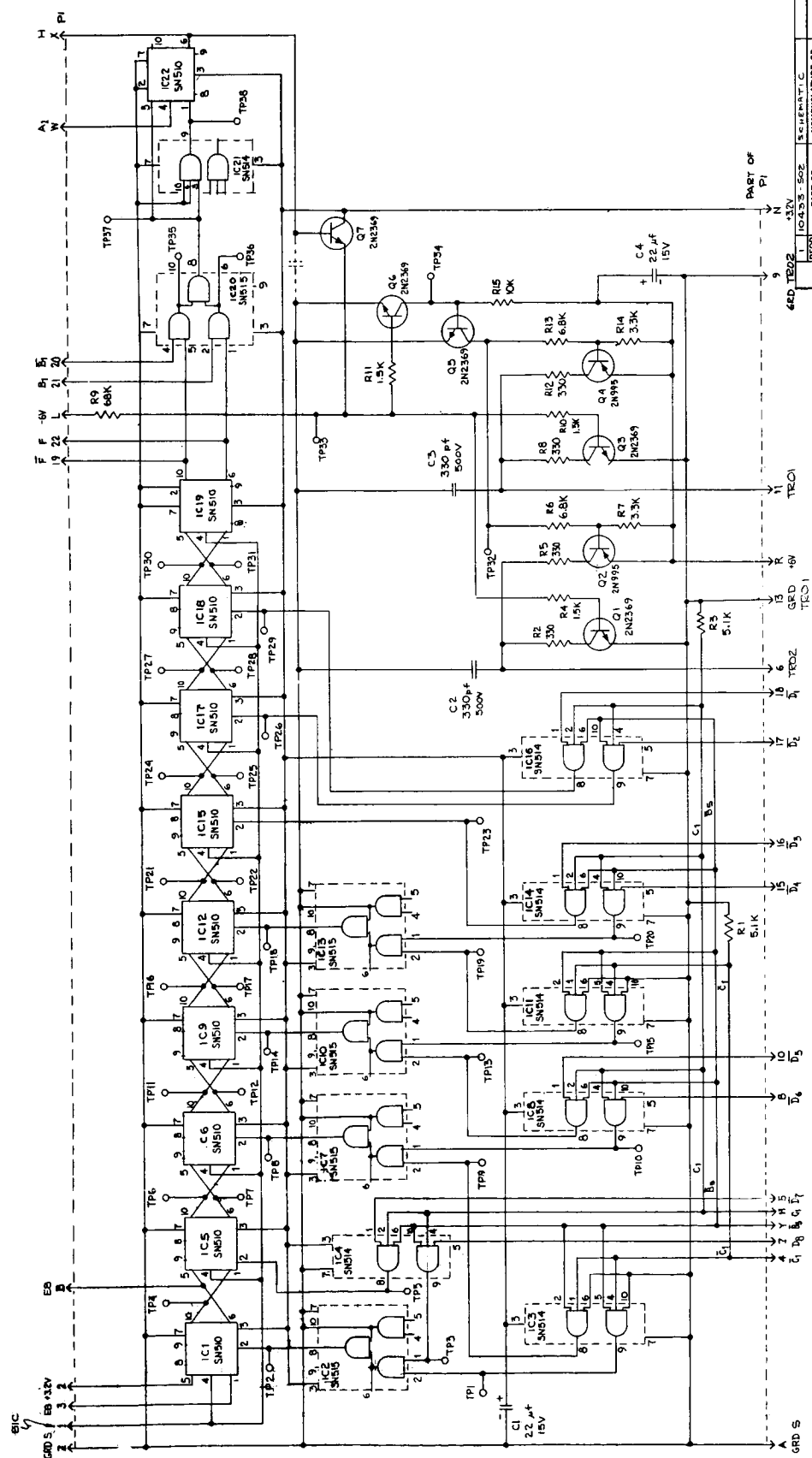


7. COAT PCB ASSY PER CCP SPEC A0108-004
 16. RAYBESTOS-MANHATTAN; LOS ANGELES, CALIF.
 15. FAIRCHILD SEMICONDUCTOR DIV. MOUNTAINVIEW, CALIF.
 14. KEMET DEPT UNION CARBIDE CORP. CLEVELAND, OHIO
 13. TEXAS INSTRUMENTS INC. DALLAS, TEXAS
 12. CORNING GLASS WORKS, BRADFORD, PA.
 11. REF SCHEMATIC DWG NO. 10433-502
 10. COMPONENT REF DESIGNATIONS ARE FOR LOCATING PURPOSES ONLY, AND DO NOT APPEAR ON ACTUAL PART.
 9. KEYSLOT DIMENSIONS ARE FOR REFERENCE ONLY, SLOT SHOULD BE CENTERED BETWEEN PINS AND MUST NOT TOUCH CIRCUITRY.
 8. MATCH DRILL AND RIVET ITEMS 1 AND 2 USING JIG FIXTURE 11430-203
 7. FABRICATE PER CCP SPEC A0105-008
 6. SILK SCREEN USING SSM 10432-502-3
 5. FABRICATE USING PCM 10432-502-3
 4. EPOXY GLASS LAMINATE WITH 2 OZ COPPER BOTH SIDES, MIL-P-13949C, TYPE GE
 3. PLATING TO BE PER CCP SPEC A0105-008
 2. CHAMFER CONNECTOR TIP .020 X .30" BOTH SIDES
 1. BOARD THICKNESS AT CONNECTOR TIP NOT TO EXCEED .065 ± .005

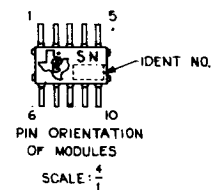
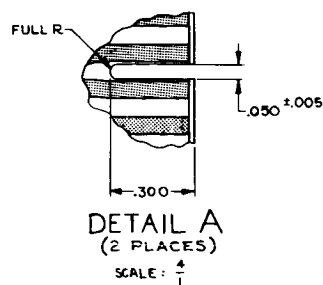
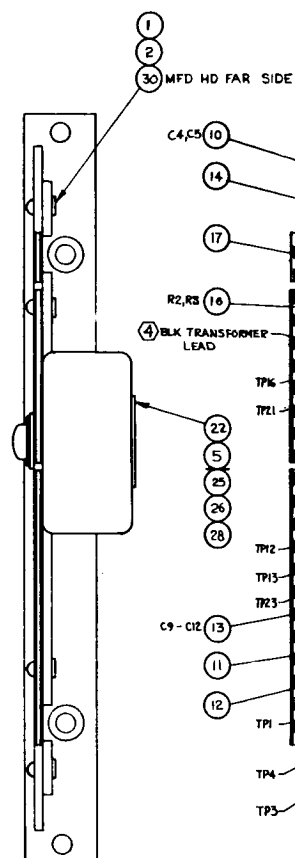
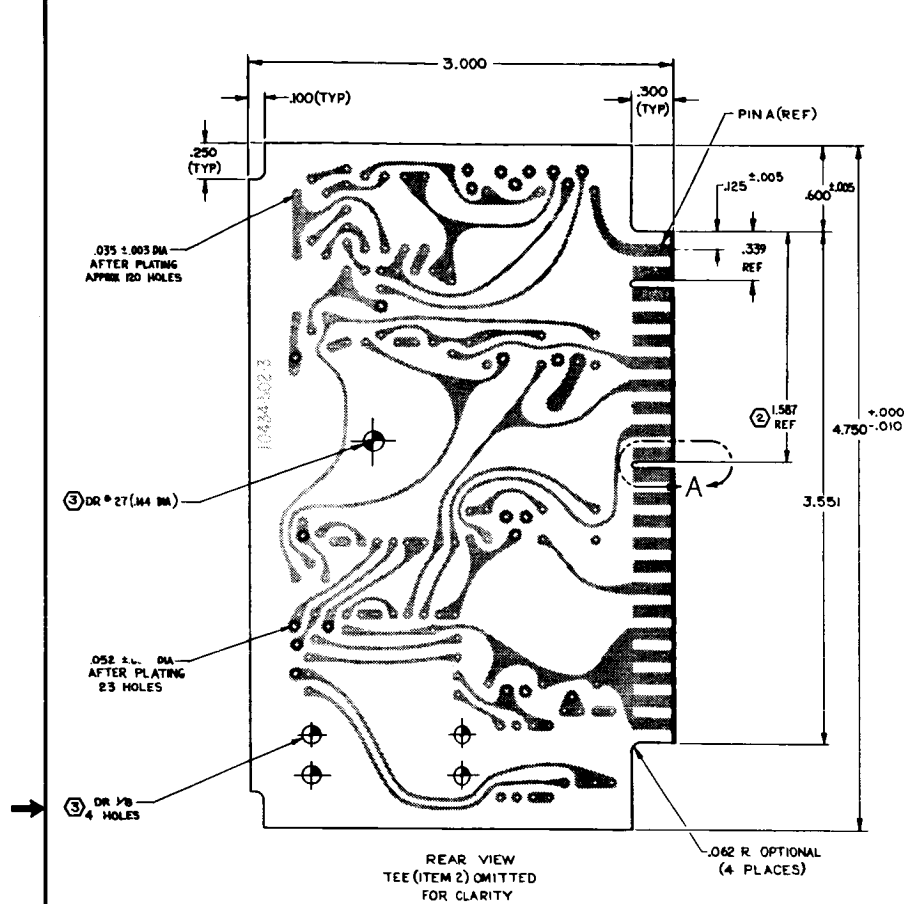
NOTE: UNLESS OTHERWISE SPECIFIED

30	5	MS20470A2-4	RIVET						
24	5	SN515	SOLID STATE MODULE WITH MYLAR INSULATOR						COML
23	7	SN514	SOLID STATE MODULE WITH MYLAR INSULATOR						COML
22	10	SN510	SOLID STATE MODULE WITH MYLAR INSULATOR						COML
20	7	RMA 2001	MOUNT TRANSISTOR						COML
19	5	2N2369	TRANSISTOR						COML
18	2	2N995	TRANSISTOR						COML
16	2	KG22J15KM5	CAPACITOR	22uf ±10% 15V					COML
15	2	CYFM15C331G	CAPACITOR	330uf ±2% 500V					COML
12	1	RL075	RESISTOR	68K ±2% 1/4W					COML
11	1			10K					
10	2			6.8K					
9	2			5.1K					
8	2			3.3K					
7	3			1.5K					
6	4	RL075	RESISTOR	330Ω ±2% 1/4W					COML
3	38	910443-203	TERMINAL						DSCD
2	1	11606-203-31	TEE-PCB ASSY						
1	1	10432-502-3	PCB	.062 ± .006 ± 4.81					
ITEM NO.	1	10432-502	FRAME SYNC & DATA OUTPUT						
REQD		PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL		SIZE, DESCRIPTION & SPECIFICATION		ZONE	
LIST OF MATERIAL OR PARTS LIST									
UNLESS OTHERWISE SPECIFIED				CALIFORNIA COMPUTER PRODUCTS INC.					
DIMENSIONS ARE IN INCHES				305 MULLER, ANAHEIM, CALIFORNIA					
TOLERANCES ON				DRAWN 0-11-66 T-27-66					
DECIMALS				CHECK <i>[initials]</i> 8-4-66					
ANGLES				APPD <i>[initials]</i>					
XX ± .03				APPD <i>[initials]</i>					
XXX ± .010				FINISH					
DRILLED HOLES				HEAT TREAT					
.000 TO .001 ± .002				SURFACE ROUGHNESS PER MIL-STD-10					
.001 TO .002 ± .003				✓					
.002 TO .003 ± .004				DO NOT SCALE THIS DRAWING					
.003 TO .004 ± .005				WEIGHT					
.004 TO .005 ± .006				SHEET					
.005 TO .006 ± .007				10432-502					
.006 TO .007 ± .008									
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REVIEWS		DATE & APPROVAL	
BY	DATE	DESCRIPTION	APPROVAL
		☐ MAY BE REWORKED ☐ CAPACITY BE INCREASED ☐ NONE	

[illegible]

REF ASSY DWG NO 10432-502
RESISTOR VALUES ARE IN OHMS * 2% AND ARE 1/4W
NOTE UNLESS OTHERWISE SPECIFIED

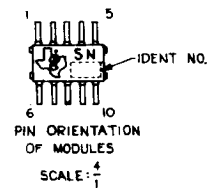
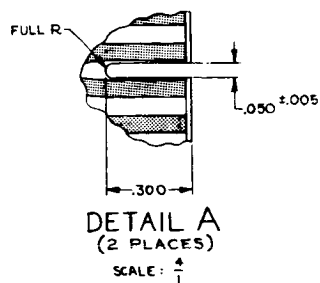
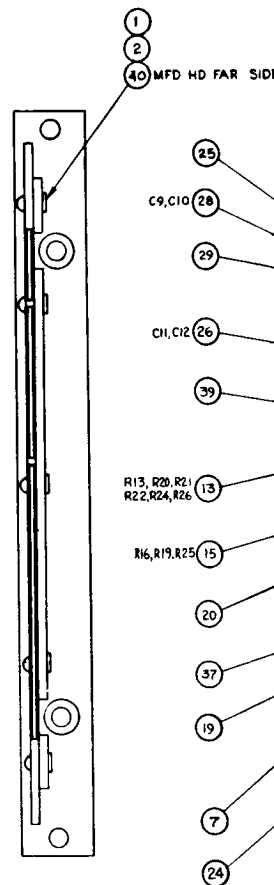
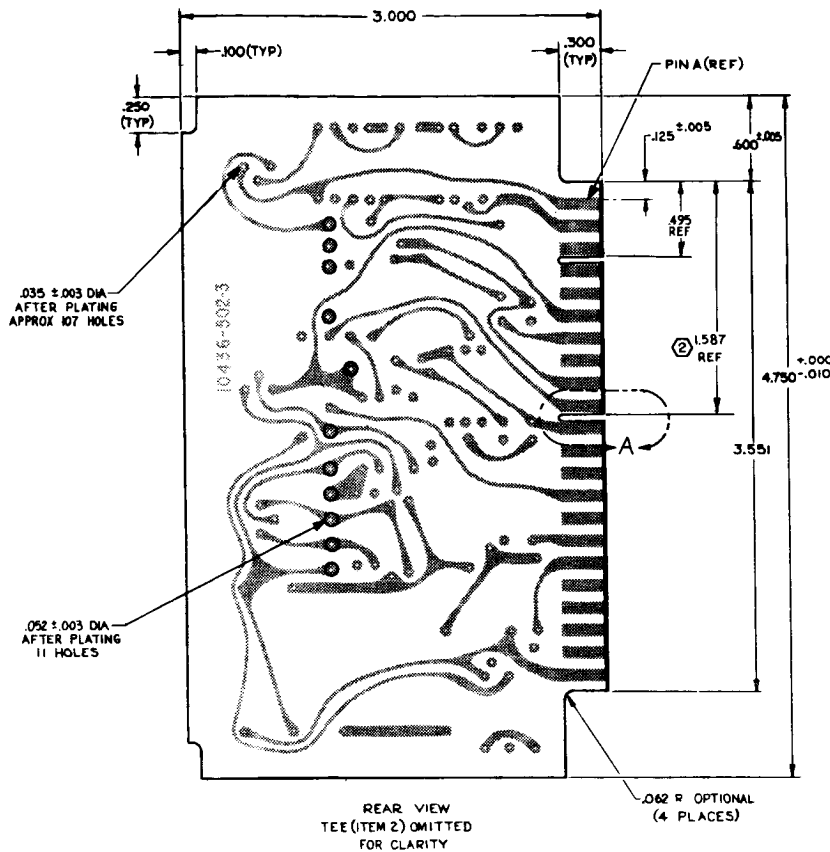


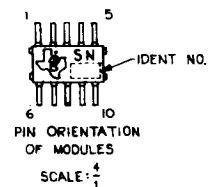
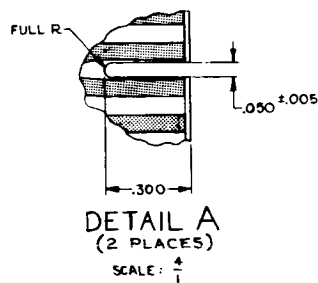
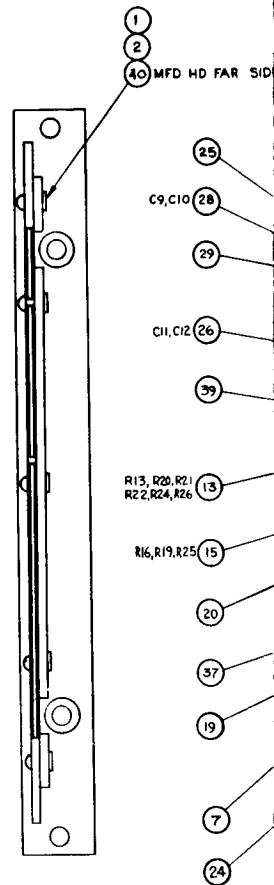
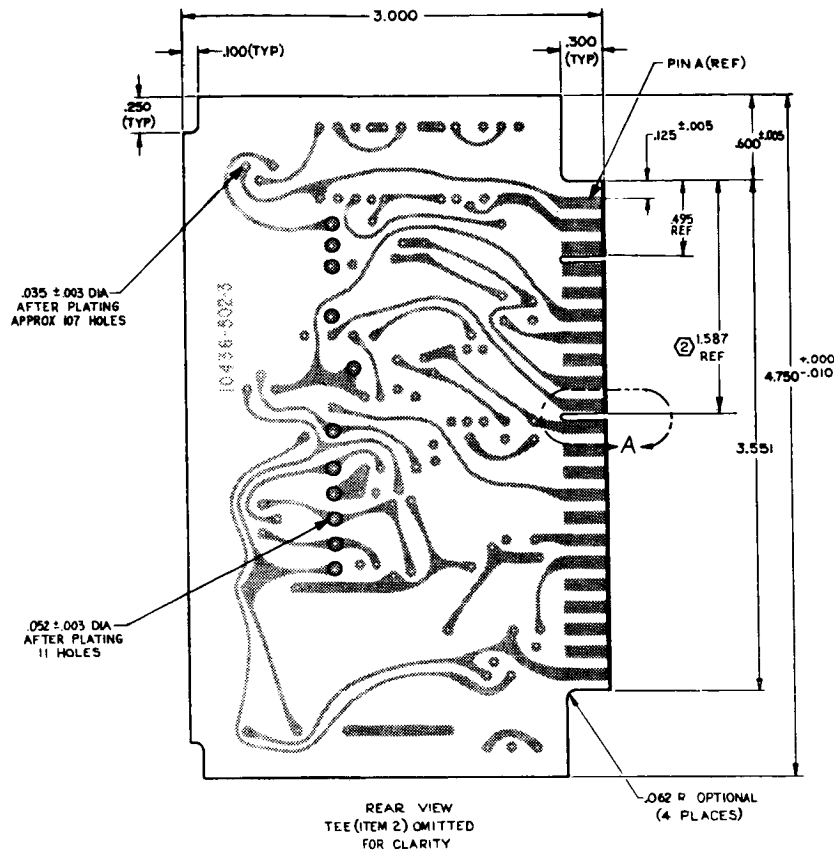
21. COAT PCB ASSY PER CCP SPEC A0108-004
- (1) 20. VALUE TO BE DETERMINED AT FUNCTIONAL TEST
NOMINAL VALUE 760 μ
- (10) 19. MODULAR ELECTRONICS, INGLEWOOD, CALIF
- (10) 18. DELBERT BLINN CO INC, POMONA, CALIF
- (8) 17. MONEYWELL SEMI COND DIV, RIVIERA BEACH, FLA
- (7) 16. RAYTHEON CO SEMI COND DIV, NEEDHAM HEIGHTS, MASS.
- (6) 15. CORNING GLASS WORKS, BRADFORD, PA.
- (6) 14. KEMET DEPT UNION CARBIDE CORP CLEVELAND, OHIO
- (4) 13. TRANSFORMER LEADS TO BE SOLDERED AT PLACES INDICATED
- (3) 12. DO NOT PLATE THRU
11. REF SCHEMATIC DWG NO. 10435-502
10. COMPONENT REF DESIGNATIONS ARE FOR LOCATING PURPOSES
ONLY AND DO NOT APPEAR ON ACTUAL PART.
- (2) 9. KEYSLOT DIMENSIONS ARE FOR REFERENCE ONLY, SLOT
SHOULD BE CENTERED BETWEEN PINS AND MUST NOT TOUCH CIRCUITRY.
8. MATCH DRILL AND RIVET ITEMS 1 AND 2 USING JIG FIXTURE
11430-203
7. FABRICATE PER CCP SPEC A0105-008
6. SILK SCREEN USING SSM 10434-502-3
5. FABRICATE USING PCM 10434-502-3
- (1) 4. EPOXY GLASS LAMINATE WITH 2 OZ COPPER BOTH SIDES,
MIL-P-13949C, TYPE GE
3. PLATING TO BE PER CCP SPEC A0106-008
2. CHAMFER CONNECTOR TIP .020 $\pm$.030 BOTH SIDES
1. PBOARD THICKNESS AT CONNECTOR TIP NOT TO EXCEED .065 $\pm$.003

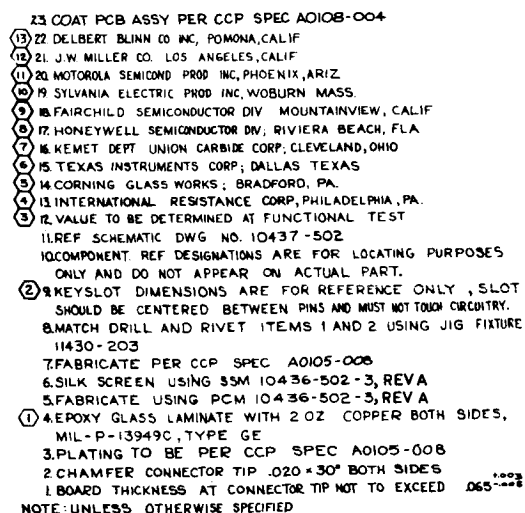
NOTE: UNLESS OTHERWISE SPECIFIED

REVISIONS				
SYN	ZONE	DESCRIPTION	DATE	APPROVAL
		1 MAY BE REWORKED 2 CANNOT BE REWORKED 3 NONE	0-10-60 11-1-60 12-1-60	1-1-60 2-1-60 3-1-60

30	5	MS204T0A2-4	RIVET					
29	4	MS35233-13	SCREW					
28	1	MS35233-31	SCREW					
27	4	MS35333-70	WASHER-LOCK					
26	1	MS35333-71	WASHER-LOCK					
25	1	AN960C6L	WASHER-FLAT					
24	4	AN340C4	NUT- HEX					
22	1	100-4	RETAINER-TOROID					COML
21	4	FP-50	MOUNT-TRANSISTOR	TO-5				COML
19	4	2N2658	TRANSISTOR	TO-5				COML
18	17	1N3730	DIODE					
17	1	RL075	RESISTOR	24K ±2% 1/4W				
16	2	RL075	RESISTOR	820 Ω ±2% 1/4W				
15	2	RL075	RESISTOR	(II)				
14	1	KQ270J6KM5	CAPACITOR	270 μF ±10% 6V				
13	4	KG120J15KM5		120 μF ±10% 15V				
12	1	K682J20KM5		82 μF ±10% 20V				
11	1	KG47J35KM5		47 μF ±10% 35V				
10	2	K622J50KM5		22 μF ±10% 50V				
9	1	KG10J20KM5		10 μF ±10% 20V				
8	4	CYK02BU223K	CAPACITOR	22,000 pF ±10% 50V				COML
5	1	910006-403	TRANSFORMER					DSCD
4	1	11508-203	RELAY					
3	23	910443-203	TERMINAL					DSCD
2	1	1NG06-203-G1	TTF-PCB ASSY					
1	1	10434-502-3	PCB	.062 ±.006 ±.481				
ITEM NO.	RECD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL SIZE, DESCRIPTION & SPECIFICATION				ZONE
LIST OF MATERIAL OR PARTS LIST								
UNLESS OTHERWISE SPECIFIED			DRAWN	CALIFORNIA COMPUTER PRODUCTS INC.				
DIMENSIONS ARE IN INCHES			CHECK	305 MULLER, ANAHEIM, CALIFORNIA				
TOLERANCES ON			APPD	DC/DC CONVERTER NO. 1				
DECIMALS			APPD					
ANGLES			FINISH					
.001 ± .003				SCALE: 2				
.003 ± .010				SIZE F				
DRILLED HOLES				10434-502				
.040 TO .125 ± .002 - .001				WEIGHT				
.136 TO .228 ± .003 - .001				SHEET				
.234 TO .360 ± .004 - .001								
.375 TO .750 ± .005 - .001								
.766 TO 1.000 ± .007 - .001								
1.015 TO 2.000 ± .016 - .001								
SURFACE ROUGHNESS PER MIL-STD-10								

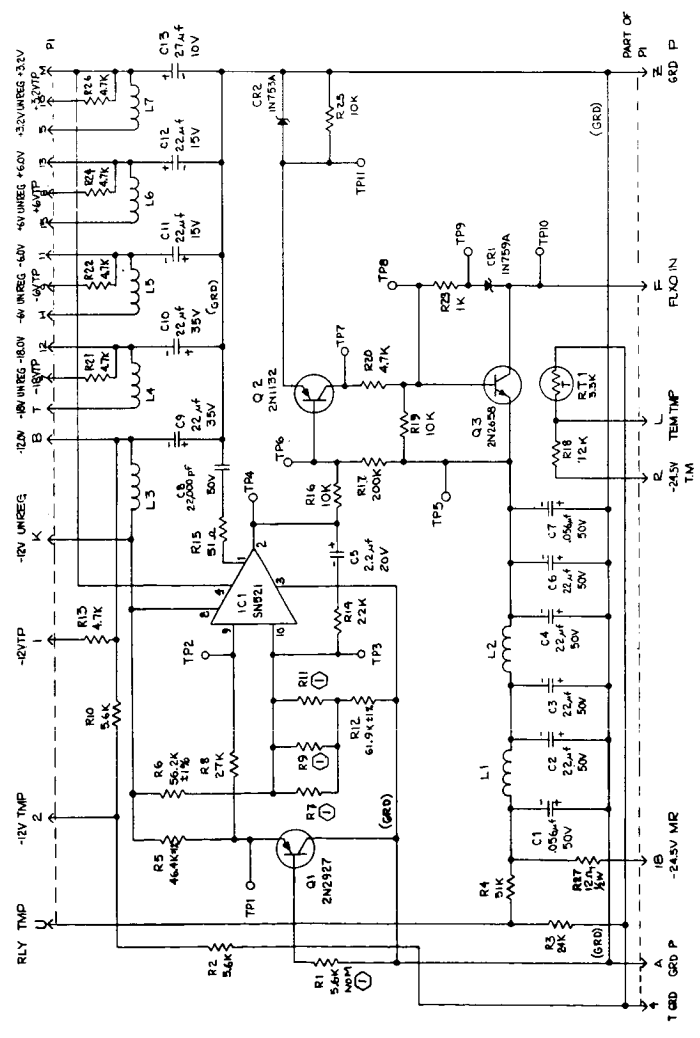






FOLDOUT FRAME 2

REVISIONS		DATE & APPROVAL
REV	DESCRIPTION	
1	MAY BE REWORKED	
2	CANNOT BE REWORKED	
3	REWORK	



6.837 LOCATED OUT OF SEQUENCE
5 CAPACITOR VALUES ARE IN MICRO FARADS $\pm 10\%$
REF. TEST POINTS ARE INDICATED BY A CIRCLE
① 3.3 VALUES BE DETERMINED BY FUNCTIONAL TEST
2.2 VALUES ARE TYPE 9320-50, 10-4
1. RESISTOR VALUES ARE IN OHMS $\pm 2\%$ AND ARE $1/4W$
NOTE: UNLESS OTHERWISE SPECIFIED

10437-502		SCHEMATIC		MATERIAL		SIZE DESCRIPTION & SPECIFICATION		ZONE	
REVISIONS		PART OR IDENTIFICATION NO.		LIST OF MATERIAL		MATERIAL		SIZE DESCRIPTION & SPECIFICATION	
UNLESS OTHERWISE SPECIFIED		DRAWN (SHEET NO.)		CHECKED (SHEET NO.)		APPROVED (SHEET NO.)		FINISH	
DIMENSIONS ARE IN INCHES		TOLERANCES IN		ANGLES		DRILLED HOLES		HEAT TREAT	
DECIMALS		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
FRACTIONS		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03		XX ± .03		XX ± .03	
HOLE DIA.		XX ± .03		XX ± .03					

APPENDIX B

MRIR-T/ME

MECHANICAL DRAWINGS

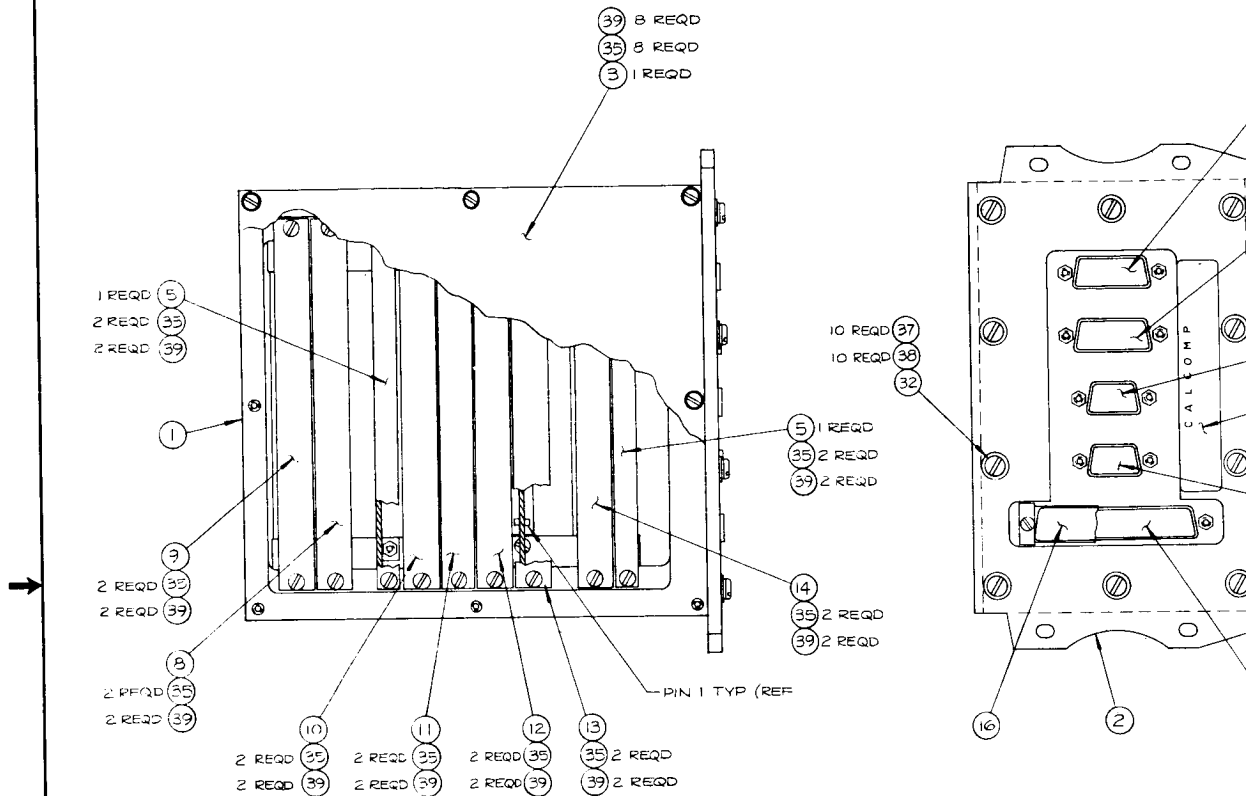
APPENDIX B

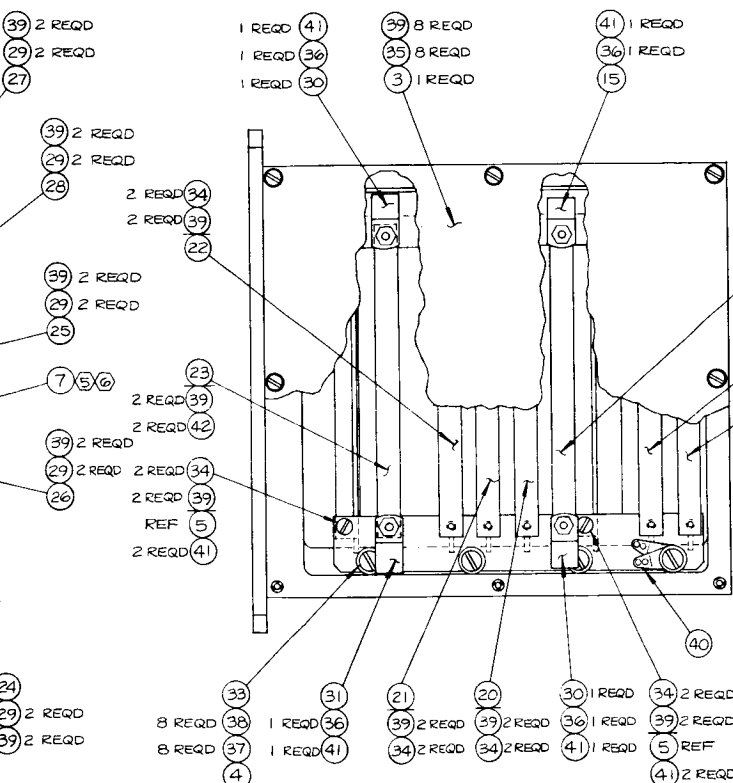
MRIR-T/ME
MECHANICAL DRAWINGS

The following section contains the mechanical drawings for the MRIR-T/ME unit.

B.1 LIST OF DRAWINGS

10015-102	MRIR-PCM Digital Subsystem
11413-203	Housing, PCM MRIR-PCM
11411-203	Connector Plate MRIR-PCM
11415-203	Cover Housing, MRIR-PCM
11416-203	Plate Mounting Connector, MRIR-PCM
11414-203	Shield, PCB MRIR-PCM
11527-203	Connector Adapter
11606-203	Tee, PCB Assembly

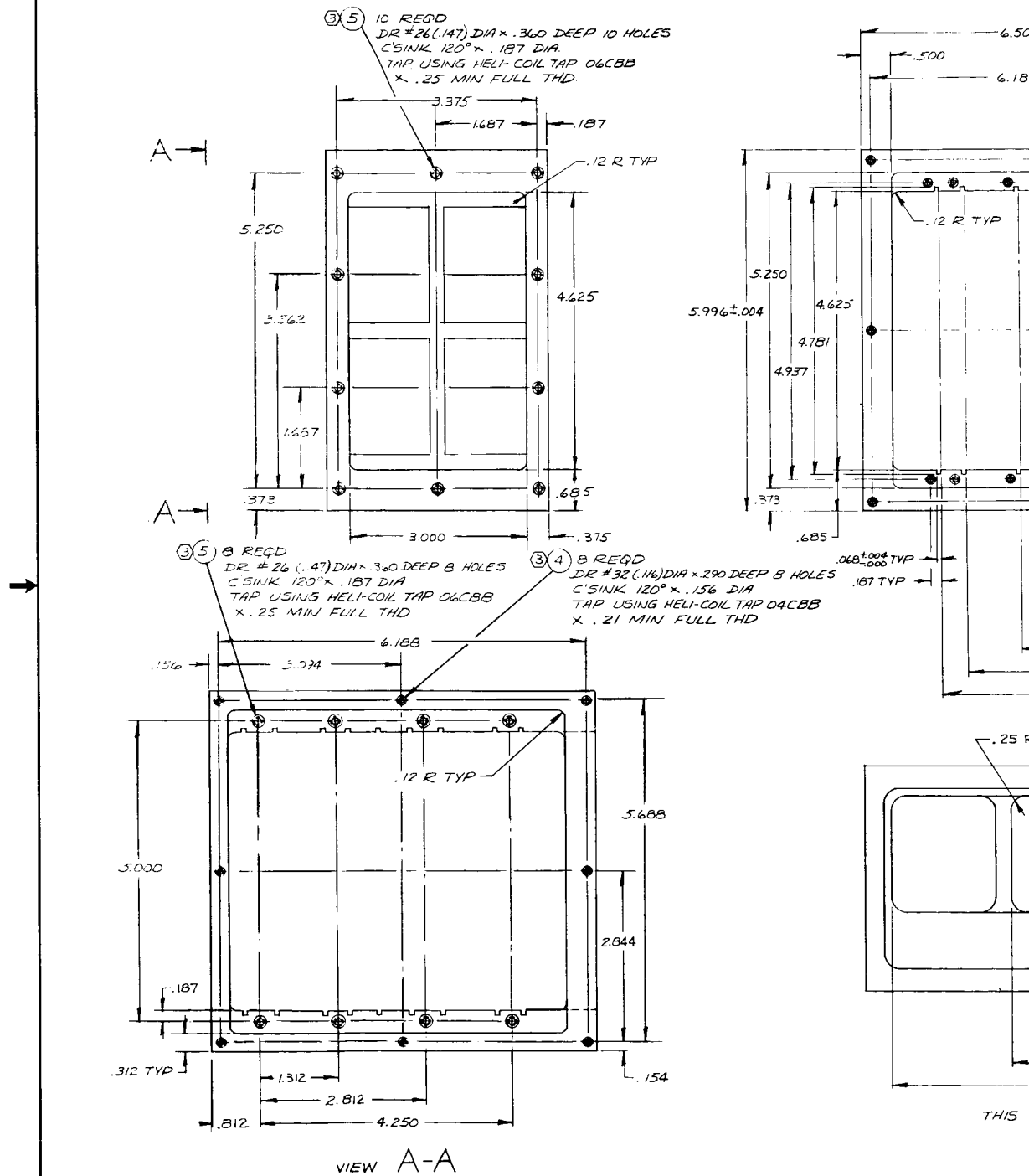




- (B) 11. WECKESSER CO., INC., CHICAGO, ILL.
 (7) 10 H.H. SMITH INC., BROOKLYN, N.Y.
 9 ALL THREADED FASTENERS WILL BE TORQUED TO THE FOLLOWING VALUES:
 *4 FASTENER = 5.2 INCH POUNDS
 *6 FASTENER = 9.6 INCH POUNDS
 (6) 8. EPOXY IN PLACE APPROX. WHERE SHOWN
 (5) 7. ELECTROETCH NAMEPLATE USING 10 HIGH CHARACTERS:
 NAME: MRIR-PCM MODEL: 221
 PART NO: 10015-102 SER NO: (AS REQD)
 6. INSTALL ALL HARDWARE WITH LOCTITE, GRADE A;
 LOCKTITE CORP, NEWINGTON, CONN.
 5. WIRE PER W/L 10015-102
 (4) 4 ELASTIC STOP NUT CORP, UNION, N.J.
 (3) 3 SEASTROM MFG. CO, GLENDALE, CALIF.
 (2) 2 CANNON ELECTRIC, LOS ANGELES, CALIF
 (1) 1 MASTERITE INDUSTRIES, INGLEWOOD, CALIF
 NOTE: UNLESS OTHERWISE SPECIFIED

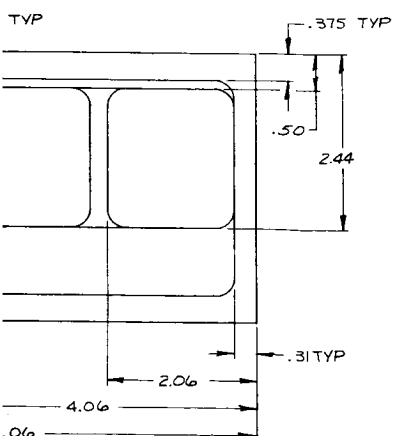
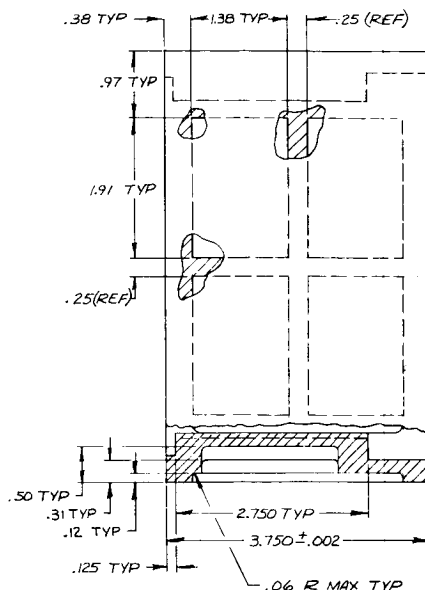
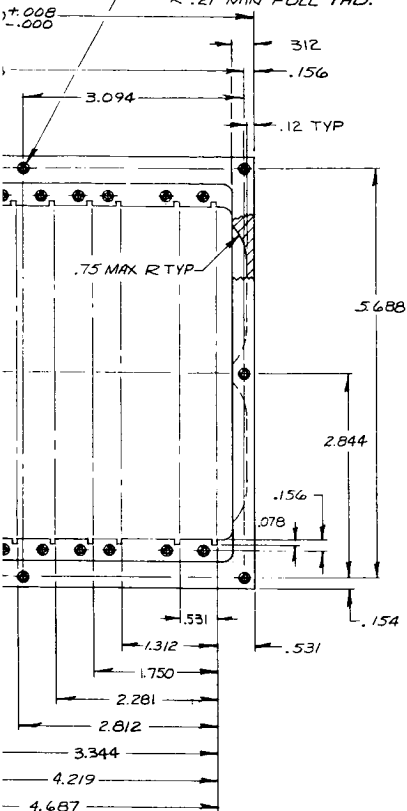
1472 R11 W17		REVISIONS		DATE & APPROVAL
SYM	ZONE	DESCRIPTION	REVISION	
A		1. IN L/M: DAM-15P CONN. WAS DBM-15P	1	E.O. 1356 HENEGAR 4-20-66
		DAM-15S CONN. WAS DBM-15S	2	
B		2. IN L/M: F/D ADDED: TERM. LUG	3	B-15-66 Hogel
		*1416-6, 2 REQD	4	
		3. IN L/M: F/D ADDED: "D" WASHER	5	
		*D4-140, 4 REQD; CABLE CLAMP	6	
		*775, 1 REQD; CABLE CLAMP *773	7	
		2 REQD; CABLE CLAMP *771, 1 REQD;	8	
		PLUG-JUMPER *11507-203, 1 REQD;	9	
		SCREW, PAN HD *MS35233-18, 4 REQD	10	
		4. IN L/M: NUT, SELF-LOCKING	11	
		*68-1660-40, 8 REQD WAS 4 REQD	12	
		SCREW, PAN HD *MS35233-15,	13	
		14 REQD WAS 18 REQD	14	
		5. ADDED G/N'S *10 & 11	15	
		EFFECT ON: ITEMS 1, 3, 4 & 5 =	16	
		UNIT 2 & SUBS; ITEM 2 = ALL	17	
		PARTS	18	
		1. IN L/M: 10424-502 WAS 10351-502,	19	
		10426-502 WAS 10361-502, 10428-502	20	
		WAS 10365-502, 10430-502 WAS	21	
		10353-502, 10432-502 WAS	22	
		10355-502, 10436-502 WAS 10371-	23	
		502, & 10434-502 WAS 10370-502	24	
		EFFECT ON: POOL & SUBS	25	
			26	

ITEM NO	REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	SIZE, DESCRIPTION & SPECIFICATION	MATERIAL	ZONE
42	4	MS35233-18	SCREW, PAN HD.	1-40X5/8		
41	8	68-1660-40	NUT, SELF-LOCKING	4-40		
40	2	1416-6	TERM. LUG			
39	62	5622-9	WASHER, MYLAR	*4		
38	18	MS35337-79	L'WASHER, SPLIT	*6		
37	18	AN960C6	WASHER, FLAT	*6		
36	4	D4-140	"D" WASHER			
35	34	MS35233-13	SCREW, PAN HD	4-40 X 1/4		
34	14	MS35233-15	SCREW, PAN HD	4-40 X 3/8		
33	8	MS35233-28	SCREW, PAN HD	6-32 X 3/8		
32	10	MS35233-29	SCREW, PAN HD	6-32 X 7/16		
31	1	775	CABLE CLAMP			
30	2	773	CABLE CLAMP			
29	10	D20418-10	SCREW LOCK			
28	1	DAM-15P-NMB-1	CONNECTOR			
27	1	DAM-15S-NMB-1	CONNECTOR			
26	1	DEM-9P-NMB-1	CONNECTOR			
25	1	DEM-9S-NMB-1	CONNECTOR			
24	1	DCM-37S-NMB-1	CONNECTOR			
23	1	BR-22-DRX1-23-56	CONNECTOR-PCB			
22	1	-23-67				
21	1	-23-78				
20	1	-23-89				
19	1	-23-910				
18	1	-34-1011				
17	1	BR-22-DRX1-23-1011	CONNECTOR-PCB			
16	1	11507-203	PLUG-JUMPER			
15	1	771	CABLE CLAMP			
14	1	10424-502	ANALOG IN & 25KC			
13	1	10426-502	A/D CONVERTER			
12	1	10428-502	A/D DATA CONTROL			
11	1	10430-502	ENCODE TIMING GEN			
10	1	10432-502	FRAME SYNC & D. OUT.			
9	1	10436-502	DC/DC CONVERT *2			
8	1	10434-502	DC/DC CONVERT *1			
7	1	11429-203	NAMEPLATE			
6	1	W/L 10015-102	WIRE LIST			
5	2	11414-203	SHIELD-PCB			
4	2	11416-203	PLATE-MTG, CONN.			
3	2	11415-203	COVER, HOUSING			
2	1	11411-203	CONN. PLATE			
1	1	11413-203	HOUSING, PCB			
10015-102			MRIR-PCM			
UNLESS OTHERWISE SPECIFIED		DRAWN		LIST OF MATERIAL OR PARTS LIST		
DIMENSIONS ARE IN INCHES		CHECK		DRAWN		
TOLERANCES ON		APPD		APPD		
DECIMALS		XX ± .03		XX ± .03		
XXX ± .010		ANGLES		ANGLES		
		° 0' 30"		° 0' 30"		
DRILLED HOLES		FINISH		FINISH		
.040 TO .125 ± .002, -.001		HEAT TREAT		HEAT TREAT		
.136 TO .228 ± .003, -.001		SURFACE ROUGHNESS		SURFACE ROUGHNESS		
.234 TO .500 ± .004, -.001		PER MIL-STD-10		PER MIL-STD-10		
.515 TO .750 ± .005, -.001		DO NOT SCALE THIS DRAWING		DO NOT SCALE THIS DRAWING		
.765 TO 1.000 ± .007, -.001		SCALE: 1/1		SCALE: 1/1		
1.015 TO 2.000 ± .010, -.001		SIZE: F		SIZE: F		
		WEIGHT		WEIGHT		
		SHEET 1 OF 1		SHEET 1 OF 1		



FOLDOUT FRAME /

26 REQD
 DR #32 (.116) DIA. x .290 DEEP 26 HOLES
 C'SINK 120° x .156 DIA
 TAP USING HELI-COIL TAP 04CBB
 x .21 MIN FULL THD.



VIEW TYP FAR SIDE

6. TAG WITH PART NO. PER CCP SPEC A0104-001
 5. INSTALL BEFORE APPLYING DOW # 23
 4.63/ ALL MACHINED SURFACES
 3. DOW #23 PER CCP SPEC A0109-005
 2. HELI-COIL CORP, DANBURY, CONN.
 1. MACHINE PER CCP SPEC A0102-001
 NOTE: UNLESS OTHERWISE SPECIFIED

1452/754		REVISIONS		DATE & APPROVAL
SYM	ZONE	DESCRIPTION		
A		1 MAY BE REWORKED 2 CANNOT BE REWORKED 3 NONE		3. KEY 9-30-66
		1. G/N#3: WAS DOW# 17 PER MIL-M-45202.		
		2. G/N#5: WAS DIP IN ZINC-CHROMATE BEFORE INSTALLING EFFECT ON: POOI & SUBS		

5	18	3585-06CNx.207	INSERT			COML
4	34	3585-04CNx.168	INSERT			COML
1	1	-3	HOUSING	700 DIA. x 3.81	2K60A-T5 MAG ALY	GG-M-31
ITEM NO	REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL		ZONE
LIST OF MATERIAL OR PARTS LIST						
UNLESS OTHERWISE SPECIFIED			DRAWN	D. MILLER 12-29-65		
DIMENSIONS ARE IN INCHES			CHECK	R. Henning 1-21-66		
TOLERANCES ON			APPD	R. Henning 2-1-66		
DECIMALS			APPD	R. Henning 2-2-66		
XX ± .03			FINISH	②		
XXX ± .010			HEAT TREAT			
DRILLED HOLES			SURFACE ROUGHNESS	✓		
.040 TO .125: +.002, -.001			PER MIL-STD-10			
.136 TO .228: +.003, -.001						
.234 TO .500: +.004, -.001						
.515 TO .750: +.005, -.001						
.765 TO 1.000: +.007, -.001						
1.015 TO 2.000: +.010, -.001						
CALIFORNIA COMPUTER PRODUCTS INC.				305 MULLER, ANAHEIM, CALIFORNIA		
HOUSING P.C.B.				MRIR-PCM		
SCALE: FULL				SIZE: F		11413-203
DO NOT SCALE THIS DRAWING				WEIGHT		SHEET 1 OF 1

FOLDOUT FRAME

2

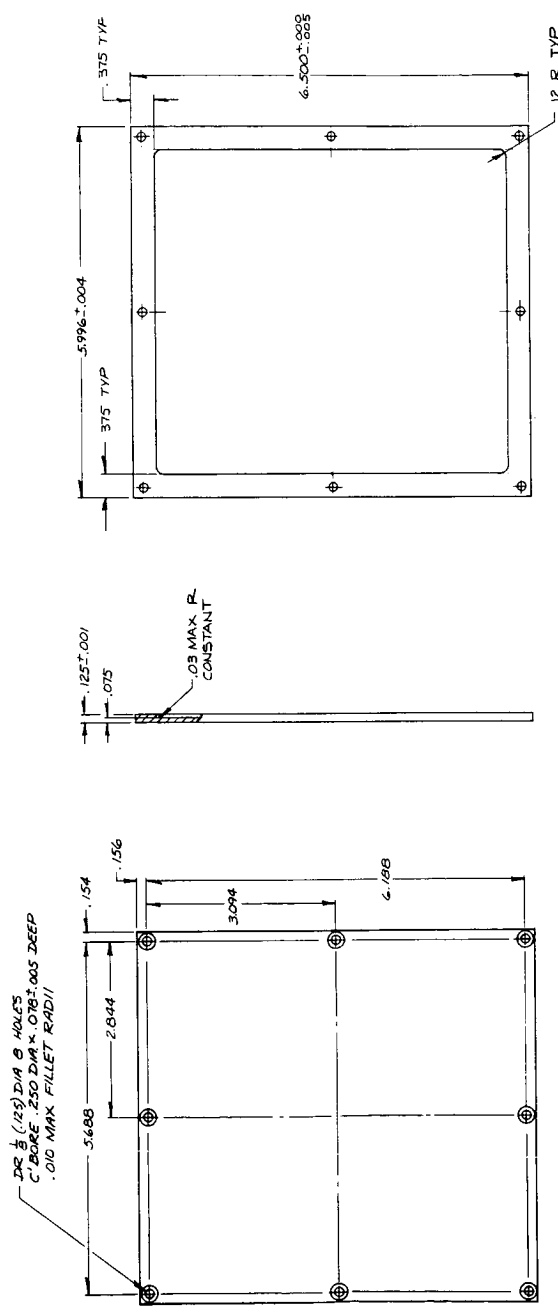
11413-203



7. IDENTIFY PER CCP SPEC AD104-001.
 ② 8. MAKE FROM TA 4510 X 5.25
 GOOST THIS ALL
 15% ALL
 9. FABRICATE PER CCP SPEC AD103-001
 10. BREAK SHARP EDGES .010-.015.
 ① 11. CAUSTIC DIP
 1. MACHINE PER CCP SPEC AD102-001.
 NOTE: UNLESS OTHERWISE SPECIFIED

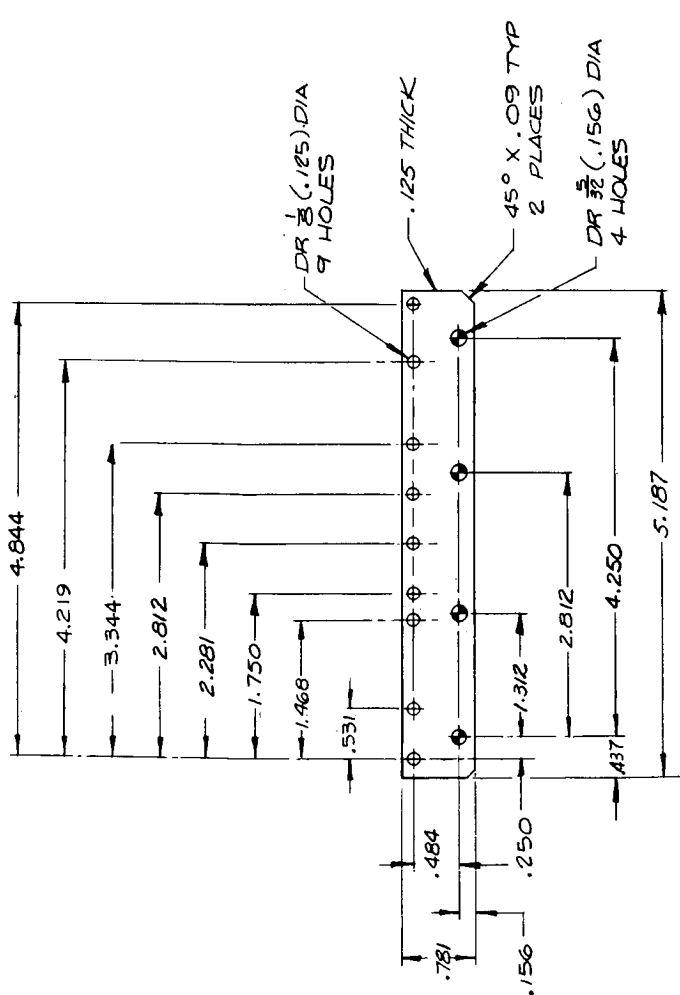
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REVISIONS		DATE & APPROVAL
REV	DESCRIPTION	
1	INITIAL	
2	DATE	
3	APPROVAL	
4	DATE	
5	APPROVAL	
6	DATE	
7	APPROVAL	
8	DATE	
9	APPROVAL	
10	DATE	
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3. TAG WITH PART NO PER CCP SPEC A1004-001
 2. DON # 23 PER CCP SPEC A1009-005
 1. MACHINE PER CCP SPEC A1002-001
 NOTE: UNLESS OTHERWISE SPECIFIED



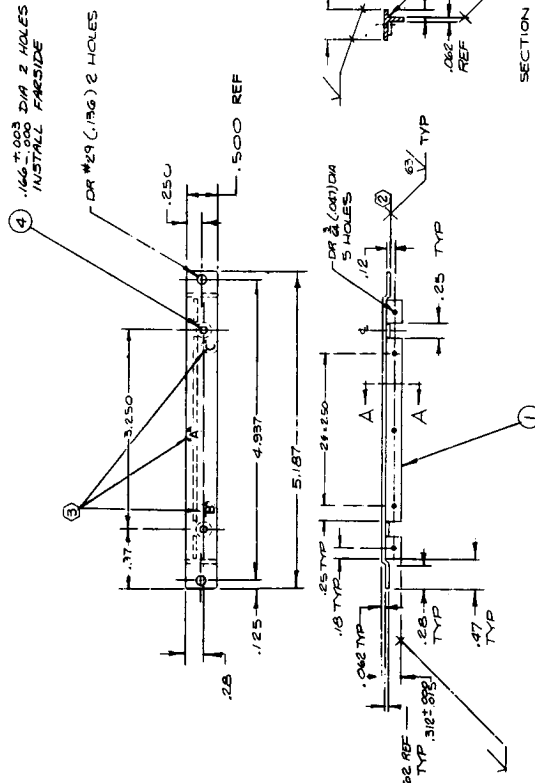
REVISIONS		DATE & APPROVAL	
SYN	ZONE	DESCRIPTION	DATE
A		1. G/N#2: WAS DOW #17 PER MIL-M-45202. EFFECT ON: POOL F SUBS	5 KEY 9-30-66

11416-203		PLATE-MTG		.125 X .875 X 5.250		123 B-H24		MADE IN U.S.A.		QQ-M-44		
REQD	PART OR IDENTIFYING NO.			NOMENCLATURE OR DESCRIPTION			MATERIAL SIZE, DESCRIPTION & SPECIFICATION					
UNLESS OTHERWISE SPECIFIED				LIST OF MATERIAL OR PARTS LIST								
DIMENSIONS ARE IN INCHES				DRAWN	A.R. COLL			1-30-66				
TOLERANCES ON				CHECK	1-21-66			CALIFORNIA COMPUTER PRODUCTS INC.				
DECIMALS				APPD	1-21-66			303 MULLER, ANAHEIM, CALIFORNIA				
ANGLES				APPD	1-21-66			PLATE-MTG. CONN.				
XX ± .03				FINISH	1-21-66			MRIR-PCM				
XXX ± .010				①			SCALE:		SIZE		C	
DRILLED HOLES				HEAT TREAT			+		DO NOT SCALE THIS DRAWING		WEIGHT	
.040 TO .125 ± .002, -.001				SURFACE ROUGHNESS			✓		PER MIL-STD-10		SHEET	
.136 TO .228 ± .003, -.001												
.234 TO .500 ± .004, -.001												
.515 TO .750 ± .005, -.001												
.765 TO 1.000 ± .007, -.001												
1.015 TO 2.000 ± .010, -.001												

3. TAG WITH PART NO. PER CCP SPEC. A0104-001.
 ① 2. DOW #23 PER CCP SPEC A0109-005
 1. MACHINE PER CCP SPEC A0102-001.
 NOTE: UNLESS OTHERWISE SPECIFIED

A 11416-203

DASH NO	A	B	C
-11	ANALOG INPUTS 25KIC	ASSY NO 10485-502	SERIAL NO 4
-21	ENCODE-TIMING	ASSY NO 10485-502	SERIAL NO 4
-31	FRAME SYNC OUTPUT	ASSY NO 10485-502	SERIAL NO 4
-41	NO DATA CONTROL	ASSY NO 10485-502	SERIAL NO 4
-51	NO DATA CONTROL	ASSY NO 10485-502	SERIAL NO 4
-61	NO DATA CONTROL	ASSY NO 10485-502	SERIAL NO 4
-71	NO DATA CONTROL	ASSY NO 10485-502	SERIAL NO 4



9. PENN ENG & MFG CORP, DOWSTOWN, PA.
 8. MAKE FROM PA 6530 X 5.25, 6063-T5 AL ALY EXT.
 7. PIONEER ALUM. LOS ANGELES, CALIFORNIA.
 6. TO BE ASSIGNED
 5. ELECTRO-ETCH DESIGNATIONS APPROX WHERE SHOWN USING .10 HIGH CHARACTERS.
 4. ALL MACHINE SURFACES.
 3. NORMAL WITHIN .005 IN/IN TYP BOTH ENDS.
 2. BREAK SHARP EDGES .010 ± .015.
 1. CAUSTIC DIPP BEFORE ELECTRO-ETCHING.
 1. MACHINE PER CCP SPEC AD 102-001.
- NOTE: UNLESS OTHERWISE SPECIFIED

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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APPENDIX C

MRIR-T/ME

INTERFACE INPUT/OUTPUT LISTING

APPENDIX C

MRIR-T/ME
INTERFACE INPUT/OUTPUT LISTINGC.1 INPUT CONNECTOR J1

<u>Pin</u>	<u>Term</u>	<u>Function</u>
1	- - -	Spare
2	-24.5 RDA	-24.5 vdc Radiometer power source from satellite regulated supply.
3	- - -	Spare
4	OFFCMDR	Off relay command return (MB)
5	OFFCMD	Off relay command (MA) -24 volt pulse, 65-millisecond duration Load: 160-ohm relay coil.
6	- - -	Spare
7	GRD S	MRIR-T/ME signal ground
8	GRD P	Primary power ground. Returned to positive terminal of the satellite regulated supply.

INPUT CONNECTOR J1 (continued)

<u>Pin</u>	<u>Term</u>	<u>Function</u>
9	-24.5M	Primary regulated input power to MRIR-T/ME. Load: 400 ohm $\pm$ 50 ohm with electronics on. ∞ with electronics off.
10	-24.5 TM	Primary regulated power for telemetry temperature monitoring network. Load: Nominal 14K ohm.
11	ONCMDR	Relay on command return line (MB).
12	ONCMD	Relay on command line (MA), -24 volt pulse, 65-millisecond duration. Load: 160 ohm relay coil.
13	- - -	Spare
14	GRD T	Telemetry ground
15	GRD C	Chassis ground

C.2 OUTPUT CONNECTOR J2

<u>Pin</u>	<u>Term</u>	<u>Function</u>
1	TRO 1	Tape recorder output No. 1 Voltage range: $6v \begin{smallmatrix} +0.5 \\ -1.0 \end{smallmatrix}$ to $0 \pm 0.6v$ Output impedance: 330 ohm Data rate: 1.66 kilobits/second
2	- - -	Spare
3	GRD TRO 1	Tape Recorder Output No. 1 reference ground.
4	GRD TRO 2	Tape Recorder Output No. 2 reference ground.
5	GRD P	Power ground
6	TRO 2	Tape Recorder Output No. 2 Signal characteristics same as TRO 1.
7	GRD S	Signal ground
8	GRD T	Telemetry ground
9	GRD C	Chassis ground

C.3 INPUT/OUTPUT CONNECTOR J3

<u>Pin</u>	<u>Term</u>	<u>Function</u>
1	-24.5 MR	-24.5 volts from primary satellite regulated supply routed through MRIR-T/ME control relay.
2	-24.5 RDA	-24.5 volts d-c radiometer power source from satellite regulated supply, routed through MRIR-T/ME unit.
3	- - -	Spare
4	CH 1	Analog Input No. 1 from radiometer electronics unit. Voltage range is 0 volts to -6.4 volts at a frequency up to 8 Hz. Input impedance is greater than 150K ohms.
5	CH 2	Analog Input No. 2 characteristics are identical to CH 1.
6	CH 3	Analog Input No. 3 characteristics are identical to CH 1.
7	GRD S	Signal ground

INPUT/OUTPUT CONNECTOR J3 (continued)

<u>Pin</u>	<u>Term</u>	<u>Function</u>
8	GRD P	Power ground connected to positive terminal of the satellite primary regulated supply.
9	100 ϕ A	Output Phase A, 100-Hz square wave is routed through the MRIR unit to the radiometer.
10	100 ϕ B	Output Phase B of a 2-phase, 100-Hz square wave routed through the MRIR unit to the radiometer. Phase B leads Phase A by 90 ^o .
11	- - -	Spare
12	CH 4	Analog Input No. 4 characteristics are identical to CH 1.
13	CH 5	Analog Input No. 5 characteristics are identical to CH 1.
14	GRD T	Telemetry ground
15	GRD C	Chassis ground

C.4 OUTPUT CONNECTOR J4

<u>Pin</u>	<u>Term</u>	<u>Function</u>
1	RLY TMP	Power Control Relay Telemetry Point Output. Voltage amplitude for ON condition is -8 ± 1.5 volts and 0 ± 0.6 volts for OFF condition. Output impedance is nominal 16.3K ohms.
2	TEM TMP	Temperature Telemetry Point Output. Voltage amplitude is variable between -3.0 volts and -6.3 volts for -10°C to $+65^{\circ}\text{C}$. Output impedance is less than 3K ohms over the temperature range.
3	- - -	Spare
4	-18V TP	MRIR -18 volts ± 3 percent regulated secondary supply. Provides 4.7K-ohm isolation resistor provided on output test point.
5	-12V TP	MRIR -12 volts ± 3 percent regulated secondary supply. 4.7K-ohm isolation resistor provided on output test point.
6	-6V TP	MRIR -6 volts ± 3 percent regulated secondary supply. 4.7K-ohm isolation resistor provided on output test point.

OUTPUT CONNECTOR J4 (Continued)

<u>Pin</u>	<u>Term</u>	<u>Function</u>
7	+6V TP	MRIR +6 volts ± 3 percent regulated secondary supply. 4.7K-ohm isolation resistor provided on output test point.
8	+3.2V TP	MRIR +3.20 (+0.22V, -0.10V) regulated secondary supply. 4.7K-ohm isolation resistor provided on output test point.
9	- - -	Spare
10	RB4	208-Hz symmetrical square wave output. Amplitude is $+0.2 \pm 0.1$ volts for the 1 state and $+2.0 \pm 0.5$ volts for the 0 state. Output impedance is greater than 4.7K ohms.
11	RB5	Pulse output that occurs every 4.8 milliseconds. Pulse duration for 1 state ($+0.2 \pm 0.1$ volts) is 100 microseconds. For the remainder of the time, the 0 state is $+2.0 \pm 0.5$ volts. Output impedance is greater than 4.7K ohms.

OUTPUT CONNECTOR J4 (continued)

<u>Pin</u>	<u>Term</u>	<u>Function</u>
12	RB1	1.66-kHz symmetrical square wave output. Amplitude for 1 state is $+0.2 \pm 0.1$ volt and $+2.0 \pm 0.5$ volts for the 0 state. Output impedance is greater than 4.7K ohms.
13	RN4 (ECD)	20-microsecond pulse output which repeats every 4.8 milliseconds. Output amplitude is $+0.2 \pm 0.1$ volts for the 1 state and $+2.0 \pm 0.5$ volts for the 0 state. Output impedance is greater than 4.7K ohms.
14	<u>RK4</u>	25-kHz symmetrical square wave output with an amplitude of $+2.0 \pm 0.5$ volts for the high level and $+0.2 \pm 0.1$ volt for the low level. The output impedance is greater than 4.7K ohms.
15	RC6	Pulse output that repeats 33 times per second with a pulse duration of 4.8 milliseconds. Voltage amplitude is $+2.0 \pm 0.5$ volts for the 0 level and $+0.2 \pm 0.1$ volts for the 1 level. The output impedance is greater than 4.7K ohms.

OUTPUT CONNECTOR J4 (continued)

<u>Pin</u>	<u>Term</u>	<u>Function</u>
16	RC1	Pulse output which occurs 30 milli-seconds after C6 occurs. The voltage amplitude and output impedance characteristics are the same as C6 on pin 15.
17	CH5	Analog Input No. 5. This pin is provided for a protective purpose. During shipping, this point is shorted to signal ground.
18	GRD S	Signal ground.
19	GRD P	Power ground.
20	-12 TMP	MRIR -12 volt telemetry point output. Nominal voltage output is -6 volts ± 4 percent. The output impedance is 2.8K ohms ± 2 percent.
21	CH4	Analog Input No. 5. Same description as pin 17 on this connector.
22	$\overline{\text{RD1}}$	LSB from the A/D data register. Voltage amplitude is $+2.0 \pm 0.5$ volts for the 0 state and $+0.2 \pm 0.1$ volts for the 1 state. Output impedance is greater than 4.7K ohms. Digital value is 2^0 .

OUTPUT CONNECTOR J4 (continued)

<u>Pin</u>	<u>Term</u>	<u>Function</u>
23	$\overline{\text{RD2}}$	2^1 Digital bit from the A/D data register. Voltage and impedance characteristics are the same as $\overline{\text{RD1}}$.
24	$\overline{\text{RD3}}$	2^2 Digital bit from the A/D data register. Voltage and impedance characteristics are the same as $\overline{\text{RD1}}$.
25	$\overline{\text{RD4}}$	2^3 Digital bit from the A/D data register. Voltage and impedance characteristics are the same as $\overline{\text{RD1}}$.
26	$\overline{\text{RD5}}$	2^4 Digital bit from the A/D data register. Voltage and impedance characteristics are the same as $\overline{\text{RD1}}$.
27	$\overline{\text{RD6}}$	2^5 Digital bit from the A/D data register. Voltage and impedance characteristics are the same as $\overline{\text{RD1}}$.
28	$\overline{\text{RD7}}$	2^6 Digital bit from the A/D data register. Voltage and impedance characteristics are the same as $\overline{\text{RD1}}$.
29	RD8	2^7 Digital bit from the A/D data register. Voltage and impedance characteristics are the same as $\overline{\text{RD1}}$.

OUTPUT CONNECTOR J4 (continued)

<u>Pin</u>	<u>Term</u>	<u>Function</u>
30	CH3	Analog Input No. 3. Same function as pin 17 on J4 connector.
31	COMP OT	Comparator output voltage. Output impedance is greater than 4.7K ohms.
32	V PREC	Precision voltage output, -10.0 $\pm$ 0.3 volts. Output impedance is greater than 4.7K ohms.
33	- - -	Spare
34	CH2	Analog Input No. 2. Same function as pin 17 on J4.
35	CH1	Analog Input No. 1. Same function as pin 17 on J4.
36	GRD T	Telemetry ground
37	GRD C	Chassis ground

C.5 INPUT CONNECTOR J5

<u>Pin</u>	<u>Term</u>	<u>Function</u>
1	10 KC CLK	10-kHz summetrical square wave. Nominal voltage swing is 0 volts to -6 volts. Nominal input impedance is 3.3K ohm.
2	- - -	Spare
3	200 KC CLK	200-kHz symmetrical square wave input. Nominal voltage swing is 0 volts to -6 volts. Nominal input impedance is 2.5K ohms.
4	GRD 200 KC	200-kHz input reference ground.
5	GRD P	Power ground.
6	100 ØA	Input Phase A, 100 Hz, square wave routed through the MRIR to the radi- ometer subsystem.
7	100 ØB	Input Phase B, 100 Hz, square wave routed through the MRIR to the radiometer subsystem. Phase B leads Phase A by 90 [°] .
8	- - -	Spare
9	GRD S	Signal ground

APPENDIX D

MRIR-T/ME
CONNECTOR PIN DESIGNATION CHART

(T/M F T.R.)
J004

J107-U	RELAY T/P	1
J107-L	TEMP T/P	2
		3
J107-07	-18.0V T.P.	4
J107-01	-12.0V T.P.	5
J107-09	-6.0V T.P.	6
J107-08	6.0V T.P.	7
J107-10	3.2V T.P.	8
		9
J104-16	RB4	10
J104-13	RB5	11
J104-15	RB1	12
J104-04	RN4	13
J101-13	RK4	14
J101-12	RC6	15
J101-11	RC1	16
J101-22	CH5	17
J106-V	GRD S	18
J102-05	GRD P	19
J107-02	-12.0V T/P	20
J101-21	CH4	21
J103-14	RD1	22
J103-15	RD2	23
J103-20	RD3	24
J103-18	RD4	25
J103-17	RD5	26
J103-07	RD6	27
J103-03	RD7	28
J103-E	RDB	29
J101-20	CH3	30
J102-12	COMP OT	31
J102-22	V. PREC	32
		33
J101-04	CH2	34
J101-03	CH1	35
J102-09	GRD. T	36
CHB	GRD. C	37

(INPUT)
J001

J003-2	-24.5 RDA	1
		2
		3
J106-20	OFF CMD	4
J106-22	OFF CMDR	5
		6
J106-Y	GRD S	7
J102-06	GRD P	8
J106-17	-24.5 VM	9
J107-R	-24.5 VTM	10
J106-21	ONCMD	11
J106-19	ONCMDR	12
		13
J102-10	GRD T	14
CHA	GRD C	15

(INPUT)
J005

J104-X	10 KC	1
		2
J101-02	200 KC	3
J101-01	200 KC GRD	4
J102-05	GRD P	5
J003-09	100 ϕ A	6
J003-10	100 ϕ B	7
		8
J106-V	GRD S	9

(OUTPUT)
J002

J105-11	TRO1	1
		2
J105-13	GRD TRO1	3
J105-9	GRD TRO2	4
J102-06	GRD P	5
J105-06	TRO2	6
J106-W	GRD S	7
J102-09	GRD T	8
CHB	GRD C	9

(IN/OUT)
J003

J106-18	-24.5V MR	1
J001-02	-24.5V RDA	2
		3
J101-03	CH1	4
J101-04	CH2	5
J101-20	CH3	6
J106-Y	GRD S	7
J102-07	GRD P	8
J005-06	100 ϕ A	9
J005-07	100 ϕ B	10
		11
J101-21	CH4	12
J101-22	CH5	13
J102-10	GRD T	14
CHA	GRD C	15

ANALOG INPUTS $\neq$ 25 KC GEN
J101

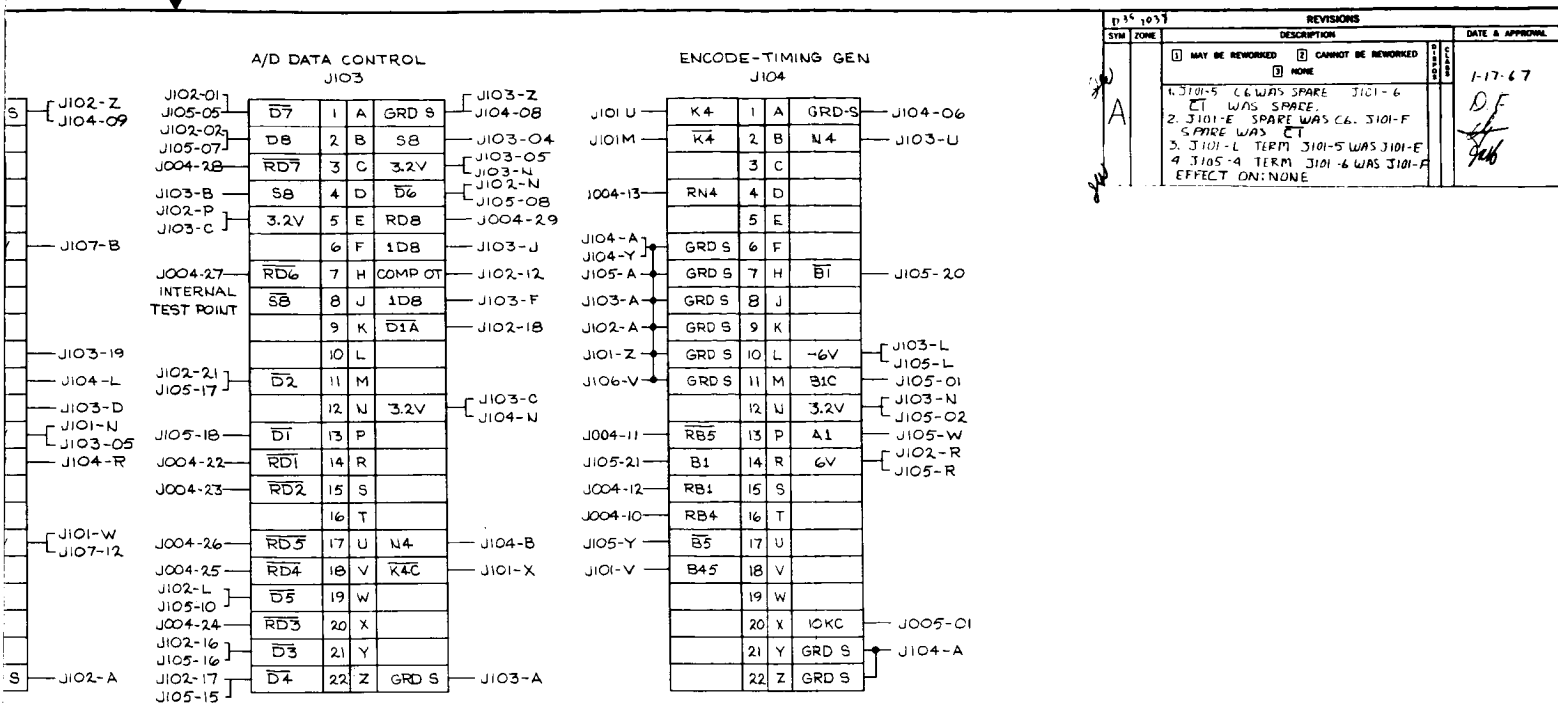
J005-04	200 KC GRD	1	A	GRD S
J005-03	200 KC	2	B	
J004-35	CH1	3	C	
J003-04	CH2	4	D	
J004-34	CH2	4	D	
J003-05	C6	5	E	
J101-L				
J105-4	C1	6	F	
		7	H	
		8	J	
		9	K	C1
		10	L	C6
J004-16	RC1	11	M	K4
J004-15	RC6	12	N	3.2V
J004-14	RK4	13	P	
		14	R	
		15	S	
		16	T	
J101-A	GRD S	17	U	K4
		18	V	B4C
INTERNAL TEST POINT J003-06	C5	19	W	-18
J004-30	CH3	20	X	K4C
J003-12	CH4	21	Y	VCHO
J104-21	CH5	22	Z	GRD S
J104-17				

A/D CONVERTER
J102

J103-01	D7	1	A	GRD
J103-02	D8	2	B	
INTERNAL TEST POINT	V COMP	3	C	
		4	D	
J004-19	GRD P	5	E	
J005-05	GRD P	6	F	-12
J001-08	GRD P	6	F	-12
J002-05	GRD P	7	H	
J003-08				
J106-Z		8	J	
J002-08	GRD T	9	K	
J004-36	GRD T	10	L	D5
J001-14	GRD T	10	L	D5
J003-14	GRD T	11	M	-6V
J107-04	GRD T	11	M	-6V
J004-31	COMP OT	12	N	D6
J103-H	VCHO	13	P	3.2V
J101-Y		14	R	6.0V
INTERNAL TEST POINT	VREF	15	S	
J103-21	D3	16	T	
J103-22	D4	17	U	-18
J103-K	D1A	18	V	
		19	W	
		20	X	
J103-11	D2	21	Y	
J004-32	VPREC	22	Z	GRD

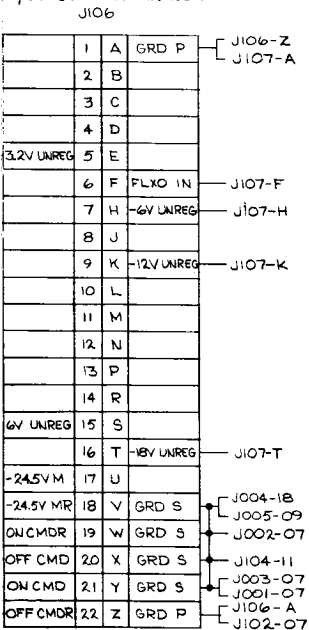
FRAME SYNC $\neq$ DATA OUTPUT
J105

J104-M	BIC	1	A	GRD S
J104-N	3.2V	2	B	E8
J105-N				
J105-B	E8	3	C	
J101-6	C1	4	D	
J103-01	D7	5	E	
J002-06	TRO2	6	F	
J103-02	D8	7	H	C1
J103-D	D6	8	J	
J002-04	GRD TRO2	9	K	
J103-19	D5	10	L	-6V
J002-01	TRO1	11	M	
		12	N	3.2V
J002-3	GRD TRO1	13	P	
		14	R	6V
J103-22	D4	15	S	
J103-21	D3	16	T	
J103-11	D2	17	U	
J103-13	D1	18	V	
INTERNAL TEST POINT J104-H	F	19	W	A1
J104-14	B1	20	X	H
INTERNAL TEST POINT	B1	21	Y	B3
	F	22	Z	GRD S

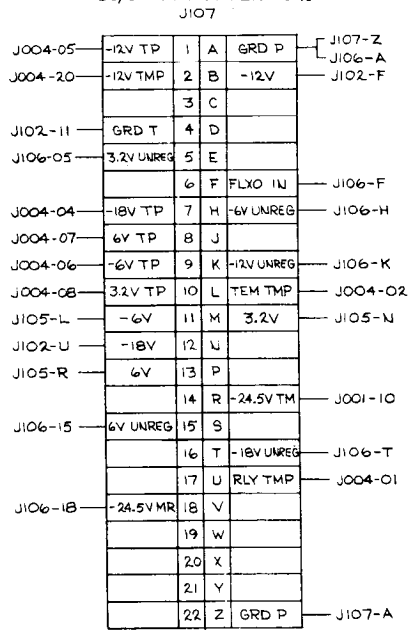


D 44 1057		REVISIONS		DATE & APPROVAL
SYM	ZONE	DESCRIPTION	DATE	APPROVAL
		1 MAY BE REWORKED		
		2 CANNOT BE REWORKED		
		3 NONE		
		4 J101-5 C6 WAS SPARE J101-6	1-17-67	DF
		5 J101-5 SPARE WAS C6. J101-F		
		6 SPARE WAS CT		
		7 J101-L TERM J101-5 WAS J101-E		
		8 J105-4 TERM J101-6 WAS J101-F		
		9 EFFECT ON: NONE		

DC/DC CONVERTER NO.1



DC/DC CONVERTER NO.2



1 10449-502		PIN CHART		MATERIAL		ZONE	
REGD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION		SIZE, DESCRIPTION & SPECIFICATION			
LIST OF MATERIAL OR PARTS LIST							
UNLESS OTHERWISE SPECIFIED				DRAWN: <i>[Signature]</i> 8-24-66			
DIMENSIONS ARE IN INCHES				CHECK: <i>[Signature]</i> 9-2-66			
TOLERANCES ON				APPD: <i>[Signature]</i> 10-3-66			
DECIMALS: .1				FINISH			
XX ± .03				HEAT TREAT			
XXX ± .010				SURFACE ROUGHNESS PER MIL-STD-10			
.040 TO .125 ± .002, -.001				SCALE: NONE			
.136 TO .228 ± .003, -.001				SIZE: F			
.234 TO .500 ± .004, -.001				WEIGHT			
.515 TO .750 ± .005, -.001				SHEET			
.765 TO 1.000 ± .007, -.001							
1.015 TO 2.000 ± .010, -.001							
CALIFORNIA COMPUTER PRODUCTS INC.				PIN CHART - MRIR-B			
305 MULLER, ANAHEIM, CALIFORNIA				10449-502			

FOLDOUT FRAME

10449-502A