

Push to Talk (PTT), J1 Pin 3

A ground closure (via FET) to key the attached radio. When transmitting, a resistance of 3-5 ohms to ground is provided. When receiving, an open circuit impedance is provided.

Ground, J1 Pin 2

Ground reference for PTT and audio line shielding.

RFDCD, J1 Pin 5

An input from the attached radio to the internal TNC (if equipped) for an RF carrier detect (squelch broken) signal.

Jumpers

A large number of jumpers are provided on the DFM-SA board to configure for various products, and allow user experimentation. The column "Fitted Y/N/S" indicates whether the position has jumper pins installed during manufacture. S means pins are installed on selected models. Positions for NORMAL operation are shown. (Table on following page.)

J1-4 Transmit Waveform Select

The transmit waveform EPROM contains a variety of general compensation waveforms. The normal selection should be used in most all cases and certainly for AO-22 (UoSAT) access and general purpose terrestrial packet work. If difficulty is experienced with a particular radio, try each of the transmit settings to find the best one. Note that the selection compensates for the DISTANT receiver - not your local receiver. Most NBFM radios responses are quite similar, and one selection should be found acceptable.

You should examine the received "eye" diagram while the sender tries different J1-4 combinations. At least one of them will be "best". Repeat for the other transmit/receive combination. You will probably find the "loopback" selection (factory setting) is best. You may also calibrate a radio channel, and have a custom EPROM created for it. This would be most appropriate for a dedicated network link with limited signal margin.

It is vital that the radios are tuned to the correct frequency. If they are mis-tuned by more than 2-3 kHz, distortion will be apparent in the received signal, which will rapidly degrade performance. Some receivers have AFC, which will be helpful if it pulls in within 50 ms and also does not try to track the data and so impair the link's low frequency performance.

DFM-SA Jumper Table

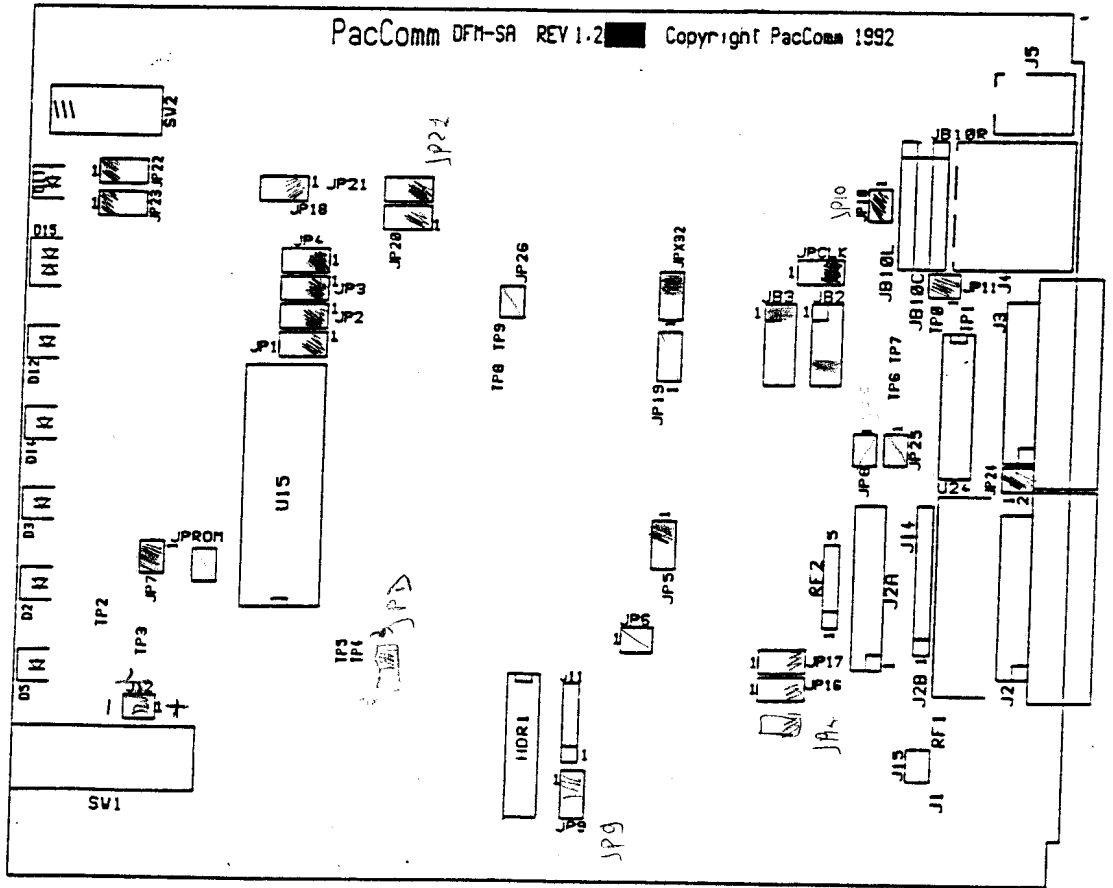
Jumper Ident	Fitted Y/N/S	Function	Normal Position	Normal Condition
- JPCLK	Y	Local/Remote Clock Source	2-3	Local
- JPD	Y	DCD Active High/Low	2-3	Low
- JPROM	Y	Alt Transmit Waveform	Open	Standard Waveforms
- JPX32	Y	x16/x32 Clock Select	2-3	x16
- JP1-4	Y	Transmit Waveform Select	1-2	Uncompensated
- JP5	Y	Data/BERT Mode	1-2	Data Mode
- JP6	Y	Audio Loopback	Open	No loopback
- JP7	Y	Transmit DAC connect	ON	Connected
- JP8	Y	TX Watchdog Defeat	Open	Watchdog Enabled
- JP9	Y	TX Level High/Low	1-2	High
- JP10	Y	PSK-1 RXD Data Bypass	ON	Bypassed
- JP11	Y	PSK-1 DCD Bypass	ON	Bypassed
JP12,13,14		Numbers not used		
- JP15	S	Output logic for IPR	2-3	For all but IPR
- JP16	S	Output logic for IPR	2-3	For all but IPR
- JP17	N	RX cutoff during Xmit	2-3	No Cutoff
- JP18	Y	TXA cutoff with no PTT	1-2	Cut Off
- JP19		Number not used ^{Jump}		
- JP20	N	Modem 4800/9600 Select	1-2	9600
- JP21	N	Modem 4800/9600 Select	1-2	9600
- JP22	Y	AFSK or DFM on power up	1-2	AFSK
- JP23	Y	AFSK or DFM on power up	1-2	AFSK
- JP24	Y	DFM-SA or TNC Clock Sel	ON	DFM-SA RXCA
- JP25	Y	PTT Bypass for PSK-1	OFF	Bypassed
- JP26	Y	New/old PSK-1	OFF	New PSK-1
- JB2	Y	PSK Connector Rate Select	7-8	1200
- JB3	Y	Aux. Modem Rate Select	1-2	Bypass
- JB10	N	PSK/Aux audio out header	C-R	PSK

NOTE: JP1-4 are three pin headers. The pin of each jumper closest to JPROM is pin A, the center pin is B, and the pin farthest from JPROM is pin C. The transmit waveform generator uses a look-up table of values stored in EPROM U15. Depending on the contents of this EPROM, and the selections of JP1-4, a variety of transmit waveform characteristics may be achieved to suit differing radio channels.



Appendix B

DFM-SA Jumper Locations



Appendix C

DFM-SA Alternate Data Rates

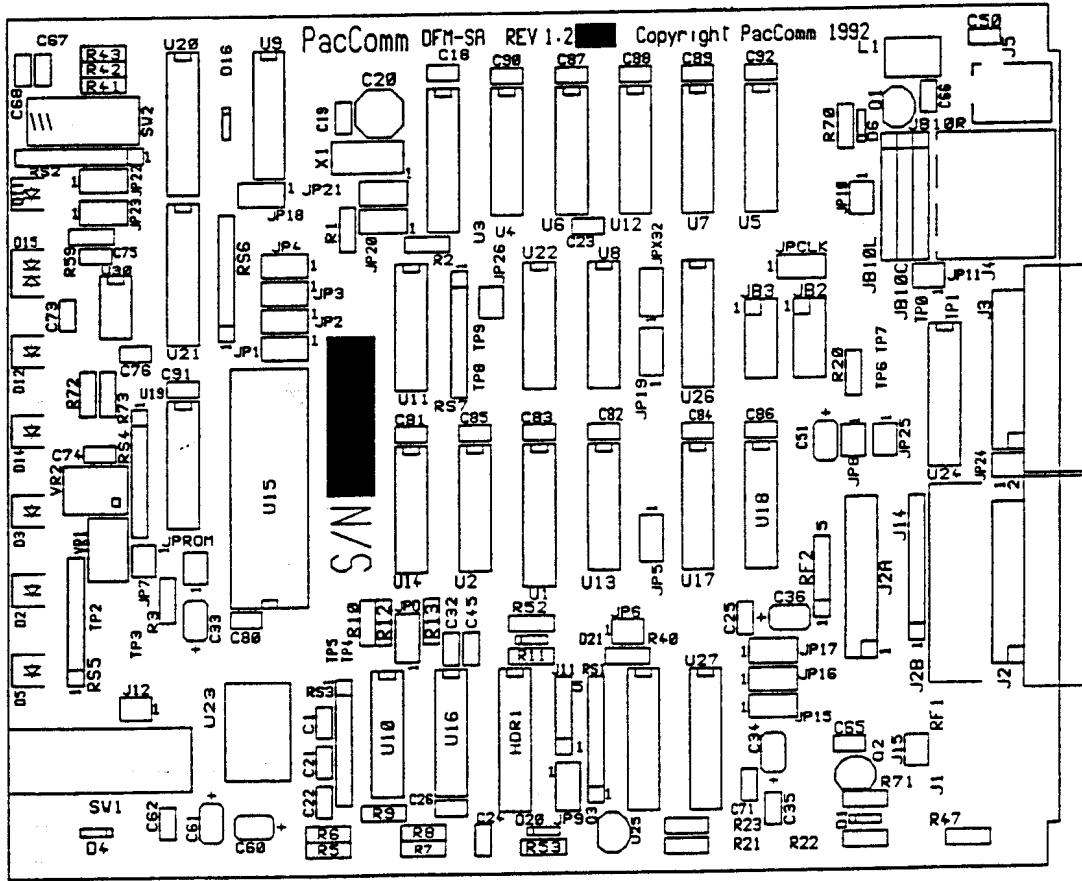
The G3RUH modem design is not sensitive to the data speed. The only changes that need to be made are time constants in the audio filters and the time constant in the Lock Detector Filter. All components in the table below are mounted on parts carrier (HDR1) for easy replacement.

Item	4800 bps	9600 bps	19200 bps	38400 bps
HDR1A	.0068uF	.0033uF	.0015uF	.001
HDR1B	220pf	100pf	47pf	27pf
HDR1C	.001uF	470pf	220pf	100pf
HDR1E	.0022uF	.001uF	470pf	220pf
HDR1F	470pf	220pf	100pf	47pf
HDR1G	.0022uF	.001uF	470pf	220pf
HDR1H	220k	100k	51k	24k

At baud rates above 20kb, it is also advisable to halve the value of C32.

Appendix D

DFM-SA Parts Placement



Appendix E

DFM-SA Parts List

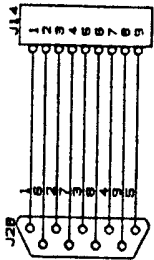
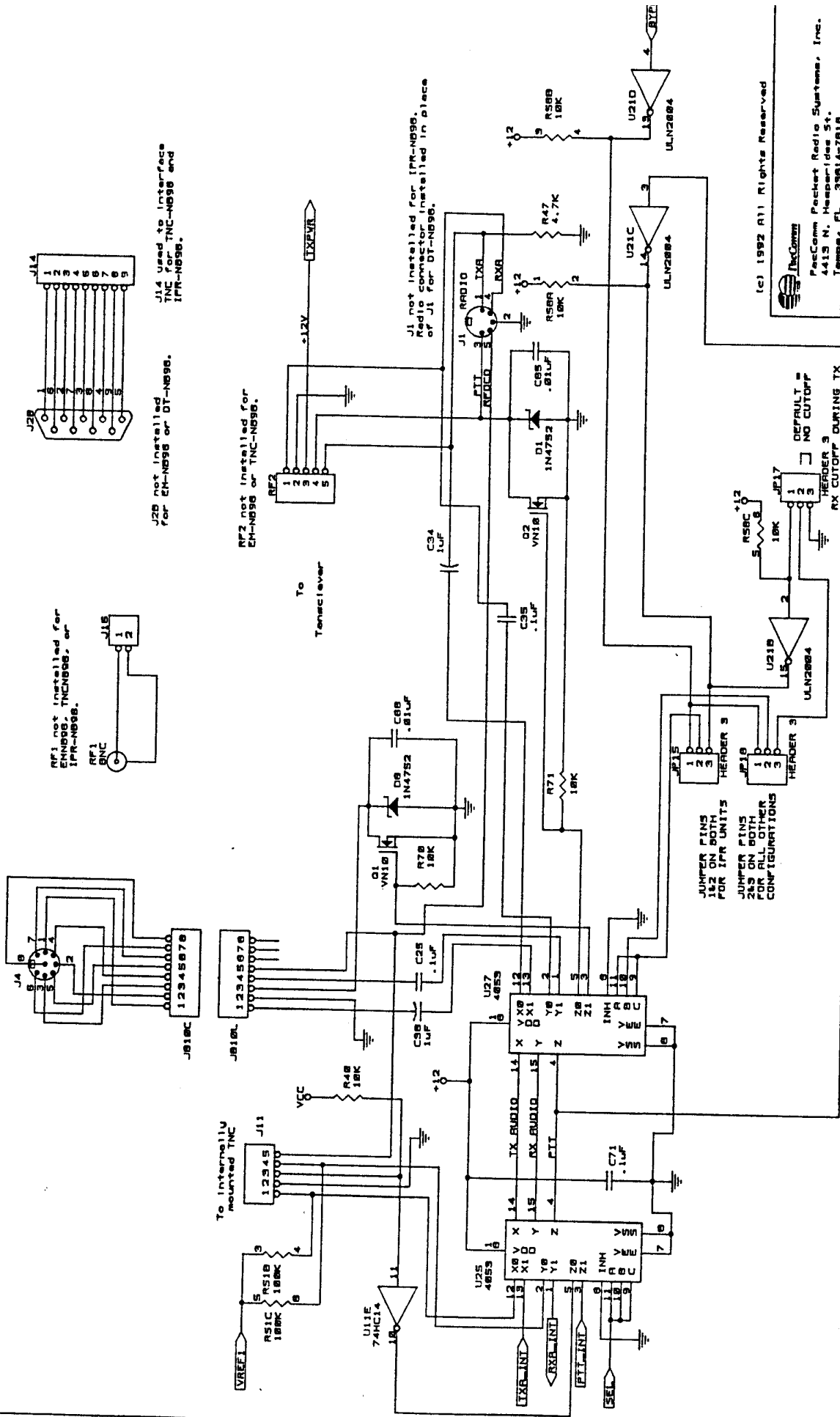
Qty	Reference	Part	Qty	Reference	Part
23	C1, C21, C22, C24, C25, C26, .1uf		1	L1	SHIELD
	C35, C45, C68, C71, C80, C81,		3	Q1, Q2, Q3	VR10
	C82, C83, C84, C85, C86, C87,		1	R1	0 OHM
	C88, C89, C90, C91, C92		2	R2, R20	1MEG
1	C18	10pf	10	VR1, R3, R84, R86, R10, R40, 10K	
1	C19	C		RS2, R53, R70, R71	
1	C20	15-60PF	1	R5	33K
4	HDR1, C23, C32, C67	.001uf	1	R6	47K
	C33, C51	10uf	1	R7	82K
2	C34, C36	1uf	1	R8	39K
4	C59, C62, C65, C66	.01uf	1	R9	27K
1	C60	22uf	1	R11	56K
1	C61	47uf	1	R12	3.3K
2	C73, C74	.022uf	1	R13	12K
3	HDR1, C75, C76	.0033uf	1	R21	22K
2	D1, D6	1M4752	4	R83, R87, R22, R47	4.7K
6	D2, D3, D11, D12, D14, D15	LED	1	R23	1K
1	D4	1M4001	2	R41, R43	1.0M
1	D5	POWER LED	1	RF1	BNC
1	D16	1M4148	1	R55	6.8K
1	D20	6.2V	1	SW1	SW DPDT
1	D21	1M5234	1	SW2	MODEM S
4	HDR1, R81, R42, R72	100K	10	TP1, TP2, TP3, TP4, TP5,	TP
4	HDR1, R82, R59, R73	R		TP6, TP7, TP8, TP9, TP0	
1	HDR1	100pf	1	U1	74HC291
1	HDR1	220pf	1	U2	74HC40;
1	HDR1	470pf	1	U3	74HC40;
1	J1	5 PIM DIN	5	U4, U7, U12, U14, U18	74HC16;
2	J2, J2A	10X2 HDR	2	U5, U17	74HC74
1	J2B	CONNECTOR DB9	2	U6, U13	74HC86
1	J3	HEADER 10X2	2	U8, U22	CD4016
1	J4	8 PIM DIN	1	U9	74HC13;
1	J5	COAX PUR CONN	1	U10	LM339
2	RF2, J11	HEADER 5	1	U11	74HC14
6	JP6, JP10, JP11, J12, J15,	HEADER 2	1	U15	27256
	JPR0M		1	U16	TL084
1	J14	HEADER 9	1	U19	2M429E
2	J82, J83	HEADER 5X2	1	U20	4017
3	J810C, J810L, J810R	HEADER 8	1	U21	ULN200
4	JP1, JP2, JP3, JP4	3HDR	1	U23	LM7805
14	JP5, JP9, JP15, JP16, JP17, JP22,	JP18, JP19, JP20, JP21, JP22,	2	U25, U27	74HC15
	JP23, JPX32, JPCLK, JPD		1	U26	4053
1	JP7	JUMPER	1	U30	74HC39
4	JP8, JP24, JP25, JP26	JMP2	1	VR2	XR567
			1	X1	9.8304

DFM-SA Jumper Table

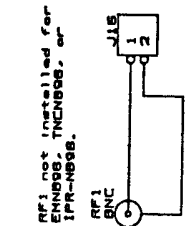
Jumper Ident	Fitted Y/N/S	Function	Normal Position	Normal Condition
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JPD	Y	DCD Active High/Low	2-3	Low
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JP11	Y	PSK-1 DCD Bypass	ON	Bypassed
JP12,13,14		Numbers not used		
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JP16	S	Output logic for IPR	2-3	For all but IPR
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JP18	Y	TXA cutoff with no PTT	1-2	Cut Off
JP19		Number not used		
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JP21	N	Modem 4800/9600 Select	1-2	9600
JP22	Y	AFSK or DFM on power up	1-2	AFSK
JP23	Y	AFSK or DFM on power up	1-2	AFSK
JP24	Y	DFM-SA or TNC Clock Sel	ON	DFM-SA RXCA
JP25	Y	PTT Bypass for PSK-1	OFF	Bypassed
JP26	Y	New/old PSK-1	OFF	New PSK-1
JB2	Y	PSK Connector Rate Select	7-8	1200
JB3	Y	Aux. Modem Rate Select	1-2	Bypass
JB10	N	PSK/Aux audio out header	C-R	PSK

NOTE: JP1-4 are three pin headers. The pin of each jumper closest to JPROM is pin A, the center pin is B, and the pin farthest from JPROM is pin C. The transmit waveform generator uses a look-up table of values stored in EPROM U15. Depending on the contents of this EPROM, and the selections of JP1-4, a variety of transmit waveform characteristics may be achieved to suit differing radio channels.

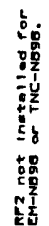
DFM TNC - MODEM



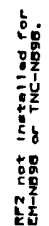
J14 used to interface TNC for TNC-NS96 and IPR-NS96.



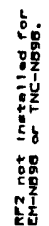
J28 not installed for EM-NS96 or DT-NS96.



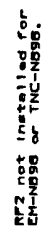
J15 not installed for IPR-NS96, TNC-NS96, or IPR-NS96.



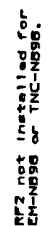
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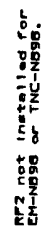
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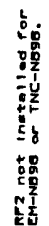
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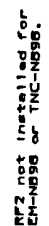
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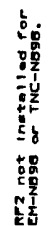
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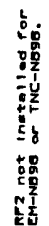
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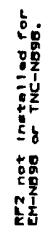
J22 not installed for EM-NS96 or TNC-NS96.



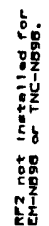
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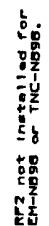
J24 not installed for EM-NS96 or TNC-NS96.



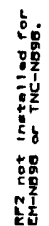
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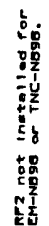
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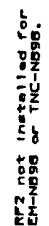
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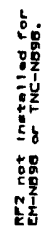
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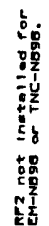
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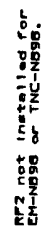
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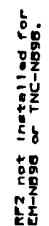
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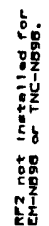
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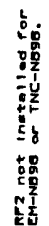
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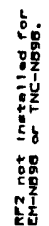
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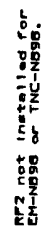
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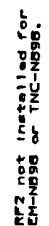
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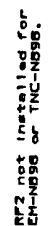
J37 not installed for IPR-NS96, TNC-NS96, or IPR-NS96.



J38 not installed for EM-NS96 or TNC-NS96.



J39 not installed for IPR-NS96, TNC-NS96, or IPR-NS96.



J40 not installed for EM-NS96 or TNC-NS96.

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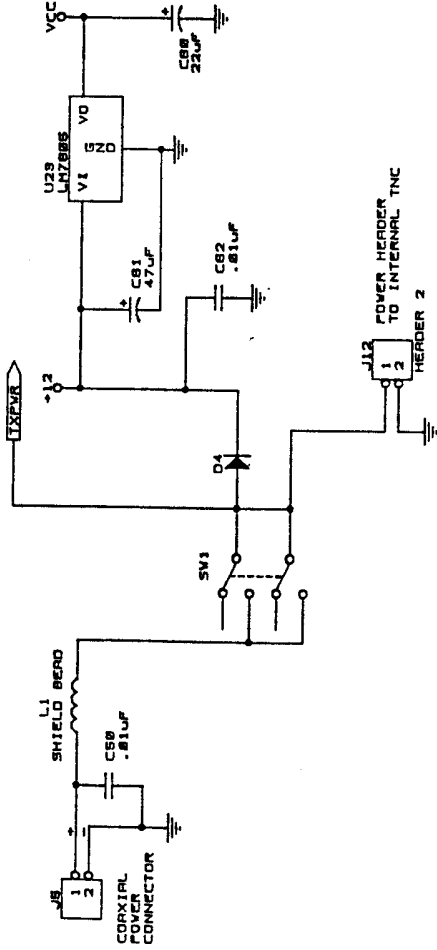
PackComm Packet Radio Systems, Inc.
4413 N. Heatherlides St.
Tampa, FL 33614-7818

Title NS96 Series External DFM Modem
Size Document Number 6 072089985-2A Interface Section
Date Jul 31, 1992 Sheet 3 of 3

DFM TNC - MODEM

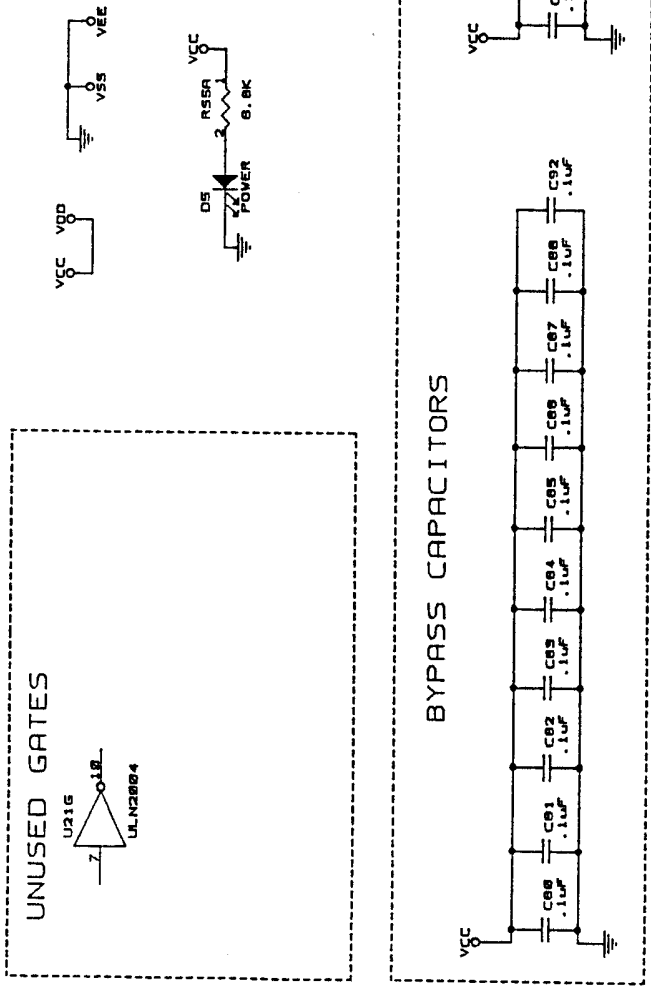
POWER SUPPLY TABLE

	VCC	GND
74HC14	14	7
74HC74	14	7
74HC00	14	7
74HC132	14	7
74HC124	16	9
74HC393	14	7
74HC4824	14	7
74HC4858	16	9
74176	16	9
74259-5	16	9
74259-6	14	7



SPEED SENSITIVE COMPONENTS

	4808_88UD	9808_88UD	19.2_K88UD	38.4_K88UD
MDR1A	.00000F	.00000F	.00220F	.0010F
MDR1B	220PF	100PF	47PF	27PF
MDR1C	.00220F	.0010F	220PF	100PF
MDR1D	.00220F	.0010F	220PF	100PF
MDR1E	.00220F	.0010F	220PF	100PF
MDR1F	.00220F	.0010F	220PF	100PF
MDR1G	.00220F	.0010F	220PF	100PF
MDR1H	.00220F	.0010F	220PF	100PF
MDR1I	.00220F	.0010F	220PF	100PF
MDR1J	.00220F	.0010F	220PF	100PF
MDR1K	.00220F	.0010F	220PF	100PF
MDR1L	.00220F	.0010F	220PF	100PF
MDR1M	.00220F	.0010F	220PF	100PF
MDR1N	.00220F	.0010F	220PF	100PF
MDR1O	.00220F	.0010F	220PF	100PF
MDR1P	.00220F	.0010F	220PF	100PF
MDR1Q	.00220F	.0010F	220PF	100PF
MDR1R	.00220F	.0010F	220PF	100PF
MDR1S	.00220F	.0010F	220PF	100PF
MDR1T	.00220F	.0010F	220PF	100PF
MDR1U	.00220F	.0010F	220PF	100PF
MDR1V	.00220F	.0010F	220PF	100PF
MDR1W	.00220F	.0010F	220PF	100PF
MDR1X	.00220F	.0010F	220PF	100PF
MDR1Y	.00220F	.0010F	220PF	100PF
MDR1Z	.00220F	.0010F	220PF	100PF



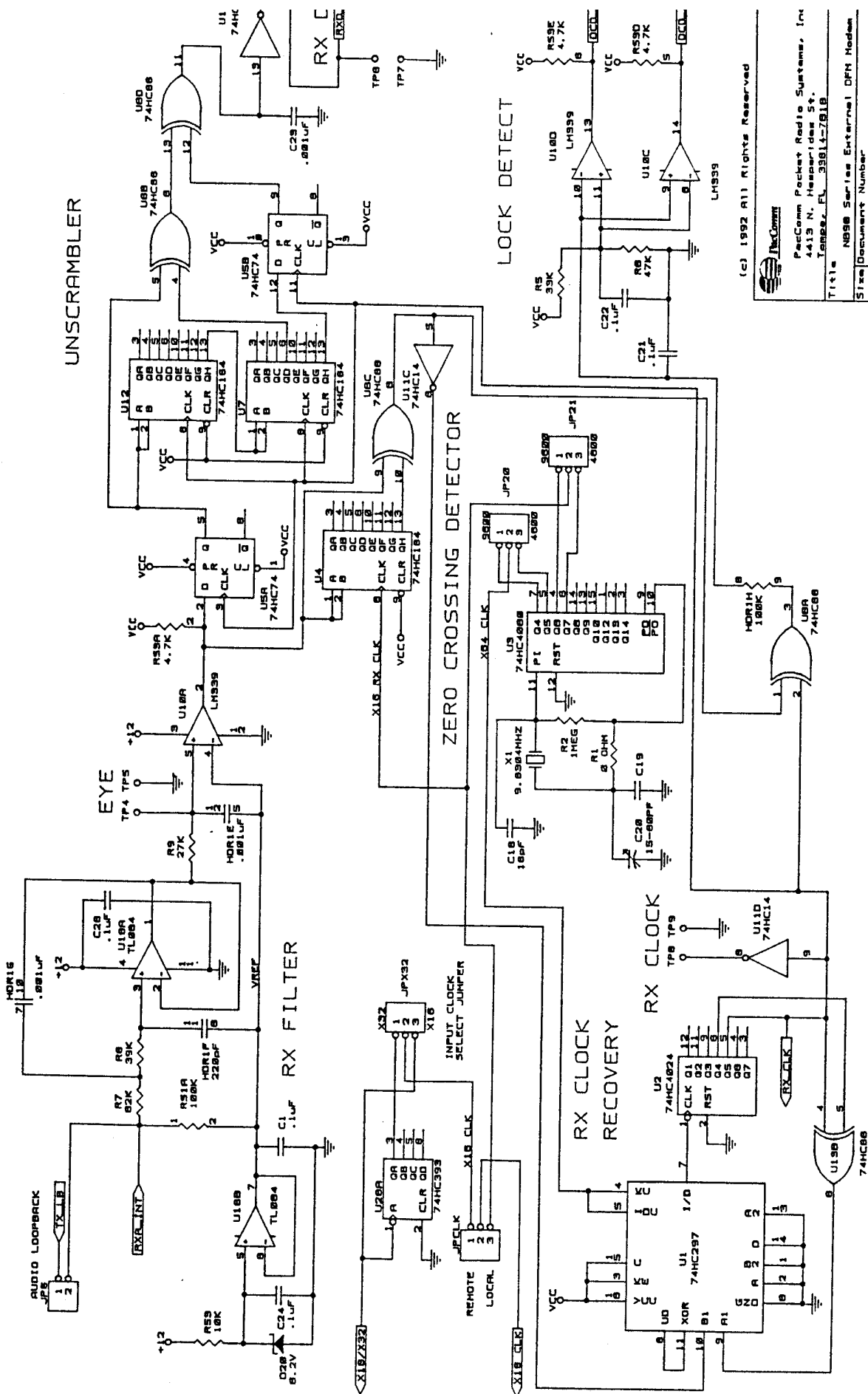
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TheComm
 PacComm Packet Radio Systems, Inc
 4419 N. Meanderides St.
 Tampa, FL 33614-7818

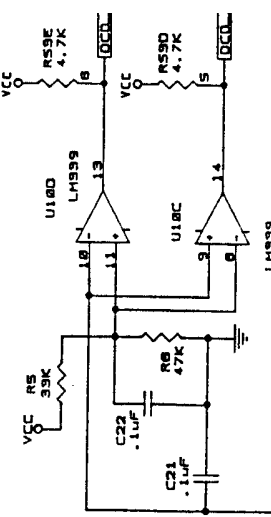
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 Date: July 21, 1992 Sheet 5

DFM TMC - MODEM

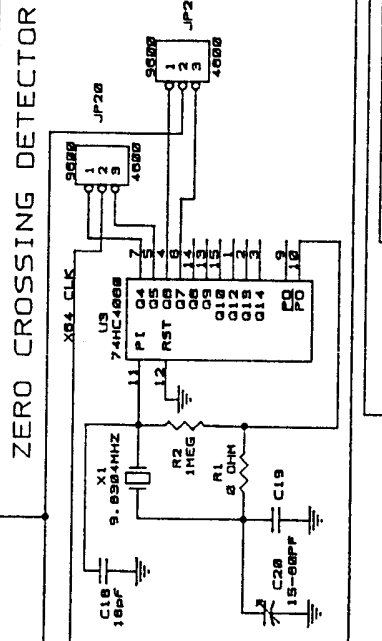
UNSCRAMBLER



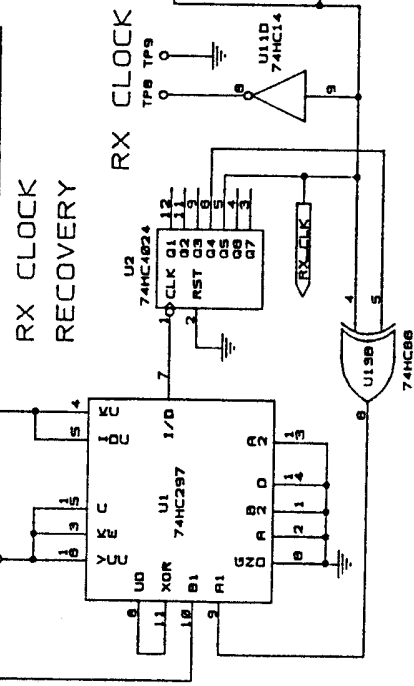
LOCK DETECT



ZERO CROSSING DETECTOR

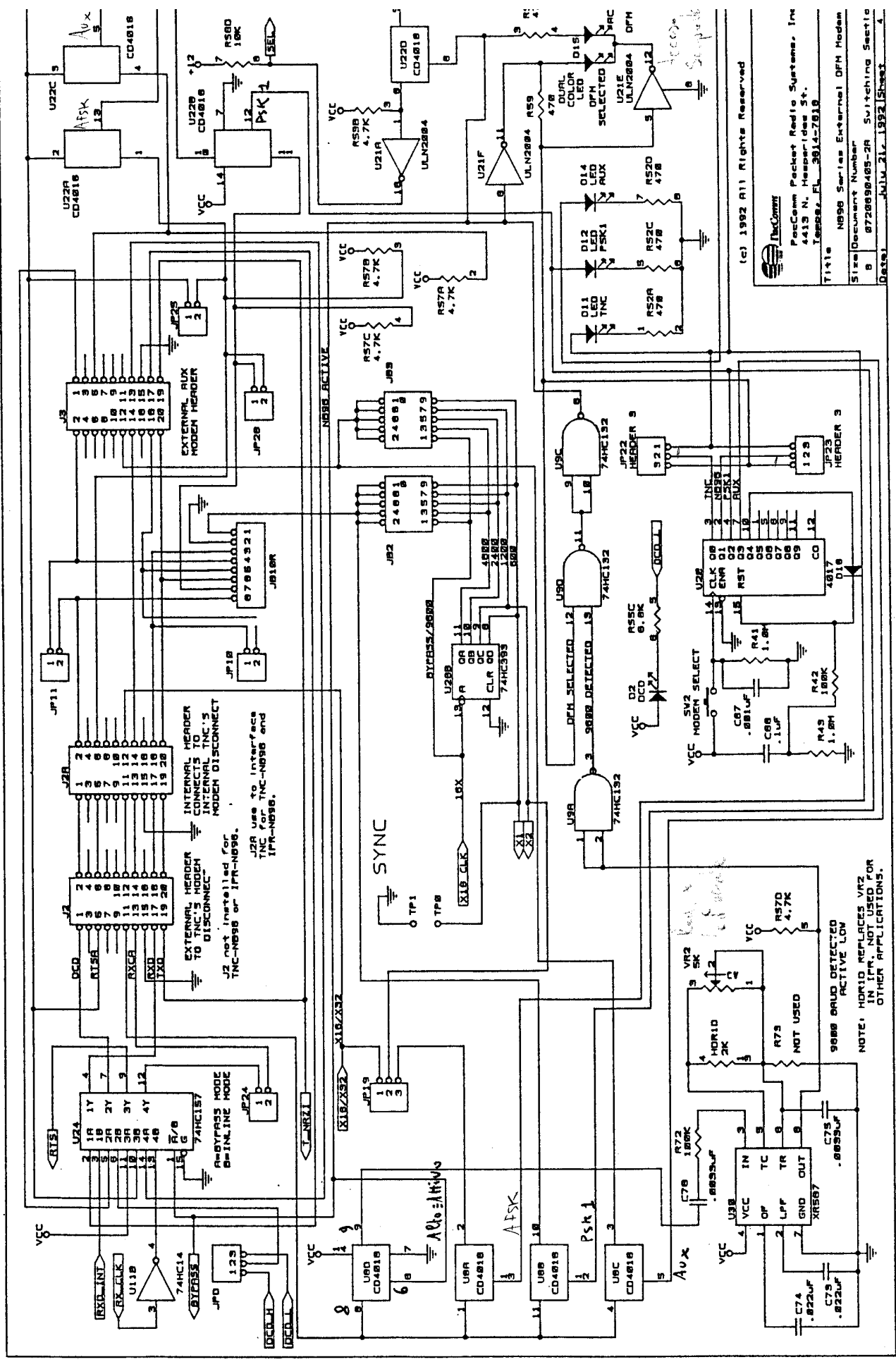


RX CLOCK RECOVERY



(c) 1992 All Rights Reserved
 RecComm
 RecComm Pocket Radio Systems, Inc.
 1415 N. Westside St.
 Tampa, FL 33613-2818
 Title: NS98 Series External DFM Modem
 Size: Document Number 8 8728898108-2A RX Section
 Date: Jul 28, 1992 Sheet 1

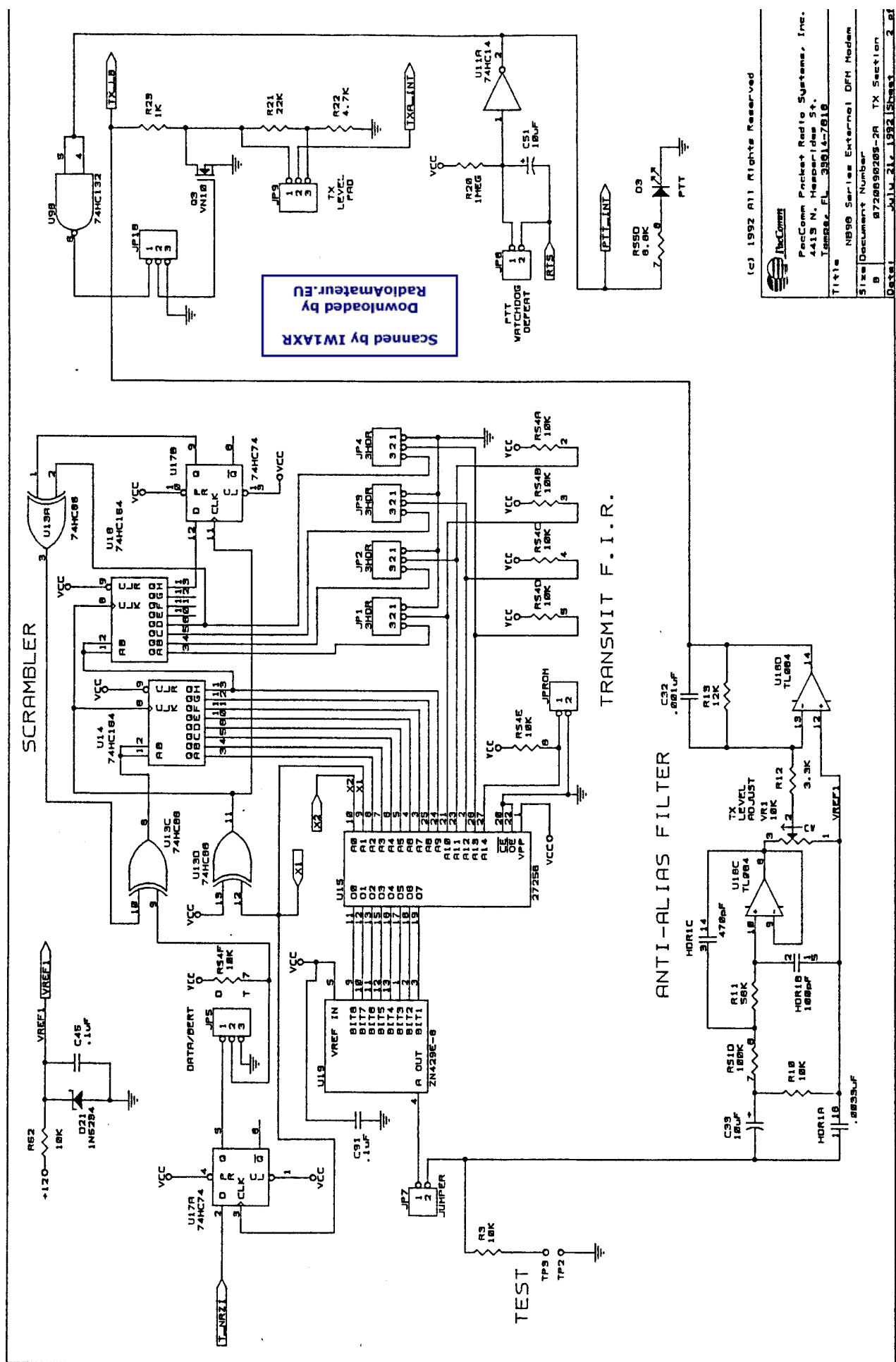
DFM TNC - MODEM




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 4413 N. Hesperides St.
 Tennesse, TN 3814-7818
 Title: N896 Series External DFM Modem
 Size: Document Number 8 8720890405-2R Switching Section
 Date: July 21, 1992 15sheet 4

NOTE: VR2 REPLACES VR2 IN IFR. NOT USED FOR OTHER APPLICATIONS.

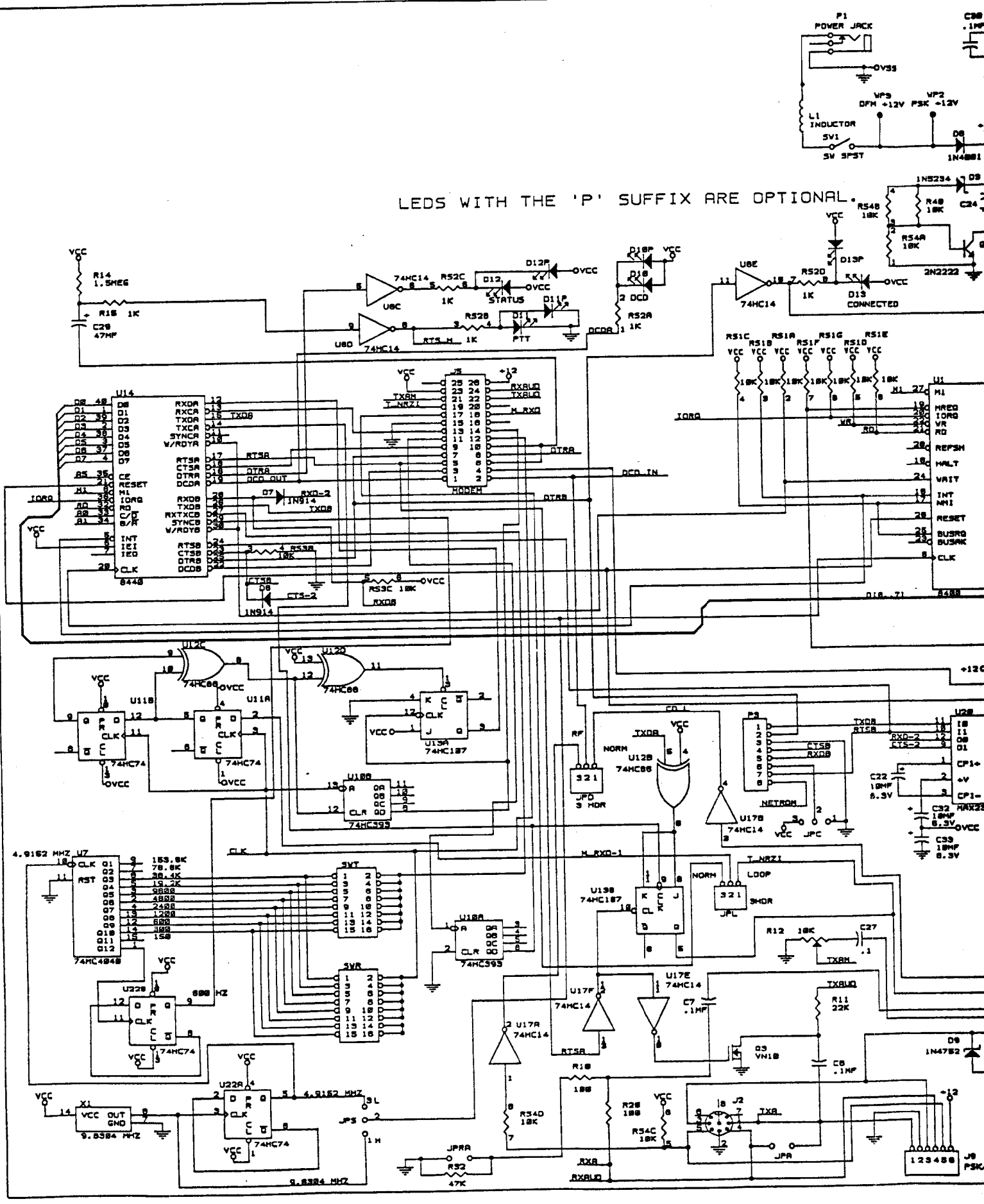
DFM TNC - MODEM

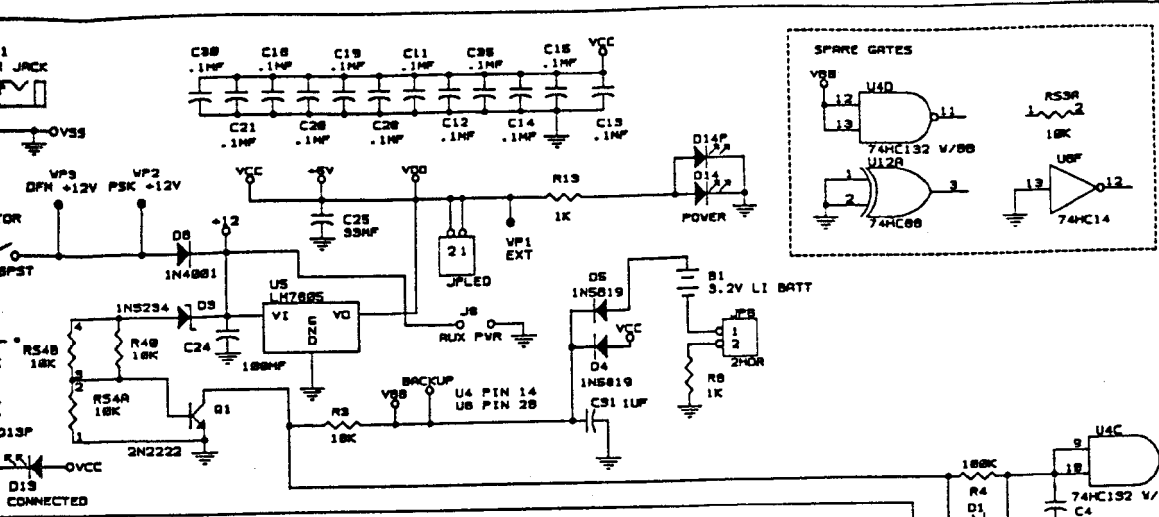


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 4415 N. Herpersides St.
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 Title: NB90 Serials External DFM Modem
 Size: Document Number: 8720090209-2A TX Section
 Date: July 21, 1992 Sheet 2 of 2

LEDS WITH THE 'P' SUFFIX ARE OPTIONAL.

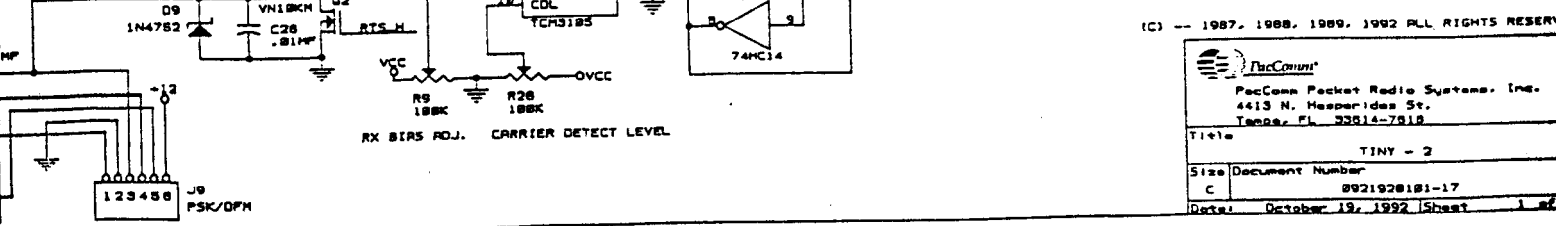
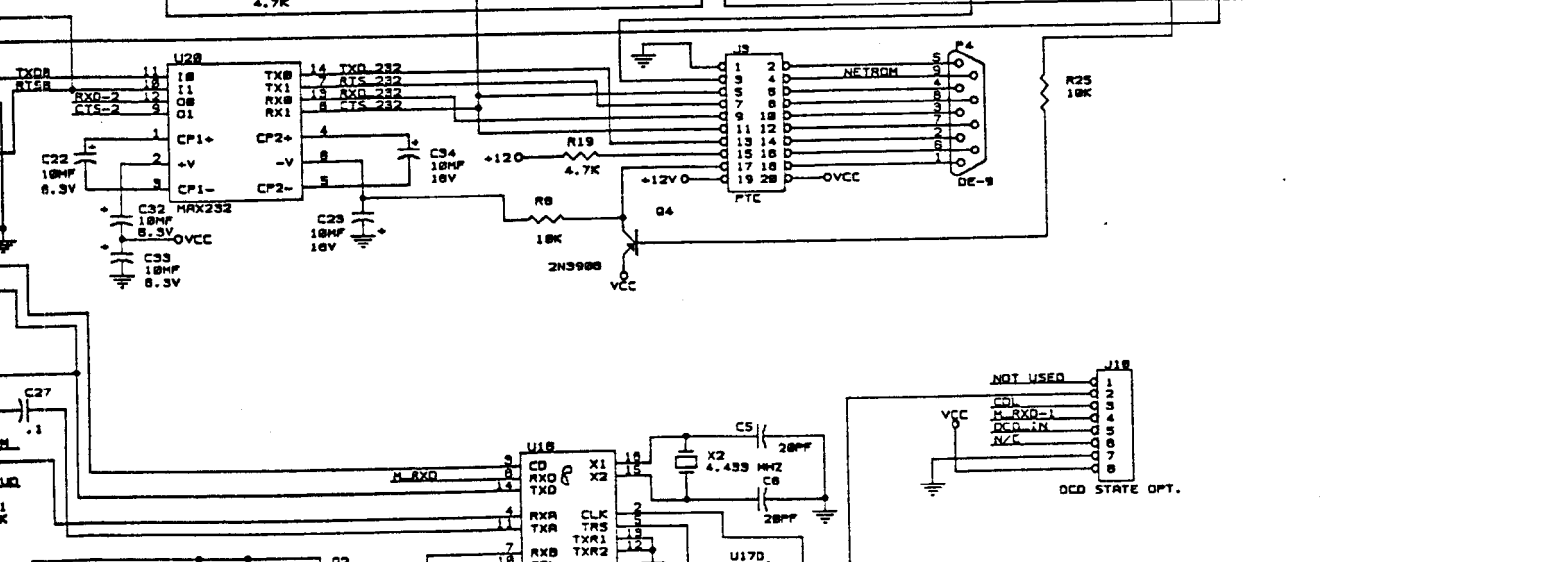
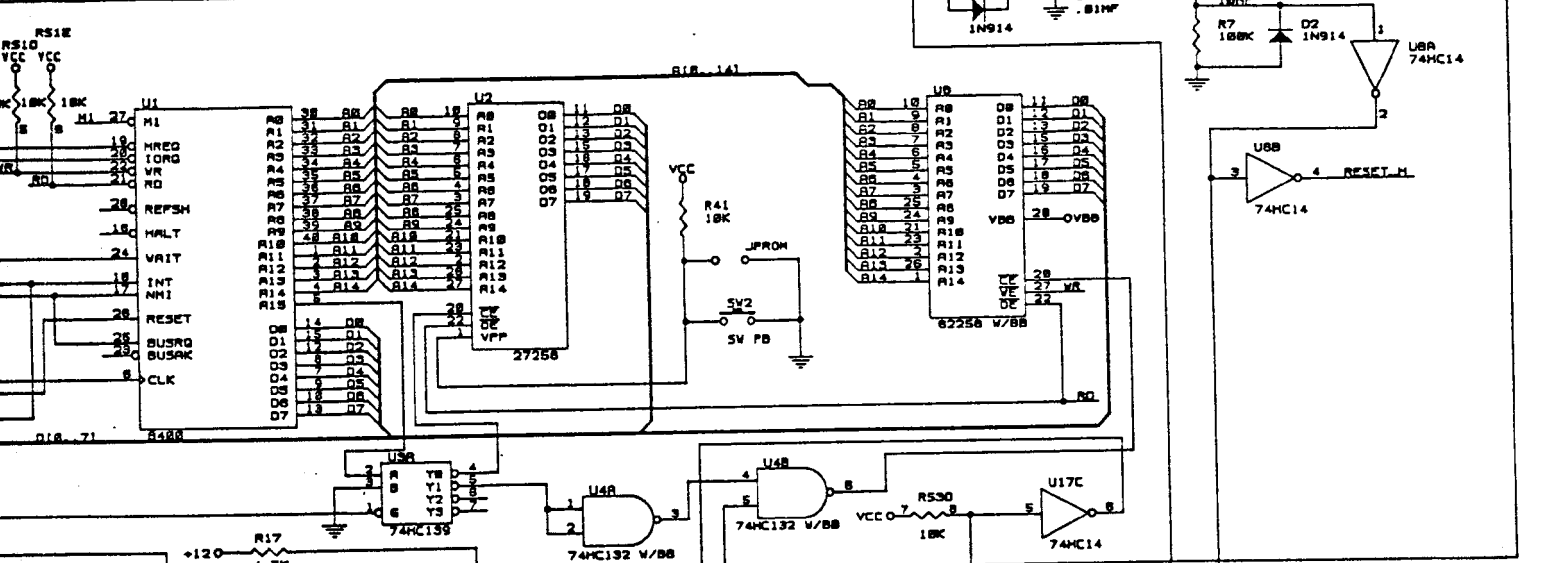




POWER SUPPLY TABLE

I.C.	+5V	+12V	-18V	GND
74HC14	14			7
74HC74	14			7
74HC88	14			7
74HC197	14			7
74HC132	14			7
74HC139	14			7
74HC393	14			7
74HC494	14			7
8488	11			20
8410	9			31
27258	28			14
82258	28			14
8255	28			7
MB8221	13	14	9	12
MB8232	18			15
TCM3105	1			9

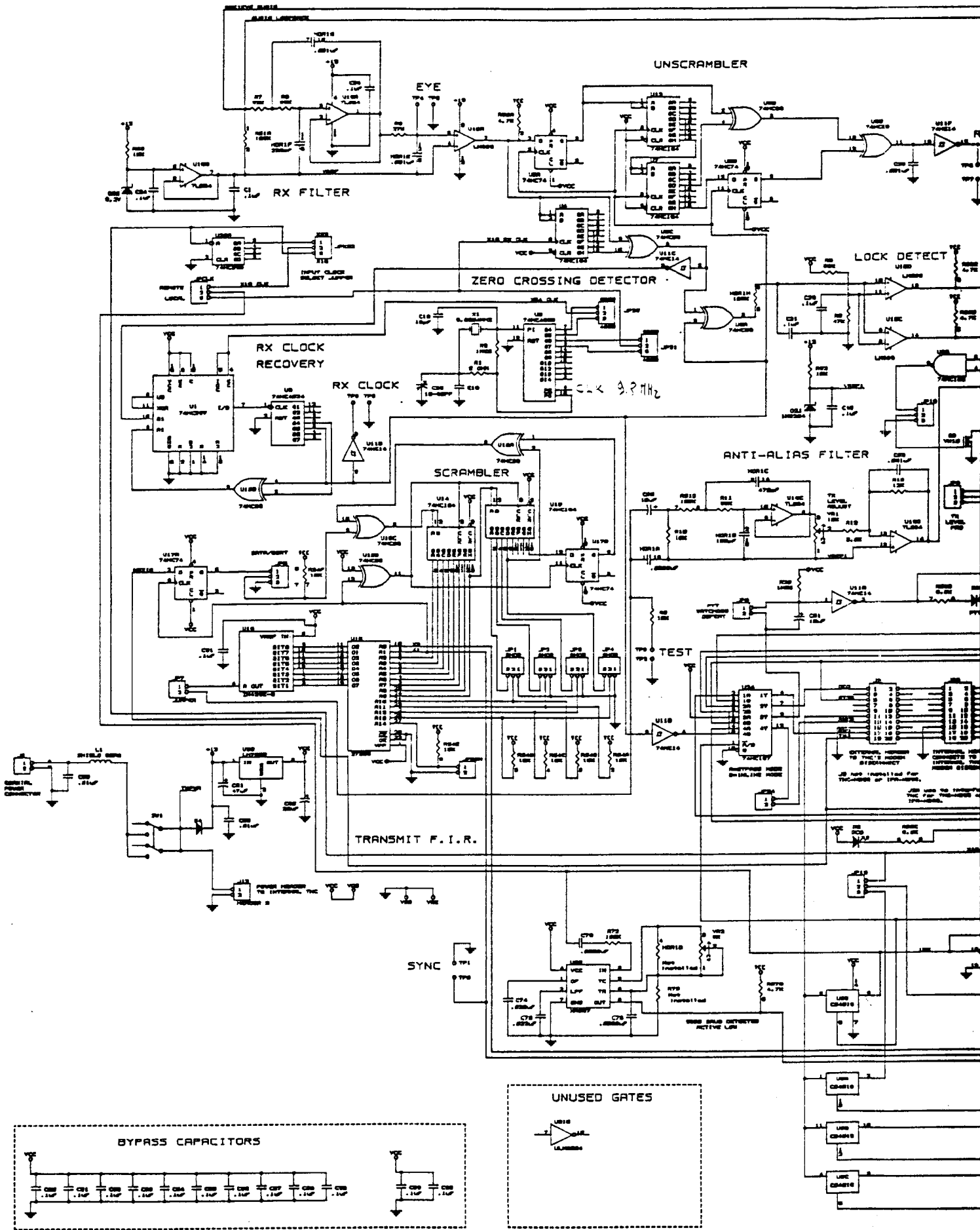
== ALSO POWERED BY BATTERY



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Title: TINY - 2
 Size/Document Number: 8921928181-17
 Date: October 19, 1992 Sheet 1 of 1



RX FILTER

UNSCRAMBLER

RX CLOCK RECOVERY

ZERO CROSSING DETECTOR

LOCK DETECT

SCRAMBLER

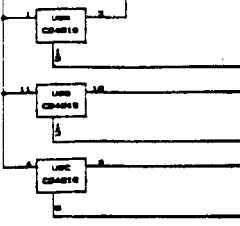
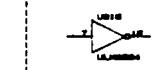
ANTI-ALIAS FILTER

TRANSMIT F.I.R.

SYNC

BYPASS CAPACITORS

UNUSED GATES





PSK-1 to TNC-NB96 Interface Notes and Satellite Operation Tips

READ THIS DOCUMENT BEFORE PROCEEDING TO MAKE RADIO CONNECTIONS

Important Notes For Satellite Users

Working satellites is NOT a simple project. You'll have a lot to learn and a lot of equipment to put together. Talk to a local satellite guru and make sure that you understand what is required. While satellites CAN be a "first time" project you'll need to take it a step at a time and be patient!

To properly operate through the satellites you must be able to work in full duplex mode. This is because a non AX.25 protocol is used. The satellite will transmit for long periods and your transmitter will remain keyed and send acknowledgements during the process of data transfer. If you experience de-sense of your UHF receiver while transmitting on VHF then data transfer will not be successful.

To operate the satellites you MUST use PB and PG software. Dumb terminals or terminal emulation will NOT work, except with FO-20 which uses conventional AX.25. (However, the FO-20 store and forward BBS is currently turned off).

PacComm provides copies of PB and PG with each PSK-1 and TNC-NB96 for your convenience, but we cannot provide instruction or assistance in learning to operate these programs. You should establish contact with AMSAT and get in touch with an experienced operator who is willing to tutor you in your first satellite operations.

For 9600 baud satellites, you'll need an FM VHF transmitter and an FM UHF receiver. For PSK birds, you'll need an FM VHF transmitter and SSB UHF receiver.

Do not EVER connect the PTT line(s) of the TNC-NB96 or PSK-1 to the UHF transmitter (if a transceiver is in use) for satellite operation, especially if an in-line, non-switched pre-amplifier is used. This will result in jamming of the downlink locally AND destruction of the pre-amplifier if it is not the RF- sensing type. If you also use the same equipment for 70 cm terrestrial operation, be careful to disable the PTT when switching from terrestrial to satellite operation

For full duplex operation you will need to defeat the watchdog timer of the TNC-NB96 by using JP8 on the DFM-SA board.

Connecting the TNC-NB96 & PSK-1

In order to allow more flexibility in radio connections to the TNC-NB96 and PSK-1 products, PacComm has

added some extra connections to the DIN radio sockets in later versions of these products.

These allow the use of separate radios for 9600 and 1200 Baud transmissions with no external switching being required. These changes also allow separate 1200 and 9600 Baud connections to be made to the same radio, if necessary.

If your PSK-1 is over one year old it may not have the dual radio capability.

Interconnecting the TNC-NB96 and PSK-1

NOTE: If you ordered the PSK-1 and TNC-NB96 at different times you will only have received the DIN connectors and some cable material and not the made up cables talked about below.

When you order and receive your TNC-NB96 and PSK-1 together you should find two short DIN cables included in the package.

Take one of these cables and connect it from the Radio socket of the TNC-NB96 to the TNC Radio Connector socket (J4) on the PSK-1 [note: RADIO to RADIO].

Take the other DIN cable and connect it from the PSK Modem socket of the TNC-NB96 to the TNC Modem Connector of the PSK-1 [note: MODEM to MODEM].

If you need to make these cables, the connections are pin-for-pin: 1 goes to 1, 2 goes to 2, etc.

Key to panel markings and circuit diagram labels

TNC-NB96		PSK-1	
#	Diagram Panel	#	Diagram Panel
J1	Radio RADIO	J4	TNC TNC RADIO Con
		J1	VHF VHF RADIO
		J3	UHF UHF RADIO
J4	PSK MODEM	J2	MODEM TNC MODEM

Jumper Settings

The following jumpers should be checked on the DFM-SA (9600) board within the TNC-NB96 and set as shown. The DFM-SA board is the board with the 7 LEDs and two switches at the front. [Remember, the TNC-NB96 is not only used for satellite work and not just with the PSK-1, so there are many variations in how the boards may be configured.]

Jumper	Default	Changed to	
JP10	ON	OFF	[1200Bd Rx pass thru]
JP11	ON	OFF	[1200Bd Rx DCD pass thru]
JP26	OFF	ON	[RTSA (PTT) pass thru]

When these jumpers are "OFF", stow the jumper on either one of the pins for safe-keeping.

Selecting One Radio or Two Radio Connections to the PSK-1

To select one radio (J1 only) or two radios (J1 and J3) operation, configure jumpers on the DFM-SA board as follows:

Jumper	One Radio	Two Radios
JP15	2-3	1-2
JP16	2-3	1-2

On the foil side of the board, existing traces join JP15 pins 2-3. Cut these traces so that two radio operation can be used. These traces are there for instances where ONLY defaults would ever be used (some options of the board are not fitted with the headers).

PSK-1 Radio Connections

Note: The connections shown on page 4 and page 5 in older versions of the PSK-1 manual are incorrect. Use the signal descriptions below.

For Two Radio Operation: Use J1 AND J3

J1 Pin Signals

1	VHF Radio TX Audio	9600 baud transmit only
2	Ground	
3	VHF Radio PTT	PTT to Transmitter
4	VHF Radio RX Audio	9600 baud receive only
5	VHF Radio RF DCD	
6	Not Used	[UHF Radio RX Audio]
7	Not Used	[UHF Radio Step Up]
8	Not Used	[UHF Radio Step Down]

J3 Pin Signals

1	UHF Radio Step Up	To UHF receiver Step up
2	Ground	
3	UHF Radio RX Audio	PSK receive only
4	Ground	
5	UHF Radio Step Down	To UHF receiver Step dwn
6	Not Used	[UHF Radio TX Audio 1200]
7	UHF RX Audio 1200	1200 baud Receive only
8	Not Used	[UHF Radio PTT 1200]

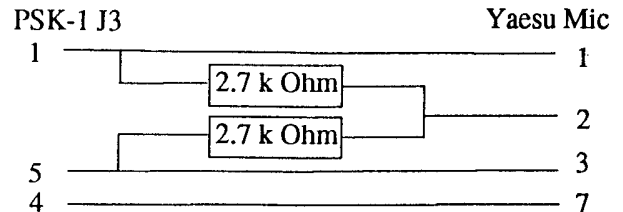
For One Radio Operation: Use J1 ONLY

J1 Pin Signals

1	VHF Radio TX Audio	9600/1200
2	Ground	
3	VHF Radio PTT	
4	VHF Radio RX Audio	9600/1200
5	VHF Radio RF DCD	9600/1200
6	UHF Radio RX Audio	PSK receive only
7	UHF Radio Step Up	
8	UHF Radio Step Down	

Note for FT-726 & FT-736 users

The diagram on page 54 of older copies of the PSK-1 manual incorrectly labels the Yaesu microphone connections as pin 1. Use the diagram below.



Important operation notes for the PSK-1 (from most frequently asked questions)

1) When not using PSK modulation the PSK-1 MUST stay powered and set to the MODEM OUT mode.

2) 400Bd telemetry can only be copied through the RS-232 port on the back of the PSK-1.

3) There is NO "smart" interconnection between the PSK-1 and the external TNC - sending commands to the PSK-1 processor can only be done through the RS-232 port on the PSK-1 NOT the TNC!

4) To fully automate the TNC and PSK-1 combination you will need TWO comm ports on a PC, one to "talk" to the TNC (regular commands or KISS mode with PB/PG) and the other to "talk" to the PSK-1 modem.

5) Interconnection with other than PacComm TNCs is possible BUT NOT NECESSARILY EASY! As an example, various PK-232 configurations exist (some made in Hong Kong, some in China) and the board layouts and connections are different on the differently assembled units. There is inadequate provision for connection to the necessary signals. This is not recommended for the electronic novice.

6) Most modern radios WILL convert for 9600Bd use. PacComm has an extensive list of these modifications and can get new configurations from the originator of the modem design, G3RUH.

7) AFSK, PSK and DFM output levels are all independently adjustable and you will need to set them for each mode in turn. Input levels are not adjustable. Some satellites have better modems than others, so don't assume that just because one works that they all will work!

8) Finally, for those who are curious about configurations, the following notes might be of interest:

- JP22 and JP23 on the DFM-SA board can be used to configure the power-up baud rate setting of the TNC-NB96. Make sure the default tracks on the foil side of the board are broken.

- JP9 on the DFM-SA board sets high or low TX modulation amplitude. Some radios are very sensitive to modulation (e.g. TEKK), while others (notably the new 9600 ready amateur radios) are not.