

NHRC REPEATER CONTROLLERS

NHRC-5 Repeater Controller

Bill Of Materials

Revised: Thursday, April 26, 2001

Revision: B

NHRC Repeater Controllers

444 Micol Road

Pembroke, NH 03275

603-485-2248

Item	Qty.	Ref.	Schematic Value		Description	Mfg.	Mfg. P/N	Notes
1	10	C1	1uF		1uF 16V Tantalum Cap	Panasonic	ECS-F1CE105K	
		C3	1uF		1uF 16V Tantalum Cap	Panasonic	ECS-F1CE105K	
		C4	1uF		1uF 16V Tantalum Cap	Panasonic	ECS-F1CE105K	
		C6	1uF		1uF 16V Tantalum Cap	Panasonic	ECS-F1CE105K	
		C7	1uF		1uF 16V Tantalum Cap	Panasonic	ECS-F1CE105K	
		C13	1uF		1uF 16V Tantalum Cap	Panasonic	ECS-F1CE105K	
		C14	1uF		1uF 16V Tantalum Cap	Panasonic	ECS-F1CE105K	
		C15	1uF		1uF 16V Tantalum Cap	Panasonic	ECS-F1CE105K	
		C29	1uF		1uF 16V Tantalum Cap	Panasonic	ECS-F1CE105K	
		C33	1uF		1uF 16V Tantalum Cap	Panasonic	ECS-F1CE105K	
2	16	C2	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
		C10	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
		C11	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
		C12	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
		C17	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
		C18	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
		C19	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
		C20	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
		C21	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
		C22	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
		C24	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
		C25	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
		C27	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
		C31	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
		C32	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
		C34	0.1uF		0.1uF 50V Z5U Ceramic Radial Cap	Panasonic	ECU-S1H104MEA	
3	2	C16	0.0068uF		0.0068uF 50V X7R Ceramic Radial Cap	Panasonic	ECU-S1H682KBA	
		C5	0.0068uF		0.0068uF 50V X7R Ceramic Radial Cap	Panasonic	ECU-S1H682KBA	
4	1	C8	220uF	25V	220uF 25V Aluminum Radial Electrolytic Cap	Panasonic	ECA-1EM221	
5	2	C30	22uF		22uF 25V Aluminum Radial Electrolytic Cap	Panasonic	ECA-1EM220	
		C9	22uF		22uF 25V Aluminum Radial Electrolytic Cap	Panasonic	ECA-1EM220	
6	1	C23	4.7uF		4.7uF 50V Aluminum Radial Electrolytic Cap	Panasonic	ECA-1HM4R7	

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Item	Qty.	Ref.	Schematic Value	Description	Mfg.	Mfg. P/N	Notes
7	4	C26 C28 C35 C36	33pF 33pF 33pF 33pF	33pF 100V C0G Ceramic Radial Cap 33pF 100V C0G Ceramic Radial Cap 33pF 100V C0G Ceramic Radial Cap 33pF 100V C0G Ceramic Radial Cap	Panasonic Panasonic Panasonic Panasonic	ECU-S2A330JCA ECU-S2A330JCA ECU-S2A330JCA ECU-S2A330JCA	Do Not Pop. Do Not Pop.
8	1	D1	1N4002	1A 100V Silicon Rectifier	Diodes Inc	1N4002	
9	3	D2 D3 D6	LED LED LED	Red T1 $\frac{3}{4}$ LED Red T1 $\frac{3}{4}$ LED Red T1 $\frac{3}{4}$ LED	Lite-On Lite-On Lite-On	LTL-4203 LTL-4203 LTL-4203	
10	4	D4 D5 D7 D8	LED LED LED LED	Green T1 $\frac{3}{4}$ LED Green T1 $\frac{3}{4}$ LED Green T1 $\frac{3}{4}$ LED Green T1 $\frac{3}{4}$ LED	Lite-On Lite-On Lite-On Lite-On	LTL-4233 LTL-4233 LTL-4233 LTL-4233	
11	2	D9 D10	LED LED	Yellow T1 $\frac{3}{4}$ LED Yellow T1 $\frac{3}{4}$ LED	Lite-On Lite-On	LTL-4253 LTL-4253	
12	1	F1	1/2 A	1.1A Polyswitch	Raychem	RUE110	
13	2	JP1 JP2	2 WAY JUMPER 2 WAY JUMPER	3 Circuit Header, .100" Straight 3 Circuit Header, .100" Straight	Molex Molex	22-03-2031 22-03-2031	
14	2	JP4 JP3	JUMPER JUMPER	2 Circuit Header, .100" Straight 2 Circuit Header, .100" Straight	Molex Molex	22-03-2021 22-03-2021	
15	2	J2 J1	CONNECTOR DB9F CONNECTOR DB9F	DB9F Right Angle Connector 0.318" PCB mount DB9F Right Angle Connector 0.318" PCB mount	NorComp NorComp	182-009-212-531 182-009-212-531	
16	1	J3	POWER JACK	Coaxial Power Jack, Right Angle PCB mount	Switchcraft	RAPC712	
17	2	J4 J5	3.5mm JACK 3.5mm JACK	3.5mm 2 Circuit Right Angle Jack, PCB mt. 3.5mm 2 Circuit Right Angle Jack, PCB mt.	Cui-Stack Cui-Stack	MJ-3536(N) MJ-3536(N)	
18	1	J6	HEADER 10	10 Circuit Header, .100" Right Angle w/ lock	Molex	22-05-3101	
19	2	J7 J8	HEADER 4 HEADER 4	4 Circuit Header, .100" Straight w/ lock 4 Circuit Header, .100" Straight w/ lock	Molex Molex	22-23-2041 22-23-2041	
20	3	Q1 Q2 Q3	IRF510 IRF510 IRF510	N Channel HEXFET N Channel HEXFET N Channel HEXFET	IRF IRF IRF	IRF510 IRF510 IRF510	
21	2	Q9 Q4	2N7000 2N7000	N Channel MOSFET N Channel MOSFET	Fairchild Fairchild	2N7000 2N7000	
22	4	Q5 Q6 Q7 Q8	2N3904 2N3904 2N3904 2N3904	NPN Transistor NPN Transistor NPN Transistor NPN Transistor	Fairchild Fairchild Fairchild Fairchild	2N3904 2N3904 2N3904 2N3904	
23	1	RP1	4.7K	4.7K x 8 Isolated Resistor Pack	Bourns	4116R-001-472	

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Item	Qty.	Ref.	Schematic Value	Description	Mfg.	Mfg. P/N	Notes
24	6	R1	100K	100K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 100K	
		R32	100K	100K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 100K	
		R33	100K	100K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 100K	
		R40	100K	100K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 100K	
		R44	100K	100K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 100K	
		R47	100K	100K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 100K	
25	18	R2	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R5	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R6	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R15	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R16	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R22	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R26	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R28	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R29	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R30	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R31	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R36	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R37	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R38	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R39	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R43	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R45	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
		R46	10K	10K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 10K	
26	2	R3	11.3K	11.3K ¼W 1% Metal Film Resistor	Yaego	MFR-25FBF 11K3	
		R23	11.3K	11.3K ¼W 1% Metal Film Resistor	Yaego	MFR-25FBF 11K3	
27	2	R4	93.1K	93.1K ¼W 1% Metal Film Resistor	Yaego	MFR-25FBF 93K1	
		R24	93.1K	93.1K ¼W 1% Metal Film Resistor	Yaego	MFR-25FBF 93K1	
28	6	R7	22K	22K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 22K	
		R8	22K	22K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 22K	
		R10	22K	22K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 22K	
		R11	22K	22K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 22K	
		R17	22K	22K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 22K	
		R19	22K	22K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 22K	
29	3	R9	33K	33K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 33K	
		R20	33K	33K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 33K	
		R41	33K	33K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 33K	

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Item	Qty.	Ref.	Schematic Value		Description	Mfg.	Mfg. P/N	Notes
30	3	R13	100		100 ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 100R	
		R14	100		100 ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 100R	
		R27	100		100 ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 100R	
31	1	R18	1K		1K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 1K0	
32	3	R25	470K		470K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 470K	
		R35	470K		470K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 470K	
		R42	470K		470K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 470K	
33	1	R34	5.1K		5.1K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 5K1	
34	1	R48	1.2K		1.2K ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 1K2	
35	8	R49	470		470 ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 470R	
		R50	470		470 ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 470R	
		R51	470		470 ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 470R	
		R52	470		470 ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 470R	
		R53	470		470 ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 470R	
		R54	470		470 ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 470R	
		R55	470		470 ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 470R	
		R56	470		470 ¼W 5% Carbon Film Resistor	Yaego	CFR-25JB 470R	
36		R12	0		Zero Ohm ¼W Jumper	Yaego	ZOR-25-B	
		R21	0		Zero Ohm ¼W Jumper	Yaego	ZOR-25-B	
37	1	U1	TL064		Quad JFET Input Op-Amp	TI	TL064CN	
38	1	U2	MAX4066		Quad SPST Analog Switch	Maxim	MAX4066	
39	1	U3	TL062		Dual JFET Input Op-Amp	TI	TL062CP	
40	2	U6	M-8870-01		DTMF Decoder	Teltone	M-8870-01	
		U4	M-8870-01		DTMF Decoder	Teltone	M-8870-01	
41	1	U5	LM7805CT		5V 1.0A Voltage Regulator	Nat'l Semi	LM340T-5.0	
42	1	U7	ISD2590P		90 sec. Voice Recorder/Playback	ISD	ISD2590P	
43	1	U8	PIC16F877-20/P		Microcontroller w/ 8K Flash Memory	Microchip	PIC16F877-20/P	
44	7	VR1	10K	POT	10K 6mm Carbon Trimpot	Panasonic	EVN-D8AA03B14	
		VR2	10K	POT	10K 6mm Carbon Trimpot	Panasonic	EVN-D8AA03B14	
		VR3	10K	POT	10K 6mm Carbon Trimpot	Panasonic	EVN-D8AA03B14	
		VR5	10K	POT	10K 6mm Carbon Trimpot	Panasonic	EVN-D8AA03B14	
		VR6	10K	POT	10K 6mm Carbon Trimpot	Panasonic	EVN-D8AA03B14	
		VR7	10K	POT	10K 6mm Carbon Trimpot	Panasonic	EVN-D8AA03B14	
		VR8	10K	POT	10K 6mm Carbon Trimpot	Panasonic	EVN-D8AA03B14	
45	2	VR9	200K	POT	200K 6mm Carbon Trimpot	Panasonic	EVN-D8AA03B25	
		VR4	200K	POT	200K 6mm Carbon Trimpot	Panasonic	EVN-D8AA03B25	
46	1	Y1	3.579MHz		16MHz Crystal	ECS	ECS-160-20-4	Do Not Pop.

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Item	Qty.	Ref.	Schematic Value	Description	Mfg.	Mfg. P/N	Notes
47	1	Y2	16MHz	3.579545MHz Crystal	ECS	ECS-35-17-4	
Additional Items							
48	1			NHRC-5 PCB rev B	NHRC	NHRC-5 PCB rev B	
49	1			40 Pin DIP Socket	Mill-Max	110-99-640-41-001	
50	2			18 Pin DIP Socket	Mill-Max	110-99-318-41-001	
51	2			14 Pin DIP Socket	Mill-Max	110-99-314-41-001	
52	1			8 Pin DIP Socket	Mill-Max	110-99-308-41-001	
53	1			10 Circuit Housing, .100" w/ lock and polarizer	Molex	22-01-3107	
54	2			4 Circuit Housing, .100" w/ lock and polarizer	Molex	22-01-3047	
55	18			Crimp Terminal for Molex Housing	Molex	08-50-0114	
56	6			Shorting Jumpers	3M	929950-00-I	