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**VX4342**  
**Dual Resistance**  
**Programming (DRP) Module**  
**Service Manual**

06/02/92 9112-04-A  
through  
9201-04-B

**Tektronix**

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# Table of Contents

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**Section 1**  
**Introduction** ..... 1

**Section 2**  
**Adjustment and Calibration** ..... 3

**Section 3**  
**Assembly And Disassembly** ..... 7

**Section 4**  
**Parts List** ..... 9



# VX4342

## Dual Resistance Programming (DRP) Module

### Section 1 Introduction

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The VX4342 Dual Resistance Programming (DRP) Module provides two sets of programmable resistors, channel A and channel B. Each set can be programmed in 4096 resistance steps. The minimum resistance step size of each channel can be individually set during module calibration to any value from 10 ohms to 100 ohms. The maximum resistance output of either channel is:

$$4095 \times \text{Minimum Resistance Step Size}$$

The output of the module can be programmed directly in resistance or as an integer multiple of the minimum resistance step size. When the module is programmed directly in resistance, the resulting output value will be the nearest integer multiple of the minimum resistance step size.

Hardware controls (switches) are provided on the module to allow either a fixed offset resistor and/or a variable offset potentiometer to be placed in series with each channel's programmable output resistor. The offset resistors are useful in those applications requiring either a constant fixed resistance offset or when the resistance value of interconnect cabling between the DRP and the Unit Under Test (UUT) needs to be trimmed to a cardinal value for ease of programming overall module-to-UUT resistance values.

When Option 1M to the VX4342 Module is ordered, the module is provided with a built-in Test Module Adapter (TMA) and isolated self test software that allow the DRP to meet the requirements of the United States Air Force's Modular Automatic Test Equipment (MATE) guidelines.

The standard module is supplied with potentiometers for setting the minimum resistance step size (10 ohms to 100 ohms) and the corresponding full scale output resistance of the module. Other potentiometer values or fixed resistor values can be ordered. Consult the factory for available resistor values and option numbers.



# Section 2

## Adjustment and Calibration

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Calibrate the VX4342 Module at the temperature at which it will be operating. If this is not feasible, or the module will be operating under a wide temperature variation, consult the temperature drift specifications. Allow a ten minute warm-up period before performing the calibration.

**NOTE:** If the module has been ordered with a special option that replaces the module's potentiometers with fixed resistors, then no calibration is required.

### Test Equipment Required

- ▶ 73A-850 Extender Card or equivalent
- ▶ 4½ Digit DMM with a resistance accuracy of 0.05% or better

### Calibration Procedure

The A and B channels of the DRP Module must each be individually calibrated. Each channel contains twelve potentiometers which are switched in and out by relays to provide the programmed output resistance. Each of the twelve resistors will be individually calibrated using the procedure detailed below:

- 1) Select a minimum step size. If the channel has been previously calibrated, this will be the value set in the channel's Minimum Step Size switch. (See the paragraph entitled Minimum Step Size Switch in the Switches sub-section). Both channels of the DRP module have been calibrated with a minimum step size of 100 ohms when shipped from the factory, unless special step size options were ordered.
- 2) For each channel to be calibrated, close rockers 2 and 3 of the channel's Configuration switch (see the Switches subsection in the Manual) to remove the trim potentiometer and offset resistor from the output signal path.
- 3) Connect the resistance input of the DMM to the output connector pins associated with the channel to be calibrated (See Appendix B for output connector pin definitions).

The system accuracy requirements may require attaching the DMM to the UUT end of the cable used to connect the DRP to the UUT to calibrate out the effects of system cabling. This can only be done if the minimum step size is greater than the system resistance.

Section 2

- 4) Use the CLS<LF> command to connect both variable resistors to the module's output connector. If the module has been ordered with Option 1M (MATE TMA), use the CIIL command CLS :CH0<CR> <LF> to connect the A channel and CLS :CH1 <CR> <LF> to connect the B channel to the module's output connector.
  
- 5) Use the SA 0; SB 0<LF> command to program the module to 0 ohms. If the module has been ordered with Option 1M (MATE TMA), use the following CIIL command to set both channels to zero ohms:

```
FNC IMP :CH0 SET RESI 0 <CR> <LF>
FNC IMP :CH1 SET RESI 0 <CR> <LF>
```

Record the resistance as read by the DMM for each channel. This resistance reading is the offset resistance of the DMM cabling plus onboard resistance.

- 6) a) VX4342 Without Option 1M

Using the commands shown in the table below, program the channel to be calibrated to each of the indicated number of multiples of the minimum step size. For each minimum step size multiple, adjust the channel's indicated potentiometer until the DMM reads the indicated number of multiples of the minimum step size plus the resistance reading from Step 5  $\pm 0.05\%$  ( $\pm 0.5\%$  for 10 ohm step size). The potentiometers are accessible through holes in the module shield, and are labeled A1 through A12 and B1 through B12.

Minimum Step Size Multiples	S Command To Program A Chan	B Chan	DMM Reading: Multiples of Min Step Size *	Pot. Number A or B
1	SA 1<LF>	SB 1<LF>	1	1
2	SA 2<LF>	SB 2<LF>	2	2
4	SA 4<LF>	SB 4<LF>	4	3
8	SA 8<LF>	SB 8<LF>	8	4
16	SA 16<LF>	SB 16<LF>	16	5
32	SA 32<LF>	SB 32<LF>	32	6
64	SA 64<LF>	SB 64<LF>	64	7
128	SA 128<LF>	SB 128<LF>	128	8
256	SA 256<LF>	SB 256<LF>	256	9
512	SA 512<LF>	SB 512<LF>	512	10
1024	SA 1024<LF>	SB 1024<LF>	1024	11
2048	SA 2048<LF>	SB 2048<LF>	2048	12

\* cabling and onboard resistance from Step 5 is added to the multiple of the minimum step size.

*NOTE:* <LF> is a line feed character, decimal 10.



6. b) VX4342 With Option 1M

Enter the command:

FNC IMP :CH<chan-num> SET RESI <real-val> <CR> <LF>

where <chan-num> is 0 or 1 for the A and B channels respectively and <real-val> is as defined in the table below. <CR> is a carriage return character, decimal 13 and <LF> is a line feed character, decimal 10. For additional details on programming in CILL, refer to Appendix M of the Operating Manual.

Minimum Step Size Multiples	<real-value> MSS = Minimum Step Size	DMM Reading: Pot. Multiples of Min Step Size *	Number A or B
1	MSS times 1	1	1
2	MSS times 2	2	2
4	MSS times 4	4	3
8	MSS times 8	8	4
16	MSS times 16	16	5
32	MSS times 32	32	6
64	MSS times 64	64	7
128	MSS times 128	128	8
256	MSS times 256	256	9
512	MSS times 512	512	10
1024	MSS times 1024	1024	11
2048	MSS times 2048	2048	12

\* cabling and onboard resistance from Step 5 is added to the multiple of the minimum step size.

*Section 2*

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# Section 3

## Assembly And Disassembly

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The VX4342 is shipped fully assembled. A schematic diagram that may also be used as a reference is included with this manual.

*Section 3*

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# Section 4

## Parts List

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The following lists give the name and part number for all field replaceable parts of the VX4342. To order replacement parts, call your Tektronix representative.

SERVICE MANUAL

VX4342

2 CHAN RESISTOR PROG RESITANCE MODULE

REFERENCE DESIGNATOR	CDS PART NUMBER	QTY.	PART DESCRIPTION	MFG. NUM.	MFG. PART NUMBER
	96000-00015	1	1 IN WHT FRONT AND SPINE VXI BUS MANUAL	0546	96000-00015
FOR USE WITH P4	45008-20418	2	SCREW LOCK ASSEMBLY FOR D CONNECTOR	0108	D-20418-2
C02,052,06,08,1011,1041,1061 1081,11,1131,1151,1171,1181,1262 1271,14,15,17,19,26,32,33,35,38 412,44,46,49,53,55,56,59,62,64 67,71,75,781,84,92,93,96,98	20128-10006	43	CAP FXD CER .1UF 20% 50VDCW	0058	C322C104M5U5CA
C03,1101	22022-10008	2	CAP FXD TA 10UF 10-20% 25VDC	0106	199D106X9025CA1
C1241,051,1251,1252,1261,411,782	22022-20008	7	CAP FXD TA 22UF 10-20% 20-25VDCW	0106	199D226X9025CA1
C16	21528-15003	1	CAP FXD MICA 150PF 5% 100VDCW	0025	CD5FA151J03
C47,57	21528-10002	2	CAP FXD MICA 10PF 5% 100VDCW	0012	DM15-100D
CR1031,1211,1212,1231,43,53,73 79,93	32000-04148	9	DIODE SILICON 75V 1A 5%	0078	1N4148
CR1241	32000-04001	1	DIODE SILICON 50V 1A 5%	0357	1N4001
CR13,23,33	32000-05260	3	DIODE ZENER 43V .5W 5%	0074	1N5260B
DCL1	40408-14342	1	LABEL VX4342 DRW 03254 REV 910	0026	40408-14342
DCL2	40409-14342	1	LABEL VX4234 DRW 03255 REV 910	0026	40409-14342
DS011,013	32000-02303	2	DIODE LIGHT EMITTING GREEN WITH RESISTOR	0039	547-2303
DS012,014	32000-02003	2	DIODE LIGHT EMITTING RED WITH RESISTOR 0	0039	547-2003
E40,43	92301-40037	2	SCREW PHIL PNHD 4-40 X 3-8 ZINC SILVER	0137	4-40X3-8 PHIL PNHD
E41,44	92302-00440	2	WASHER STAR NUMBER 4 INTERNAL ZINC	0137	4 IN STAR WASH ZIN
E42,45	92303-00440	2	HEX MACHINE NUT 4-40 ZINC	0137	HEX MACH NUT 4-40

REFERENCE DESIGNATOR	CDS PART NUMBER	QTY.	PART DESCRIPTION	MFG. NUM.	MFG. PART NUMBER
F79	42202-73040	1	FUSE MICRO 4AMP 125V FAST PLUG IN CLEAR CAP	0061	273 004
FP1	47006-14342	1	FACE PLATE VX4342 DRW 02332 REV 910	0026	47006-14342
FP10,11	92505-25005	2	WASHER WAVY 2.7MM	0026	92505-25005
FP12,13	92501-25010	2	SCREW M2.5X10 CHEESEHEAD	0026	92501-25010
FP14	92502-25008	1	SCREW PHIL M 2.5 X 8 CSK BRITE ZINC	0137	PHIL M 2.5 X 8 CSK
FP15	92500-25008	1	SCREW M 2.5 X 8 SELF TAP	0266	21100-710
FP16	92520-00183	1	VME PCB-FRONT PANEL HOLDER	0266	60807-183
FP17	92500-25025	1	HEX NUT M2.5 ZINC	0266	21100-144
FP18,20	92500-25011	2	COLLAR SCREW M 2.5 X 11 SL NICKEL	0266	21100-379
FP19,21	92510-00464	2	SLEEVE CAPTIVE SCREW GRAY	0266	21100-464
FP2,22,4,8	40406-00140	1	EJECTOR HANDLE C-TOP VX1400	0266	20817-328
FP23,3,5,9	40406-00141	1	EJECTOR HANDLE C-BOTTOM VX1400	0266	20817-327
FP6,7	92500-25005	2	SCREW 2.5MM PHIL CSK 5MM	0026	92500-25005
K01,02,1011,1021,11,1111,1121,12 1211,1221,21,22,31,32,41,42,43 51,52,53,61,62,71,72,81,82,91,92	83000-20007	28	RELAY REED SPDT 175 OHMS 3.75V NO SUB	0138	7001-5165
K1031,1231,73,93	83500-20004	4	RELAY DPDT 70 OHM 5V AROMAT ONLY	0013	DS2E-S-DC5
L79	27051-50007	1	INDUCTOR 5 UH 5A .015 OHMS 50MHZ FR	0037	IHA-501
P2,1	45003-09600	2	CONNECTOR DIN 96 PIN MALE RT ANGLE SOLDER	0265	10-8457-096-002097
P4	45008-09001	1	RT ANGLE DE-9 PIN PC MOUNT	0164	DEU-9P-AA-F202
PCB1	41140-43420	1	P.C. BOARD VERSION 6L 9201	0498	41140-43420
Q1111	51100-03646	1	TRANSISTOR NPN HIGH SPEED SWITCH	0074	MPS3646



REFERENCE DESIGNATOR	CDS PART NUMBER	QTY.	PART DESCRIPTION	MFG. NUM.	MFG. PART NUMBER
Q19,59	51100-00300	2	TRANSISTOR VMOS N-FET	0102	VN0300L
Q691,692	51100-03906	2	TRANSISTOR PNP SWITCHING	0107	2N3906
R011,021,1011,1021,111,1111,1121 1131,1132,121,211,221,311,321 411,421,513,521,611,621,711,721 811,821,831,832,911,921	00000-00000	28	NOT INSTALLED PART	0026	00000-00000
R012,022	15118-20003	2	200 OHM RES VAR 22TRN CER 1W 100PPM	0021	3252W-1-201
R07,15,18,58,64	12008-33004	5	3.3K RES NETWORK SIP 5% 1.5W 9-PKG	0027	750-101-R3.3K
R1012,1022	15118-20006	2	200K OHM RES VAR 22TRN CER 1W 100 PPM	0021	3252W-1-204
R1031,16,691,693,73	14024-10005	5	10K RES FILM 1-4W 1% 100PPM	0035	RN55D1002F
R1101,1102,1161,1241,1242,1243 1281,951,952	10117-10004	9	1K RES COMP 1-4W 5%	0087	R25J-1K-5%
R1112,1122	15118-50006	2	500K OHM RES VAR 22 TRN CER 1W 100 PPM	0021	3252W-1-504
R112,122,212,222	15118-50003	4	500 OHM RES VAR 22TRN CER 1W 100PPM	0021	3252W-1-501
R1133,833	14024-20003	2	200 OHM RES FILM 1-4W 1% 100PPM	0035	RN55D2000F
R1141,791,792,793,991,992	10117-47004	6	4.7K RES COMP 1-4W 5%	0087	R25J-4.7K-5%
R1244,1251,1292,28,861,862,96	10117-18005	7	18K RES COMP 1-4W 5%	0087	R25J-18K-5%
R1291	14024-82503	1	825 OHM RES FILM 1-4W 1% 100PPM	0035	RN55D8250F
R312,322	15118-10004	2	1K OHM RES VAR 22TRN CER 1W 100PPM	0021	3252W-1-102
R412,422	15118-20004	2	2K OHM RES VAR 22TRN CER 1W 100PPM	0021	3252W-1-202
R511,512	15117-20002	2	20 OHM RES VAR CER 22 TRN 1W 100PPM	0105	43P-200
R514,522	15118-50004	2	5K OHM RES VAR 22TRN CER 1W 100PPM	0021	3252W-1-502

REFERENCE DESIGNATOR	CDS PART NUMBER	QTY.	PART DESCRIPTION	MFG. NUM.	MFG. PART NUMBER
R57	10117-10007	1	1M RES COMP 1-4W 5%	0087	R25J-1M-5%
R612,622	15118-10005	2	10K OHM RES VAR 22TRN CER 1W 100PPM	0021	3252W-1-103
R692,694	10117-33004	2	3.3K RES COMP 1-4W 5%	0087	R25J-3.3K-5%
R712,722	15118-20005	2	20K OHM RES VAR 22TRN CER 1W 100PPM	0021	3252W-1-203
R812,822	15118-50005	2	50K OHM VAR 22TRN CER 1W 100PPM	0021	3252W-1-503
R912,922	15118-10006	2	100K OHM RES VAR 22TRN CER 1W 100PPM	0021	3252W-1-104
S051,052,541,542,79	42050-10300	5	SWITCH DIP ROTARY BCD ENCODED	0007	DRW-10C
S1131,83	42050-10103	2	SWITCH DIP 3POS SPST	0048	76S803S
S481,482	42050-10301	2	SWITCH DIP ROTARY HEX	0007	DRW-16C
S99	42050-10101	1	SWITCH DIP 1POS SPST	0093	JS-8794-01
SH1	47007-74342	1	SHIELD FRONT 342 CARD DRW 01804 REV 900	0026	47007-74342
SH10,11,13,14,17,2,20,31,4,5,7,8	92500-25010	12	SCREW M 2.5 X 10 CSK OVAL PHIL NIK PL	0266	21100-500
SH12,3,6,9	92519-25019	4	STANDOFF HEX M2.5 X 19.5MM DRW 01801 REV 900	0026	92519-25019
SH15,18,21,33	92201-19451	4	STANDOFF HEX M2.5 THRU X .538L DRW 01673 REV 920	0026	92201-19451
SH16,19,30,34	92500-25017	4	SCREW 2.5MM X 16MM 90 DEG CSK FLHD PHIL STAINLS	0420	DIN965M2.5X16
SH22	47007-74002	1	SHIELD BACK CONN MTG CONFIG -01816 REV 9004	0026	47007-74002
SH23,24,25,26,27,28,29,32	92519-25004	8	REAR SHIELD SPACER 73A DRW 01807 REV 890	0212	19501-A-0029
U03	79814-00337	1	PAL PROGRAMMED EP310 REV A 73A-342	0000	
U04	76901-07402	1	IC TTL LS QUAD 2-INPUT NOR GATE	0107	74LS02
U06	76603-74645	1	IC TTL AS OCTAL BUS TRANSCIEVER	0107	74AS645

REFERENCE DESIGNATOR	CDS PART NUMBER	QTY.	PART DESCRIPTION	MFG. NUM.	MFG. PART NUMBER
U07	73003-74574	1	IC TTL ALS OC TRI LATCH NON INV TI ONLY	0107	74ALS574
U08,18,45	73005-74574	3	IC HCT OCTAL TRISTATE LATCH NON-INVERT	0107	74HCT574
U09,19	73308-74645	2	IC TTL ALS OCTAL BUS TRANSCEIVER	0107	74ALS645-1
U1041	81001-04052	1	CMOS ANALOG MUX DUAL 4 CHANNEL	0088	CD74HCT4052
U1051	73301-07404	1	IC TTL LS HEX INVERTER	0107	74LS04
U1091	76606-07400	1	IC HCT QUAD 2-INPUT NAND GATE	0088	74HCT00
U1151,89	76510-07410	2	IC TTL ALS TRIPLE 3-INPUT NAND GATE	0107	74ALS10
U1161,1181,95	73005-07474	3	IC HCT DUAL D-TYPE FLIP FLOP	0092	74HCT74N
U1171,1271,1281,99	73001-07431	4	IC LS DELAY ELEMENT	0107	74LS31
U1191	78403-07414	1	IC HCT HEX SCHMITT INVERTING BUFFER	0088	74HCT14
U1251	74200-09602	1	IC TTL DUAL RETRIGGERABLE MONOSTABLE	0078	9602
U1261,1291	77203-07408	2	IC TTL ALS QUAD 2-INPUT AND GATE	0107	74ALS08
U13,23,33	73405-02803	3	IC HIGH-VLT-CUR DARLINGTON TRANS ARRAY	0531	ULN2803A
U14,24,34,44	73001-74273	4	IC TTL LS OCTAL D-TYPE FLIP-FLOP	0107	74LS273
U15,25,64,74	73309-74244	4	IC HCT OCTAL BUFFER NON-INVERTING	0107	74HCT244
U16	20100-00804	1	IC A-D CONVERTER 8-BIT	0092	ADC0804LCN
U17	79814-00439	1	PAL PROGRAMMED 5AC312 REV A 73A-SUPER 8	0000	
U26	73003-74573	1	IC TTL ALS OCTAL D-TYPE EDGE TRIG FLIP-FLOP	0107	74ALS573
U27,35	73005-74273	2	IC HCT OCTAL D-TYPE FLIP FLOP W RESET	0088	74HCT273N

REFERENCE DESIGNATOR	CDS PART NUMBER	QTY.	PART DESCRIPTION	MFG. NUM.	MFG. PART NUMBER
U291	76602-07438	1	IC TTL S QUAD 2-INPUT NAND BUFFER W-OC	0107	74S38
U36	73006-74573	1	IC TTL AS OCTAL D-TYPE LATCH	0107	74AS573
U37	79825-88002	1	IC SUPER 8 CPU ROMLESS 20 MHZ	0117	Z08800A20PSC
U38	79814-00374	1	PAL PROGRAMMED C16L8 REV A 73A-332	0000	
U391,68	77203-07430	2	IC TTL ALS 8-INPUT NAND GATE	0107	74ALS30
U392	79814-00468	1	PAL PROGRAMMED 20L8 REV C 73A-SUPER 8	0000	
U46,28,292,691	73308-74244	4	IC TTL ALS OCTAL BUFFER NON-INVERTING	0107	74ALS1244
U49	71701-74682	1	IC TTL LS 8-BIT COMPARATOR	0107	74LS682
U55	79805-58256	1	IC CMOS 32K X 8 SRAM 120NS	0052	HM62256P-12
U56	79813-00276	1	PROGRAMMED PROM	0000	
U58	73308-74245	1	IC TTL ALS OCTAL BUS TRANSCEIVER	0107	74ALS245
U59	73313-74760	1	IC TTL AS OCTAL BUFFER NON-INV	0107	74AS760
U63	73300-07406	1	IC TTL HEX INVERTER BUFFER-DRIVER	0107	7406
U692,84,94	79008-74138	3	IC HCT 3-TO-8 LINE DECDR DEMULTIPLEXER	0107	74HCT138
U85	79008-74238	1	IC HCT 3-TO-8 LINE DECDR DEMULTIPLEXER	0107	74HCT238
U86	79814-00186	1	PAL PROGRAMMED 18P8L REV B 73A-256 AND 342	0000	
U88	79814-00467	1	PAL PROGRAMMED EP1810 REV A	0000	
U96	77825-07432	1	IC TTL ALS QUAD 2-INPUT OR GATE	0107	74ALS32
X37	45010-48100	1	SOCKET 48-PIN DIP	0089	ICN-486-S5-G
X56	45012-28128	1	SOCKET 28-PIN DIP MACHINED	0089	ICA-286-S-TG30
X79	42300-28105	1	FUSE SOCKET MICRO VERTICAL .025 LEADS .1 CNT	0061	281 005

REFERENCE DESIGNATOR	CDS PART NUMBER	QTY.	PART DESCRIPTION	MFG. NUM.	MFG. PART NUMBER
X88	45010-80186	1	SOCKET 68 PIN PLCC	0243	QILE68P-410T
Y57	89500-20000	1	CRYSTAL 20.000 MHZ 50 PPM	0062	MP-1 20.000