Maintenance Manual

MASTR® III
DATA MODULE
(Paging Adapter)
19D904558G1

ERICSSON

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1-800-528-7711 (Outside USA, 804-528-7711)

Printed in U.S.A.

TABLE OF CONTENTS

SPECIFICATIONS*

Input Voltage Range:	-25V to +25V max 0V to +5V min
Input Data Range:	0-9600 baud
Input Data Type:	2 level NRZ such as Golay, POCSAG, etc.
RF Frequency Stability:	Less than or equal to 2.0 ppm (-30°C to +60°C)
RF Output Frequency:	12.800 MHz
RF Output Level:	0 dBm ± dB

* These specifications are intended primarily for the use of the serviceman. Refer to the appropriate Specification Sheet for the complete specifications.

DESCRIPTION

Data Module 19D904558G1 allows the MASTR III Base Station to transmit **N**on **R**eturn to **Z**ero **(NRZ)** data such as those produced by paging systems. The Data Module accepts data with rates up to 9600 baud within a range of -25V to +25V. The output of the data adapter is a modulated 12.8 MHz reference signal and a filtered data that modulates the Transmit Synthesizer.

COMPATIBILITY

The Data Module (19D904558G1) is not compatible with EDACS, Voice Guard, Simulcast and Voting Receivers.

Firmware 344A3307G13 and above on the System Module and PC Programmer version 7.0 and above must be installed to use the Data Module.

CIRCUIT ANALYSIS

The Data Module is designed to operate using the +5V, -5V, +12V, -12V and 13.8V supply voltages generated by the Power Module and applied through the backplane. The voltage regulator, U6 (LM317) and is associated components, maintain +10V for ICOM operation.

A block diagram of the Data Module is given in Figure 2. The Data Module is enabled by grounding **RTS** (on the backplane). The data signal is applied to **DATA** (of the backplane). The Data Module transforms the input data into TTL data using transistor Q1 configured as a common-emitter buffer and inverts the data where appropriate by selecting switch S1 as shown in Table 1. This prepares the data for the modulation process.

Once the data is conditioned by Q1, it is passed to a multiplexer circuit (U1), where U1 is used to select the output deviation level. When the data bit is positive, a voltage divider consisting of resistors R9 and R11 and potentiometer R10 is used to control the negative deviation output. If the data bit is negative, a voltage divider consisting of resistors R6 and R8 and potentiometer R7 is used to control the positive deviation output. To set the positive and negative adjustments refer to the procedure outlined in the adjustments section.

The data is then filtered through two (U3.1, U3.2) or three active low-pass filters (U2.2, U3.1, U3.2) based upon the input data rate selected. For high speed data (1200-9600), S1 is selected, as shown in Table 1, to allow only two filters (U3.1 and U3.2) to be used. For data rates equal to or less than 1200 baud, S1 is configured as shown in Table 1, to use filters U2.2, U3.1 and U3.2. The frequency response of the filters is shown in Figure 3. When U3.1 and U3.2 filters are used the response rolls off at about 1 kHz. When all the filters are used the roll off does not occur until about 5.5 kHz.

After the data is filtered, the output is split into two signals. The first signal is filtered data. This data is amplified by U4.1 and the gain of the data is adjusted by R26. The data is then output on **EXT_HSD** (J1.26B) of the data module and used to modulate the Voltage Controlled Oscillator (VCO) of the transmit synthesizer. The second signal is used to modulate the 12.8 MHz reference ICOM (J2.3). The output of the ICOM (J2.2) is a 12.8 MHz modulated reference with a +10 dBm output. The modulated output is fed to high input impedance buffer Q2 which drives the **MMIC** amplifier (U5) into compression, and the gain of the **MMIC** is about 14 dB. The low pass elliptical filter, consisting of L1 and C20-C22 filters the high frequency harmonics. The next stage is a resistive pad (R35-R37) that provides a constant input/output impedance (50 ohms) and protects the amplifier from externally induced impedance mismatches.

The final output is a 0 dBm, 12.8 MHz modulated reference signal that replaces the receive synthesizer reference normally used to drive the transmit synthesizer.

The above operations enable the Data Module to modulate the 12.8 MHz reference oscillator and allow the high and low frequency components of the input data to be transmitted when using the paging adapter on the MASTR III Base Station.

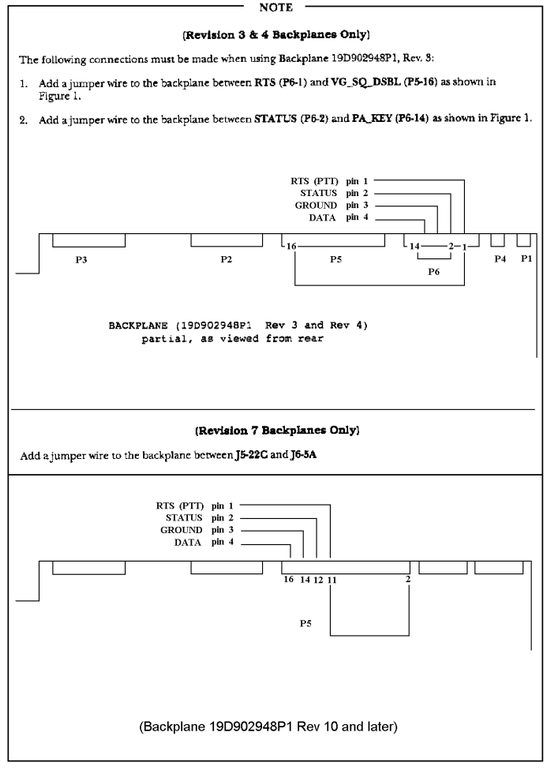


Figure 1 - MASTR III Backplane

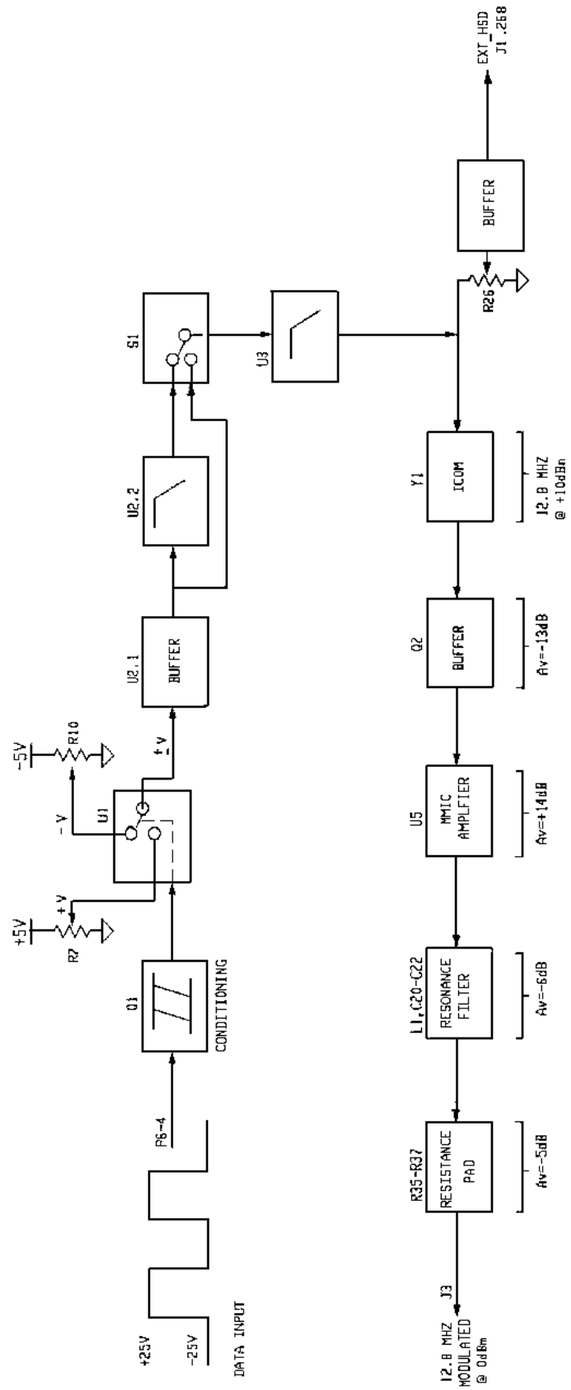


Figure 2 - Data Module Block Diagram

TABLE 1 - Switch S1 Configurations

S1.1	S1.2	S1.3	S1.4	S1.5	S1.6	
OFF	OFF	X	X	X	X	Transmit inverted data
OFF	ON	X	X	X	X	Transmit normal data
X	X	OFF	ON	X	X	Three filters, below 1200 baud
X	X	ON	OFF	X	X	Two filters, 1200-9600 baud
ON	X	X	X	X	X	Data select over-ride

X - don't care

INSTALLATION

EQUIPMENT

The Data Module options package **SXDE5B** includes the following items:

- Data Adapter Module (19D904558G1)
- BNC-BNC Cable (344A4688P1)

The following equipment is required to install the Data Module:

- Personal Computer (IBM PC compatible)
- PC Programmer versions 7.0 and above (TQ3353)
- Programming Cable (TQ3356)

MODULE INSTALLATION

1. Connect the computer serial **COM** port and **DATA PORT** on the front of the T/R Shelf using TQ3356 Interconnect cable.
2. Enable the Digital Pager in the Control Shelf Options menu of the PC Programmer installed at the personal computer interfaced with the station.
3. Remove the blank panel from slot #2 of the control section of the station.
4. Remove the U-Link between the Transmit Synthesizer and the Receive Synthesizer. (**RF_IN** and **RF_OUT**)
5. Connect the BNC-BNC Cable (344A4688P1) between **RF_IN** of the Transmit Synthesizer and the Data Module as shown in Figure 5.
6. On the Transmit Synthesizer (19D902780), adjust VR601 for zero modulation.

NOTE

For stations with Backplane 19D902948P1, Rev. 3 see additions and Figure 1 in the **Compatibility** Section.

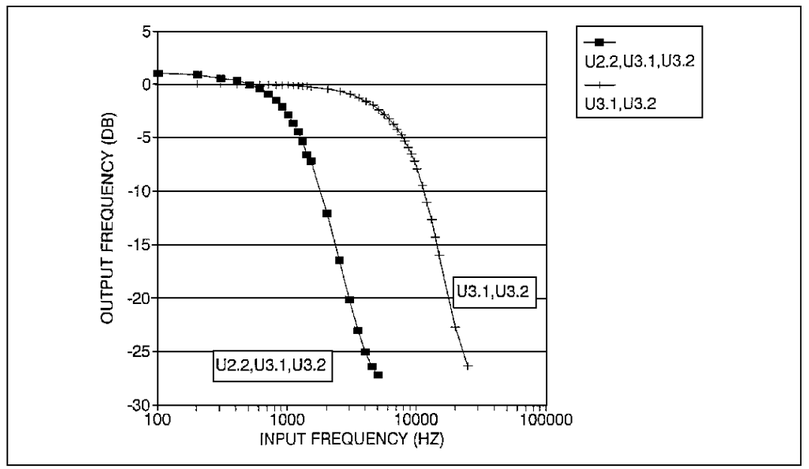
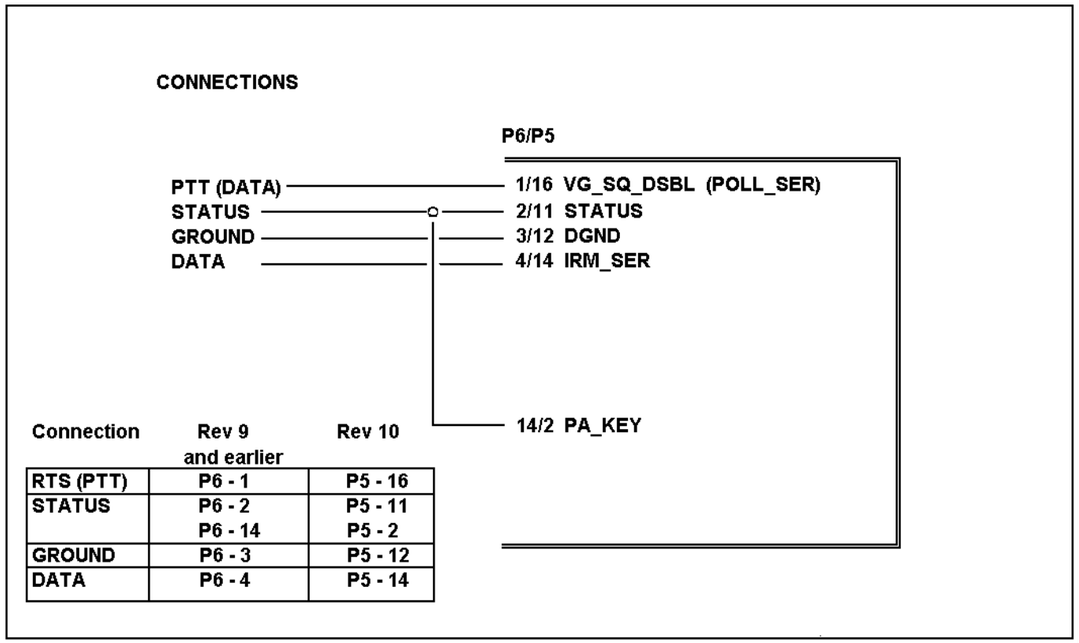


Figure 3 - Frequency Response Of Filters



Connection	Rev 9 and earlier	Rev 10
RTS (PTT)	P6 - 1	P5 - 16
STATUS	P6 - 2 P6 - 14	P5 - 11 P5 - 2
GROUND	P6 - 3	P5 - 12
DATA	P6 - 4	P5 - 14

Figure 4 - Data Interface Connections

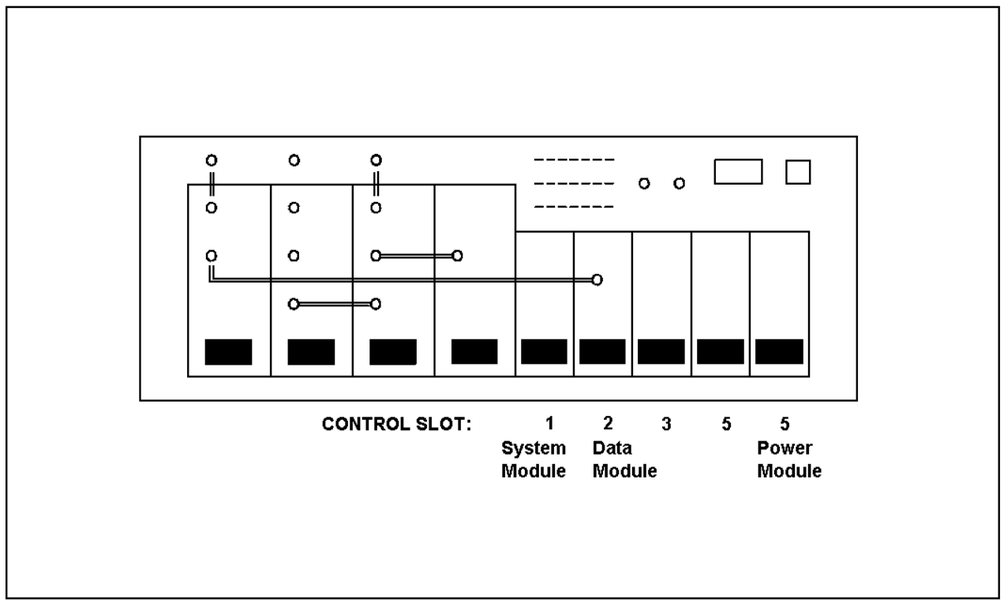


Figure 5 - MASTR III Station

ALIGNMENT

Once the Data Module has been correctly installed, the positive and negative data deviation levels, the average deviation, and the station nominal frequency should be adjusted.

EQUIPMENT

- Calibrated Frequency Counter:
  0.5 ppm measurements (800 MHz)
  1.0 ppm measurements (UHF, VHF)
- Data Modulated Extender Card (19A903197G2)
- BNC-BNC Cable (344A4688P1)

DATA DEVIATION ADJUSTMENT

1. Make the following connections to the Backplane as shown in Figure 1:

   RTS - Ground this pin to enable the external data to be routed to the transmitter instead of voice.

   STATUS - Monitor this output. It should go HIGH (5 volts) when the transmitter is keyed and at full power output.

   GROUND - Common ground connection for data and control.

   DATA - Connect DATA to data output of paging unit.

2. Attach the Data Adapter Module (19D904558G1) to the Data Module Extender Card (19A903197G2) and insert in slot #2 of the control section of the station.

3. Connect the **RF_OUT** of the transmit synthesizer to the frequency counter to monitor the nominal carrier frequency.

4. Select the filter type by setting S1 according to the data transmission requirements:

S1.1	S1.2	S1.3	S1.4	S1.15	S1.6	
XXX	XXX	ON	OFF	XXX	XXX	Data rates 1200-9600 baud
XXX	XXX	OFF	ON	XXX	XXX	Data rates up to 1200 baud

XXX - don't care

5. Select the data mode by setting S1 according to the data polarity requirements:

S1.1	S1.2	S1.3	S1.4	S1.5	S1.6	
OFF	OFF	XXX	XXX	XXX	XXX	DAT INV, transmit inverted data
OFF	ON	XXX	XXX	XXX	XXX	DAT NORM, transmit normal data

XXX - don't care

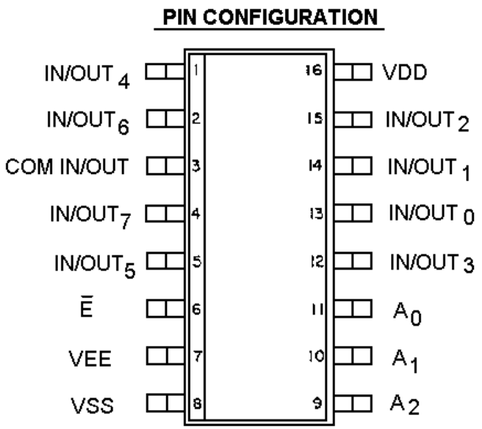
6. Set the nominal carrier frequency by opening **RTS** and keying the transmitter with the **REM PTT** on the System Module. Adjust the ICOM frequency until the nominal carrier frequency is obtained on the frequency counter. Release the **REM PTT**.

7. Set the negative frequency shift by grounding **RTS** and adjusting R10 until the nominal carrier frequency is minus 4.5 kHz.

8. Set the positive frequency deviation by grounding **DATA** (or set S1 to **DAT INV**) and keying the data path by grounding **RTS**. Adjust R7 until the nominal carrier frequency is plus 4.5 kHz.

9. Set the data deviation level by grounding **RTS** and applying a periodic data signal to **DATA.** Adjust R26 for a 4.5 kHz peak deviation.

ANALOG MULTIPLEXER U1
19A702705P3 (4051 BM)

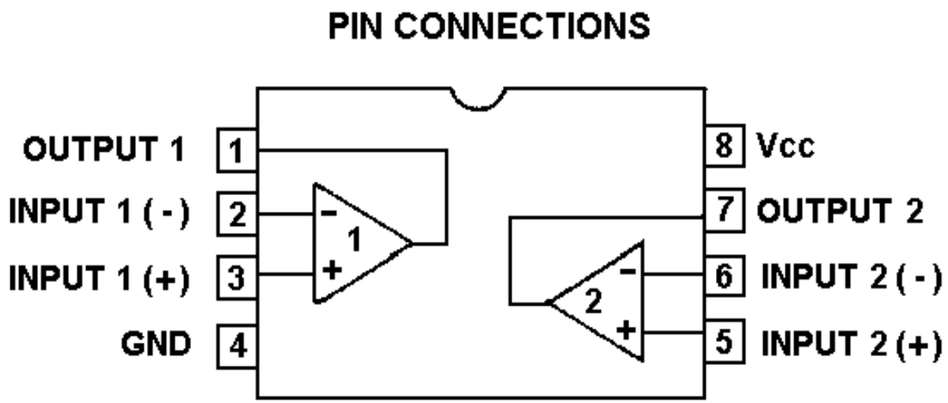


FUNCTION TABLE

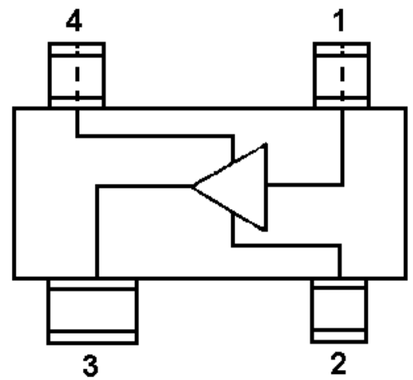
INPUTS				CHANNEL ON
E	A2	A1	A0	
L	L	L	L	Y0 - Z
L	L	L	H	Y1 - Z
L	L	H	L	Y2 - Z
L	L	H	H	Y3 - Z
L	H	L	L	Y4 - Z
L	H	L	H	Y5 - Z
L	H	H	L	Y6 - Z
L	H	H	H	Y7 - Z
H	X	X	X	NONE

H = HIGH STATE (THE MORE POSITIVE VOLTAGE)
L = LOW STATE (THE LESS POSITIVE VOLTAGE)
X = STATE IS IMMATERIAL

DUAL OPERATIONAL AMPLIFIERS U2, U3, U4
19A116297P7 (MC4558DC)

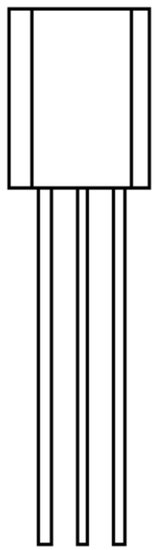


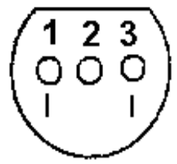
BIPOLAR OPERATIONAL AMPLIFIER U5
19A705927P1 (AVANTEK MSA-0611)



PIN 1. RF INPUT
2. GROUND
3. RF OUTPUT AND BIAS
4. GROUND

VOLTAGE REGULATOR U6
19A701999P5 (LM317LD)





BOTTOM VIEW

PIN IDENTIFICATION

PIN 1. ADJUST
PIN 2. OUTPUT
PIN 3. INPUT

MASTR III DATA MODULE
19D904558G1
Issue 1

SYMBOL	PART NUMBER	DESCRIPTION
		— — — MISCELLANEOUS — —
2	19D904549G1	Board, Data.
3	19D904559P1	Chassis.
4	19D902555P1	Handle.
5	19A702381P508	Screw, thd. form: No. 3.5-0.6 x 8.
6	19B235310P1	Nameplate, Blank.
7	19A702364P408	Machine screw: TORX Drive, M3.5 - 0.6 x 8.
8	19A700032P6	Lockwasher, internal tooth: No. 3.5MM.

* COMPONENTS, ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

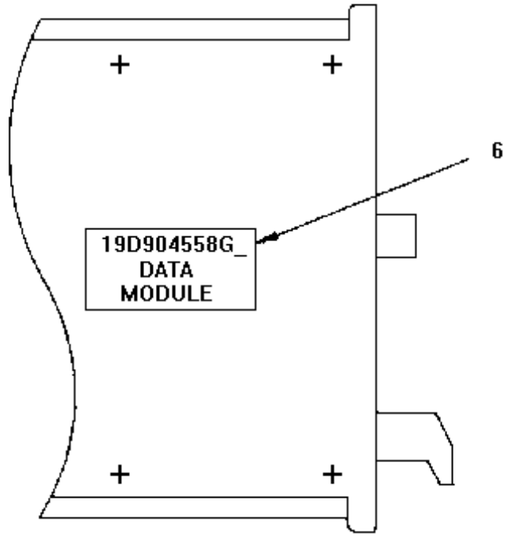
UNIVERSAL DATA ADAPTER
19D904549G1
Issue 1

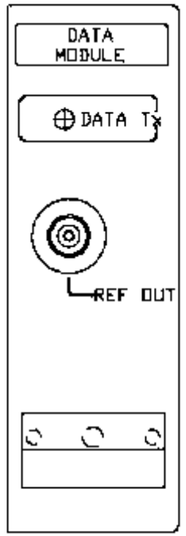
SYMBOL	PART NUMBER	DESCRIPTION
		— — — CAPACITORS— — — —
C1	19A702052P1	Ceramic: 220 pF 10%, 50 VDCW.
C2	19A702052P116	Ceramic: 0.015 µF 5%, 50VDCW.
C3	19A702052P110	Ceramic: 4700 pF 5%, 50 VDCW.
C4	19A702052P130	Ceramic: 0.022 µF ±5%, 50 VDCW.
C5	19A702052P114	Ceramic: 0.01 µF 5%, 50 VDCW.
C6	19A702052P105	Ceramic: 1000 pF 5%, 50 VDCW.
C7	19A702052P110	Ceramic: 4700 pF 5%, 50 VDCW.
C8	19A702052P114	Ceramic: 0.01 µF 5%, 50 VDCW.
C9	19A702052P105	Ceramic: 1000 pF 5%, 50 VDCW.
C10	19A702052P3	Ceramic: 470 pF 10%, 50 VDCW.
C11	19A705205P2	Tantalum: 1 µF, 16 VDCW; sim to Sprague 293D.
C12	19A702052P3	Ceramic: 470 pF 10%, 50 VDCW.
C13 and C14	19A702052P14	Ceramic: 0.01 µF 10%, 50 VDCW.
C15	19A702052P26	Ceramic: 0.1µF 10%, 50 VDCW
C16	19A702052P14	Ceramic: 0.01 µF 10%, 50 VDCW.
C17	19A702052P5	Ceramic: 1000 pF ±10%, 50 VDCW.
C18	19A702052P26	Ceramic: 0.1µF 10%, 50 VDCW
C19	19A702052P14	Ceramic: 0.01 µF 10%, 50 VDCW.
C20	19A702052P1	Ceramic: 220 pF 10%, 50 VDCW.
C21	19A702236P43	Ceramic: 51 pF ±10%, 50 VDCW.
C22	19A702052P1	Ceramic: 220 pF 10%, 50 VDCW.
C23 thru C25	19A702052P14	Ceramic: 0.01 µF 10%, 50 VDCW.
C27	19A705205P2	Tantalum: 1 µF, 16 VDCW; sim to Sprague 293D.
C28	19A705205P6	Tantalum: 10 µF, 16 VDCW; sim to Sprague 293D.
C29 and C30	19A702052P5	Ceramic: 1000 pF ±10%, 50 VDCW.
C31 and C32	19A702052P26	Ceramic: 0.1µF 10%, 50 VDCW
C33 and C34	19A702052P5	Ceramic: 1000 pF ±10%, 50 VDCW.
C35	19A705205P2	Tantalum: 1 µF, 16 VDCW; sim to Sprague 293D.
C36	19A702052P5	Ceramic: 1000 pF ±10%, 50 VDCW.
C37	19A705205P2	Tantalum: 1 µF, 16 VDCW; sim to Sprague 293D.
C38 and C39	19A702052P5	Ceramic: 1000 pF ±10%, 50 VDCW.

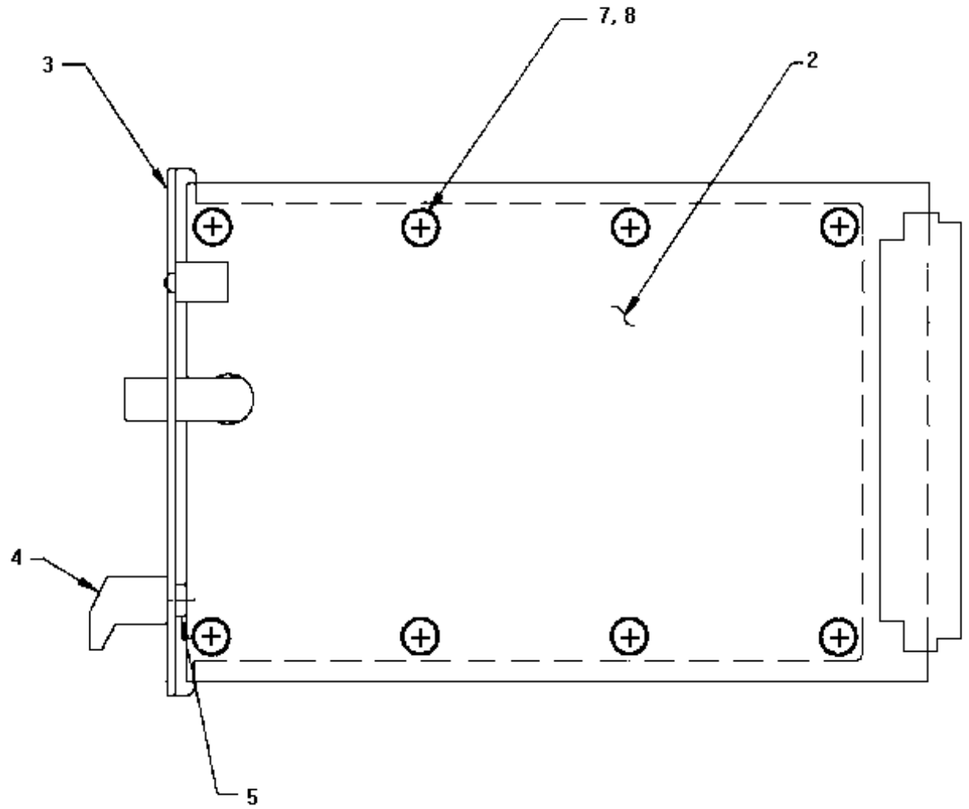
* COMPONENTS, ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	PART NUMBER	DESCRIPTION
C40 and C41	19A705205P2	Tantalum: 1 µF, 16 VDCW; sim to Sprague 293D.
		— — — — — DIODES — — — —
D1	19A700053P3	Silicon: 2 Diodes in Series, Common Cathode; sim to MBAV70L.
D2	19A703595P12	Diode, OPTO ELE
		— — — — — JACKS— — — — —
J1	19B801587P7	Connector, DIN: 96 male contacts, right angle mounting; sim to AMP 650887-1.
J2	19A116659P31	Connector, printed wiring: 9 contacts rated at 5 amps; sim to Molex 09-66-1091.
J3	19A115938P24	Connector, Receptacle
		— — — — INDUCTORS — — —
L1	19A705470P24	Coil, Fixed
		— — — TRANSISTORS — — —
Q1 thru Q3	19A700076P2	Silicon, NPN: sim to MMBT3904, low profile.
Q4	19A700059P2	Silicon, PNP: sim to MMBT3906, low profile.
		— — — — RESISTORS— — — —
R1	19B800607P472	Metal film: 4.7K ohms ±5%, 1/8 w.
R2 and R3	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R4	19B800607P563	Metal film: 56K ohms ±5%, 1/8 w.
R5	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R6	19B800607P101	Metal film: 100 ohms ±5%, 1/8 w.
R7	19A700043P7	Resistor, Variable
R8 and R9	19B800607P101	Metal film: 100 ohms ±5%, 1/8 w.
R10	19A700043P7	Resistor, Variable
R11	19B800607P101	Metal film: 100 ohms ±5%, 1/8 w.
R12	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R13	19B800607P153	Metal film: 15K ohms ±5%, 1/8 w.
R14	19B800607P562	Metal film: 5.6K ohms ±5%, 1/8 w.
R15 thru R17	19A702931P301	Metal film: 10K ohms ±1%, 200 VDCW, 1/8 w.
R18	19A702931P269	Metal film: 5110 ohms ±1%, 200 VDCW, 1/8 w.
R19	19A702931P201	Metal film: 1000 ohms ±1%, 200 VDCW, 1/8 w.
R20	19A702931P322	Metal film: 16.5K ohms ±1%, 200 VDCW, 1/8 w.
R21	19A702931P210	Metal film: 1240 ohms ±1%, 200 VDCW, 1/8 w.

SYMBOL	PART NUMBER	DESCRIPTION
R22 and R23	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R24	19B800607P472	Metal film: 4.7K ohms ±5%, 1/8 w.
R25	19B800607P271	Metal film: 270 ohms ±5%, 1/8 w.
R26	19A700043P7	Resistor, Variable
R27	19A702931P169	Metal film: 511 ohms ±1%, 200 VDCW, 1/8 w.
R28	19B800607P821	Metal film: 820 ohms ±5%, 1/8 w.
R29	19B800607P561	Metal film: 560 ohms ±5%, 1/8 w.
R30	19B800607P101	Metal film: 100 ohms ±5%, 1/8 w.
R31 and R32	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R33	19B800607P102	Metal film: 1K ohms ±5%, 1/8 w.
R34	19B800607P471	Metal film: 470 ohms ±5%, 1/8 w.
R35	19B800607P181	Metal film: 180 ohms ±5%, 1/8 w.
R36	19B800607P270	Metal film: 27 ohms ±5%, 1/8 w.
R37	19B800607P181	Metal film: 180 ohms ±5%, 1/8 w.
R38	19A702931P137	Metal film: 237 ohms ±1%, 200 VDCW, 1/8 w.
R39	19A702931P221	Metal film: 1620 ohms ±1%, 200 VDCW, 1/8 w.
R40	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
R41	19B800607P471	Metal film: 470 ohms ±5%, 1/8 w.
R42	19B800607P103	Metal film: 10K ohms ±5%, 1/8 w.
		— — — — — SWITCHES — — —
S1	19A149955P2	Switch, RKR
		— — INTEGRATED CIRCUITS —
U1	19A702705P3	Digital: 8-Channel Analog Multiplexer; sim to 4051BM.
U2 thru U4	19A116297P7	Linear: Dual Op Amp; sim to MC4558CD.
U5	19A705927P1	Silicon, bipolar: sim to Avantek MSA-0611.
U6	19A701999P5	Voltage Regulator, LM317
		— — — — — CRYSTAL— — — —
Y1	19A130605G37	FM, Oscillator
		— — — MISCELLANEOUS — —
18	19C321660G5	FM, Oscillator
20	19A129392P32	Form, FREQ



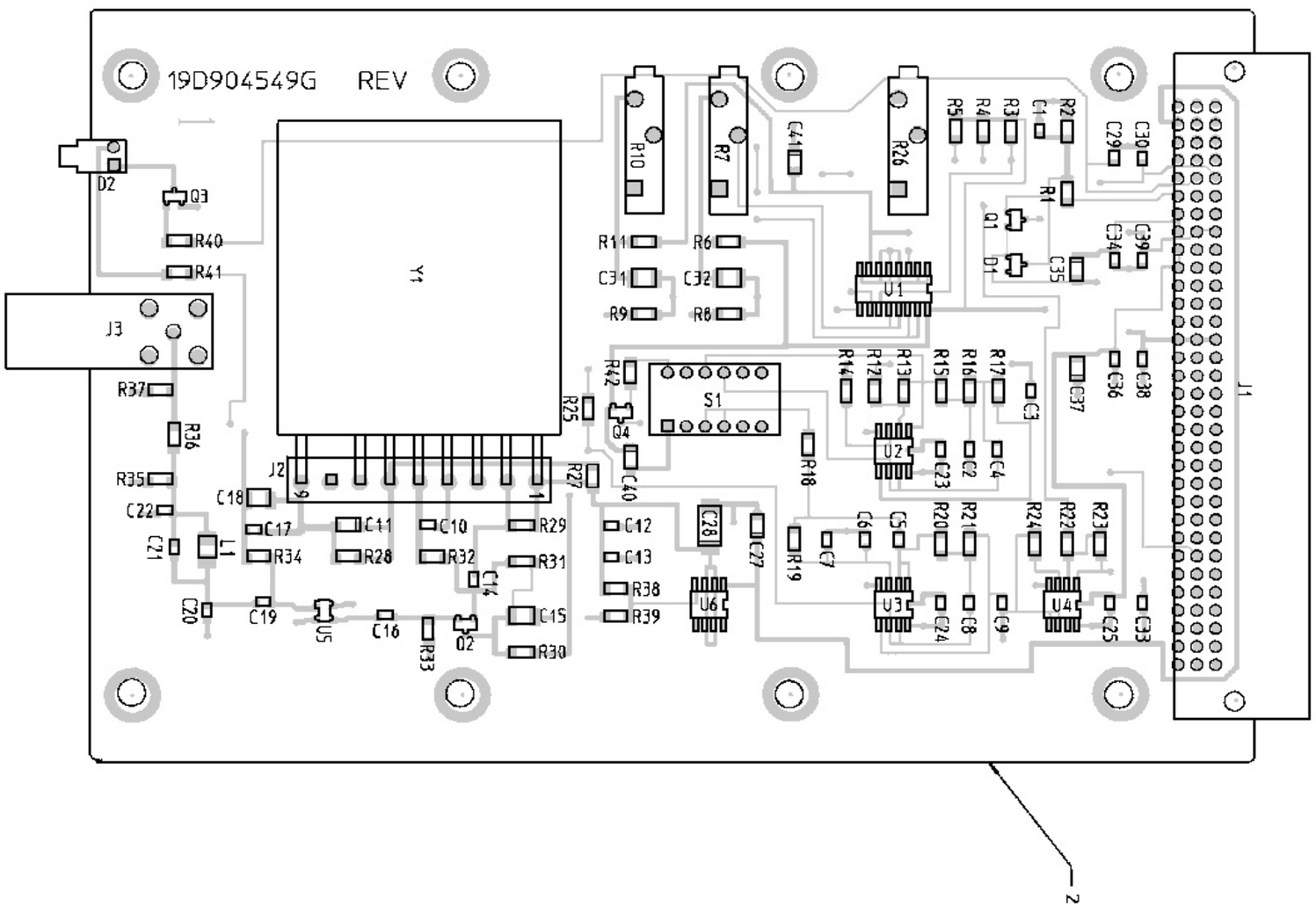




DATA MODULE
19D904558G1

(19D904558, Rev. 0)

COMPONENT SIDE



LEAD IDENTIFICATION FOR
Q1
(SOT) DIODES
(TOP VIEW)

(A) (C)

LEAD IDENTIFICATION FOR
Q1-Q4
(SOT) TRANSISTORS
(TOP VIEW)

(B) (C)
(E)

LEAD IDENTIFICATION FOR
U5
(SOT) IN CKT
(TOP VIEW)

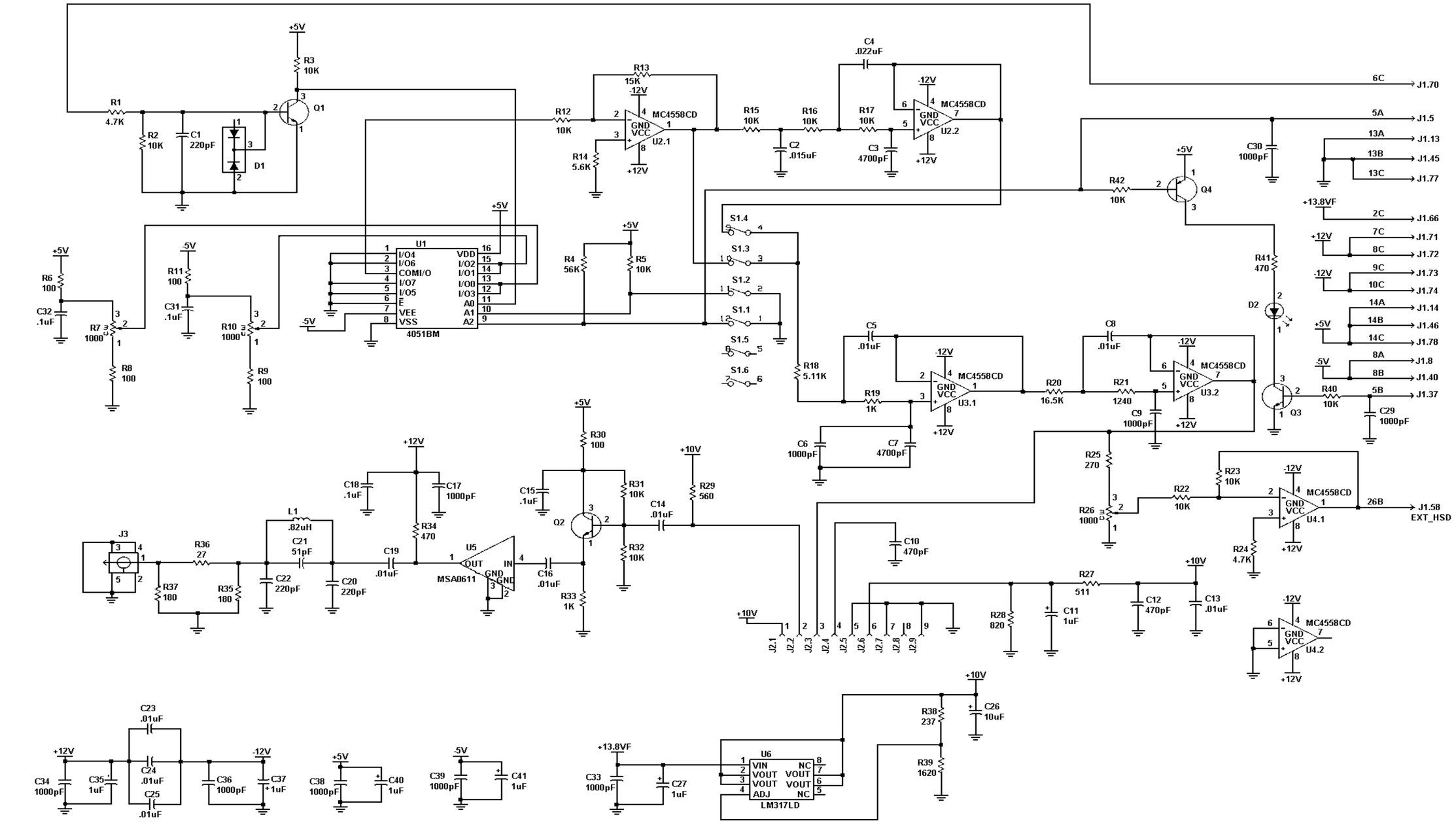
OUTPUT GND
GND INPUT

CAUTION
OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE
DEVICES

(19D904547, Rev. 0)

UNIVERSAL DATA ADAPTER
19D904549G1

(19D904549, Rev. 1)



UNIVERSAL DATA ADAPTER
19D904549G1

(19D904556, Rev. 1)

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