FF-800
Technical Manual

Technical Data for the FF-800
Repeater Control System

Revised October 6, 2024

FF SYSTEMS

www.ke0ff.org

"AFFORDABLE REPEATER CONTROL SOLUTIONS"

FF-800 Technical Manual

TABLE OF CONTENTS

Warranty

FF Systems warrants its products to be free from defects for one year from the date of shipment. FF Systems may opt to repair or replace (at our option) any defective product. FF Systems does not warrant any defect due to lightning or other natural disaster. Any user modifications or repairs to any product sold by FF Systems will void this warranty. All returns must be accompanied by a Return Material Authorization (RMA) number provided by FF Systems prior to shipment. Shipments that do not have the proper return authorization prominently noted on the outside of the package will not be accepted. The purchaser is responsible for all shipping charges for any service procedure(s) performed by FF Systems (including warranty service).

30 Day Money Back Guarantee

FF Systems offers a 30 day trial period on all products. The 30 day trial begins 5 calendar days after shipment from FF Systems. If the purchaser decides to return a product they must contact FF Systems for a Return Material Authorization (RMA) number on or before 6:00pm central time within 35 calendar days of the original shipment date. The purchaser then has fourteen additional days to return the merchandise to FF Systems. FF Systems claims no liability for lost or mis-directed shipments. The purchaser is responsible for all shipping charges.

Product Condition

Products must be in new condition or warranty repairable to qualify for refund. If merchandise incurs damage not covered under warranty, the refund will be delayed until the unit has been repaired and the cost of that repair shall be deducted from the refund. FF Systems is not responsible for damages incurred during shipment -- the purchaser should insure the merchandise for the purchase amount to avoid possible loss due to damage during shipment.

Contact Address

FF Systems

e-mail: joeh@ke0ff.org

web: www.ke0ff.org
www.github.com/ke0ff

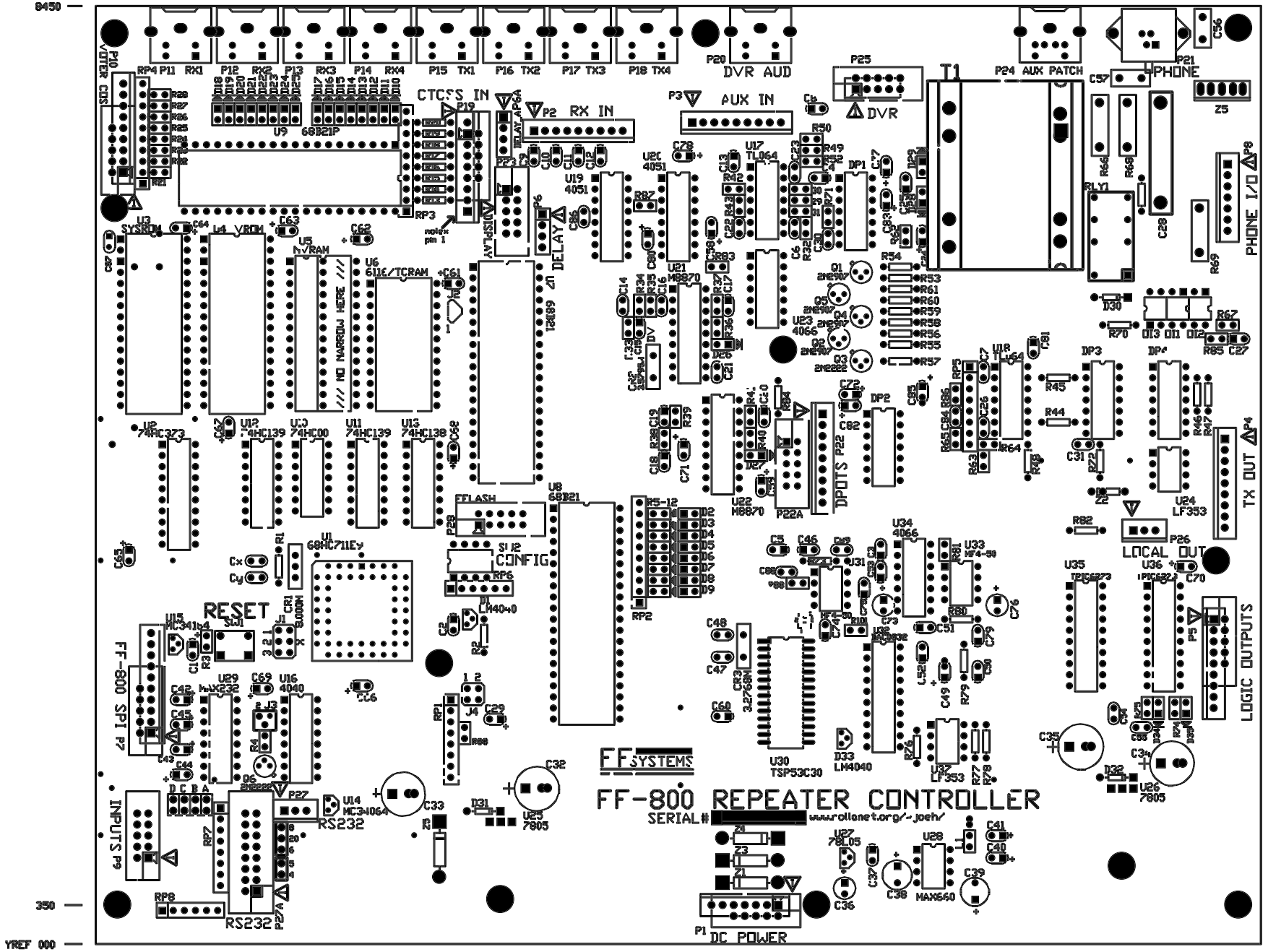
FF-800 Parts List	
Reference Designator	**Component Description**
C1, 24, 36, 42, 43, 44, 45, 58, 59, 60, 63, 65, 69, 73, 76, 78, 81, 83	10 UF electrolytic capacitor, 25V
C2, 17, 20, 29, 37, 40, 41, 46, 62, 64, 67, 68, 70, 71, 72, 74, 75, 77, 79, 80, 82, 87	0.1 UF ceramic capacitor, 50V
C3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 18	1.0 UF non-polarized electrolytic capacitor, 25V
C6, 7, 22, 23, 26, 30, 31	100 PF ceramic capacitor, 50V
C16, 19	470 PF ceramic capacitor, 50V
C21	33 PF ceramic capacitor, 50V
C25	0.001 UF ceramic capacitor, 50V
C28	1.0 UF ceramic capacitor, 200V
C32, 34	330 UF electrolytic capacitor, 25V
C33, 35, 38, 39	100 UF electrolytic capacitor, 35V
C47, 48	22 PF ceramic capacitor, 50V
C56, 57	220PF ceramic capacitor, 2KV
C61, 66	1.0 UF tantalumn capacitor, 16V
C84, 86	0.0047 UF ceramic capacitor 50V (not installed)
C85	4.7 UF electrolytic capacitor, 25V (not installed)
C89	0.01 UF ceramic capacitor, 50V
C90	0.1 UF ceramic chip capacitor, 50V
CR1	8.000MHz ceramic resonator w/ caps
CR2	3.5795MHz crystal, HC-49U
CR3	3.2768MHz crystal, HC-49U

FF-800 Parts List	
Reference Designator	**Component Description**
D1	LM4040-5.0, 5V ref. I.C.
D2 - 25	5.1V zener diode, 1W
D28, 29	qty 2, 1N914 diodes in series
D30, 31, 32	1N4001 diode
D36	BAS16 diode, SOT-23
DP1	DS1267-100 digital pot, 100K
DP2 - 4	DS1267-010 digital pot, 10K
L1	1000uH coil
LED1	Red LED, SMD 1206 pkg
OI1 - 3	Opto-isolator, NPN 4 pin DIP
Q1, 2, 4, 5	2N2907 PNP transistor
Q3	2N2222 NPN Transistor
Q7, 8	2N2907 PNP transistor, SOT-23
Q9	2N2222 NPN transistor, SOT-23
R01	10M ohm, 1/4W resistor
R02	3.3 K ohm, 1/4W resistor
R03	4.7K ohm, 1/4W resistor
R5 - 28	330 ohm, 1/4W resistor
R29, 30, 31, 32, 63	51K ohm, 1/4W resistor
R33, 101	5.1K ohm, 1/4W resistor
R34, 35, 38, 39, 42, 57, 64	100K ohm, 1/4W resistor
R36, 37, 40, 41	750K ohm, 1/4W resistor

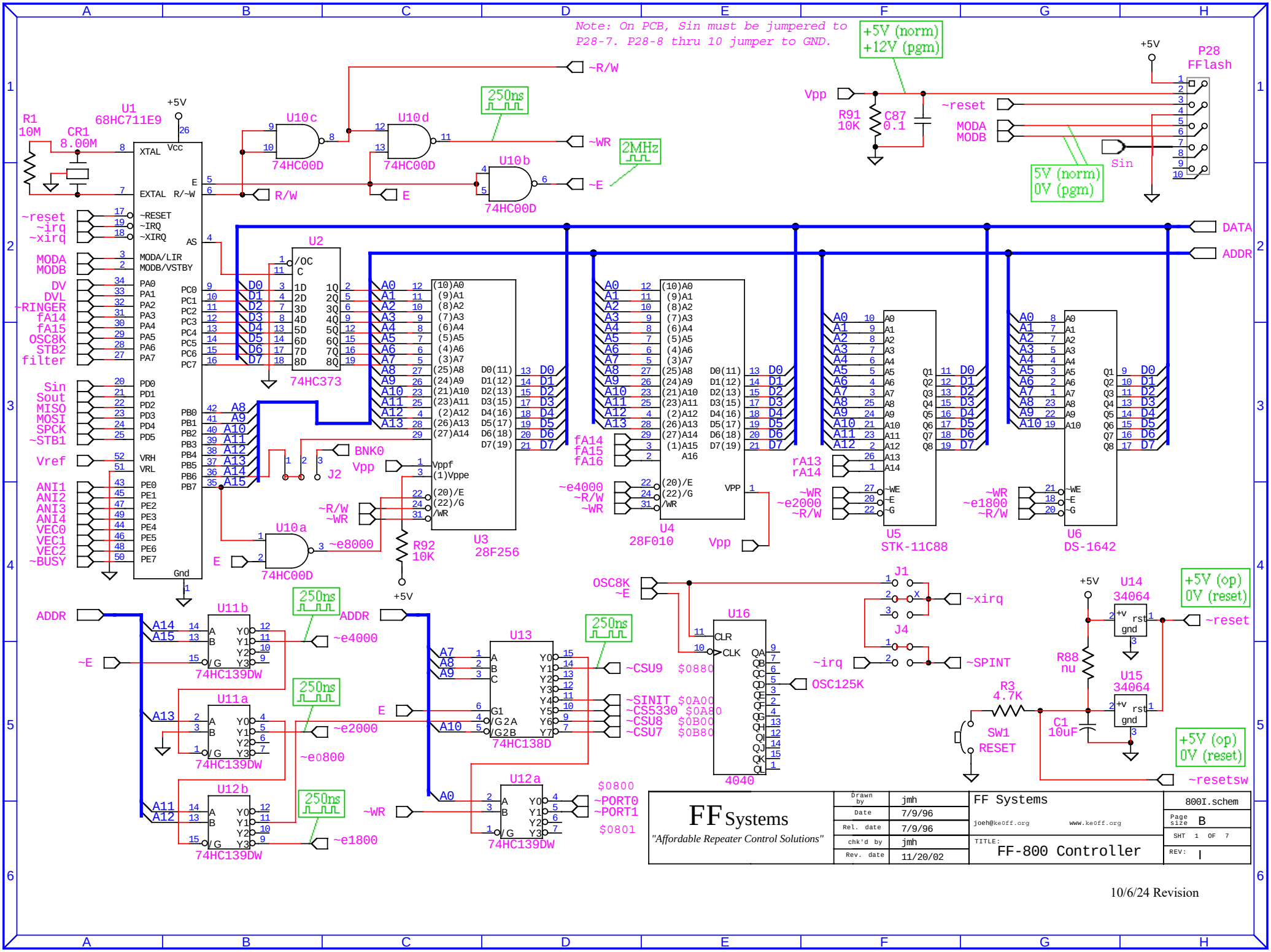
FF-800 Parts List	
Reference Designator	**Component Description**
R43, 49, 50, 52	6.2K ohm, 1/4W resistor
R44 - 48, 65, 66, 82, 83, 84	100 ohm, 1/4W resistor
R51	6.2K ohm, 1/8W resistor
R53 - 56, 58 - 61	20K ohm, 1/4W resistor
R62, 69	470 ohm, 1/4W resistor
R67, 85	10K ohm, 1/4W resistor
R68	18K ohm, 1/4W resistor
R70 - 73	510 ohm, 1/4W resistor
R86	2.4K ohm, 1/4W resistor
R87	12K ohm, 1/4W resistor
R89 - 94, 98, 99	20K ohm, 1/8W resistor
R95, 96	36K ohm, 1/8W resistor
R97, 100	1K ohm, 1/8W resistor
R103	330 ohm, 1/8W resistor
RLY1	DPDT Relay, 12V coil
RP1, 5	10K X 7 resistor pack
RP2 - 4	22K X 9 resistor pack
RP6	10K X 5 resistor pack
RP7	1K X 4 (indiv) resistor pack
RP8	2.2K X 5 resistor pack
SW1	mini push button switch, momentary contact, normally open
SW2	4 position DIP switch
T1	MIDCOM 671-0236 or equiv.

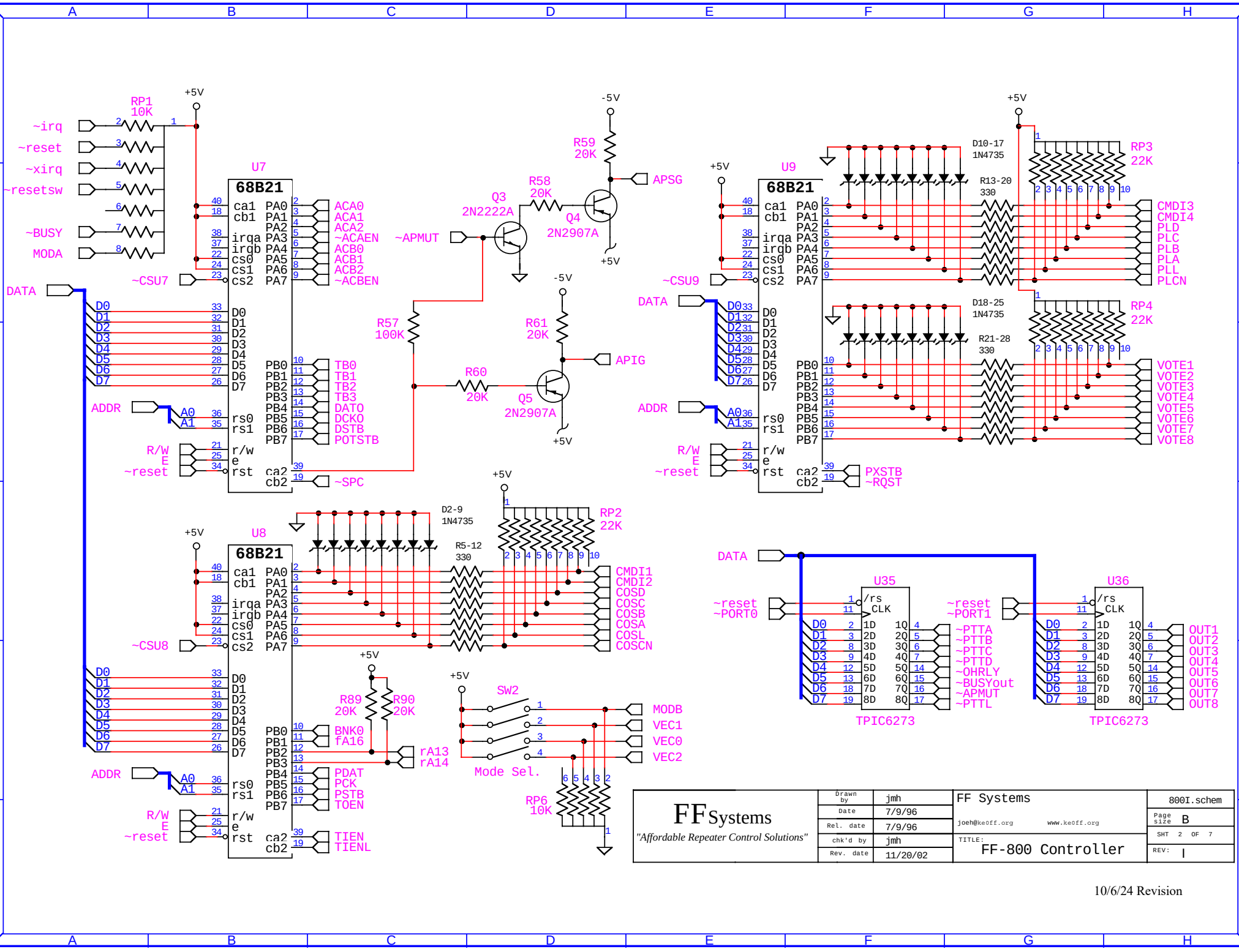
FF-800 Parts List	
Reference Designator	**Component Description**
U1	MC68HC711E9CFN2 microcontroller I.C.
U2	74HC373 hex latch I.C.
U3	28F256 32K x 8 FLASH memory I.C.
U4	28F010 64K x 8 FLASH memory I.C.
U5	STK11C88 32K x 8 NVRAM I.C.
U6	48T1512 2K timekeeper NVRAM I.C.
U7 - 9	MC68B21P PIA I.C.
U10	74HC00 quad NAND gate I.C.
U11, 12	74HC139 dual 2 input MUX I.C.
U13	74HC138 3 input MUX I.C.
U14, 15	MC34064 low voltage monitor I.C.
U16	CD4040 12 bit ripple counter I.C.
U17, 18	TL064 quad OPAMP I.C.
U19, 20	CD4051 1 of 8 analog MUX I.C.
U21, 22	M8870 DTMF receiver I.C.
U23	CD4066 quad analog switch I.C.
U24	LF353 dual OPAMP I.C.
U25, 26	M7805 5V regulator I.C., 1A
U27	78L05 5V regulator I.C., 100mA
U28	MAX660 dc-dc converter I.C.
U29	MAX232CPA RS-232 line xcvr I.C.
U30	TSP53C30 speech synthesizer I.C.
U31, 33	MF4-50 switched capacitor filter I.C.
U35, 36	TPIC6273 quad open drain, high current driver I.C.
Z1	15V tranzorb, 600W
Z2	PTC fuse, 100mA
Z3, 4, 6	6.8V tranzorb, 600W
Z5	gas tube, dual spark gap

Connector Designator	Connector Type	Function
P1	10 position dual row header, w/ shroud	DC POWER IN
P2	9 pin Molex header	RX IN
P4	9 pin Molex header	TX OUT
P5	10 position dual row header, w/ shroud	LOGIC OUTPUT
P6	4 pin SIP header	All ports Audio DELAY
P6A	4 pin SIP header	Port A only Audio DELAY
P7	10 position dual row header, w/ shroud	FF-800 SPI
P8	7 pin Molex header	PHONE I/O
P9	10 position dual row header, w/ shroud	INPUTS
P10	10 position dual row header, w/ shroud	VOTER COS
P11	4 pin mini-DIN female	RX1
P12	4 pin mini-DIN female	RX2
P13	4 pin mini-DIN female	RX3
P14	4 pin mini-DIN female	RX4
P15	4 pin mini-DIN female	TX1
P16	4 pin mini-DIN female	TX2
P17	4 pin mini-DIN female	TX3
P18	4 pin mini-DIN female	TX4
P19	10 position dual row header, w/ shroud	CTCSS IN
P20	4 pin mini-DIN female	DVR AUD
P21	4 pin RJ11 jack, right angle	Phone line in
P22	9 pin Molex header	DPOTS
P22A	10 position dual row header, w/ shroud	DPOTS
P23	10 position dual row header, w/ shroud	DISPLAY
P24	6 pin mini-DIN female	AUX PATCH
P25	10 position dual row header, w/ shroud	DVR
P26	3 pin Molex header	LOCAL OUT
P27	3 pin Molex header	RS232
P27A	16 position dual row header, w/ shroud	RS232 (alt)
P28	10 position dual row header, w/ shroud	FFLASH



10/6/24 Revision


Note: On PCB, Sin must be jumpered to P28-7. P28-8 thru 10 jumper to GND.
+5V (norm) +12V (pgm)
Vpp
R91 10K
C87 0.1
~reset
MODA
MODB
Sin
5V (norm) 0V (pgm)
+5V
P28 FFlash
U1 68HC711E9
R1 10M
CR1 8.00M
XTAL
EXTAL
Vcc
R/~W
E
AS
~RESET
~IRQ
~XIRQ
MODA/LIR
MODB/VSTBY
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PB0
PB1
PB2
PB3
PB4
PB5
PB6
PB7
PD0
PD1
PD2
PD3
PD4
PD5
VRH
VRL
PE0
PE1
PE2
PE3
PE4
PE5
PE6
PE7
Gnd
~reset
~irq
~xirq
MODA
MODB
DV
DVL
~RINGER
fA14
fA15
OSC8K
STB2
filter
Sin
Sout
MISO
MOSI
SPCK
~STB1
Vref
ANI1
ANI2
ANI3
ANI4
VEC0
VEC1
VEC2
~BUSY
U10c
74HC00D
U10d
74HC00D
U10b
74HC00D
~R/W
~WR
~E
250ns
2MHz
R/W
E
U2
74HC373
/OC
C
D0
D1
D2
D3
D4
D5
D6
D7
U3
28F256
U4
28F010
U5
STK-11C88
U6
DS-1642
DATA
ADDR
BNK0
J2
Vpp
Vppf
(1)Vppe
(20)/E
(22)/G
/WR
R92 10K
U10a
74HC00D
~e8000
~R/W
~WR
fA14
fA15
fA16
rA13
rA14
~e4000
~e2000
~e1800
U11b
74HC139DW
U11a
74HC139DW
U12b
74HC139DW
U13
74HC138D
U12a
74HC139DW
~e4000
~e2000
~e0800
~e1800
~CSU9 $0880
~SINIT $0A00
~CS5330 $0A80
~CSU8 $0B00
~CSU7 $0B80
$0800
~PORT0
~PORT1
$0801
U16
4040
OSC125K
J1
J4
~xirq
~SPINT
U14 34064
U15 34064
R88 nu
R3 4.7K
C1 10uF
SW1 RESET
+5V (op) 0V (reset)
~resetsw
FF Systems
"Affordable Repeater Control Solutions"
Drawn by jmh
Date 7/9/96
Rel. date 7/9/96
chk'd by jmh
Rev. date 11/20/02
FF Systems
joeh@ke0ff.org
www.ke0ff.org
TITLE: FF-800 Controller
800I.schem
Page size B
SHT 1 OF 7
REV: I
10/6/24 Revision



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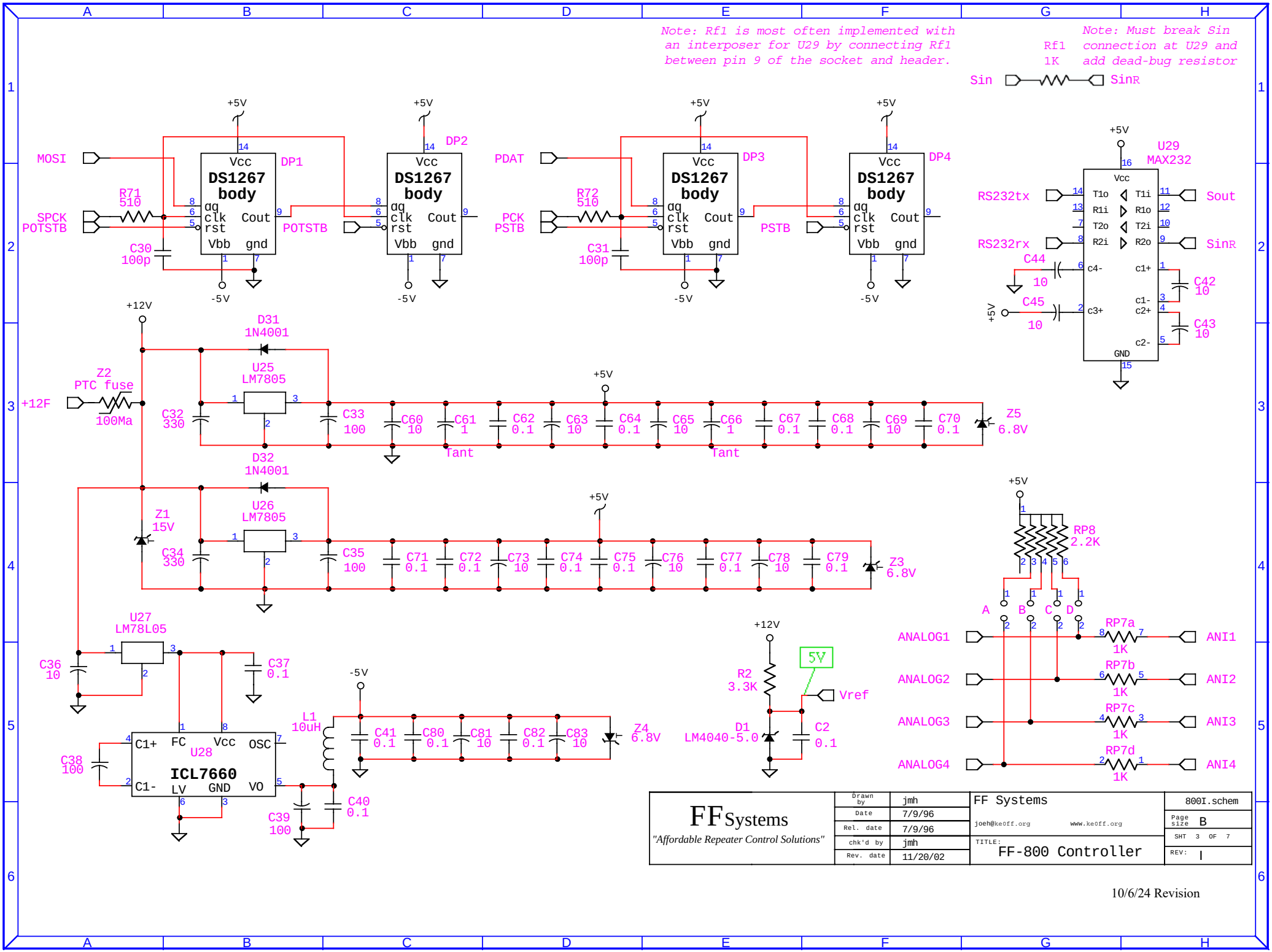
10/6/24 Revision


Note: Rf1 is most often implemented with an interposer for U29 by connecting Rf1 between pin 9 of the socket and header.
Note: Must break Sin connection at U29 and add dead-bug resistor
Rf1 1K
Sin
SinR
MOSI
SPCK
POTSTB
R71 510
C30 100p
DP1
DP2
DS1267 body
Vcc
clk
rst
Cout
Vbb
gnd
PDAT
PCK
PSTB
R72 510
C31 100p
DP3
DP4
+5V
-5V
U29 MAX232
RS232tx
RS232rx
Sout
SinR
C44 10
C45 10
C42 10
C43 10
+12V
+12F
Z2 PTC fuse
100Ma
D31 1N4001
D32 1N4001
U25 LM7805
U26 LM7805
C32 330
C33 100
C34 330
C35 100
C60 10
C61 1 Tant
C62 0.1
C63 10
C64 0.1
C65 10
C66 1 Tant
C67 0.1
C68 0.1
C69 10
C70 0.1
Z5 6.8V
Z1 15V
C71 0.1
C72 0.1
C73 10
C74 0.1
C75 0.1
C76 10
C77 0.1
C78 10
C79 0.1
Z3 6.8V
U27 LM78L05
C36 10
C37 0.1
U28 ICL7660
C1+
C1-
FC
LV
GND
VO
OSC
C38 100
C39 100
C40 0.1
L1 10uH
C41 0.1
C80 0.1
C81 10
C82 0.1
C83 10
Z4 6.8V
R2 3.3K
5V
Vref
D1 LM4040-5.0
C2 0.1
RP8 2.2K
A
B
C
D
RP7a 1K
RP7b 1K
RP7c 1K
RP7d 1K
ANALOG1
ANALOG2
ANALOG3
ANALOG4
ANI1
ANI2
ANI3
ANI4
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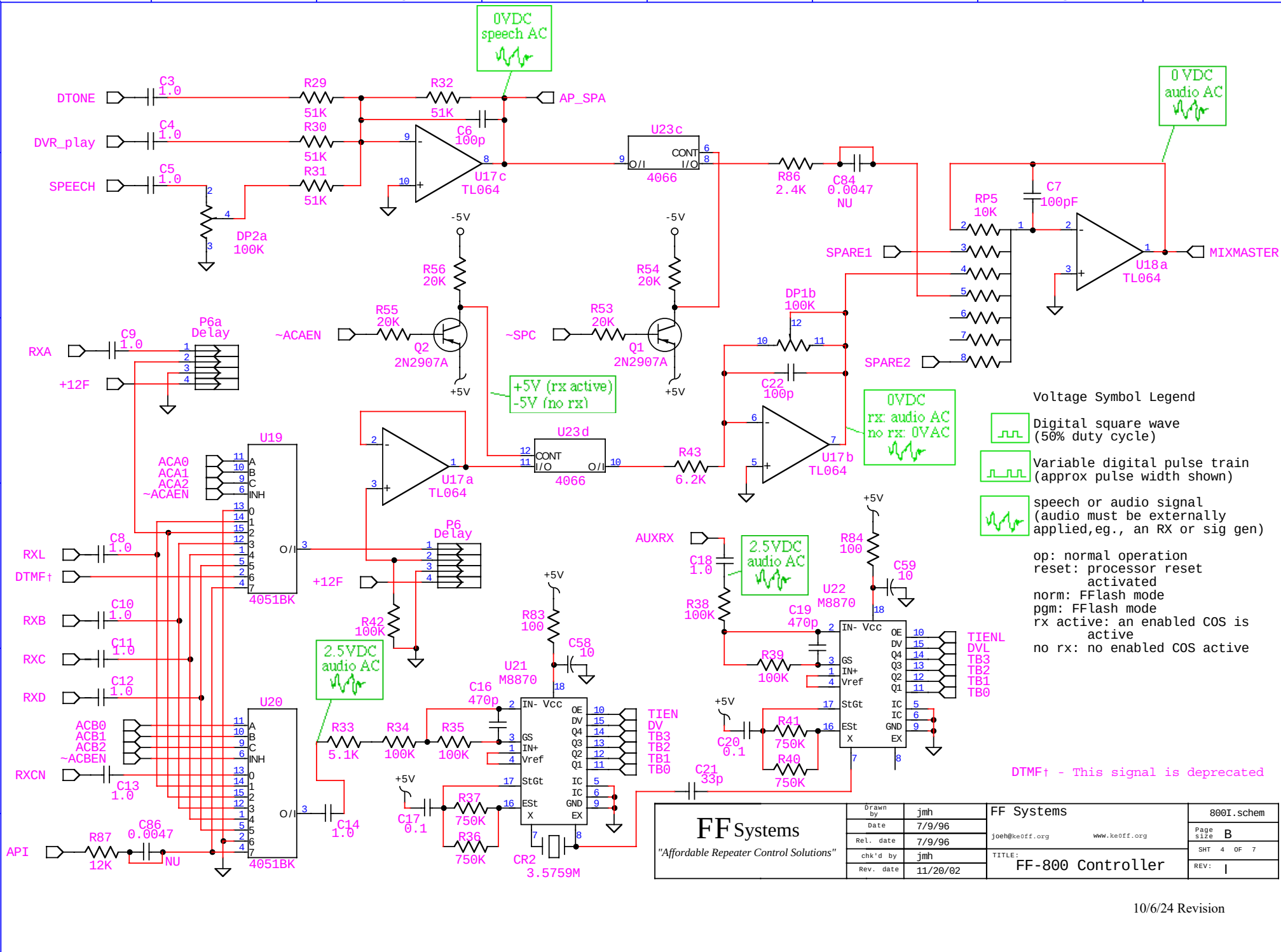
800I.schem
Page size B
SHT 3 OF 7
REV: I
10/6/24 Revision


0VDC speech AC
DTONE
DVR_play
SPEECH
C3 1.0
C4 1.0
C5 1.0
R29 51K
R30 51K
R31 51K
R32 51K
C6 100p
U17c TL064
DP2a 100K
AP_SPA
U23c 4066
R86 2.4K
C84 0.0047 NU
0 VDC audio AC
RP5 10K
C7 100pF
U18a TL064
MIXMASTER
SPARE1
SPARE2
DP1b 100K
C22 100p
R56 20K
R55 20K
Q2 2N2907A
~ACAEN
R54 20K
R53 20K
Q1 2N2907A
~SPC
-5V
+5V
+5V (rx active)
-5V (no rx)
U23d 4066
R43 6.2K
U17b TL064
0VDC rx: audio AC no rx: 0VAC
RXA
+12F
C9 1.0
P6a Delay
U17a TL064
U19
ACA0
ACA1
ACA2
~ACAEN
4051BK
RXL
DTMF†
RXB
RXC
RXD
C8 1.0
C10 1.0
C11 1.0
C12 1.0
P6 Delay
R42 100K
2.5VDC audio AC
U20
ACB0
ACB1
ACB2
~ACBEN
RXCN
C13 1.0
C14 1.0
API
R87 12K
C86 0.0047 NU
R33 5.1K
R34 100K
R35 100K
U21 M8870
C16 470p
R83 100
C58 10
R37 750K
R36 750K
C17 0.1
CR2 3.5759M
TIEN
DV
TB3
TB2
TB1
TB0
AUXRX
C18 1.0
R38 100K
R84 100
C59 10
U22 M8870
C19 470p
R39 100K
C20 0.1
R41 750K
R40 750K
C21 33p
TIENL
DVL
TB3
TB2
TB1
TB0
Voltage Symbol Legend
Digital square wave (50% duty cycle)
Variable digital pulse train (approx pulse width shown)
speech or audio signal (audio must be externally applied,eg., an RX or sig gen)
op: normal operation
reset: processor reset activated
norm: FFlash mode
pgm: FFlash mode
rx active: an enabled COS is active
no rx: no enabled COS active
DTMF† - This signal is deprecated
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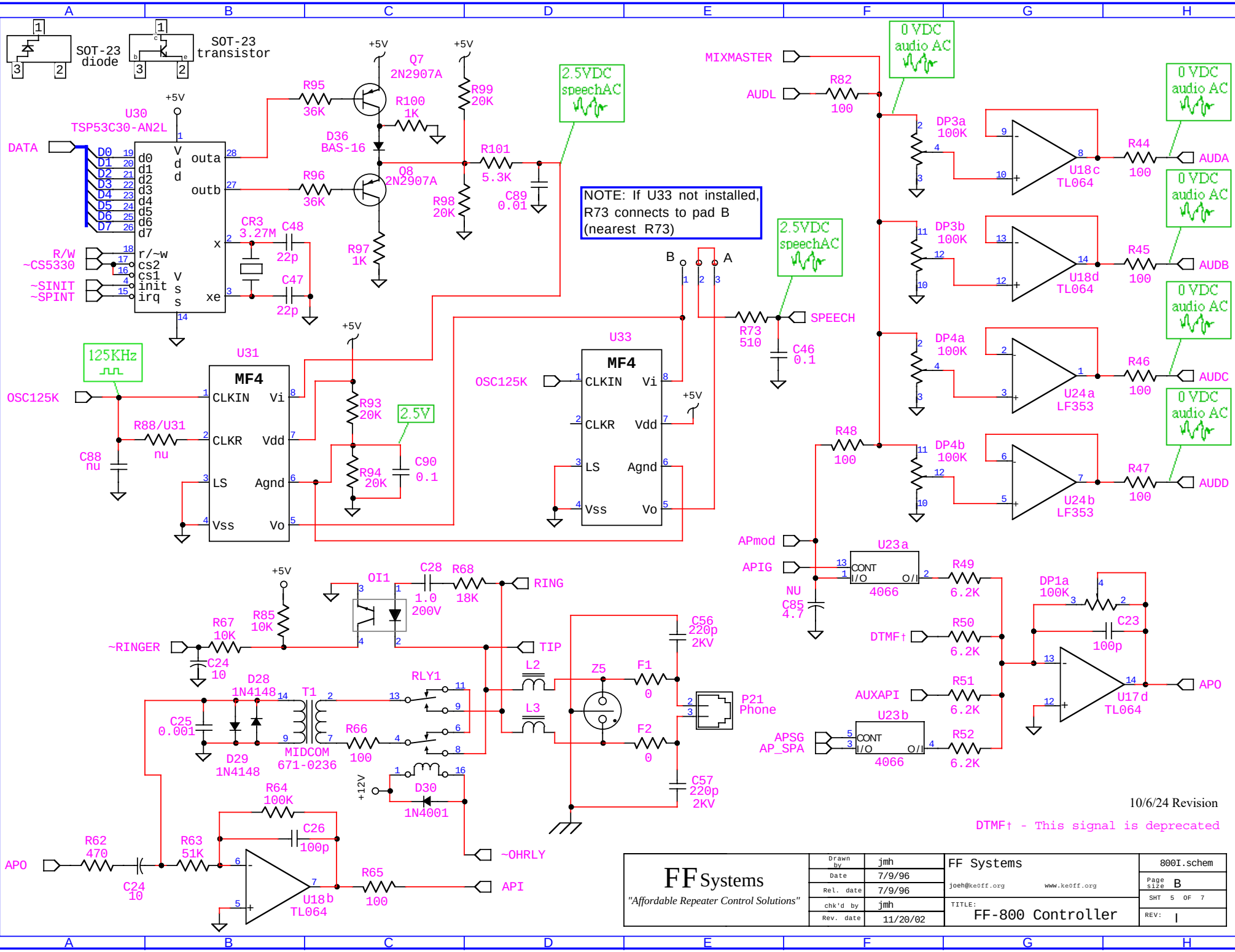
800I.schem
Page size B
SHT 4 OF 7
REV: I
10/6/24 Revision


SOT-23 diode
SOT-23 transistor
U30 TSP53C30-AN2L
DATA
R/W ~CS5330
~SINIT ~SPINT
Q7 2N2907A
Q8 2N2907A
R95 36K
R96 36K
R97 1K
R99 20K
R100 1K
R101 5.3K
R98 20K
C89 0.01
D36 BAS-16
CR3 3.27M
C48 22p
C47 22p
2.5VDC speechAC
NOTE: If U33 not installed, R73 connects to pad B (nearest R73)
R73 510
C46 0.1
SPEECH
U31 MF4
U33 MF4
125KHz
OSC125K
R88/U31 nu
C88 nu
R93 20K
R94 20K
C90 0.1
2.5V
MIXMASTER
AUDL
R82 100
0 VDC audio AC
DP3a 100K
DP3b 100K
DP4a 100K
DP4b 100K
U18c TL064
U18d TL064
U24a LF353
U24b LF353
R44 100
R45 100
R46 100
R47 100
R48 100
AUDA
AUDB
AUDC
AUDD
APmod
APIG
NU
C85 4.7
U23a 4066
U23b 4066
R49 6.2K
R50 6.2K
R51 6.2K
R52 6.2K
DTMF↑
AUXAPI
APSG
AP_SPA
DP1a 100K
C23 100p
U17d TL064
APO
~RINGER
R67 10K
R85 10K
C24 10
OI1
C28 1.0 200V
R68 18K
RING
TIP
RLY1
D28 1N4148
D29 1N4148
T1 MIDCOM 671-0236
C25 0.001
R66 100
L2
L3
Z5
F1 0
F2 0
C56 220p 2KV
C57 220p 2KV
P21 Phone
+12V
D30 1N4001
~OHRLY
R64 100K
C26 100p
R62 470
R63 51K
C24 10
U18b TL064
R65 100
API
10/6/24 Revision
DTMF↑ - This signal is deprecated
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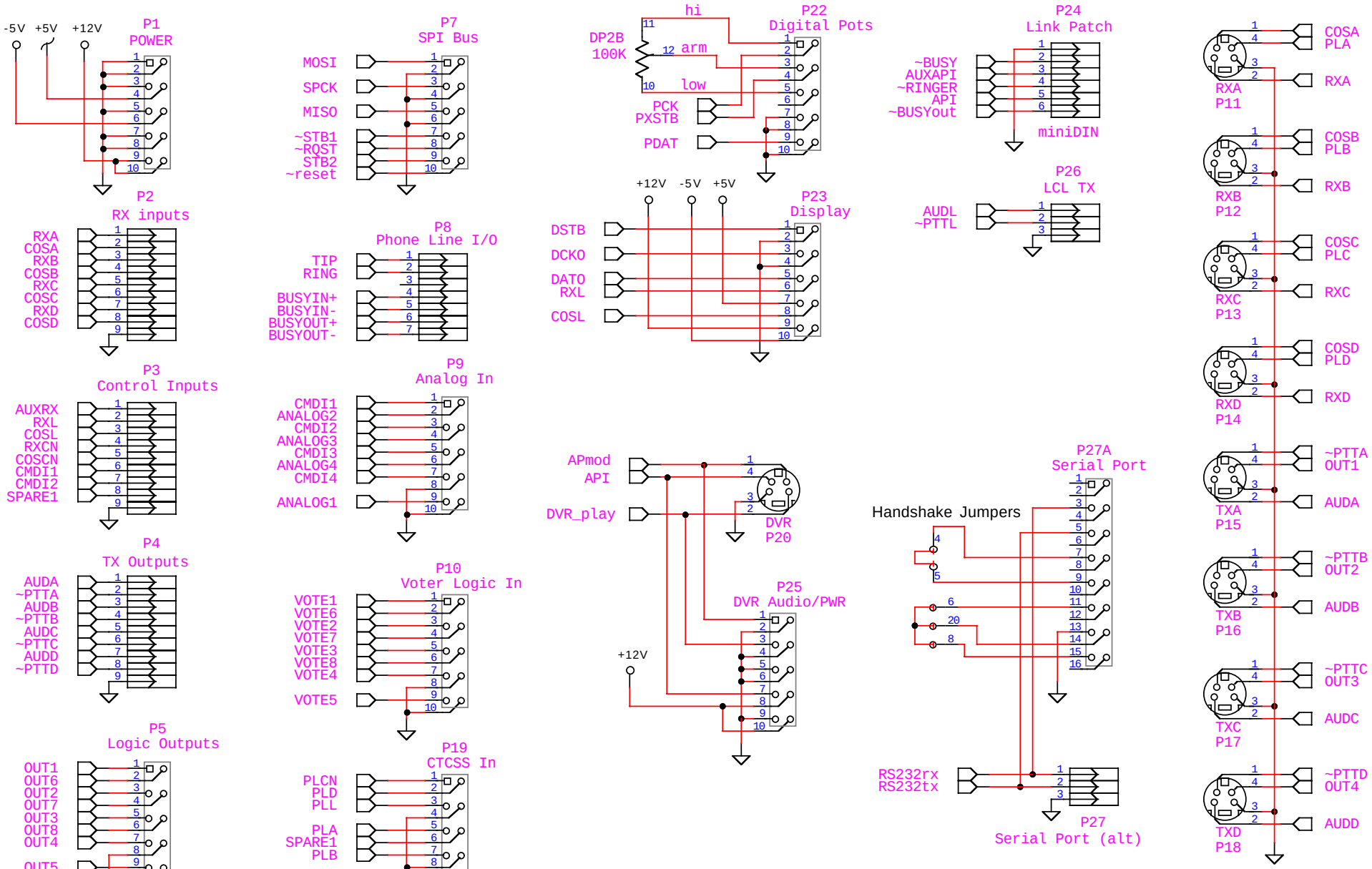
Page size B
SHT 5 OF 7
REV: I



Rev H+ Factory Standard Connectors.
Note: Many of these connectors have revE/G patterns available (except P9 & P23). These legacy patterns may be filled at the factory per customer request. Refer to the RevE/G connector sheet for legacy pinouts. For each connector, only one pattern can be filled. When used with a 10 pin ribbon to DB-9 cable, the DB-9 pinouts will match those shown in the original printed FF-800 Operation Manual.

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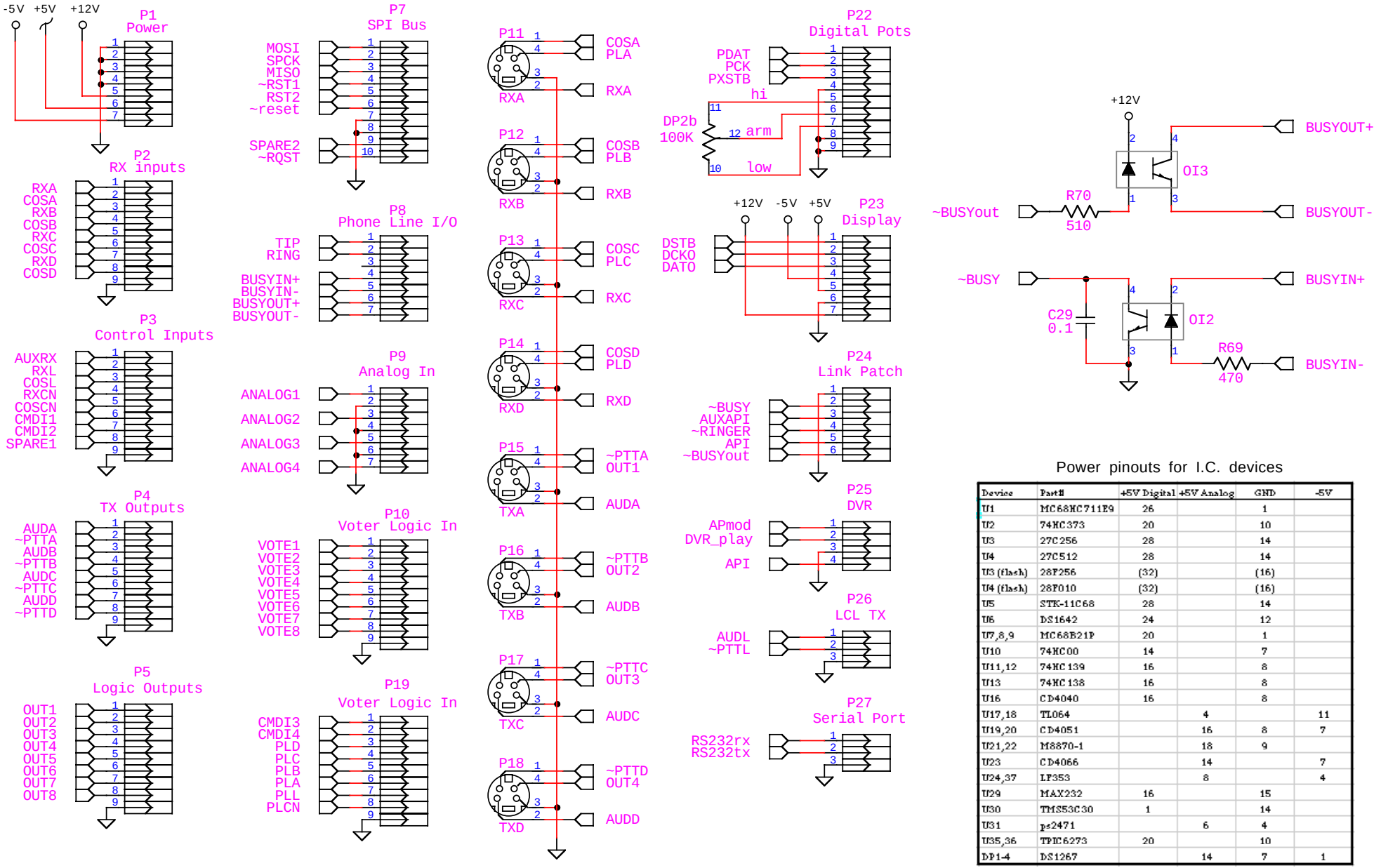
10/6/24 Revision



Power pinouts for I.C. devices

Device	Part#	+5V Digital	+5V Analog	GND	-5V
U1	MC68HC711E9	26		1	
U2	74HC373	20		10	
U3	27C256	28		14	
U4	27C512	28		14	
U3 (flash)	28F256	(32)		(16)	
U4 (flash)	28F010	(32)		(16)	
U5	STK-11C68	28		14	
U6	DS1642	24		12	
U7,8,9	MC68B21P	20		1	
U10	74HC00	14		7	
U11,12	74HC139	16		8	
U13	74HC138	16		8	
U16	CD4040	16		8	
U17,18	TL064		4		11
U19,20	CD4051		16	8	7
U21,22	M8870-1		18	9	
U23	CD4066		14		7
U24,37	LF353		8		4
U29	MAX232	16		15	
U30	TMS53C30	1		14	
U31	ps2471		6	4	
U35,36	TPIC6273	20		10	
DP1-4	DS1267		14	7	1

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RevE/G Legacy Connector Pinouts.
Note: These pinouts are included for reference to support previous hardware releases. These pinouts are not supplied with the current product revision unless requested at the time of the original order.

10/6/24 Revision

FF-800 Connector Pinouts (Revision H+)

P1 (10pin dual row)
Power

Pin#	Description
1	GND
2	GND
3	GND
4	+5V out
5	GND
6	-5V out
7	GND
8	GND
9	+12V in
10	+12V in

P2 (9 pin Molex)
Receiver Inputs

Pin#	Description
1	RXA audio input
2	RXA COS input
3	RXB audio input
4	RXB COS input
5	RXC audio input
6	RXC COS input
7	RXD audio input
8	RXD COS input
9	GND

P3 (9 pin Molex)
Aux. Inputs

Pin#	Description
1	Aux. DTMF audio input
2	Local RX audio input
3	Local RX COS input
4	Cntl. RX audio input
5	Cntl. RX COS input
6	Command Trigger 1 in
7	Command Trigger 2 in
8	Spare audio input
9	GND

P4 (9 pin Molex)
Transmitter Ouputs

Pin#	Description
1	TXA audio output
2	~TXA PTT output
3	TXB audio output
4	~TXB PTT output
5	TXC audio output
6	~TXC PTT output
7	TXD audio output
8	~TXD PTT output
9	GND

P5 (10pin dual row)
Logic Ouputs

Pin#	Description
1	Output# 1
2	Output# 6
3	Output# 2
4	Output# 7
5	Output# 3
6	Output# 8
7	Output# 4
8	GND
9	Output# 5
10	GND

P6 (4 pin single row)
Main Audio Delay

Pin#	Description
1	Audio to delay module
2	Audio from delay
3	GND
4	+12V

P6a (4 pin single row)
RXA Audio Delay

Pin#	Description
1	Audio to delay module
2	Audio from delay
3	GND
4	+12V

P7 (10pin dual row)
SPI Bus

Pin#	Description
1	MOSI
2	GND
3	SPCK
4	GND
5	MISO
6	GND
7	~strobe1
8	~RQST
9	strobe2
10	~reset

P8 (7 pin Molex)
Phone Line I/O

Pin#	Description
1	TIP
2	RING
3	n/c
4	BUSYIN+
5	BUSYIN-
6	BUSYOUT+
7	BUSYOUT-

P9 (10pin dual row)
Analog Inputs

Pin#	Description
1	Command Trigger 1 in
2	Analog#2 in
3	Command Trigger 2 in
4	Analog#3 in
5	Command Trigger 3 in
6	Analog#4 in
7	Command Trigger 4 in
8	GND
9	Analog#1 in
10	GND

P10 (10pin dual row)
Voter Logic Inputs

Pin#	Description
1	VOTE#1
2	VOTE#6
3	VOTE#2
4	VOTE#7
5	VOTE#3
6	VOTE#8
7	VOTE#4
8	GND
9	VOTE#5
10	GND

P11 (4 pin mini-DIN)
RX Port A

Pin#	Description
1	Port A COS
2	Port A RX audio
3	GND
4	Port A CTCSS

P12 (4 pin mini-DIN)
RX Port B

Pin#	Description
1	Port B COS
2	Port B RX audio
3	GND
4	Port B CTCSS

P13 (4 pin mini-DIN)
RX Port C

Pin#	Description
1	Port B COS
2	Port B RX audio
3	GND
4	Port B CTCSS

P14 (4 pin mini-DIN)
RX Port D

Pin#	Description
1	Port D COS
2	Port D RX audio
3	GND
4	Port D CTCSS

P15 (4 pin mini-DIN)
TX Port A

Pin#	Description
1	~Port A PTT
2	Port A TX audio
3	GND
4	Logic output# 1

P16 (4 pin mini-DIN)
TX Port B

Pin#	Description
1	~Port B PTT
2	Port B TX audio
3	GND
4	Logic output# 2

P17 (4 pin mini-DIN)
TX Port C

Pin#	Description
1	~Port C PTT
2	Port C TX audio
3	GND
4	Logic output# 3

P18 (4 pin mini-DIN)
TX Port D

Pin#	Description
1	~Port D PTT
2	Port D TX audio
3	GND
4	Logic output# 4

P19 (10 pin dual row)
CTCSS Logic Inputs

Pin#	Description
1	Cntl. RX CTCSS in
2	Port D CTCSS in
3	Local CTCSS in
4	GND
5	Port A CTCSS in
6	Spare audio in
7	Port B CTCSS in
8	GND
9	Port C CTCSS in
10	GND

20 (4 pin mini-DIN)
EXT DVR Audio

Pin#	Description
1	DVR audio in A (rec)
2	DVR audio out (play)
3	GND
4	DVR audio in B (rec)

P21 (4 pin RJ-11)
Phone Line

Pin#	Description
1	n/c
2	TIP
3	RING
4	n/c

P22 (10 pin dual row)
Ext. Digital Pots

Pin#	Description
1	Aux pot HI
2	P_CLK
3	Aux pot ARM
4	P_STROBE
5	Aux pot LO
6	n/c
7	GND
8	GND
9	P_DATA
10	GND

P23 (10 pin dual row)
Display

Pin#	Description
1	D_STROBE
2	GND
3	D_CLK
4	GND
5	D_DATA
6	Lcl RX Audio in
7	+5V
8	Lcl RX COS
9	+12V
10	-5V

P24 (6 pin mini-DIN)
Link Patch

Pin#	Description
1	GND
2	~BUSY in
3	AUX audio (to patch)
4	~RING
5	Audio (from patch)
6	~BUSY out
7	GND

P25 (10 pin dual row)
DVR Audio/PWR

Pin#	Description
1	DVR audio in A (rec)
2	GND
3	DVR audio out (play)
4	GND
5	GND
6	GND
7	DVR audio in B (rec)
8	+12V
9	GND
10	+12V

P26 (3 pin Molex)
Local TX Port

Pin#	Description
1	LCL Audio out
2	~LCL_PTT
3	GND

P27a (16 pin dual row)
RS-232 Serial I/O Port

Pin#	Description
1	n/c
2	n/c
3	FF-800 serial in
4	n/c
5	FF-800 serial out
6	n/c
7	Jump pad 4
8	n/c
9	Jump pad 5
10	n/c
11	Jump pad 6
12	n/c
13	GND
14	Jump pad 20
15	Jump pad 8
16	n/c

P28 (10 pin dual row)
FFLASH Control

Pin#	Description
1	+5V
2	Vpp
3	~reset
4	GND
5	MODA
6	MODB
7	(jumper to Sin)
8	(jumper to GND)
9	(jumper to GND)
10	(jumper to GND)

FF-800 Connector Pinouts (Revision E/G)

P1 (7 pin Molex)
Power

Pin#	Description
1	GND
2	GND
3	GND
4	GND
5	+12V in
6	+5V out
7	-5V out

P2 (9 pin Molex)
Receiver Inputs

Pin#	Description
1	RXA audio input
2	RXA COS input
3	RXB audio input
4	RXB COS input
5	RXC audio input
6	RXC COS input
7	RXD audio input
8	RXD COS input
9	GND

P3 (9 pin Molex)
Aux. Inputs

Pin#	Description
1	Aux. DTMF audio input
2	Local RX audio input
3	Local RX COS input
4	Cntl. RX audio input
5	Cntl. RX COS input
6	Command Trigger 1 in
7	Command Trigger 2 in
8	Spare audio input
9	GND

P4 (9 pin Molex)
Transmitter Ouputs

Pin#	Description
1	TXA audio output
2	~TXA PTT output
3	TXB audio output
4	~TXB PTT output
5	TXC audio output
6	~TXC PTT output
7	TXD audio output
8	~TXD PTT output
9	GND

P5 (9 pin Molex)
Logic Ouputs

Pin#	Description
1	Output# 1
2	Output# 2
3	Output# 3
4	Output# 4
5	Output# 5
6	Output# 6
7	Output# 7
8	Output# 8
9	GND

P6 (4 pin single row)
Main Audio Delay

Pin#	Description
1	Audio to delay module
2	Audio from delay
3	GND
4	+12V

P6a (4 pin single row)
RXA Audio Delay

Pin#	Description
1	Audio to delay module
2	Audio from delay
3	GND
4	+12V

P7 (10 pin Molex)
SPI Bus

Pin#	Description
1	MOSI
2	SPCK
3	MISO
4	~strobe1
5	strobe2
6	~reset
7	GND
8	GND
9	Spare audio in
10	~RQST in

P8 (7 pin Molex)
Phone Line I/O

Pin#	Description
1	TIP
2	RING
3	n/c
4	BUSYIN+
5	BUSYIN-
6	BUSYOUT+
7	BUSYOUT-

P9 (7 pin Molex)
Analog Inputs

Pin#	Description
1	Analog#1 in
2	GND
3	Analog#2 in
4	GND
5	Analog#3 in
6	GND
7	Analog#4 in

P10 (9 pin Molex)
Voter Logic Inputs

Pin#	Description
1	VOTE#1
2	VOTE#2
3	VOTE#3
4	VOTE#4
5	VOTE#5
6	VOTE#6
7	VOTE#7
8	VOTE#8
9	GND

P11 (4 pin mini-DIN)
RX Port A

Pin#	Description
1	Port A COS
2	Port A RX audio
3	GND
4	Port A CTCSS

P12 (4 pin mini-DIN)
RX Port B

Pin#	Description
1	Port B COS
2	Port B RX audio
3	GND
4	Port B CTCSS

P13 (4 pin mini-DIN)
RX Port C

Pin#	Description
1	Port B COS
2	Port B RX audio
3	GND
4	Port B CTCSS

P14 (4 pin mini-DIN)
RX Port D

Pin#	Description
1	Port D COS
2	Port D RX audio
3	GND
4	Port D CTCSS

P15 (4 pin mini-DIN)
TX Port A

Pin#	Description
1	~Port A PTT
2	Port A TX audio
3	GND
4	Logic output# 1

P16 (4 pin mini-DIN)
TX Port B

Pin#	Description
1	~Port B PTT
2	Port B TX audio
3	GND
4	Logic output# 2

P17 (4 pin mini-DIN)
TX Port C

Pin#	Description
1	~Port C PTT
2	Port C TX audio
3	GND
4	Logic output# 3

P18 (4 pin mini-DIN)
TX Port D

Pin#	Description
1	~Port D PTT
2	Port D TX audio
3	GND
4	Logic output# 4

P19 (9 pin Molex)
CTCSS Logic Inputs

Pin#	Description
1	Command Trigger 3 in
2	Command Trigger 4 in
3	Port D CTCSS in
4	Port C CTCSS in
5	Port B CTCSS in
6	Port A CTCSS in
7	Local CTCSS in
8	Cntl. RX CTCSS in
9	GND

20 (4 pin mini-DIN)
EXT DVR Audio

Pin#	Description
1	DVR audio in A (rec)
2	DVR audio out (play)
3	GND
4	DVR audio in B (rec)

P21 (4 pin RJ-11)
Phone Line

Pin#	Description
1	n/c
2	TIP
3	RING
4	n/c

P22 (9 pin Molex)
Ext. Digital Pots

Pin#	Description
1	P_DATA
2	P_CLK
3	P_STROBE
4	GND
5	Aux pot HI
6	Aux pot ARM
7	Aux pot LO
8	GND
9	GND

P23 (7 pin Molex)
Display

Pin#	Description
1	D_STROBE
2	D_CLK
3	D_DATA
4	-5V
5	+5V
6	GND
7	+12V

P24 (6 pin mini-DIN)
Link Patch

Pin#	Description
1	GND
2	~BUSY in
3	AUX audio (to patch)
4	~RING
5	Audio (from patch)
6	~BUSY out
7	GND

P25 (4 pin Molex)
DVR Audio

Pin#	Description
1	DVR audio in A (rec)
2	DVR audio out (play)
3	GND
4	DVR audio in B (rec)

P26 (3 pin Molex)
Local TX Port

Pin#	Description
1	LCL Audio out
2	~LCL_PTT
3	GND

P27 (3 pin Molex)
RS-232 Serial I/O Port

Pin#	Description
1	FF-800 serial in
2	FF-800 serial out
3	GND

P28 (6 pin dual row)
FFLASH Control

Pin#	Description
1	+5V
2	~reset
3	MODA
4	Vpp
5	GND
6	MODB

FF-180 Chassis

The FF-180 chassis enclosure provides a convenient means for rack mounting the FF-800 system. The chassis includes cut-outs for DB-9 type connectors, provision for an optional LED display module, and has room for an FF-8070 DVR and up to 2 user supplied prototype cards. This manual describes the physical and electrical characteristics of the basic chassis along with installation instructions.

In addition to the connectors supplied with the FF-800, the FF-180 chassis includes the following connectors and accessories:

Quantity	Description
2	DB-9 female ribbon cable assemblies
4	Jack screws and associated hardware
1	Female DB-9, solder cup terminations
2	Male DB-9, solder cup terminations
3	DB-9 shielded hood
1	1A fuse (installed)

The user must supply suitable cable for completing the connection of the chassis to their system (reasonably good 4 and 9 conductor shielded cables are available from most electronic supply outlets).

The ribbon cable assemblies may be installed at the appropriate cut-out location(s) as desired. If needed, additional cables may be purchased from FF Systems.

Basic Installation

Using the FF-800 manual as a guide, construct mini-DIN cables for your receiver and transmitter. The only remaining connection required is the power connection on the FF-180. Using the female DB-9 supplied with the FF-180, connect +12V (nominal, +15V Max) to pin 1 of the DB-9. Connect ground to pins 6-9. Wrap the DB-9 connections with one or two layers of electrical tape and install the DB-9 hood. De-energize the +12V supply and install the DB-9 power connector at P208 on the chassis back panel. Use an ohm meter to check the power supply for shorts. If the ohm meter check is OK, energize the +12V supply and turn on the front panel power switch. The power LED should illuminate and the FF-800 should key up the TX and send its announcement message.

Advanced Istallation

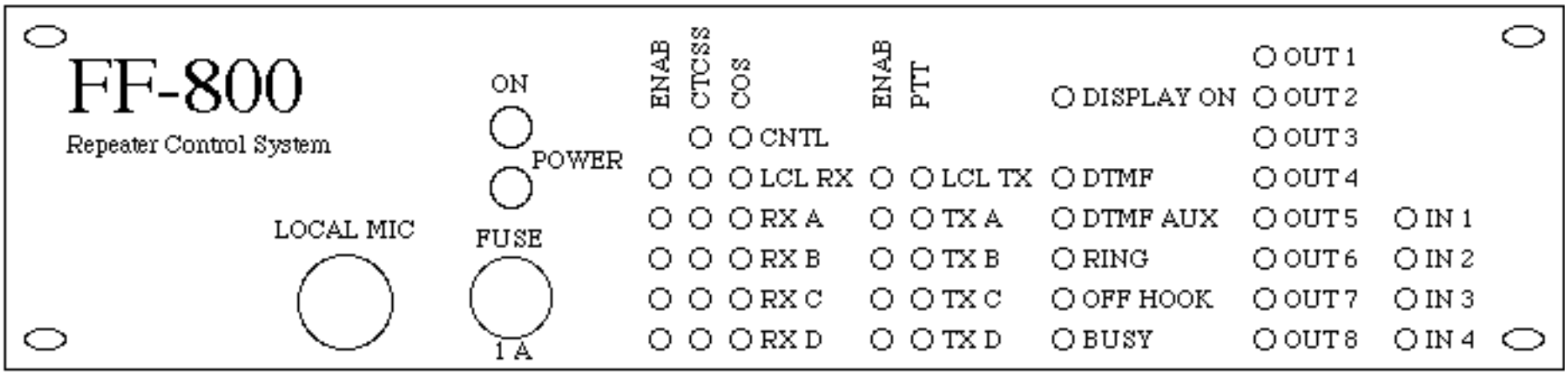
The front/back and top views of the chassis are shown in figures 1 and 2, respectively. The placement of the FF-800 is such that the DIN type connectors (phone, P11-18, P20, and P24) are against the back of the chassis where they are accessed via round or square hole openings.

The remaining panel cut-outs are are rectangular and are designed to to accept a DB-9, or DB-15E (high density) connectors (male or female). Most of these cut-outs are labled, but have no connector installed. These labled cut-outs indicate that there is a pre-defined connector (i.e., one of the two DB-9 ribbon cables supplied) that may be installed which has a pinout described in the "Chassis Connector Pinouts" section. The un-labled cut-outs are available for user defined connections.

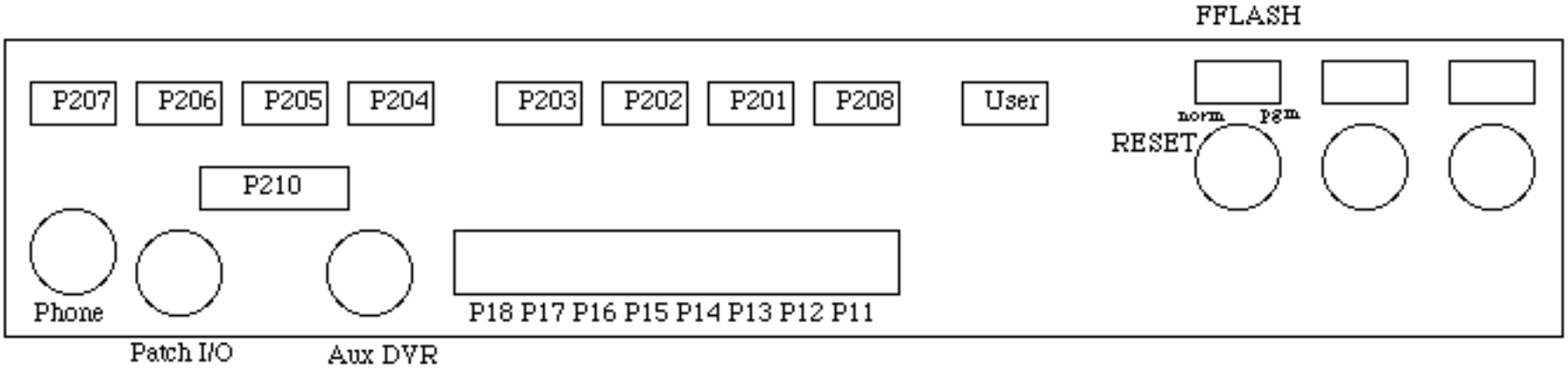
While the FF-800 manual does not describe the pinouts for the DB-9 connections, it does describe the signals and how they might be connected. Use the FF-800 manual as a guide in conjunction with the "Chassis Connector Pinouts" section to complete your installation.

Determine which functions are needed and install the DB-9 ribbon cable(s) in the appropriate cut-out(s). The other end of the cable connects to a shrouded connector on the FF-800 as indicated in the "Chassis Connector Pinouts" section.

Figure 3 illustrates the cable preparation dimensions for the DB-9 and DB-25 connectors. The heat shrink tubing can be omitted by splicing a short piece (3/4") of hook-up wire to the shield wire where it emerges from the cable sheath (the excess shield wire would then be trimmed with wire cutters). The strain relief must then secure the cable in the appropriate hood such that the shield splice can not short to any of the connector pins. When assembling the DB-9 connectors, the user should always connect the cable shield to pin 9 of the connector. Other ground pins included on some connectors represent SIGNAL ground and should not be used for shield group.



FF-180 Front Panel View



FF-180 Back Panel View

Figure 1

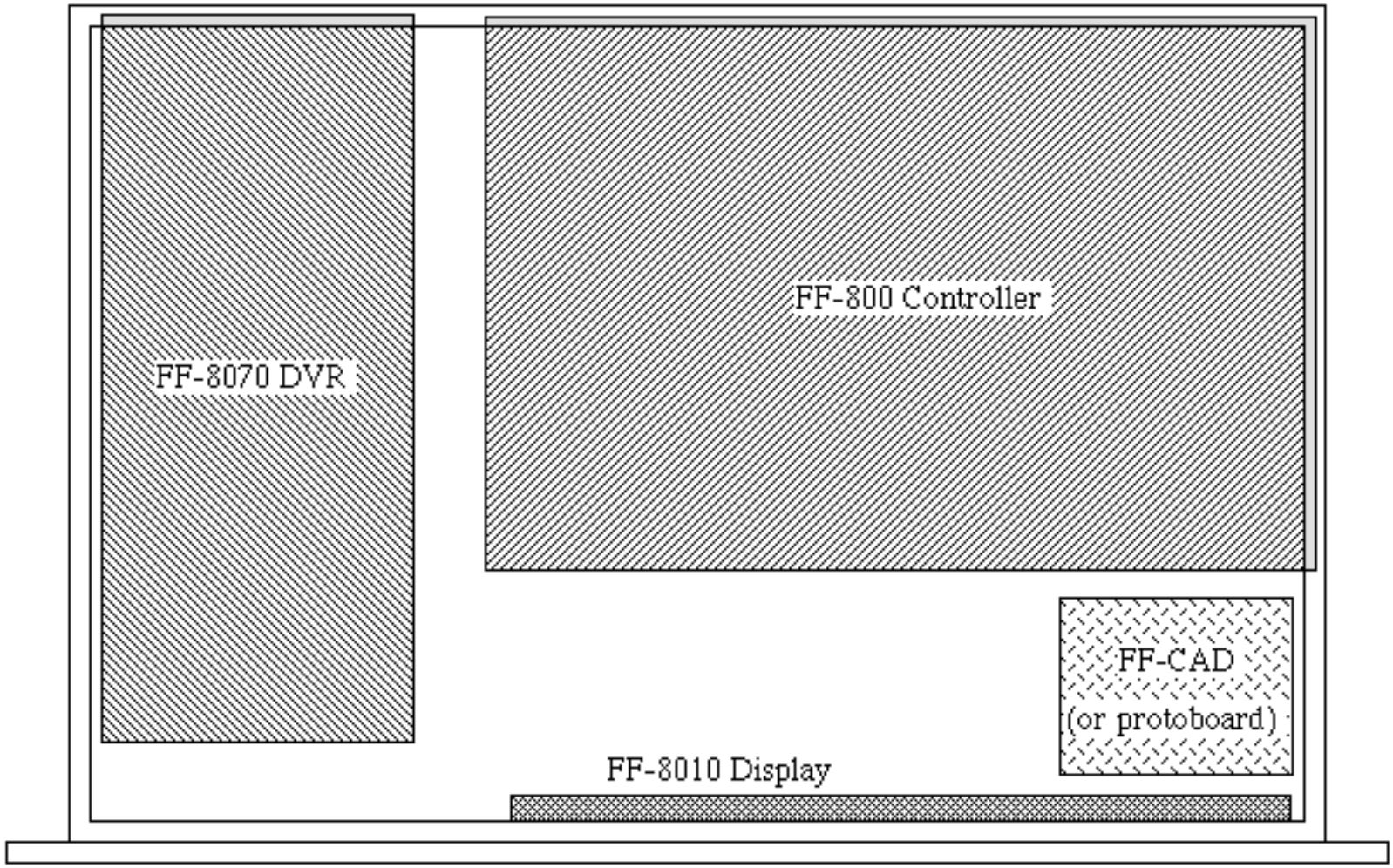


Figure 2. Chassis Top View

FF-180 Chassis Connector Pinouts

P201 (connect to P10)
Voter Logic Inputs

Pin#	Description	FF-800 pin
1	Voted RX #1 COS	P10-1
2	Voted RX #2 COS	P10-2
3	Voted RX #3 COS	P10-3
4	Voted RX #4 COS	P10-4
5	Voted RX #5 COS	P10-5
6	Voted RX #6 COS	P10-6
7	Voted RX #7 COS	P10-7
8	Voted RX #8 COS	P10-8
9	GND	P10-9

P202 (connect to P19)
CTCSS Inputs

Pin#	Description	FF-800 pin
1	Cntl RX CTCSS Input	P19-8
2	Lcl RX CTCSS Input	P19-7
3	RX A CTCSS Input	P19-6
4	RX B CTCSS Input	P19-5
5	RX C CTCSS Input	P19-4
6	RX D CTCSS Input	P19-3
7	GND	P19-9
8	Spare Audio to Mixer	P3-8
9	GND	P19-9

P203 (connect to P7)
SPI Bus

Pin#	Description	FF-800 pin
1	MOSI	P7-1
2	SPCK	P7-2
3	MISO	P7-3
4	~STROBE1	P7-4
5	~STROBE2	P7-5
6	~RESET	P7-6
7	+5V	P1-6
8	~RQST	P7-10
9	GND	P7-7

P204 (connect to P9)
Inputs

Pin#	Description	FF-800 pin
1	Command Trigger #1	P3-6
2	Command Trigger #2	P3-7
3	Command Trigger #3	P19-1
4	Command Trigger #4	P19-2
5	Analog Input #1	P9-1
6	Analog Input #2	P9-3
7	Analog Input #3	P9-5
8	Analog Input #4	P9-7
9	GND	P9-4

P205 (connect to P22)
Digital POT I/O

Pin#	Description	FF-800 pin
1	User POT HI	P22-5
2	User POT Arm	P22-6
3	User POT Low	P22-7
4	GND	P22-8
5	PDATout	P22-1
6	PCKout	P22-2
7	PRSTout	P22-3
8		
9	GND	P22-4

P206 (connect to P5)
Logic Outputs

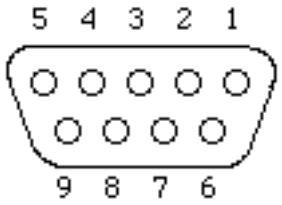
Pin#	Description	FF-800 pin
1	Output #1	P5-1
2	Output #2	P5-2
3	Output #3	P5-3
4	Output #4	P5-4
5	Output #5	P5-5
6	Output #6	P5-6
7	Output #7	P5-7
8	Output #8	P5-8
9	GND	P5-9

P207 (connect to P8)
Phone Line I/O

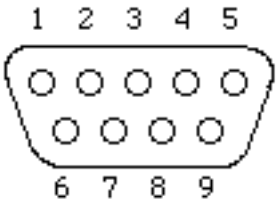
Pin#	Description	FF-800 pin
1	Busy(+) Input	P8-4
2	Busy(-) Input	P8-5
3	In Use (+) Output	P8-6
4	In Use (-) Output	P8-7
5		
6		
7		
8		
9	GND	

P208 (switch module)
Power

Pin#	Description	FF-800 pin
1	+12V Input	n/a
2	+12V Input	n/a
3	Switched +12V Output	P1-5
4	Switched +5V Output	P1-6
5	Switched -5V Output	P1-7
6	GND	P1-1
7	GND	P1-2
8	GND	P1-3
9	GND	



DB9 Male
wiring side



DB9 Female
wiring side

Used on P201-207

Used on P208

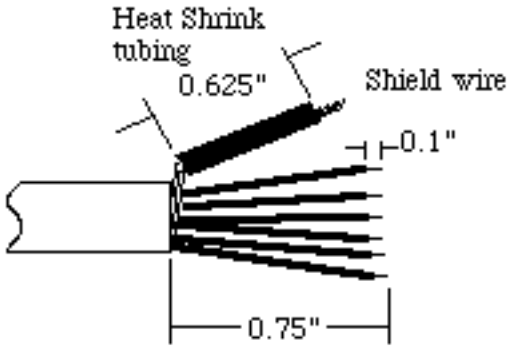


Figure 3. DB-9 cable prep and pinout

Figure 4 illustrates the wiring of the RS-232 serial connector, P210. The chassis connector is a female DB-25 wired as a DCE (Date Communications Equipment). This connection is ready to connect to any DTE device such as a terminal or PC. If the FF-800 is to connect to another DCE type device (ie., a modem or TNC) the user must supply a null modem cable or adapter (available from Radio Shack or other electronics outlet).

DB-25 pin	Description
2	RXD (TO FF-800)
3	TXD (FROM FF-800)
4	pin 5 *
5	pin 4 *
6	pins 8 & 20 *
7	GND
8	pins 6 & 20 *
20	pins 6 & 8 *

* Note: For FF-800 revH or later, these jumpers may be located located near P27a on the FF-800 board

all others are N/C

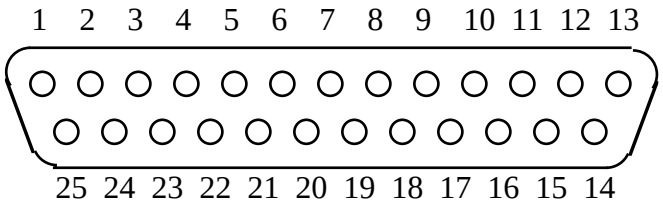


Figure 4. RS-232 chassis connector (DB-25 female, wiring side view)

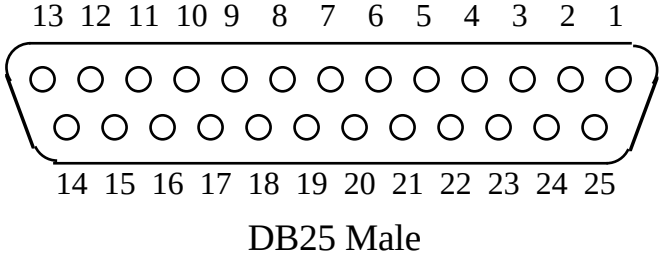


Figure 5. RS-232 cable connector (DB-25 male, wiring side view)

9-pin DSUB COM port connection:
P27-1 to DSUB(female)-3 (FF800-RXD)
P27-2 to DSUB(female)-2 (FF800-TXD)
P27-3 to DSUB(female)-5 (GND)

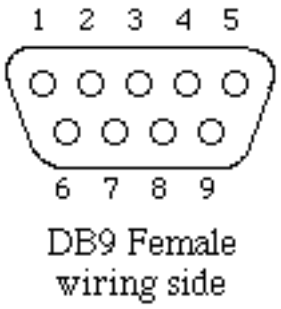


Figure 5b. 9-pin RS-232 connector

FF-800 mini-DIN Connector Pinouts

The following tables describe the mini-DIN connector pinouts for the FF-800:

Figure 6. Four (4) pin mini-DIN connector, wiring side view

Figure 7. Six (6) pin mini-DIN connector wiring side view

Port A Receiver P11:

Pin	Description
1	COS **(in)**
2	RX Audio **(in)**
3	GND
4	Port A CTCSS **(in)**

Port B Receiver P12:

Pin	Description
1	COS
2	RX Audio
3	GND
4	Port B CTCSS

Port C Receiver P13:

Pin	Description
1	COS
2	RX Audio
3	GND
4	Port C CTCSS

Port D Receiver P14:

Pin	Description
1	COS
2	RX Audio
3	GND
4	Port D CTCSS

Port A Transmitter P15:

Pin	Description
1	PTT **(out)**
2	TX Audio **(out)**
3	GND
4	Logic Out 1 **(out)**

Port B Transmitter P16:

Pin	Description
1	PTT
2	TX Audio
3	GND
4	Logic Out 2

Port C Transmitter P17:

Pin	Description
1	PTT
2	TX Audio
3	GND
4	Logic Out 3

Port D Transmitter P18:

Pin	Description
1	PTT
2	TX Audio
3	GND
4	Logic Out 4

Aux. DVR Audio P20:

Pin	Description
1	Chan. A Record Audio **(out)**
2	DVR Play audio **(in)**
3	GND
4	Chan. B Record Audio **(out)**

Link Patch P24:

Pin	Description
1	GND
2	~Patch_Busy **(in)**
3	Aux. Patch Audio **(in)**
4	~RING **(out)**
5	Repeater Audio **(out)**
6	~Off_Hook **(out)**

Note: **(in)** and **(out)** signal directions are from the perspective of the FF-800.

mini-DIN Connector Assembly Detail

The mini-DIN connectors are comprised of a contact array, two metal inner shells, two plastic outer shells, and a plastic connector housing. Figure 10 illustrates the pin diagrams for both the 4 pin and 6 pin connectors.

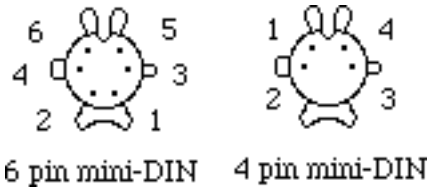


Figure 10. mini-DIN pin assignments (wire side view).

There are two steps to assembling the mini-DIN connectors: the inner assembly and the outer assembly. The inner assembly involves cable preparation and connection and figure 11 illustrates the steps involved. First, prepare the cable (preferably shielded) by exposing 3/8" of the conductors as shown. Next, place the outer hood over the cable (see figure 12) and attach the wires to the contact assembly. Be sure to note the color code of each connection for later reference. Next, place a small piece of electrical tape around the soldered connections -- one wrap is sufficient, too much tape will prevent the top and bottom shells from mating properly.

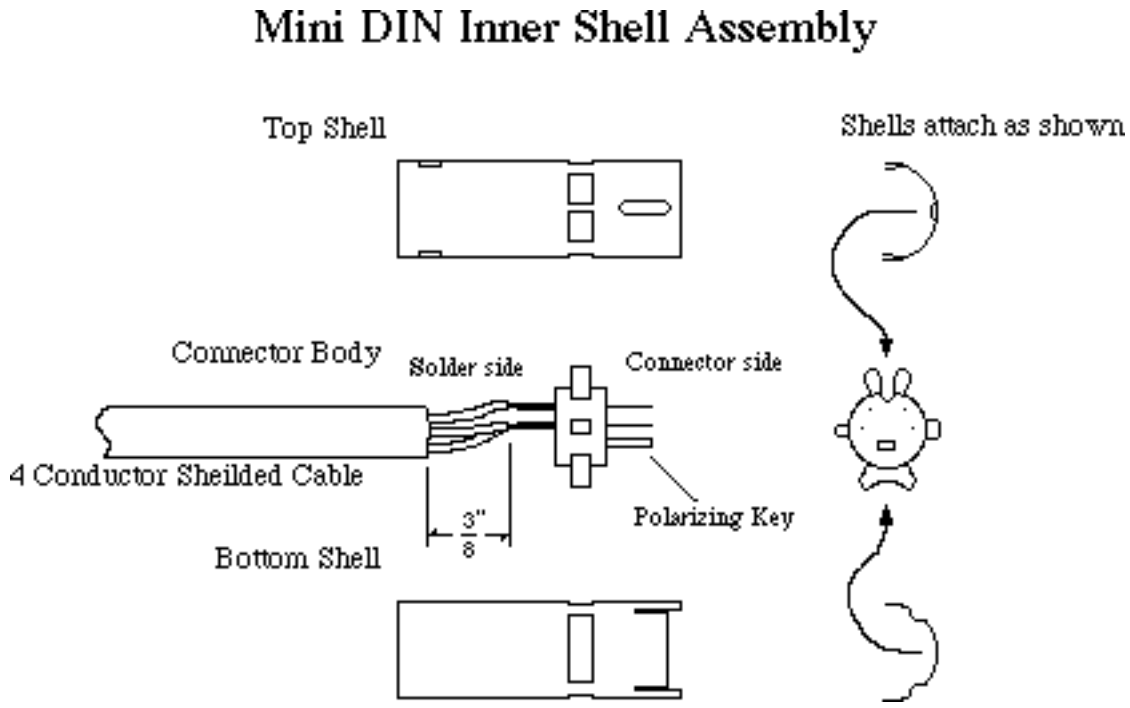


Figure 11. Assembly details of the inner portion of a 4 pin mini-DIN male connector. The details for the 6 pin mini-DIN are similar except for the pin pattern.

Place the top and bottom shells around the contact assembly and then do the same with the left and right shells (as shown in figure 12). Be sure to properly orient the left and right shells as shown or they wll not mate properly. Finally, push the connector housing over

the outer shells until it is flush with the inner shells at location (A) in figure 12. Be sure to hold the outer shells in place until the connector housing is pressed into place. Once the assembly is complete, the connector is ready to install -- the alignment mark on the connector housing should point "up" when inserting into the female mini-DIN connectors.

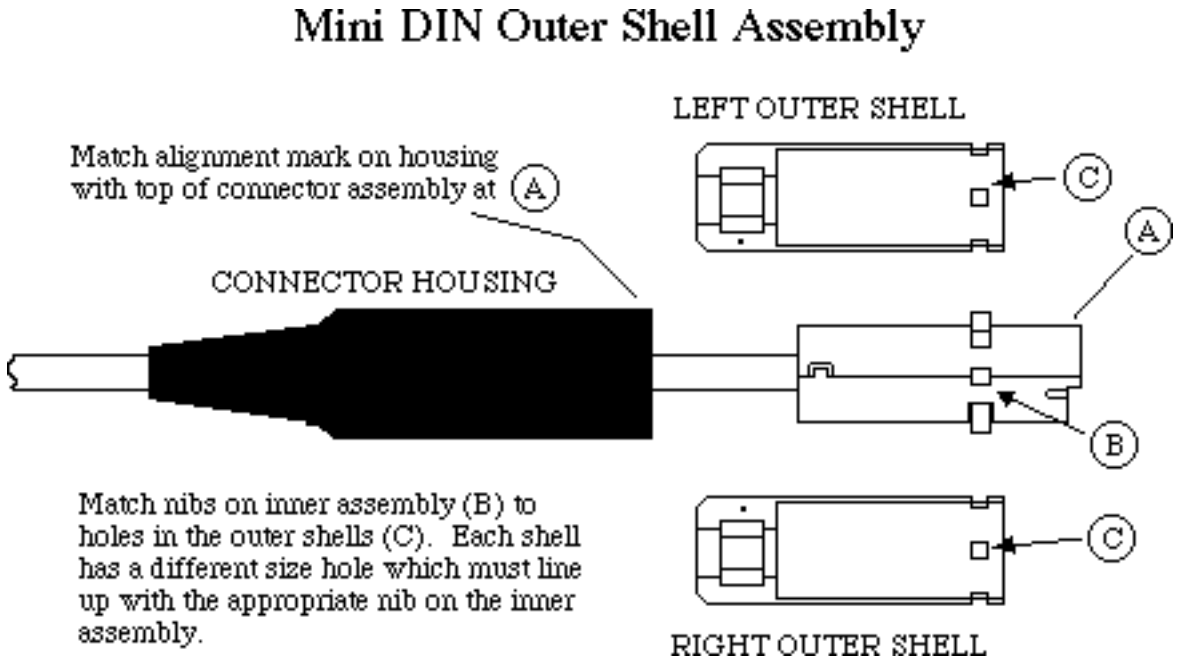


Figure 12. Assembly details of the outer portion of the mini-DIN male connector. The connector housing slides over the completed assembly.

Molex Connector Assembly Detail

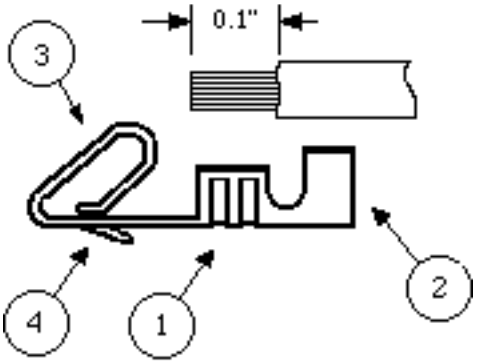


Figure 8. Molex pin insert detail.

Most connections to the FF-800 board are made via Molex connectors (supplied) -- although the transmitter and receiver connections are duplicated using a 4 pin "mini-DIN" style connector. The Molex connectors are easily installed once the method of attaching the pin inserts is mastered. Figure 8 illustrates a typical Molex pin insert. Notice that there are two flanges near one end of each pin insert. Prepare each wire to be attached by stripping 0.1" of insulation -- do not pre-tin conductors.

The wires are attached by crimping the inner flange (1) on the exposed conductor and then applying a small amount of solder to secure the connection. Once the connection has

cooled, the outer flange (2) is crimped around the insulation to provide strain relief. If an appropriate crimp tool is not available, use a pair of medium needle-nose pliers to carefully bend the flanges around the conductor. Make sure that the crimped connection is reasonably secure before soldering.

If too much solder is applied to the connection, excess solder may wick up to the contact loop (3) and/or the locking clip (4). If this happens, the pin insert is ruined and must be replaced. Only use the minimum amount of solder and heat to establish a good electrical connection.

Figure 9 illustrates a typical Molex housing. Pin one is located by orienting the housing as shown. Alternately, the last pin (opposite of pin 1) on the housing can be located by looking at the bottom face of the housing. For a 9 pin housing, the number "9" is imprinted in the housing next to the appropriate hole, a 7 pin housing has a "7", and so on... . Thus pin 1 is the hole at the opposite end of the housing.

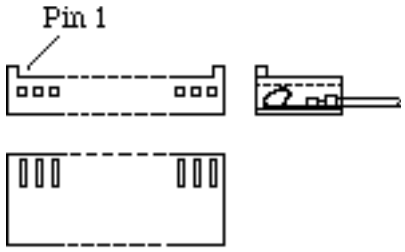
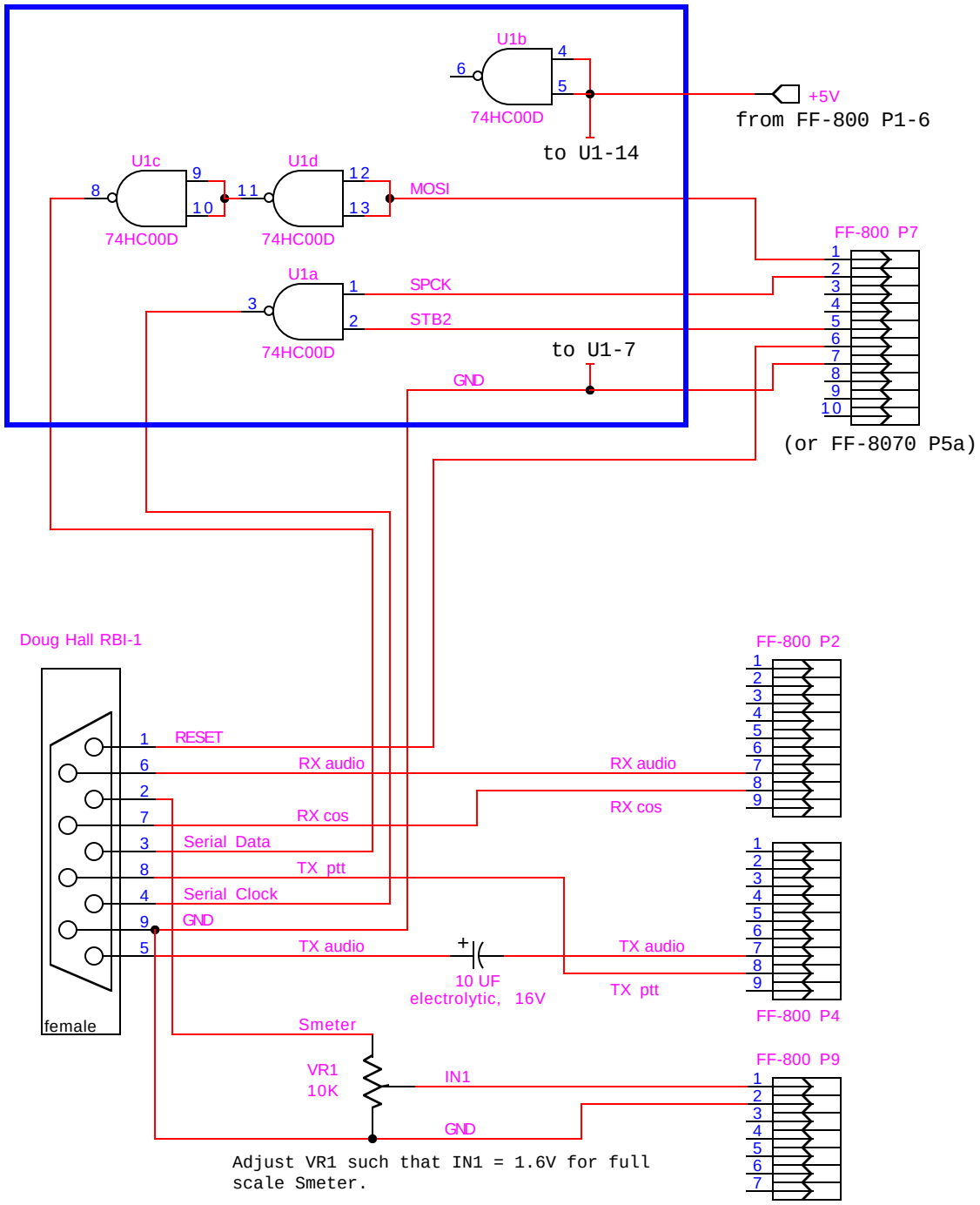


Figure 9. Molex Housing

Doug Hall RBI-1 Connection

The FF-800 includes all the software needed to interface to the Doug Hall RBI-1 Kenwood radio interface. However, some additional hardware is required to allow the interface to work properly. The schematic on the next page illustrates the recommended hardware connections to interface the RBI-1 to the FF-800 SPI bus.



NOTE: FF-800 connector pinouts are for revE/G style connections.
Refer to the FF-800 Tech Manual for rev H+ style pinouts.

RBI-1 hookup.schem

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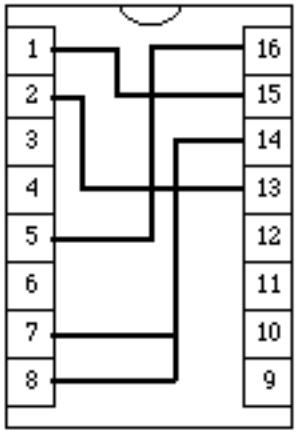
FF-8010 Display Module

Microphone Header Wiring

The FF-8010 microphone preamplifer includes an 8-pin microphone plug that allows any standard DTMF microphone to be used with the system. A 16 pin DIP header allows the FF-8010 to be "programmed" to the pinout desired. Pins 1 through 8 of the header correspond with pins 1 through 8 of the microphone connector. Pins 13 through 16 correspond to the FF-8010 pre-amp inputs. By connecting the pre-amp header pins to the corresponding microphone header pins, the microphone connection to the FF-8010 is completed (up/down buttons, etc… are not connected). The table below lists some of the more popular microphone formats along with the header wiring for each.



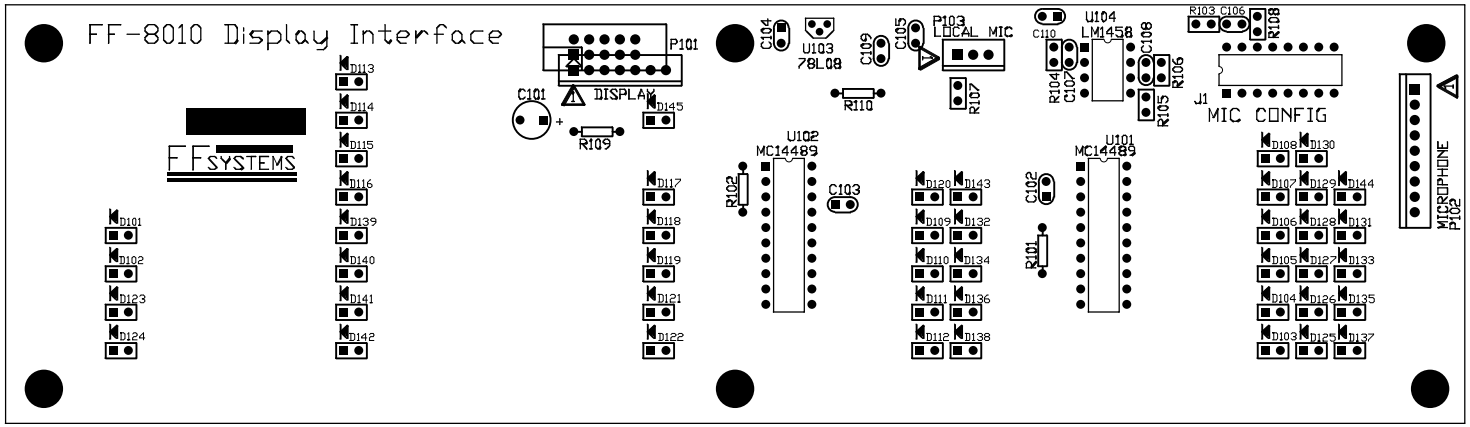
16 pin DIP Header
(top view)

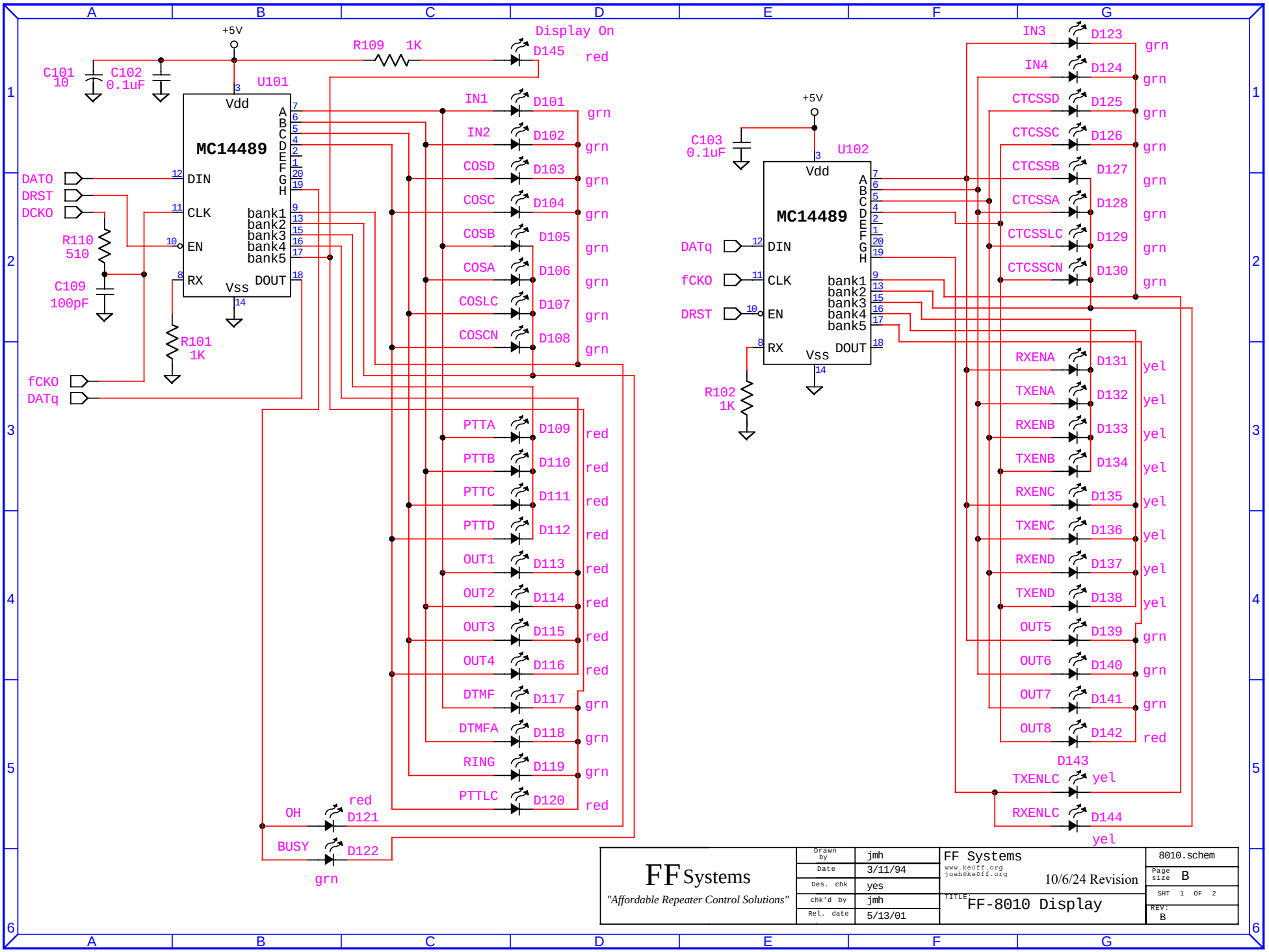
Figure 1. Kenwood MC-48 header wiring.

Description	Header pin	ICOM HM-23	Kenwood MC-48	Alinco
Mic. Power	16	2	5	5
Mic. Audio	15	1	1	1
Mic. GND	14	7 & 6	7 & 8	7 & 8
Mic. PTT	13	5	2	2

FF-8010 Parts List

C101, 104, C110	10 uF electrolytic capacitor, 25V
C102, 103, 105	0.1uF ceramic capacitor, 50V
C106	1.0 uF non-polarized electrolytic capacitor, 35V
C107, 108, 109	100pF ceramic capacitor, 50V
R101, 102, 109	1K ohm resistor, 1/4W
R103, 105	10K ohm resistor, 1/4W
R104	100K ohm resistor, 1/4W
R106	51K ohm resistor, 1/4W
R107	100 ohm resistor, 1/4W
R108	2.2K ohm resistor, 1/4W
R110	510 ohm resistor, 1/4W
U101, 102	MC14489A LED Driver I.C.
U103	LM78L05 5V regulator I.C.
U104	LF353 (or equivalent) op-amp I.C.
D101-108, 117-119, 122-130	Green LED
D109-116, 120-121,139-142, 145	Red LED
D131-138, 143-144	Yellow LED
J1	16 pin DIP header


FF-8010 Display Interface
FFSYSTEMS
P101
DISPLAY
C101
R109
C104
U103
78L08
C109
C105
P103
LOCAL MIC
R110
R107
C110
U104
LM1458
R104
C107
C108
R106
R105
R103
C106
R108
J1
MIC CONFIG
U102
MC14489
U101
MC14489
R102
C103
C102
R101
MICROPHONE
P102



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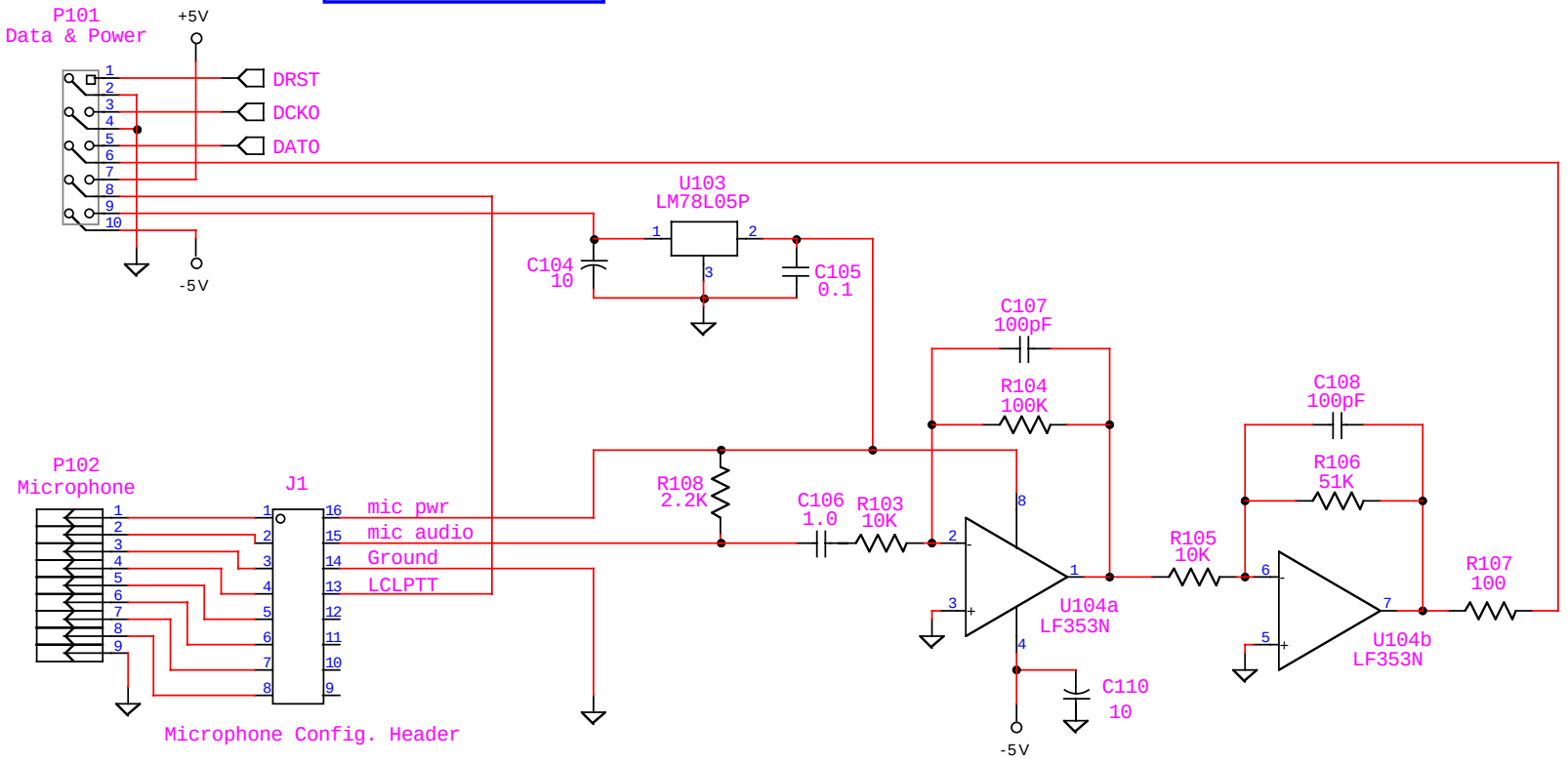
REV A Connector Wiring:
P101 (7 pin Molex)
1 DRST
2 DCKO
3 DATO
4 -5V
5 +5V
6 GND
7 +12V

P103 (3 pin Molex)
1 Audio
2 GND
3 PTT



NOTE: J1 is a user programmed 16 pin DIP header.
See FF-8010 manual for wiring details

10/6/24 Revision

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	chk'd by	jmh	TITLE: FF-8010 Display	REV: B
	Rel. date	5/13/01		

FFlash (rev C) Module

FFlash (revC) Parts List

C1, 2	22pF ceramic capacitor, 0603 pkg
C3, 4, 5, 6	10 uF electrolytic capacitor, 16V
C7, 8	0.1 uF ceramic capacitor, 1206 pkg
D1	Amber LED, 1206 pkg
D2	Red LED, 1206 pkg
P1	10 pin IDC header
Q1	2N2907, SOT-23 pkg
Q2	2N2222, SOT-23 pkg
R1	10M resistor, 0603 pkg
R2, 3	68K resistor, 0603 pkg
R4, 5, 8, 9, 10	4.7K resistor, 0603 pkg
R6, 7	470 resistor, 1206 pkg
R11, 12	1K resistor, 0603 pkg
R13	100K resistor, 0603 pkg
SW1	Push-button switch
U1	MC68HC908 Microcontroller I.C.
U2	MAX662 DC-DC converter I.C.
Y1	4.915MHz crystal

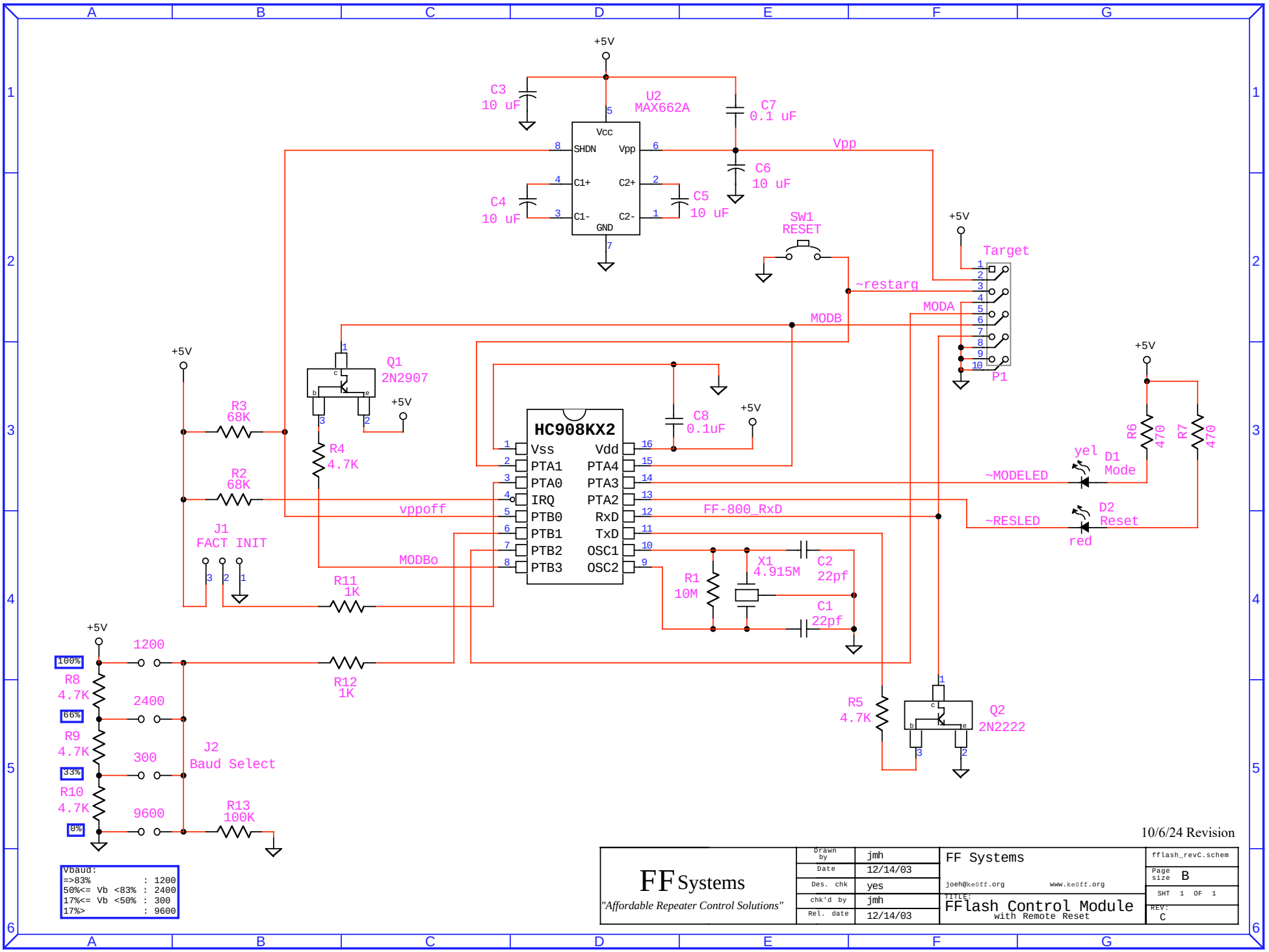
Jumper Options

J1 selects the factory initialize option. No jumper, or a jumper at position 2-3 selects normal operation. A jumper at position 1-2 sets the factory initialize mode -- if a reset is activated, the FF-800 will enter its factory initialize routine which resets the controller configuration. Jumper position 1-2 is only a temporary selection, it should not be selected for normal operation.

J2 selects the baud rate for the serial command detect feature. J2 is a series of jumper pads which are either open, or connected with a solder "blob". If all of the positions are open, the 9600 baud rate is selected. The 1200 pad selects 1200 baud, the next pad selects 2400 baud, and the next pad selects 300 baud. The 9600 baud pad is obstructed by P1 and is not used (select no pad for 9600).

The "irq" pads just above U1 allow the FFlash serial command password to be reset. Temporarily short these two pads together and apply power. The MODE LED will flash "O K" in CW to indicate that the erase operation is complete.

See the FFlash Operations Manual for more information regarding the FFlash commands and options.


+5V
C3
10 uF
U2
MAX662A
C7
0.1 uF
Vcc
SHDN
Vpp
C1+
C2+
C1-
C2-
GND
C4
10 uF
C5
10 uF
C6
10 uF
Vpp
SW1
RESET
~restarg
Target
MODA
MODB
P1
Q1
2N2907
R3
68K
R2
68K
R4
4.7K
HC908KX2
Vss
PTA1
PTA0
IRQ
PTB0
PTB1
PTB2
PTB3
Vdd
PTA4
PTA3
PTA2
RxD
TxD
OSC1
OSC2
C8
0.1uF
vppoff
MODBo
FF-800_RxD
~MODELED
~RESLED
yel
D1
Mode
D2
Reset
red
R6
470
R7
470
J1
FACT INIT
R11
1K
R1
10M
X1
4.915M
C2
22pf
C1
22pf
R12
1K
R5
4.7K
Q2
2N2222
100%
1200
R8
4.7K
66%
2400
R9
4.7K
33%
300
R10
4.7K
0%
9600
J2
Baud Select
R13
100K
Vbaud:
=>83% : 1200
50%<= Vb <83% : 2400
17%<= Vb <50% : 300
17%> : 9600
10/6/24 Revision
FF Systems
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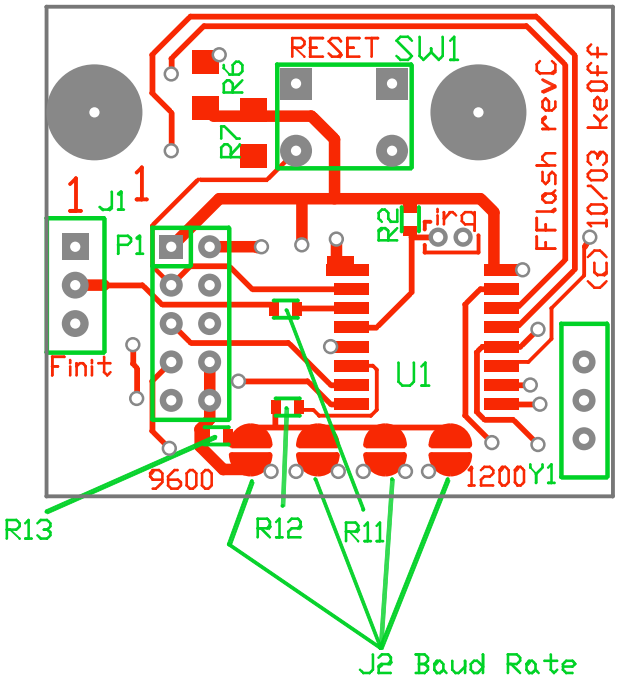
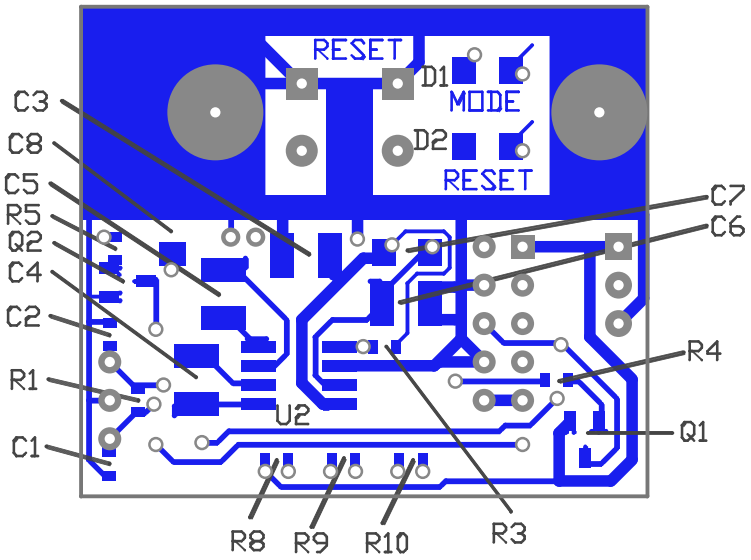
Drawn by jmh
Date 12/14/03
Des. chk yes
chk'd by jmh
Rel. date 12/14/03
FF Systems
joeh@ke0ff.org www.ke0ff.org
TITLE: FFlash Control Module
with Remote Reset
fflash_revc.schem
Page size B
SHT 1 OF 1
REV: C

FFLASH Rev C Layout

TOP View



BOT View



FFLASH Rev-C Install Notes
DOC date: 10/13/24, REV -

The FFLASH is a small control board that allows the software load of the FF-800 repeater controllers. It controls the reset modes and facilitates the programming configuration process. It is intended to attach to an unused DB-9 cutout on the FF-180 (or similar) chassis. Since the Revision C device allows the reset of the FF-800 to be accomplished using serial commands (<CTRL-Y> sequences), it is not required that the module be accessible via a DB-9 style cutout. This can be useful in the event that there is not a suitable cutout available. The photo below illustrates a typical mounting scenario.

A 10-conductor ribbon cable connects the FFLASH P1 to the FF-800 P28 connector (P28b on FF-800 boards with revision F artwork and a U29 interposer).

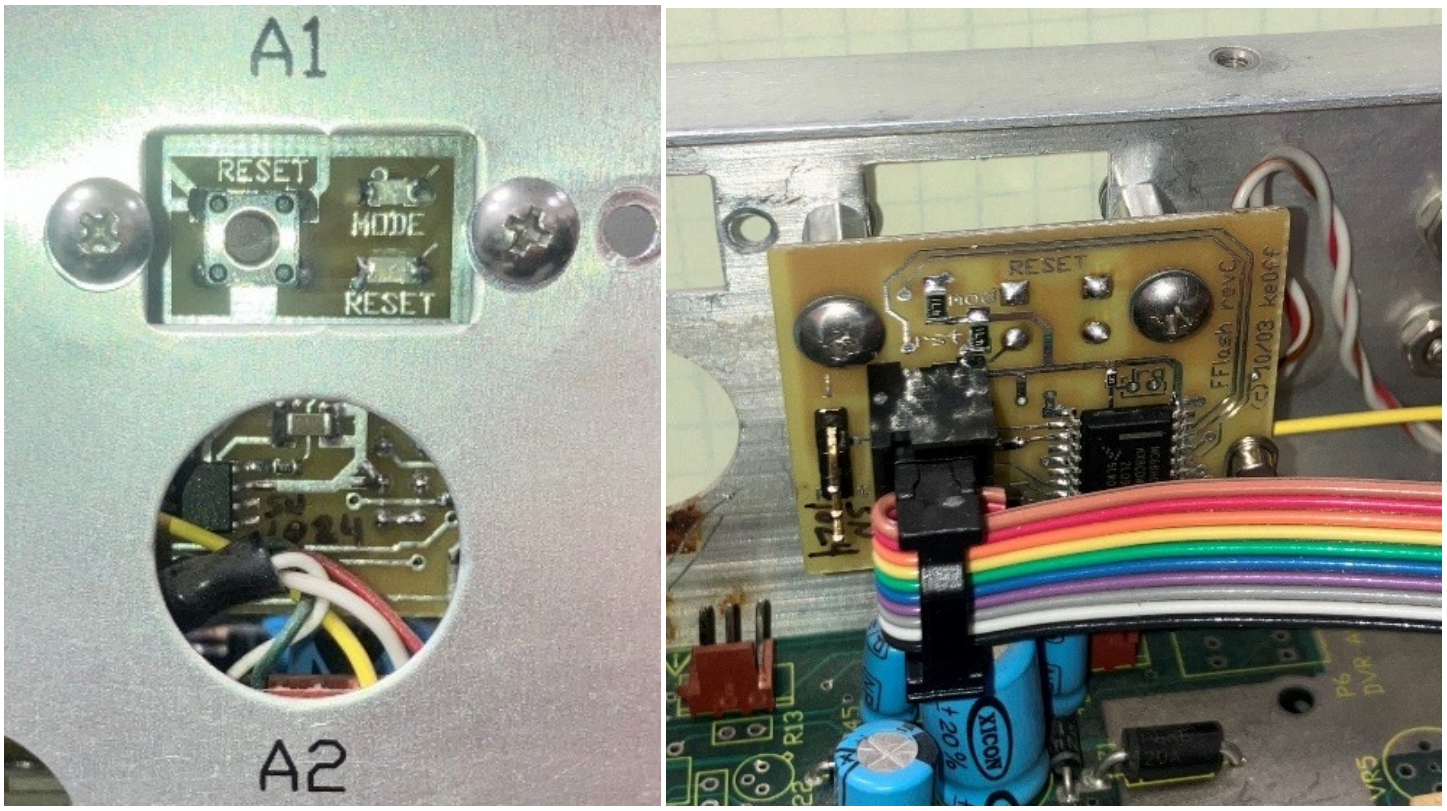


Photo: FFLASH FF-180 Chassis mounting.