MAINTENANCE MANUAL
DIGITAL DATA BOARD 19C336825G1,G2

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DESCRIPTION

The Digital Data Board enables the Mastr II exciters to accept two-level NRZ (non return to zero) digital input at data speeds up to 9600 baud. The Data Board is provided in two groups: Group 1 is used with the VHF PLL exciter 19D423249 and Group 2 is used with the UHF FM exciter 19D423679. The input data may be either unipolar or bipolar within the range of -25 to +25 volts. The switching threshold between a logical 0 and a logical 1 is nominally +1.0 volt.

The Digital Data Board converts the input data to plus and minus voltage levels, filters the data to limit spectral occupancy, and couples the data to the exciter. It also completes the voice path for transmit audio. Provisions have been made to invert the data when required, and for filter selection to match the data rate. The Data Board contains input signal conditioning, level shifting, two low-pass filters, and a negative voltage converter.

The Digital Data Board provides operation in either of two modes, Voice or Data. In the Voice Mode, transmit audio from the audio processor is routed to the Data Board through J304/P304, coupled through C315, and passed through relay contacts K301-B3, B2, and back to the exciter through J305-3.

In the Data Mode, the Data Board is powered on, data is converted to the proper levels and polarity, is filtered and routed to the exciter through relay K301. The Data Mode is selected when a positive voltage is applied to the base of

Voice/Data Select Switch Q303, turning it on and supplying a ground path for relay K301. With K301 energized, +10 volts is applied to the Data Board through contacts K301-A1, A2; this disables the voice path and connects the data path.

CIRCUIT ANALYSIS

DATA POLARITY SELECTION

Input data is applied to the base of buffer Q304 through J306-9. The output of the buffer is applied to the base of Q302 or, if the sense of the data is to be inverted, is applied to the base of Q301. Q301 inverts the data and applies it to the base of Q302.

This inversion is jumper-selectable. With P301 connecting J301-1 and J301-2, the normal data sense is selected; that is, a logic 1 on the data input will drive the transmit frequency higher and a logic 0 will drive the frequency lower. If this sense is to be inverted, connect P301 from J301-3 to J301-2.

DEVIATION ADJUST, FILTER SELECTION

The data is applied to the base of Q302 which, together with R307, R308/R333, R309, R310/R334 and R311 is used to control transmitter deviation. If the data sense is "upright" or non-inverted, then R308/R333 will control deviation in the negative direction and R310/R334 will control deviation in the positive direction. Since the function of Q302 is to switch resistors in parallel, there will be some interaction between the two deviation adjust controls.

The data is filtered by two active low-pass filters, one formed by U301a, b, and the other formed by U304a, b, c and d. Jumpers are used to select the appropriate filter for the data rate being used. For high speed data (1200- 9600 baud), only U304 is used. In this case, install jumper P302 across J302-2,3 and P303 across J303-1,3. For data rates equal to or less than 1200 baud, both filters are used. Connect P302 across J302-3,4 and P303 across J303-1,3.

Additional jumper positions are provided to allow the input of either filter to be connected to ground for setting channel center frequency or for troubleshooting purposes.

U302 and its associated components form a free-running multivibrator which generates a nominal -7 volts dc to power the op-amps and to provide the negative voltage required to modulate the exciter.

Output data is taken from U304d-14 and passed through relay contacts K301-B1,B2, and then through J305-3 to the exciter.

ADJUSTMENTS

The only adjustment required on the Digital Data Board is the setting of positive and negative data deviation. All other station adjustments are made as instructed in the appropriate station maintenance manual.

TEST EQUIPMENT REQUIRED

- Frequency counter

DATA DEVIATION ADJUSTMENT

NOTE

Some means of switching the station into the Data Mode and of providing a logic 1 and logic 0 at the station Data input terminal is required. This can be the data device that will normally be used with the station, or alternatively the 12 volt power supply can be used to supply a logic 1. The station ground can be used to supply logic 0.

J2-7 is the Data/Voice Select input and J2-8 is Data input line. J2 is the 9 pin Molex connector on the rear of the station control shelf.

1. Tune the station as directed in the appropriate maintenance manual. Set the ICOM on frequency.

2. Connect P302 and P303 on the Data Board as appropriate for the baud rate that will be used in the system. Connect P301 across J301-2,3.

3. With the transmitter in the Voice Mode, key the station and, with a frequency counter, observe the transmit frequency.

4. Apply a positive voltage (logic 1) to J2-7 (Data/Voice Select) to drive the station into the Data Mode.

5. Apply a ground (logic 0) to J2-8 (Data input). Using the frequency counter to measure frequency offset from the channel center as measured in step 3, adjust R310 on the Data Board (R334 on UHF) to set the required deviation in the positive direction.

6. Apply a positive voltage (logic 1) to Data input. Adjust R308 on the Data Board (R333 on UHF) to set the required deviation in the negative direction. There is a small amount of interaction between these two adjustments. Repeat steps 5 and 6 until the deviation is the correct level and symmetrical on both sides of channel center frequency.

7. Return the station to Voice mode. This completes the adjustment of the Data Board.

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WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.

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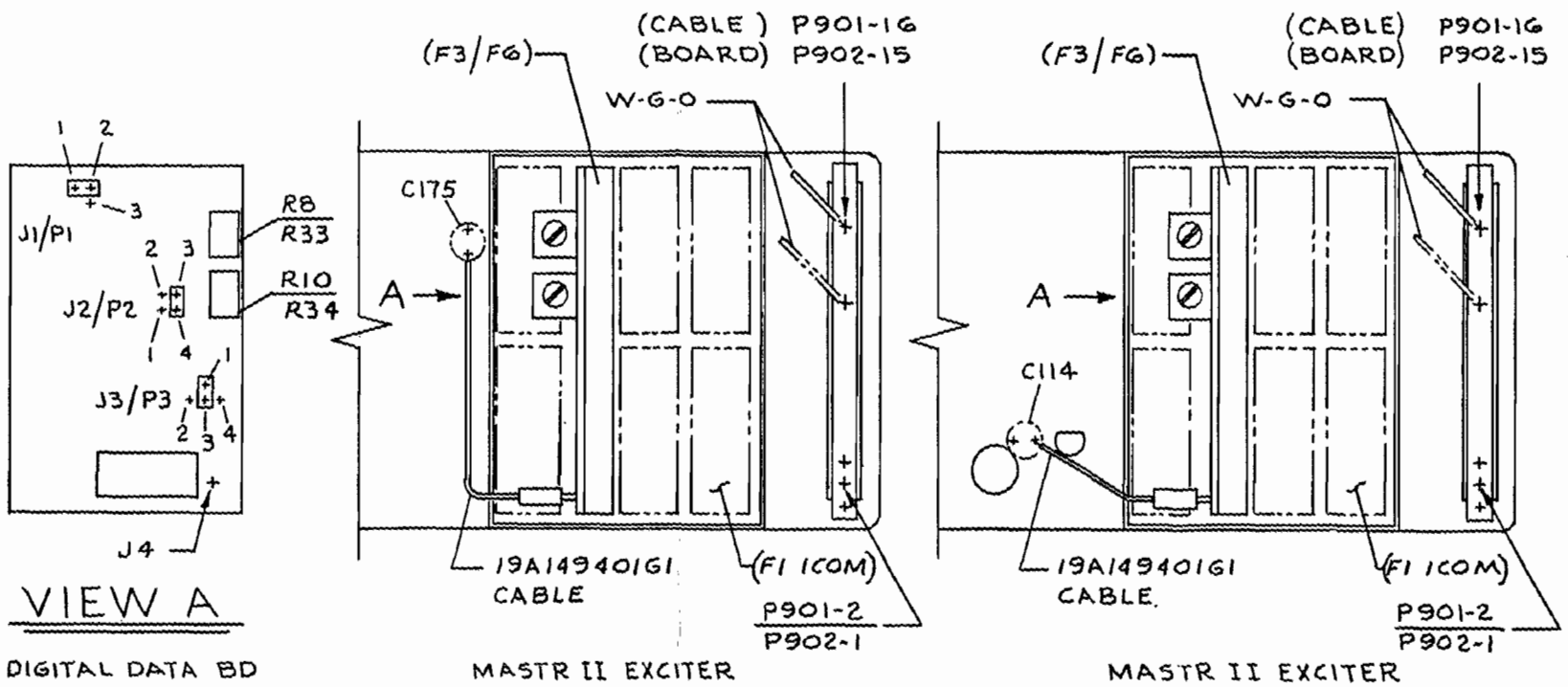


INSTALLATION

THIS INSTRUCTION MODIFIES A MASTR II HIGH BAND PLL EXCITER (19D423249) OR A UHF FM EXCITER (19D432679) FOR THE INSTALLATION OF DIGITAL DATA BOARD 19C336825 (G1 FOR HB, G2 FOR UHF).

1. REMOVE AND DISCARD AUDIO COUPLING CAPACITOR ON EXCITER (C175 ON HB PLL, C114 ON UHF FM).

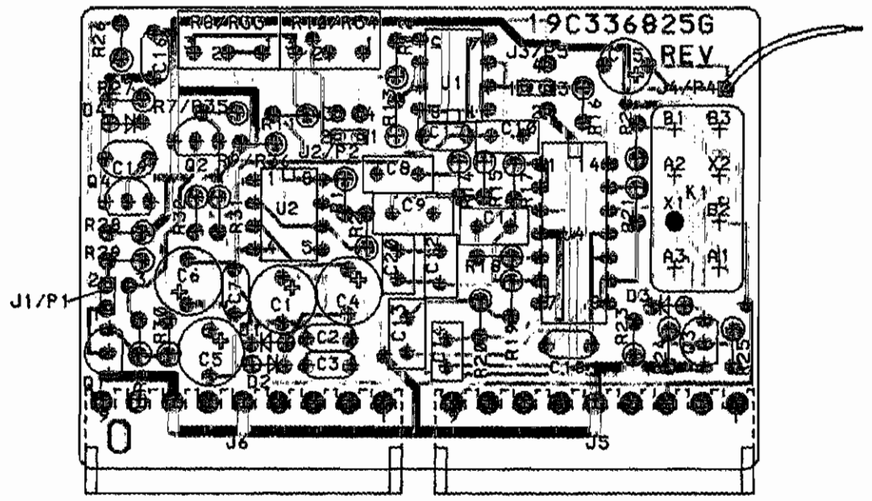
2. SOLDER FREE END OF CABLE 19A149401G1 IN HOLE WHERE THE + END OF COUPLING CAPACITOR WAS FORMERLY CONNECTED.

3. PLUG DATA BOARD ONTO THE CONNECTORS FOR F3 AND F6 ICOMS, WITH THE COMPONENT SIDE OF THE BOARD FACING AWAY FROM F1 ICOM. PLUG THE SOCKET OF CABLE 19A149401G1 TO J4 ON THE DATA BOARD. INSTALL EXCITER IN STATION.

4. REMOVE CONTACT FROM P901-12. THIS IS THE W-G-O WIRE IN THE EXCITER CONNECTOR. REINSTALL THIS CONTACT IN P901-16 (THIS CORRESPONDS TO PIN 15 ON THE EXCITER).

5. THIS COMPLETES THE INSTALLATION OF THE DIGITAL DATA BOARD. CONNECTIONS TO THE DATA BOARD ARE AVAILABLE AT J2, THE 9 PIN MOLEX CONNECTOR ON THE REAR OF THE CONTROL SHELF. J2-7 IS NOW REDEFINED AS DATA/VOICE ENABLE, AND J2-8 IS NOW DATA INPUT.

(19C336914, Sh. 1, Rev. 0)


19C336825G
REV
J1/P1
J2/P2
J3/P3
J4/P4
J5
J6
U1
U2
C1
C2
C3
C4
C5
C8
C9
C10
C11
C12
C13
C14
C15
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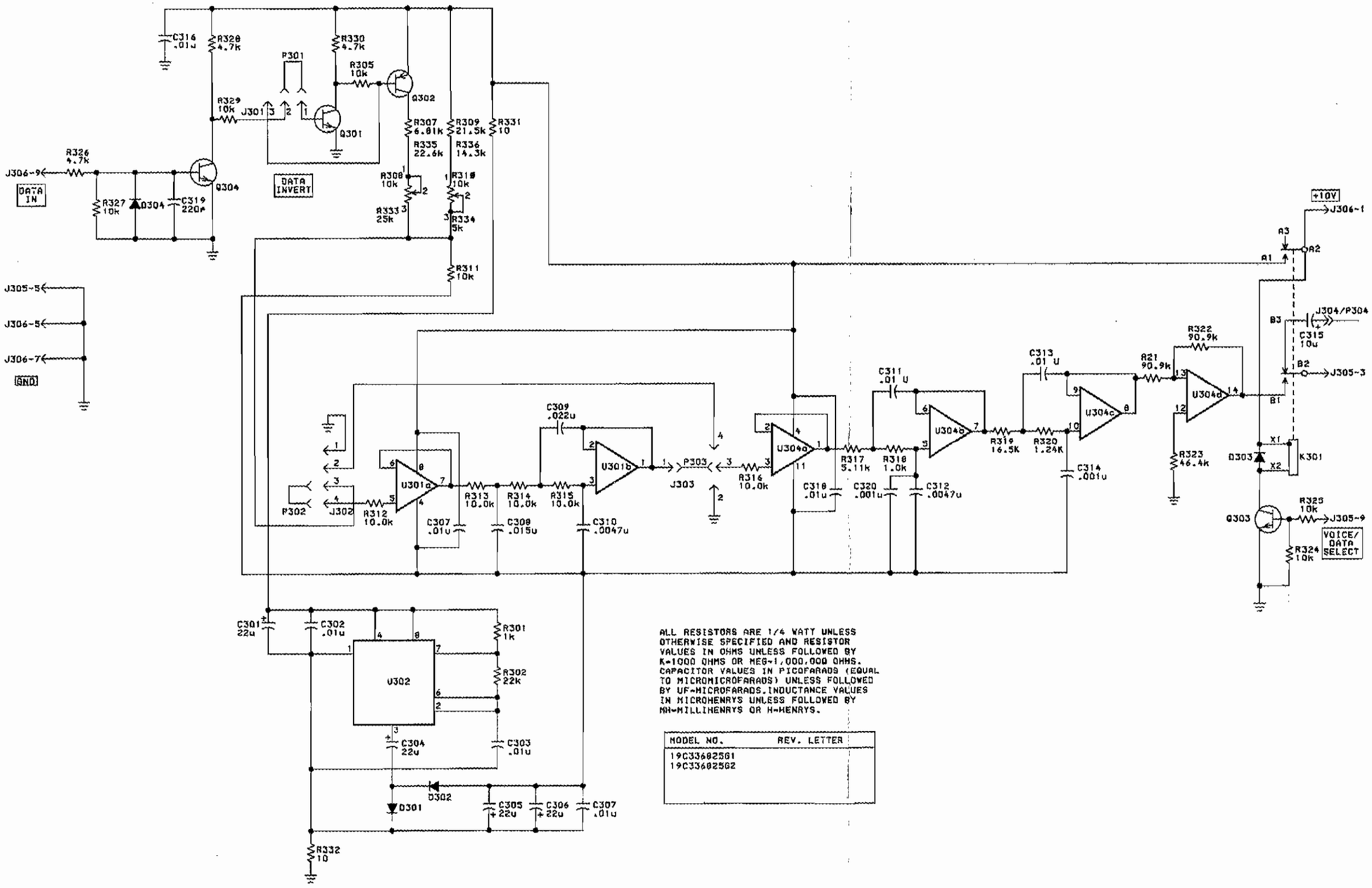

ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN PICOFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF=MICROFARADS. INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH=MILLIHENRYS OR H=HENRYS.

MODEL NO.	REV. LETTER
19C336825G1	
19C336825G2	

(19D438339, Sh. 1, Rev. 0)

SCHEMATIC DIAGRAM

Digital Data Board, 19C336825G1,G2

PARTS LIST

DIGITAL DATA BOARD
19C336825G1,2
ISSUE 1

SYMBOL	GE PART NO.	DESCRIPTION
		- - - - - - - - - - CAPACITORS - - - - - - - - -
C301	19A701534P8	Tantalum: 22 uF + or -20%, 16 VDCW.
C302 and C303	T644ACP310K	Polyester: .010 uF + or -10%, 50 VDCW.
C304 thru C306	19A701534P8	Tantalum: 22 uF + or -20%, 16 VDCW.
C307	T644ACP310K	Polyester: .010 uF + or -10%, 50 VDCW.
C308	19A701371P8	Polyester: 0.015 uF + or -5%, 50 VDCW.
C309	19A701371P9	Polyester: 0.022 uF + or -5%, 50 VDCW.
C310	19A701371P5	Polyester: 4700 pF + or - 5%, 50 VDCW.
C311	19A701371P7	Polyester: 0.01 uF + or -5%, 50 VDCW.
C312	19A701371P5	Polyester: 4700 pF + or - 5%, 50 VDCW.
C313	19A701371P7	Polyester: 0.01 uF + or -5%, 50 VDCW.
C314	19A701371P1	Polyester: 1000 pF + or -5%, 50 VDCW.
C315	19A701534P7	Tantalum: 10 uF + or -20%, 16 VDCW.
C316 thru C318	T644ACP310K	Polyester: .010 uF + or -10%, 50 VDCW.
C319	19A700233P3	Ceramic: 220 pF + or -10%, 50 VDCW.
C320	19A701371P1	Polyester: 1000 pF + or -5%, 50 VDCW.
		- - - - - - - - - - DIODES - - - - - - - - - -
D301 thru D304	19A700028P1	Silicon, fast recovery: fwd current 75 mA, 75 PIV; sim to Type 1N4148.
		- - - - - - - - - - JACKS - - - - - - - - - -
J305 and J306	19A116659P76	Connector, printed wiring: 9 contacts rated at 5 amps; sim to Molex 09-52-3091.
		- - - - - - - - - - RELAYS - - - - - - - - - -
K301	19A700061P1	Hermetic sealed: 180 to 341 ohms coil res, 8-16.3 VDC; sim to GE 3SAV1760A2, CP Clare HPW-1201558, or Potter-Brumfield HCM6160.
		- - - - - - - - - - PLUGS - - - - - - - - - -
P301 thru P303	19A702104P2	Connector: gold plated, two position shorting; sim to: Berg 65474-003.
		- - - - - - - - - - TRANSISTORS - - - - - - - - -
Q301	19A700023P1	Silicon, NPN; sim to Type 2N3904.
Q302	19A700022P1	Silicon, PNP; sim to Type 2N3906.
Q303	19A702503P2	Silicon, NPN.
Q304	19A700023P1	Silicon, NPN; sim to Type 2N3904.
		- - - - - - - - - - RESISTORS - - - - - - - - - -
R301	19A700019P37	Deposited carbon: 1K ohms + or - 5%, 1/4 w.
R302	19A700019P53	Deposited carbon: 22K ohms + or - 5%, 1/4 w.
R305	19A700019P49	Deposited carbon: 10K ohms + or - 5%, 1/4 w.
R307	19A701250P281	Metal film: 6.81K ohms + or -1%, 1/4 w.
R308	19A116559P106	Variable cermet: 10K ohms + or - 20%, 1/2 w; sim to CTS Series 360.
R309	19A701250P133	Metal film: 21.5K ohms + or - 1%, 250 VDCW, 1/4 w.
R310	19A116559P106	Variable cermet: 10K ohms + or - 20%, 1/2 w; sim to CTS Series 360.
R311 thru R316	19A701250P301	Metal film: 10K ohms + or - 1%, 1/4 w.
R317	19A701250P269	Metal film: 5.11K ohms + or -1%, 1/4 w.
R318	19A701250P201	Metal film: 1K ohms + or -1%, 250 VDCW, 1/4 w.
R319	19A701250P322	Metal film: 16.5K ohms + or -1%, 250 VDCW, 1/4 w.
R320	19A701250P210	Metal film: 1240 ohms + or -1%, 250 VDCW, 1/4 w.
R321 and R322	19A701250P393	Metal film: 90.9K ohms + or - 1%, 250 VDCW, 1/4 w.
R323	19A701250P365	Metal film: 46.4K ohms + or -1%, 250 VDCW, 1/4 w.
R324 and R325	19A700019P49	Deposited carbon: 10K ohms + or - 5%, 1/4 w.
R326	19A700019P45	Deposited carbon: 4.7K ohms + or - 5%, 1/4 w.
R327	19A700019P49	Deposited carbon: 10K ohms + or - 5%, 1/4 w.
R328	19A700019P45	Deposited carbon: 4.7K ohms + or - 5%, 1/4 w.
R329	19A700019P49	Deposited carbon: 10K ohms + or - 5%, 1/4 w.
R330	19A700019P45	Deposited carbon: 4.7K ohms + or - 5%, 1/4 w.
R331 and R332	19A700019P13	Deposited carbon: 10 ohms + or - 5%, 1/4 w.
R333	19A116559P107	Variable cermet: 25K ohms + or - 20%, 1/2 w; sim to CTS Series 360.
R334	19A116559P102	Variable cermet: 5000 ohms + or - 20%, 1/2 w; sim to CTS Series 360.
R335	19A701250P335	Metal film: 22.6K ohms + or -1%, 250 VDCW, 1/4 w.
R336	19A701250P316	Metal film: 14.3K ohms + or -1%, 1/4 w.
		- - - - - - - - - INTEGRATED CIRCUITS - - - - - - -
U301	19A701789P2	DUAL OP AMP; sim to LM358.
U302	19A701865P1	Linear: 555 Timer, sim to Signetics NE555N.
U304	19A701789P1	Linear, Low Power OP AMP; sim to LM324N.
		- - - - - - - - - MISCELLANEOUS - - - - - - - - -
	19A149401G1	Cable, Data Board.
	19A703248P1	Contact, electrical (Quantity 12).

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PARTS LIST
19C336825G1 (HIGH BAND)
19C336825G2 (UHF BAND)

1.0 SCOPE

This is a module test specification for the Mastr II Digital Data Board PL19C336825.

2.0 DESCRIPTION

This board is designed to plug onto the Mastr II VHF PLL exciter (19D423249) or to the UHF FM exciter (19L432679), and enable the exciter to accept NRZ digital input at data speeds up to 9600 bits/sec. The input data can be either unipolar or bipolar within the range of -25 to +25 volts. The switching threshold between a logical 0 and 1 is nominally +1.0 volt. Provision has been made to invert the input data sense if necessary.

The Data Board has two modes of operation. In the Voice mode, transmit audio from the Audio Processor is routed onto the Data Board, through a set of relay contacts and a coupling capacitor, and back to the exciter. In the Data mode, the Data Board is powered up, and the input data is converted to plus and minus voltage levels, low-pass filtered to limit spectrum occupancy, and then relay switched onto the modulator input line. Transmit audio is inhibited in Data mode.

The Data Board has two active low-pass filters; the one formed by U4a, b, c, and d is used for data rates up to 9600 bits/sec, and for data rates below 600 bits/sec, a second filter formed by U1a and b is switched in series with U4.

There are two groups of Data Board, G1 being used for VHF and G2 being used for UHF.

3.0 REFERENCE INFORMATION

3.1 Drawings: 19D438339 Schematic
19D336825 Assembly

3.2 Data port input impedance > 4.7 kohms

3.3 Current drain: Voice mode < 1 mA @ 10.0 volts
Data mode < 80 mA @ 10.0 volts

L30
122.3
145

PRINTS TO

REVISIONS

2	12-11-87 H.W.Patrick	REV. 4-3 REC. 14498
1	8 AUG 2 K. Beaver	

4.0 TEST PROCEDURE

4.1 Hook up the test setup per Figure 5.0.

4.2 Turn both pots on the Data Board fully clockwise.

4.3 Install the following jumpers: J1 - either position
J2-1 to J2-4
J3-1 to J3-3

4.4 Apply +10 volts supply to the Data Board. Close S1, putting the Board in the Data mode. Measure the DC voltage at J5-3. This voltage should be within 50 millivolts of 0.0 volts. Remove the jumper at J2; the voltage at J5-3 should be either + or -, with magnitude greater than 5.0 volts.

4.5 Measure the dc voltage at U1 pin 4. It should be negative and greater than 6.0 volts.

4.6 Replace the jumper on J2 to connect J2-3 to J2-4.

4.7 Set the input signal generator to 12-15 volts pk-pk and 200 +/- 10 Hz. With an oscilloscope, measure the pk-pk output level at output pin J5-3. Increase the input frequency until the output voltage drops to 50% of the 200 Hz value. This frequency should be between 1400 and 1550 Hz.

4.8 Move the jumper on J2 to connect J2-2 to J2-3, and move the jumper on J3 to connect J3-3 to J3-4.

4.9 Set the input signal generator to 12-15 volts pk-pk and 200 +/- 10 Hz. Again, measure the pk-pk output voltage at output pin J5-3. Increase the input frequency until the putput voltage drops to 50% of the 200 Hz value. This frequency should be between 8.75 and 10.3 kHz.

4.10 Open switch S1, placing the board in the Voice mode. The output voltage at J5-3 should drop to zero.

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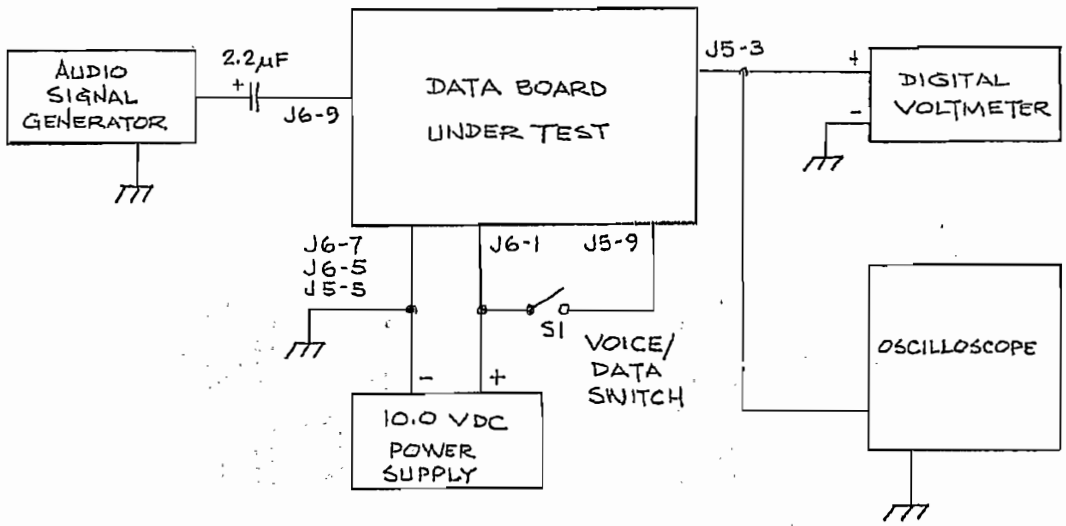
PRINTS TO

5.0 TEST CIRCUIT



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PRINTS TO