

IMPORTANT NOTICE

It is noted with regret that Jacques Brodeur, VE2EMM, passed away 2009. Contact information or web links contained in this document or on web pages linked herein may or may not yield results.

This document is an archival representation of the content of the original pages.

The original URL of the main “Doppler 3” page was:

<http://www.qsl.net/ve2emm/pic-projects/doppler3/doppler3-e.html>

The contents of this document include additional pages and images linked to the above page as noted. As much as practical, the original formatting of the pages was retained along with many of the original hyperlinks for your reference. Note that it may be possible to use a web archive to look at the web pages in their original form.

Where the original text referred to other web pages, documents or pictures, these were added within the original document as noted.

Any comments added by me are noted in [square brackets].

As of the time of the last update of this document, the Montreal Doppler 3V2 boards were still available from FAR Circuits but it is unknown if the *original* code for the Doppler 3V2 is still available from any source.

However, the “Alternate” firmware for the Doppler 1, 2 or 3 units is still available and information about it may be found at this web site:

http://ka7oei.com/ardf_getting_chips.html

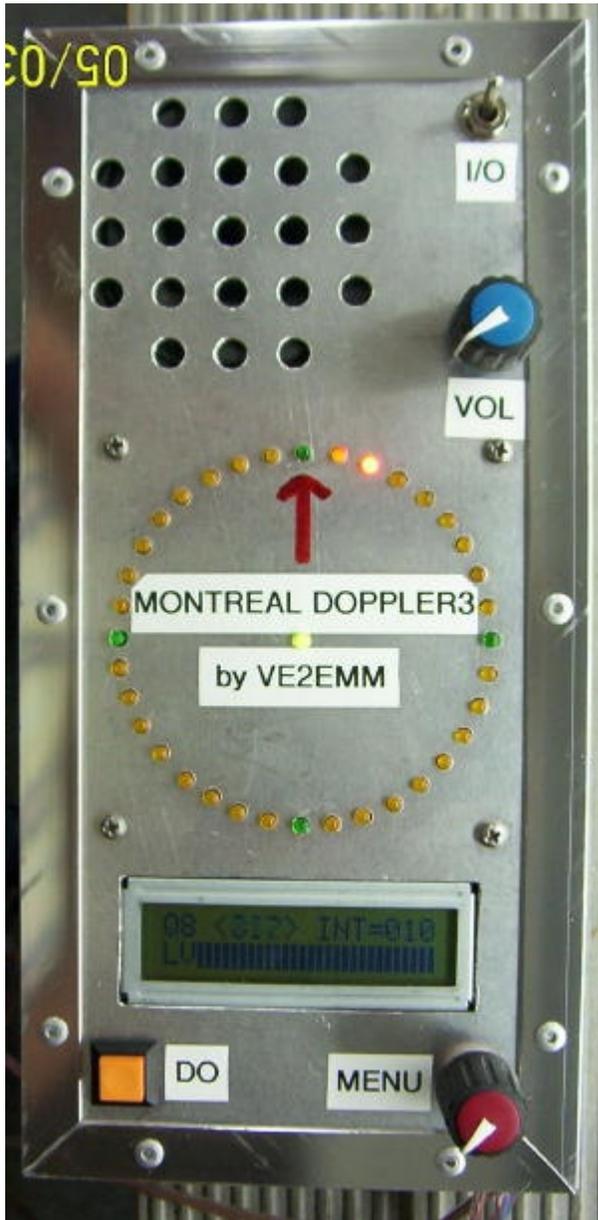
Additional information about the Montreal Doppler 1, 2 and 3 units is also available at the following web site:

http://ka7oei.com/ardf_pages.html

Please note that these aren't “official” Montreal Doppler sites, but I'll offer what help that I can.

-- The Montreal Doppler 3V2 --

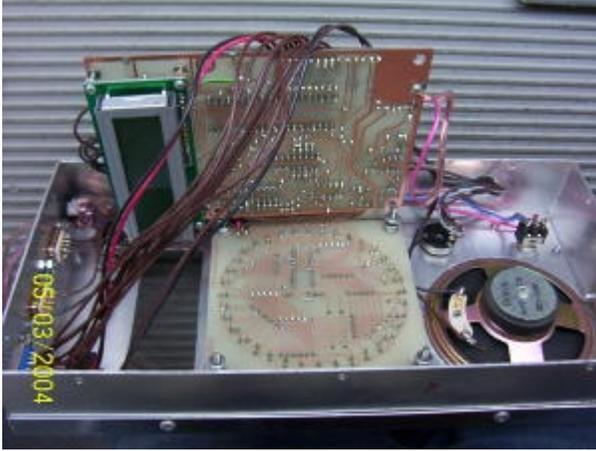
Last update, March 23, 06



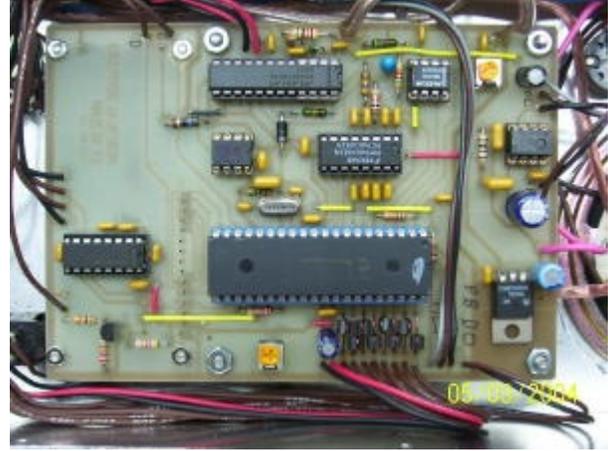
FRONT PANEL



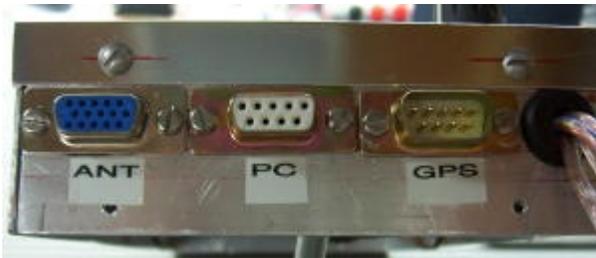
INSIDE VIEW



2 BOARDS ARE BACK TO BACK



MAIN BOARD



CONNECTORS

MORE PHOTOS FROM BUILDERS...

[The photos mentioned above may be found at the end this document]

Lots more pictures on the web page of the AMATEUR RADIO CLUB VE2UMS:

http://www.ve2ums.ca/chasse/Serge/Transmitter%20Hunting/Doppler/doppler_links.htm

Please contact me for more info.

[Note: Due to Jacques' passing, email addressed to him may be directed elsewhere and it is unknown if it will be answered.]

FEATURES

- 36 LEDs display; center LED when green = good signal, when red = no signal , the direction is frozen to the last good signal.
- Uses 3 PICs; a PIC16F628A for the display, a PIC18F4520 as the main processor and a PIC12F675 as a frequency divider.
- Filters; a Max 267, the best bandpass filter that I have ever seen, followed by the Roanoke switch cap filter for very narrow band width (+/- 0.5Hz).
- My DopplerII integrating and phase detection software in the main PIC.
- LM386 for monitoring the audio independently from the doppler.
- Simpler menu selection, turning a selection pot and a pushing a DO switch.
- It will switch 4 antennas with a + or - going signal, 4 antennas differential, 8 antennas with a + or - going signal.
- Pushing the DO PB sends the direction to APRS. The protocol is: `<cr><lf>%359/Q<cr><lf>`. The Q (0<8) is the quality of the signal just before the extraction of the phase information.
- GPS information goes through the doppler, it will be instantly interrupted when the doppler sends a DF to APRS on a PC.
- Faster main processor, PIC18F4520. ****** NEW **** June 06**

THE MENUS:

0 - Main operating position ;

First line shows: Quality Factor(signal out of the last soft filter in the PIC), direction in deg., # of returns being integrated.

Second line shows: A bargraph of the signal level out of the MAX267 input filter or a S-Meter DC signal from your radio if needed.

The DO Push Button alternate between no signal processing and selected integration.

This menu can be removed by removing a jumper (H1) if only APRS is in use.

1 - Also a main operating position;

First line shows: Quality Factor(signal out of the last soft filter in the PIC), direction in deg., # of returns being integrated.

Second line shows: A bargraph of the signal level out of the MAX267 input filter or a S-Meter DC signal from your radio if needed.

The DO PushButton sends a DF to a PC. (via RS232)

2 - Reduce the quantity of integration by pushing the DO PB.

3 - Increase the quantity of integration by pushing the DO PB.

4 - Auto calibration to forward by pushing the DO PB.

5 - Reduce the calibration position manually by pushing the DO PB.

6 - Increase the calibration position manually by pushing the DO PB.

7 - Selection of the minimum Quality Factor (1<8) for displaying a good return. Less then the selected number, freeze the display to the last good return.

8 - LCD display, BRIGHT / DIM control. ****** NEW **** June 06**

9 - Future menu

10- Selection of the DF to PC baud rate, 2400, 4800, 9600, 19200.

11- Bargraph selection of the S-Meter from a radio or the level out of first MAX 267 filter.

12- Selection of 3 complete setup for different radios or cars. ****** NEW **** June 06**

13- Selection of antenna rotation CW or CCW.

14- Selection of antenna switching, 4 +/- and 4 differential or 8 +/-.

15- Selection of antenna under test. (individual activation of each antenna)

Construction and setup text

[Note: This was originally a separate document]

HOW TO, MONTREAL DOPPLER3V2, June 06

***** ASSEMBLY *****

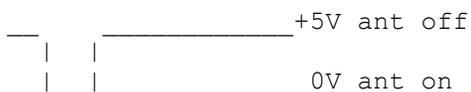
- 1- Install the 2 PCBs back to back, use #4 screws and nuts to hold them separated and mounted to the case.
- 2- install the LCD display using #2 screws and nuts, make shure that no traces on the LCD PCB are short circuit with the mounting screws, you may need a fiber washer to insulate them.
- 3- Solder the LEDs on the display PCB with their flange at the height of the top of the PIC16F628A IC.
- 4- If you are using R72 to R79 in the antennas switching circuits, install the FB on the leads going to the antennas. If no resistors are needed, pass 2 turn of #26 enamel wire in the FB.
- 5- If you are not using the S-Meter option, do not install the #50 componants. Ground the center of P50.
- 6- If you are not using a PC and or GPS, do not install the #100 group of componants.
- 7- The GPS input can be on pin 2 for a null-modem RS-232 cable, or 3 for a staight RS-232 cable.

[Note: This information refers to the *original* VE2EMM firmware.]

- 1- Remove header "H1" to display only the APRS TX menu.
Install the header "H1" to display the 2 operation menus.
- 2- P20 should be adjusted near ground for proper contrast on the LCD.
- 3- For 4 antennas and an antenna switcher that needs +5V to turn on an antenna, connect the switcher control leads to the ANT1 to ANT4 terminals.



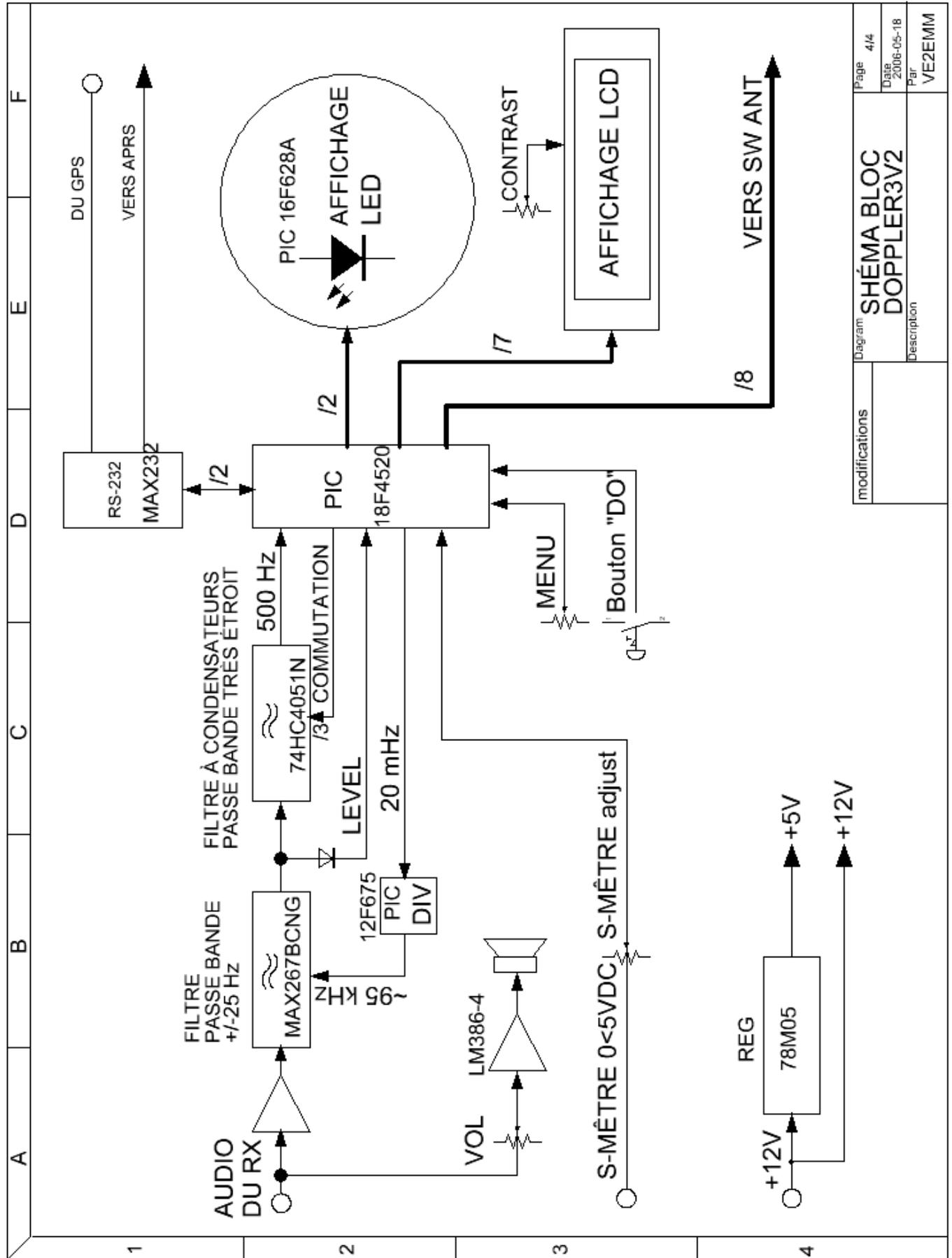
- 4- For 4 antennas and a switcher that needs a ground to turn on an antenna, connect to the ANT5 to ANT8 terminals.



- 5- For 4 antennas and a differential switcher, connect antenna 1 to the ANT1 and ANT5 terminals while respecting the correct polarity for your switcher type. Antenna 2 to ANT2 and ANT6 terminals, antenna 3 to ANT3 and ANT7 terminals and antenna 4 to ANT4 and ANT8 terminals.
ANT1 to ANT4 terminals supply a +5 to the antenna that is ON, ANT5 to ANT8 terminals supply a ground to the antenna that is ON.
- 6- For 8 antennas, connect to the ANT1 to ANT8 terminals, use the antennas menu to select +or ground switching.
- 7- If you are using the S-Meter option, adjust P50 for full scale on the bargraph with the maximum signal strength out of the radio.
- 8- Using a good DF signal, adjust the radio volume control for near Full Scale on the bargraph. There is no need to re_adjust it any more.
- 9- Increase the integration to your taste, push the DO button to instantly reduce the integration to 5 rotation of the antenna, push again to return to your selected integration.
- 10- Calibrate to foward with a friend driving in front of you on a straight road and transmitting, push the DO button on the CAL to FOWARD menu, the direction will then be calibrated to the front of your car.

Jacques VE2EMM

Block diagram



modifications	Diagram	Page
	SHÉMA BLOC	4/4
	DOPPLER3V2	Date
	Description	2006-05-18
		Par
		VE2EMM

Main board schematic with scope waveforms for trouble shooting

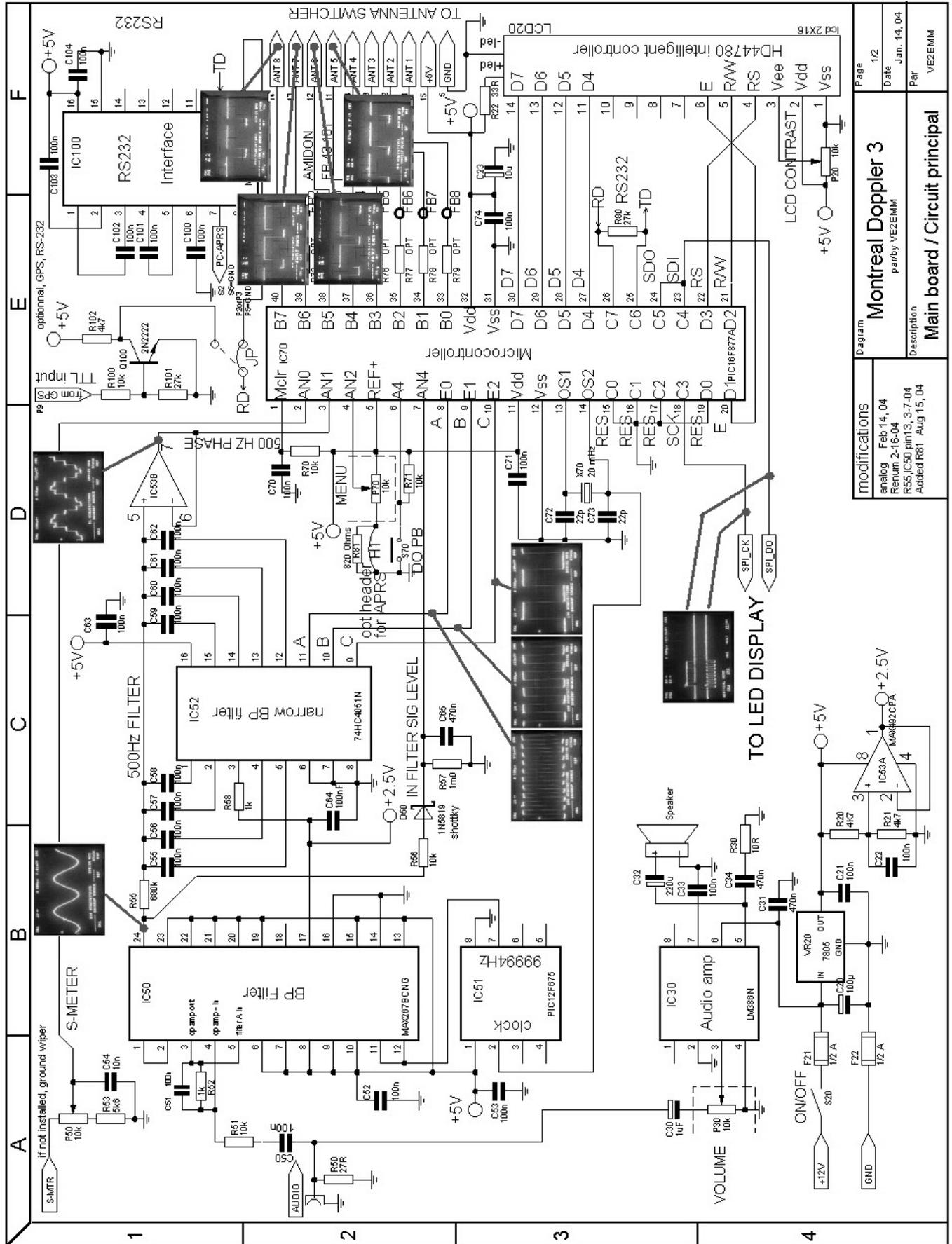
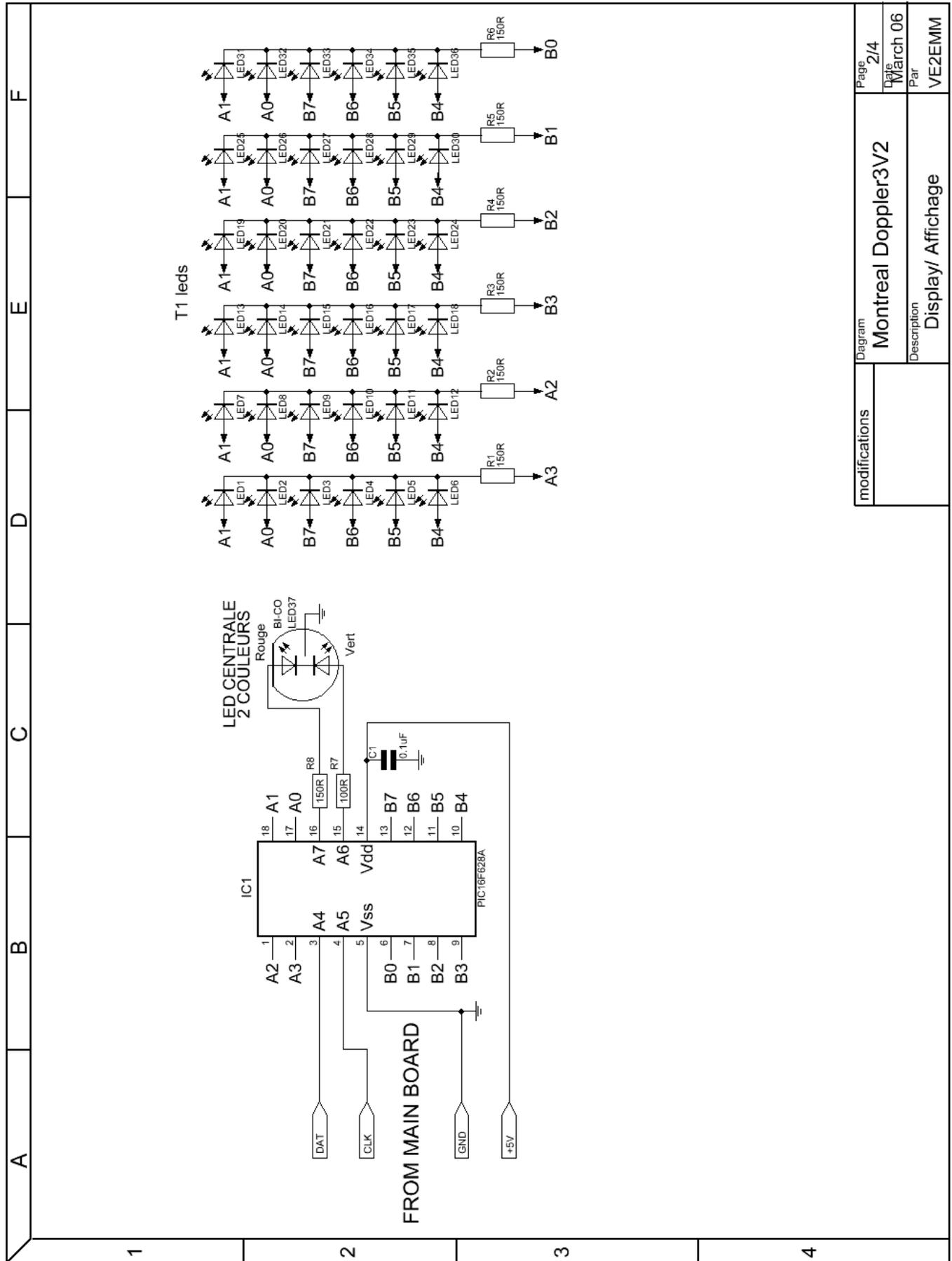


Diagram	Montreal Doppler 3 parby VE2EMM
Page	1/2
Date	Jan. 14, 04
Par	VE2EMM
Modifications	analog Feb 14, 04 Renum 2-16-04 RS5, IC50 pin 13, 3-7-04 Added R61 Aug 15, 04
Description	Main board / Circuit principal

Display schematic



modifications	Diagram	Page
	Montreal Doppler3V2	2/4
	Description	March 06
		Par
	Display/ Affichage	VE2EMM

Parts list Doppler3V2.

Components list MONTREAL DOPPLER3V2 March 8,06

***** DOPPLER3V2 MAIN BOARD *****

C11,C20,C21,C22,C50,C33,C51,C52,C53,C55,C56,C57,C58,C59,C60,
C61,C62,C63,C70,C71,C74,C100,C101,C102,C103,C104, = 0.1uF CER
C23 = 10uF EL 16 Volts
C30 = 1uF EL 16 Volts
C31,C34,C65 = 0.470uF CER
C32 = 220uF EL 25 Volts
C35 = .001uF CER
C54 = 0.01uF CER
C72,C73 = 22pF CER

R20,R21,R102= 4K7 1/4W
R22 = 33 OHMS 1/4W
R30 = 10 OHMS 1/4W
R50 = 27 OHMS 1/2W
R51,R56,R70,R71,R100 = 10K 1/4W
R52,R58 = 1K0 1/4W
R53 = 5K6 1/4W
R55 = 820K 1/4W
R57 = 1M0 1/4W
R72,R73,R74,R75,R76,R77,R78,R79 = OPT, for switcher.
100 OHMS 1/4W to replace the FBs when switching logic

R80,R101 = 27K

F21,F22 = 1/2 A

FB1 < FB8 = 101

IC30 = LM386N-4 THE "-4" IS NECESSARY FOR 12v USE AND HIGHER POWER
IC50 = MAX267BCNG
IC51 = PIC12F675-I/P
IC52 = 74HC4051N buy from DK for good quality chip
IC53 = MAX492CPA
IC70 = PIC18F4520-I/P
IC100 = MAX232ACPE

Q100 = 2N2222 TO-92 optionnal
VR20 = 7805 TO-220
X70 = 20 mHz HC49 DK #300-6042-nd
D20 = 1N4004 RECTIFIER DIODE
D50 = 1N5819 Schottky Diode

LCD20 = lcd 2X16, HD44780 intelligent controller

P20 = 10k LINEAR TAPER pot
P30 = 10k AUDIO TAPER pot
P50 = 10k LINEAR TAPER pot
P70 = 10k LINEAR TAPER pot

S20 = SP-ST Miniature Toggle
S70 = NO Miniature Push-Button

SP = Speaker

***** 36 LEDs DISPLAY BOARD *****

C1 = .1uF CER
IC1 = PIC16F628A-I/P

LED1 < LED36 = 3mm size, RED and/or GREEN
LED37 = 3 or 5mm Bi-Co red/green 3 leads, common cathode

R1,R2,R3,R4,R5,R6,R8 = 150 OHMS 1/4W
R7 = 100 OHMS 1/4W

***** EXPERIMENTAL SWITCHER BOARD *****

D1 < D8 = HSMP389b pin diode AGILENT Surface Mount, OR YOUR PREFERRED PIN DIODE
C1 < C8 = 470 pF CER SM
C11 < C15 = .1 uF CER SM
L1 < L4 = 0.47 uH inductor SM
R1 < R4 = 560 Ohms SM
IC1 = MAX204CWE SM, RS232 interface, 4 circuits TTL to RS232
T1 < T4 = TV 2 holes balun cores taken from 75 Ohms to 300 Ohms adapter
Misc = PCB material, fiberglass rods or white PVC tubes, #26 enamel wire
Antennas dimentions from Joe Moell's Homing In web site

***** MISC *****

BOX
CONNECTORS
PLUGS
FUSE HOLDERS

Parts list Doppler3.

[Note: This parts list was for the older, original Montreal Doppler 3 and it differs slightly from the above. Refer to this parts list ONLY if you have an older “non-3V2” board.]

Components list MONTREAL DOPPLER3 Jun24,05

C1,C11,C20,C21,C22,C50,C33,C51,C52,C53,C55,C56,C57,C58,C59,C60,
C61,C62,C63,C70,C71,C74,C100,C101,C102,C103,C104, = 0.1uF CER
C23 = 10uF EL 16 Volts
C30 = 1uF EL 16 Volts
C31,C34,C65 = 0.470uF CER
C32 = 220uF EL 25 Volts
C54 = 0.01uF CER
C72,C73 = 22pF CER

Do not install C64, it has been removed to prevent oscillations from IC53A.

R1,R2,R3,R4,R5,R6, = 180 OHMS
R7 = 220 OHMS
R20,R21,R102= 4K7
R22 = 33 OHMS
R30 = 10 OHMS
R50 = 27 OHMS
R51,R56,R70,R71,R100 = 10K
R52,R58 = 1K0
R53 = 5K6
R55 = 820K
R57 = 1M0
R72,R73,R74,R75,R76,R77,R78,R79 = OPT, for switcher
R80,R101 = 27K

F21,F22 = 1/2 A

IC1 = PIC16F628A-I/P
IC30 = LM386N
IC50 = MAX267BCNG
IC51 = PIC12F675-I/P
IC52 = 74HC4051N
IC53 = MAX492CPA
IC70 = PIC16F877A-I/P
IC100 = MAX232ACPE

Q100 = 2N2222 TO-92
VR20 = 7805 TO-220
X70 = 20 mHz HC49 DK #300-6042-nd

D50 = 1N5819 Schottky Diode

LCD20 = lcd 2X16, HD44780 intelligent controller

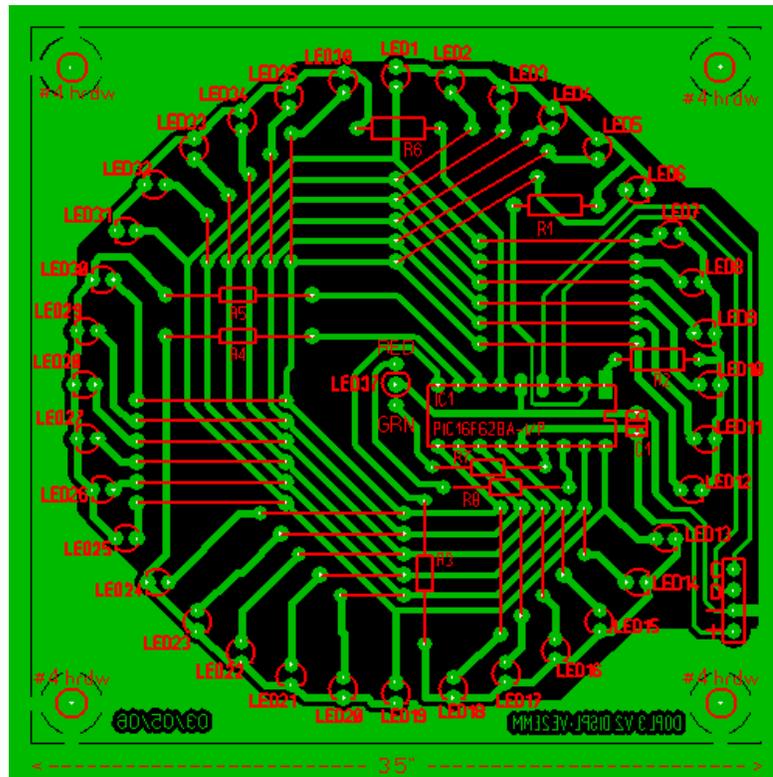
LED1,LED2,LED3,LED4,LED5,LED6,LED7,LED8,LED9,LED10,LED11,
LED12,LED13,LED14,LED15,LED16,LED17,LED18,LED19,LED20,LED21,
LED22,LED23,LED24,LED25,LED26,LED27,LED28,LED29,LED30,LED31,
LED32,LED33,LED34,LED35,LED36 = T1 RED and/or GREEN
LED37 = T1 Bi-Co 2 leads

P20 = 10k LINEAR TAPER pot
P30 = 10k AUDIO TAPER pot
P50 = 10k LINEAR TAPER pot
P70 = 10k LINEAR TAPER pot

S20 = SP-ST Miniature Toggle
S70 = NO Miniature Push-Button

SP = Speaker

Display Board



May I suggest the use of Joe Moell K0OV's wide band antenna system for this doppler. It is on the [Homing In](#) web site.

Here is the [viewer/printer software](#) for the schematic, and the complete [schematics](#) for the doppler3V2, includes the switcher.

Here is the [viewer/printer software](#) for the PCBs, and the complete [PCBs](#) files for the doppler3V2, includes the switcher.

The above viewers are self contained software and do not leave traces in your PC.

Buy the PCBs and PICs from Fred KF9GX at [Far Circuits](#).

I can program your PICs, the source program and the object code is also available for Amateur Radio use only by writing to [VE2EMM](#).

[**NOTE:** The above .RAR files may be found on the ka7oei..com web site linked at the beginning of this document.]

SUGGESTIONS

Please send your [suggestions and requests](#), they will be appreciated.

Thanks & 73, Jacques VE2EMM

My new [untested switcher](#), a variant of Joe Moell wideband switcher. One more untested antenna switcher prototype.

Switcher [center](#), switcher [antenna ends](#)

Fine print:

All material on this page is distributed on a WYSIWYG basis and as such I can't take any responsibility for the use of this design and its results. However in saying this it must also be mentioned that every effort has been taken to ensure that it as error free as possible.

[BACK TO HOME PAGE INDEX](#)

Many thanks to Al Waller K3TKJ for graciously hosting my web pages on QSL.NET.

[**IMPORTANT NOTE:**

It is unknown if the email addresses or links above work now or will continue to do so in the future.

MORE PHOTOS FROM BUILDERS...
BACK TO DOPPLER 3 ENGLISH PAGE
RETOUR À LA PAGE FRANÇAISE DOPPLER 3

[These pictures were originally located on a separate page. The original hyperlinks have been retained.]

From builder WN0X Sept 04



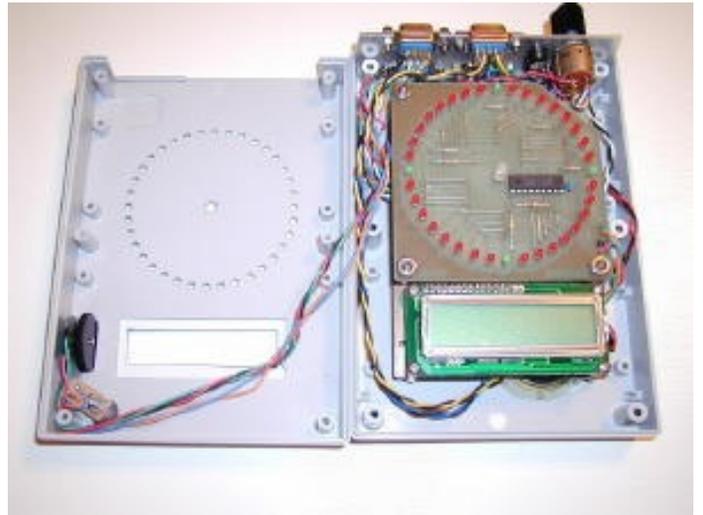
OPERATING MODE



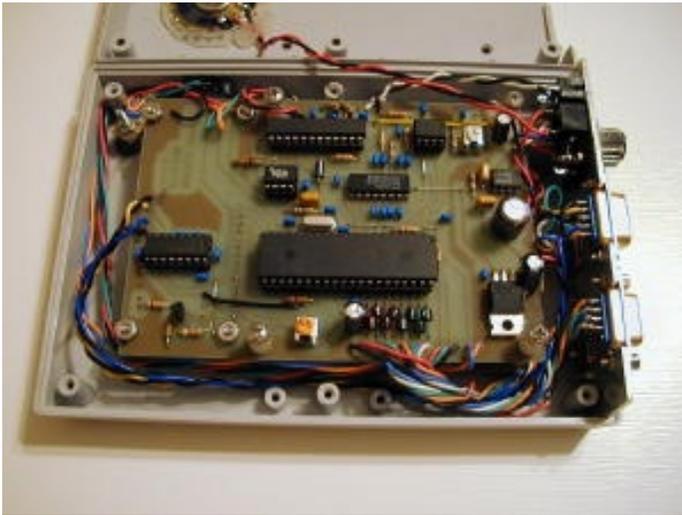
CONNECTORS



TOP



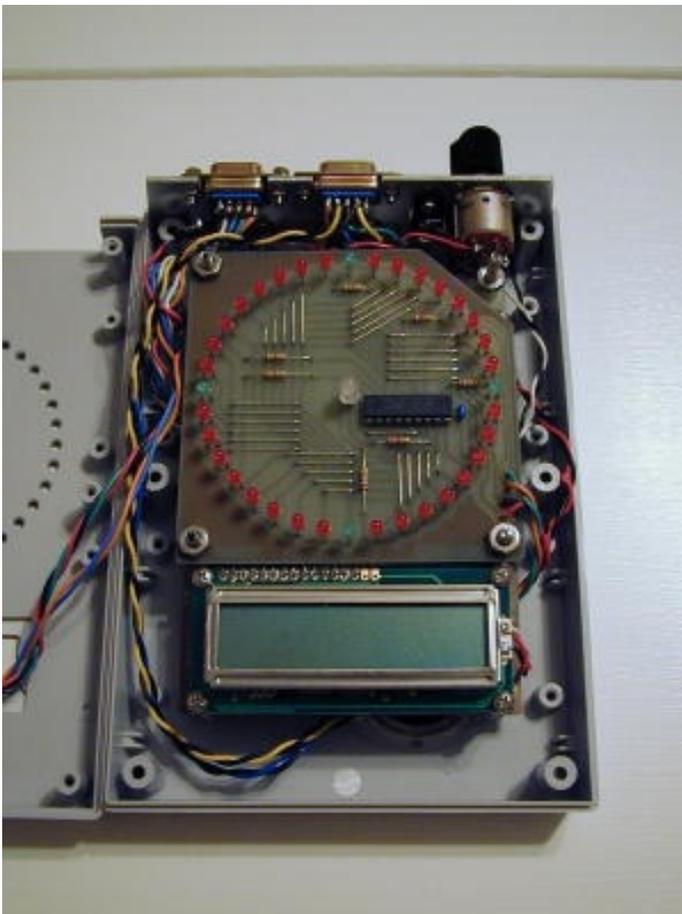
INSIDE



TOP OF MAIN BOARD



ANTENNA CONNECTIONS



TOP OF DISPLAY BOARD

From builder IK4CIE Oct 04



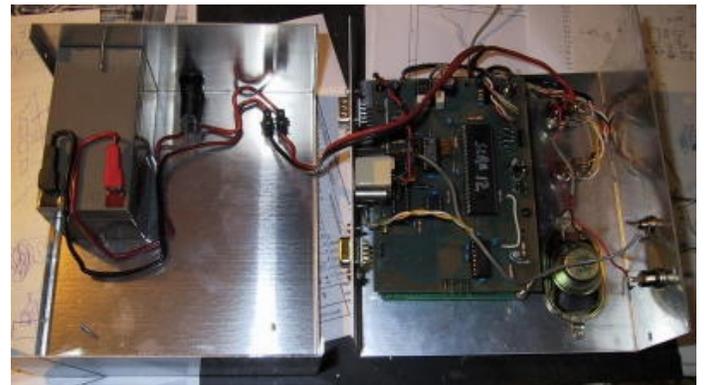
LEDs TESTING



THE "FS" BARGRAPH USED AS A BATTERY MONITOR

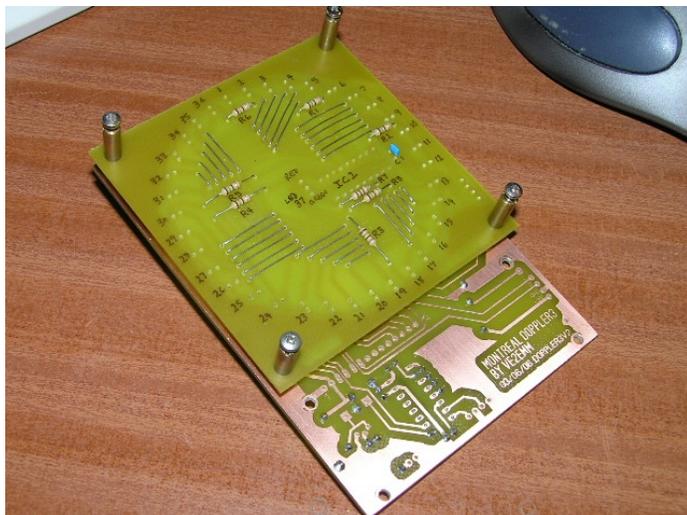


CONNECTORS ON THE RIGHT SIDE



THIS MD3 IS BATTERY POWERED

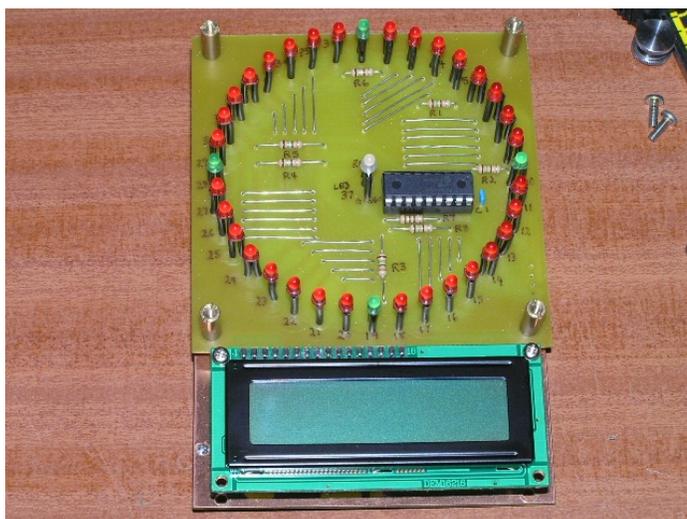
From builder M0MBX May 09



BOARDS



INSIDE



POPULATED BOARDS



FINISHED DOPPLER



TESTING DOPPLER



CAR ANTENNAS



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[END OF DOCUMENT]