

# WX-250

## Digital Weather Receiver

### ***Computer Automation Technology, Inc***

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# Table of Contents

Chapter		Page
1.	Introduction and Specifications	3
2.	Interfacing to Repeater	5
3.	Configuration Programming	9
4.	Drawings	14
5.	Schematics	15
6.	Parts List	17

REVISED 07/30/09 (V1.00)

## **Chapter 1 - Introduction and Specifications**

### **WX-250 Weather Receiver**

The WX-250 is a highly sensitive quality receiver. A digital decoder responds to Specific Area Message Encoded (SAME) alerts transmitted by the NOAA weather station located in your geographic area. Select your county code and the type of alert. Select warnings and or watches. During a weather alert, a relay in the WX-250 will disconnect the transmitter from the controller and connect it to the weather receiver. The relay provides a ground for the transmitter PTT line. Weather audio will be transmitted for the period of the alert announcement. A programmable alert timer provides back-up protection.

### **Weather Alert Log**

As alerts are received the WX-250 stores the date, time and type of alert in non- volatile memory. Storage space is provided for forty alerts. Use the RS-232 port and the WX-250 configuration program to down load the data.

### **WX Alert Start Logic Output (J3-7)**

An ALERT START output provides a TTL logic high one second pulse when a weather alert is received. This output can be used to set off an external alarm or trigger the controller to execute a macro or load a "SEVERE WEATHER ALERT" memory save.

### **WX Alert Stop Logic Output (J3-6)**

Included in the digital packet is the length of the severe weather alert. The WX-250 stores this information and generates a stop logic output when the time period has expired. The STOP output provides a TTL logic high for one second. This output can be used to trigger the repeater's controller to reload the "NORMAL" memory save.

### **WX Alert Warning Logic Output (J3-14)**

When a weather warning is received, this output goes low. It remains low for the duration of the warning period.

### **WX Alert Watch Logic Output (J3-13)**

When a weather watch is received, this output goes low. It remains low for the duration of the watch period.

### **WX Alert Advisory Logic Output (J3-12)**

When a weather advisory is received, this output goes low. It remains low for the duration of the alert period.

### **Weather Enable Input (J3-9)**

When this input is grounded the weather receiver will activate. When connected to a controller's user function output switch, weather reports on demand are available.

### **Weather Disable Input (J3-4)**

When this input is grounded the WX-250 will not respond to weather alerts issued by the NOAA weather station. Once a "Sky Warn Net" is activated, it may be desirable to stop any additional alerts. When this input is momentary grounded, the WX-250 will reset, canceling an alert.

### **Alert Message Timer Selection**

At the conclusion of an alert message the weather station send a digital termination packet. The WX-250 decodes this packet and turns the transmitter off. If the weather station fails to send the termination packet the alert message timer will take over. Select this time with the WX-250 configuration program.

## Specifications

<b>Available NOAA Channels:</b>	162.400 MHz, 162.425 MHz, 162.450 MHz, 162.475 MHz 162.500 MHz, 162.525 MHz, 162.550 MHz
<b>Sensitivity Receive:</b>	0.5 microvolts for 20 dB quieting
<b>Sensitivity Decoder:</b>	1.0 microvolts for 95% decoder accuracy
<b>Modulation:</b>	Narrow Band FM, 5KHz Deviation
<b>Antenna:</b>	50 Ohm, Type BNC Connector
<b>L.O. Emissions:</b>	Fully complaint with FCC Rules, Part 15
<b>Relay Closure:</b>	2 Form C (DPDT) by Digital Alert Packet
<b>Power:</b>	+12VDC @ 100 ma, DC Power Type 2.5mm
<b>Dimensions:</b>	1.75" H x 19" W x 5" D
<b>Operating Temperature:</b>	-15 to +55 C

### **FCC Part 15 RF Interference**

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

User changes or modifications to the WX-250 not expressly approved by Computer Automation Technology could void the user's authority to operate the equipment.

### **FCC Part 97.113.e Prohibited transmissions.**

No station shall retransmit programs or signals emanating from any type of radio station other than an amateur station, except propagation and weather forecast information intended for use by the general public and originated from United States Government stations.

## Chapter 2 - Interfacing to Repeater

### CAT-1000 Controller Interface

Connect the WX-250 to the CAT-1000B and the repeater as shown in Figure 2-1A. PTT and transmit audio from the CAT-1000B are connected to the repeater's transmitter through the normally closed contacts of the double pole double throw relay located in the WX-250. Set the power switch to on, the WX-250 will announce the firmware version. When a weather alert is received, the relay will switch the weather alert audio to the TX audio input and provide a PTT signal to key the transmitter.

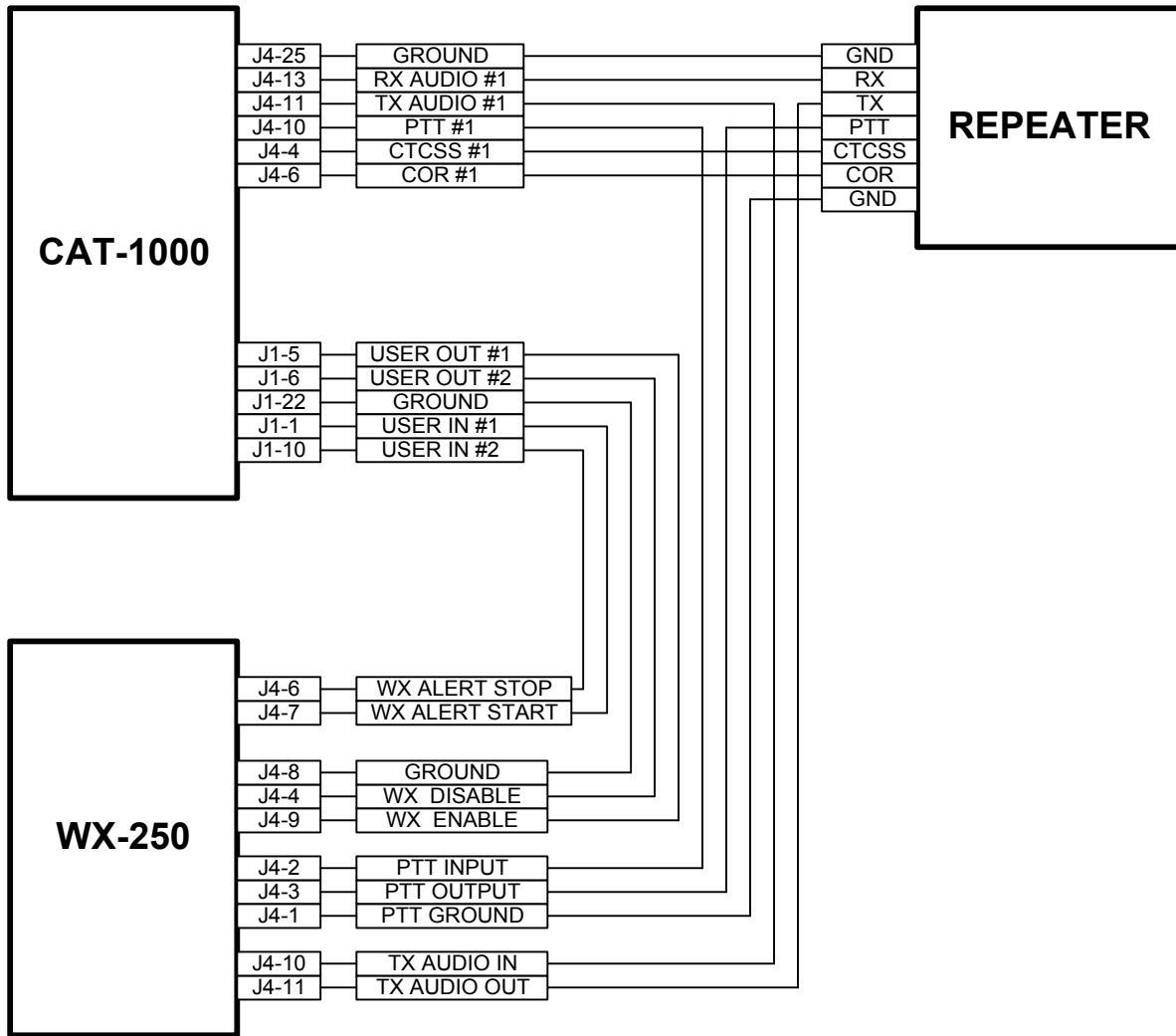


Figure 2-1A

NOTE: To prevent the weather receiver from locking up the transmitter, turn off Zone 8 Channels 1 and 2 on the CAT-1000 until NORMAL and SEVERE WEATHER memory files have been created

### Controller Interface

Connect the WX-250 to the controller and repeater as shown in Figure 2-1B. PTT and transmit audio from the controller are connected to the repeater's transmitter through the normally closed contacts of the double pole double throw relay located in the WX-250. Set the power switch to on, the WX-250 will announce the firmware version. When a weather alert is received, the relay will switch the weather alert audio to the TX audio input and provide a PTT signal to key the transmitter.

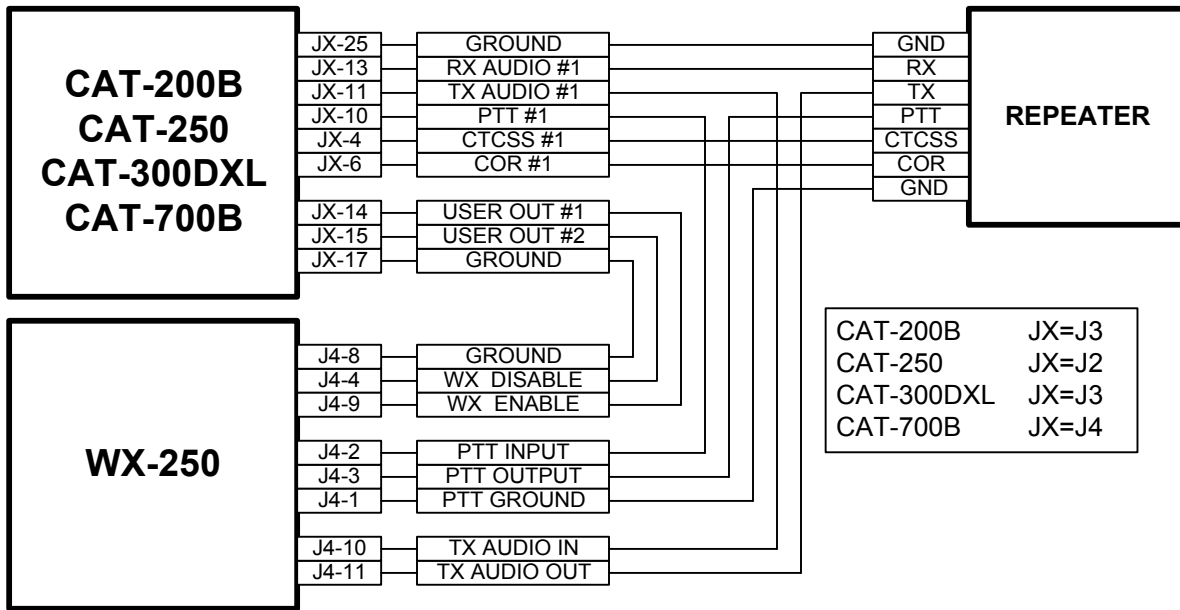


Figure 2-1B

The WX-250 receiver can be activated anytime, by turning on user function switch output #1 which grounds the WX ENABLE pin (J4-14) on the WX-250 receiver.

It may be desirable to stop additional alerts when a sky-warn net is activated. Turn on user function switch output #2. This grounds the WX DISABLE pin (J4-4) on the WX-250.

When a weather alert is received, the WX ALERT START OUTPUT (J4-7) will provide a one second positive DC voltage [TTL] level to be used to activate other equipment at the repeater site.

Included in the alert packet is the length of the alert. When the alert time has expired, the WX ALERT STOP OUTPUT (J4-6) will provide a one second positive DC voltage [TTL] level to be used to activate other equipment at the repeater site.

### **Headphone Interface J1**

Plug a set of stereo headphones into J1 to monitor the NOAA weather station.

### **Computer Interface J2**

Connect your computer's serial port to the WX-250 receiver at connector J1. Use Radio Shack shielded RS-232 cable (cat No. 26-117B) or equivalent. This cable is a DB-9 male to DB-9 female with pins 2-2 and 3-3.

### **12VDC Interface J3**

Connect a 12VDC power supply to the WX-250 receiver through the 2.5mm power jack J2. The center pin is positive. In stand-by mode the WX-250 requires 100 ma.

### **Repeater Interface PTT Ground [J4-1]**

Connect this pin to the transmitter chassis ground. This will insure that during an alert the PTT line will be returned to transmitter chassis ground.

### **Repeater Interface PTT Input [J4-2]**

Connect this pin to the controller PTT output.

### **Repeater Interface PTT Output [J4-3]**

Connect this pin to the transmitter PTT input.

### **Repeater Interface Weather Alert Disable Input [J4-4]**

Connect this pin to a user function switch on the controller. When this input is grounded, the receiver will not respond to alerts issued by the weather station. NOTE: When this input is momentary grounded, the WX-250 will reset, canceling the alert.

### **Repeater Interface Weather Alert Stop Output [J4-6]**

When a weather alert is received, embedded in the digital message is the length of the alert. When this time period has expired, this output will go active high (TTL) for one second.

### **Repeater Interface Weather Alert Start Output [J4-7]**

When a weather alert is received, this output goes active high (TTL) for one second.

### **Repeater Interface Ground [J4-8]**

Connect this pin to controller ground. This provides a common ground between the controller and WX-250 receiver.

### **Repeater Interface Weather Alert Enable Input [J4-9]**

Connect this input to a user function switch on the controller. When this input is grounded, the weather receiver will activate.

### **Repeater Interface TX Audio Input [J4-10]**

Connect this input to the controller transmit audio output.

### **Repeater Interface TX Audio Output [J4-11]**

Connect this output to the repeater transmit audio input.

### **Antenna Interface J5**

Connect a VHF antenna to the BNC connector J5. If the WX-250 is located in the fringe area of the NOAA transmitter an external antenna is recommended. Do not locate the antenna near any transmitting antennas.

## WX-250 Controls

### Test Switch [S1]

Press [S1] to initiate a test sequence of the logic functions of the WX-250. NOTE: This test does not verify the operation of the RF1 receiver module.

### Read FIP Code Switch [S2]

Press [S2] to initiate a read back of the FIP codes programmed into the WX-250. Perform this test after the WX-250 has been programmed to verify the correct county codes have been entered into the WX-250 memory.

### Monitor Switch [S3]

Press [S3] to activate the headphone audio. Press the switch a second time to deactivate headphone audio. NOTE: This switch will also activate the transmitter.

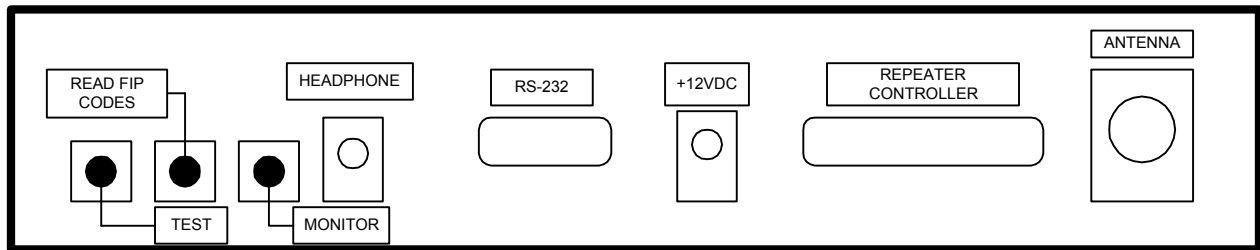


Figure 2-2

## WX-250 Frequency Adjustments [S4]

The WX-250 is shipped with its frequency set to 162.400 MHz. To change to a different NOAA frequency, change the settings of the dipswitch per Figure 2-3.

S4-1	S4-2	S4-3	FREQUENCY
OFF	OFF	OFF	162.400 MHz
ON	OFF	OFF	162.425 MHz
OFF	ON	OFF	162.450 MHz
ON	ON	OFF	162.475 MHz
OFF	OFF	ON	162.500 MHz
ON	OFF	ON	162.525 MHz
OFF	ON	ON	162.550 MHz

Figure 2-3

## WX-250 Audio Adjustments

Transmit audio from the controller has a direct connection to the transmitter through the WX-250. There is no need to readjust transmitter deviation. Press the MONITOR switch [S3] on the rear panel. Monitor the transmitter output. Adjust the LINE LEVEL audio control R13 for the desired level of NOAA weather station audio.

Press the FIP CODE switch [S2]. The voice synthesizer will announce the selected FIP codes. Continue to press [S2] as required until the VOICE LEVEL audio control R8 is adjusted for the desired voice synthesizer level. The Headphone audio output is fixed.



## Chapter 3 - Configuration Editor

The WX-250 Configuration program requires a Windows 98, through VISTA operating system. Install the program. From your desktop click the WX-250 Editor Icon to display the WX-250 SAME Weather Receiver Configuration Editor window.

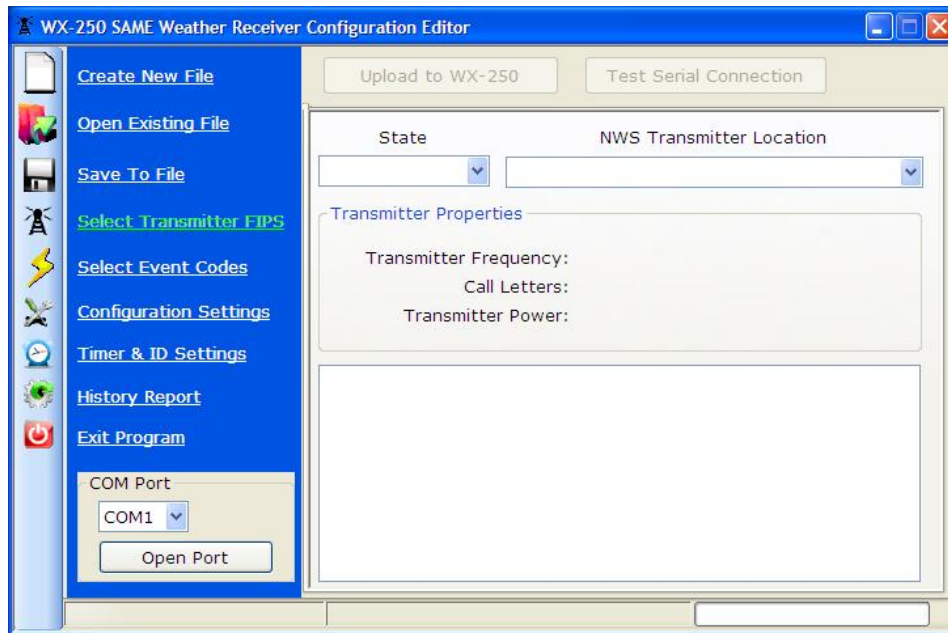


Figure 3-1

### Federal Information Processing Codes

Select the STATE and NWS Transmitter Location. The window will display the counties served by that transmitter. Check the boxes of the counties of interest. In the lower left select the COM port your computer will be using to communicate with the WX-250. Do not open the port at this time.

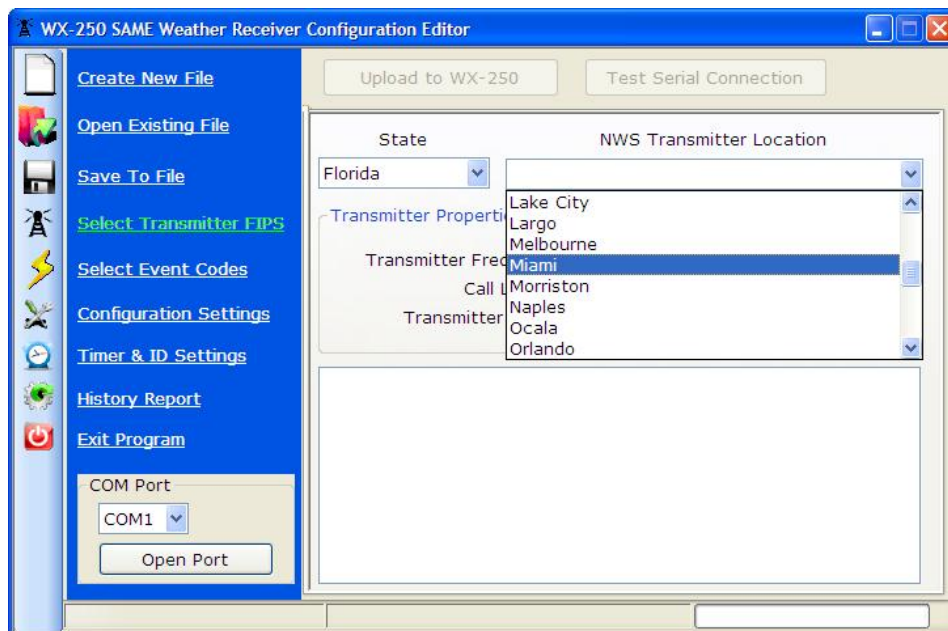


Figure 3-2

### WX-250 Event Codes

Select [**Select Event Codes**] to display a list of Weather Related Events. Check the boxes to select the Events of interest.

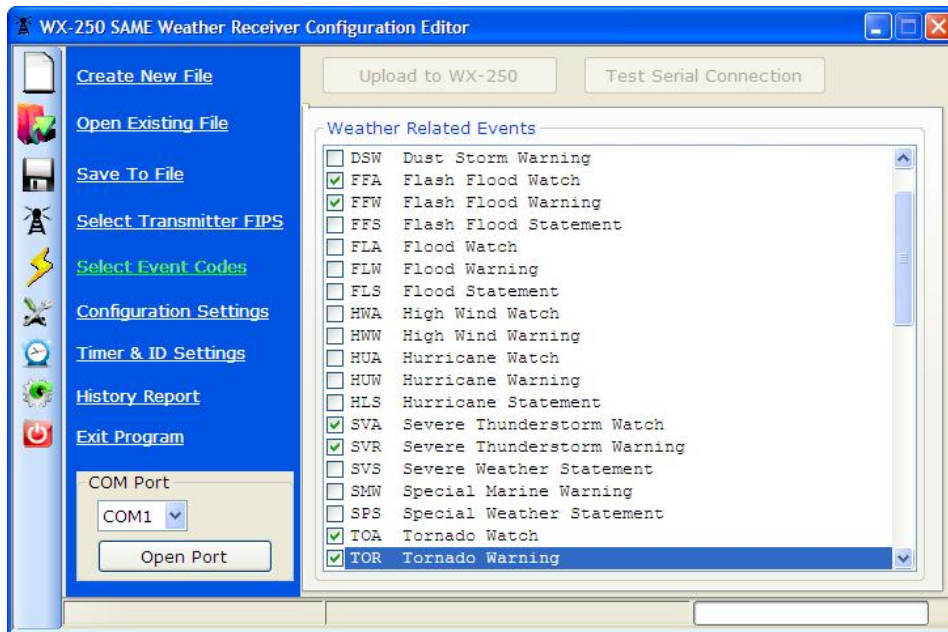


Figure 3-3

### WX-250 Configuration Settings

Select [**Configuration Settings**] to display a list of Receiver Override Options and Voice Interval Options. Check the boxes to select the desired options.

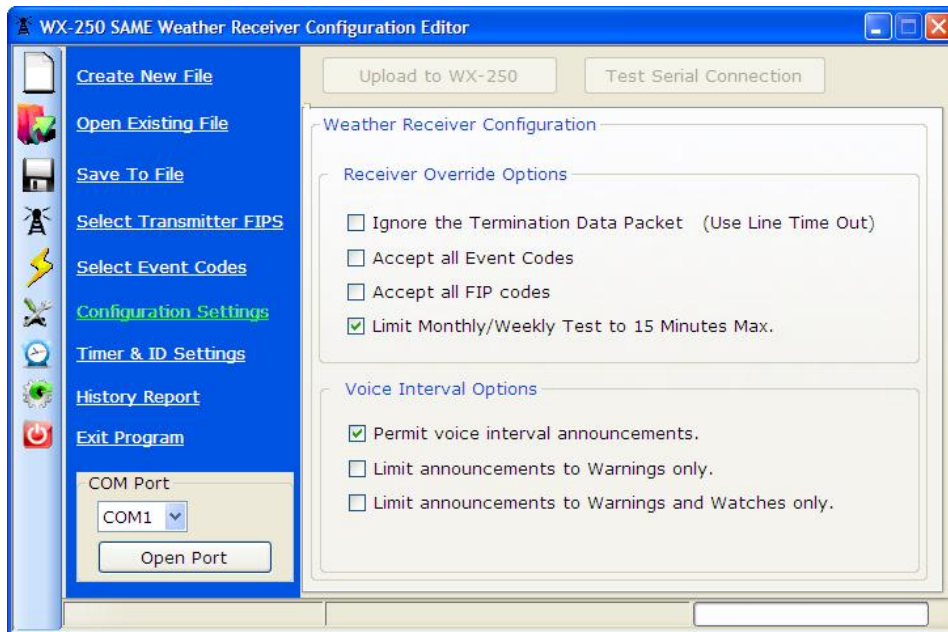


Figure 3-4

### Receiver Override Options

If the accept all FIP and Event Codes boxes are checked, the WX-250 will respond to all alerts issued by the weather station. Operation is similar to a receiver with 1050Hz decoder only.

## Voice Interval Options

When the alert message is finished the weather station sends three termination data packets. Upon receipt of these packets the WX-250 will turn off the line audio and repeater transmitter. The voice synthesizer will continue to announce the alert until the time period has expired. Select the desired voice alert options and click OK.

## WX-250 Timer & ID Settings

Select [**Timer & ID Settings**]. Timers include: Line Time-out, Pre Voice Delay Timer, Voice Interval Timer and Relay Activation Delay Timer. Select the desired times.

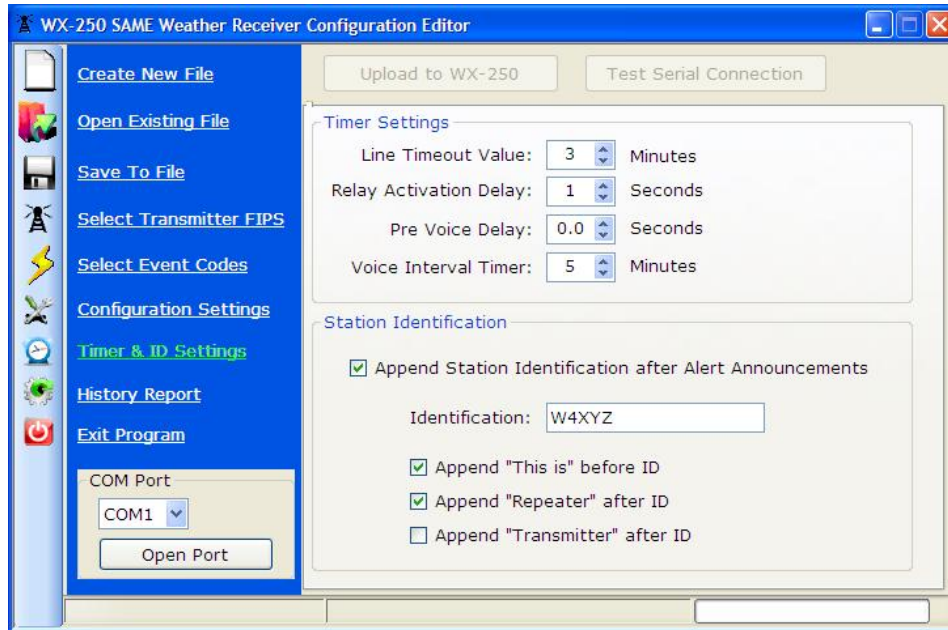


Figure 3-5

### Line Time-out Value

This timer selects the time the line audio and PTT outputs are active when an alert message is received. A termination data packet is sent at the end of the alert message. Should the weather station fail to send the termination data packet this timer will limit the alert transmission time.

### Relay Activation Delay

When the digital packet is decoded the relay disconnects the transmitter from the controller. If you want to use the features of your repeater's controller to send paging tones, alert tones or a custom voice message announcement this disconnect must be delayed. Use this feature to select the delay.

### Pre Voice Delay

This timer selects the delay between activation of the control relay and when the voice synthesizer begins to speak.

### Voice Interval Timer Option

Imbedded in the alert information packet is the time the warning or watch is in effect. The time is sent in fifteen-minute increments for the first hour and thirty minute increments for the remaining time of the alert. Once the alert message is finished, the WX-250 voice synthesizer will periodically key-up the repeater transmitter and announce the nature of the alert. This timer sets the time between voice synthesizer announcements.

### Station Identification

Use the WX-250 voice synthesizer to identify the transmitter at the end of an alert and during the periodic voice weather announcements. Enter your station identification in the Call Letter Box. Valid characters are A-Z and 0-9. Up to fifteen (15) characters can be entered. Additional check boxes are provided to add the words "This is", "Transmitter" and "Repeater" to the identification announcement.

### Save File As to Memory

Once you have completed selection of the FIPS and EVENT codes, set the configuration, timers and ID save the file to your computer's memory.

### WX-250 Test Serial Port

Click the [Open Port] button at the lower left. This will highlight the [Test Serial Port] and [Upload to WX-250] buttons. Click the [Test Serial Port] button to verify the computer can establish communications with the WX-250.

### WX-250 Upload to WX-250

Click the [Upload to WX-250] button to upload the file created with the WX-250 Editor into the WX-250 memory.

### WX-250 History Report

Click the [Request History Data from WX-250] button at the lower center to display a list of the alerts stored in the WX-250 memory. Click the [Erase History] button to clear the history data.

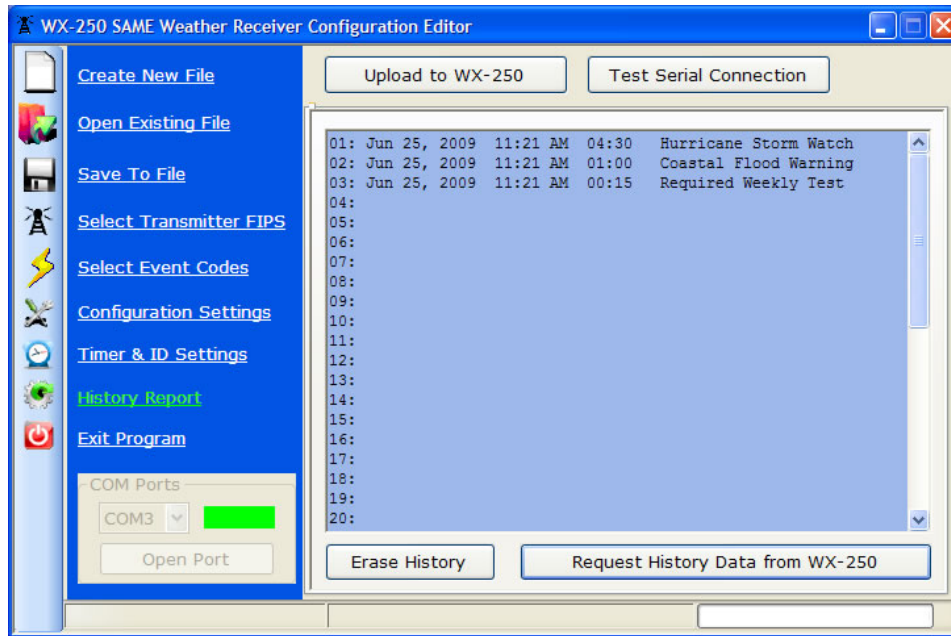
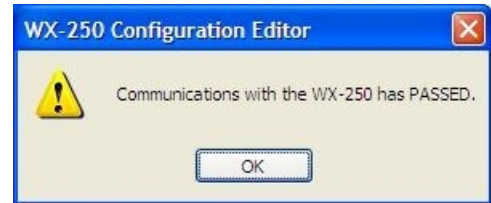


Figure 3-6

### Test County FIP Codes

After a data transfer, press the FIP code switch S2. The voice synthesizer will read out the county FIP codes stored in memory. Example: The voice will say: "TEST FIP CODES 012011 012086."

### Reset WX-250 Memory

If you wish to reset the WX-250 memory remove +12VDC power from the WX-250 receiver. Set dipswitch #8 to ON and apply DC power. The WX-250 will reset. After approximately ten seconds the voice synthesizer will say: "WX-250 VERSION 1.00 RESET DATA LOAD COMPLETE" and load the default FIPS codes for South Florida. Set dipswitch #8 to OFF and reprogram the WX-250 for the desired FIPS and EVENT codes.

### Raw Data Display

The WX-250 will display the raw data on its RS-232 port when an alert is received. Set dipswitch #7 to ON. Open a communications program such as Hyper-terminal and set the communications for 9600 baud 8N1. Figure 3-7 displays A Tornado Warning simulated by the SG-2000 S.A.M.E signal generator. When finished observing the WX-250 output set dipswitch #7 OFF.

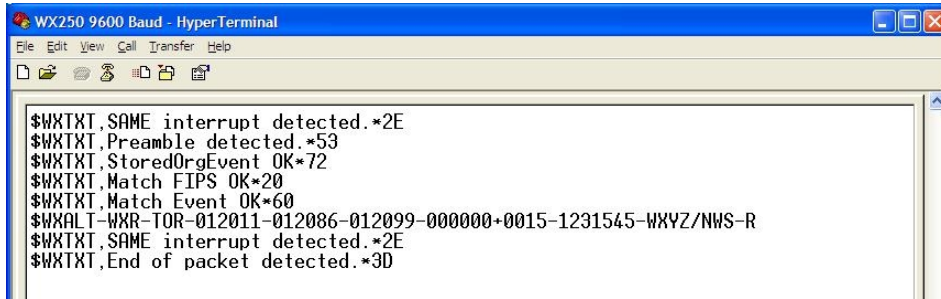


Figure 3-7

Line six displays the raw data received from the NOAA weather transmitter.

**WXR-TOR-012011-012086-012099-000000+0015-1231545-WXYZ-NWS**

Figure 3-8 describes how to read the data.

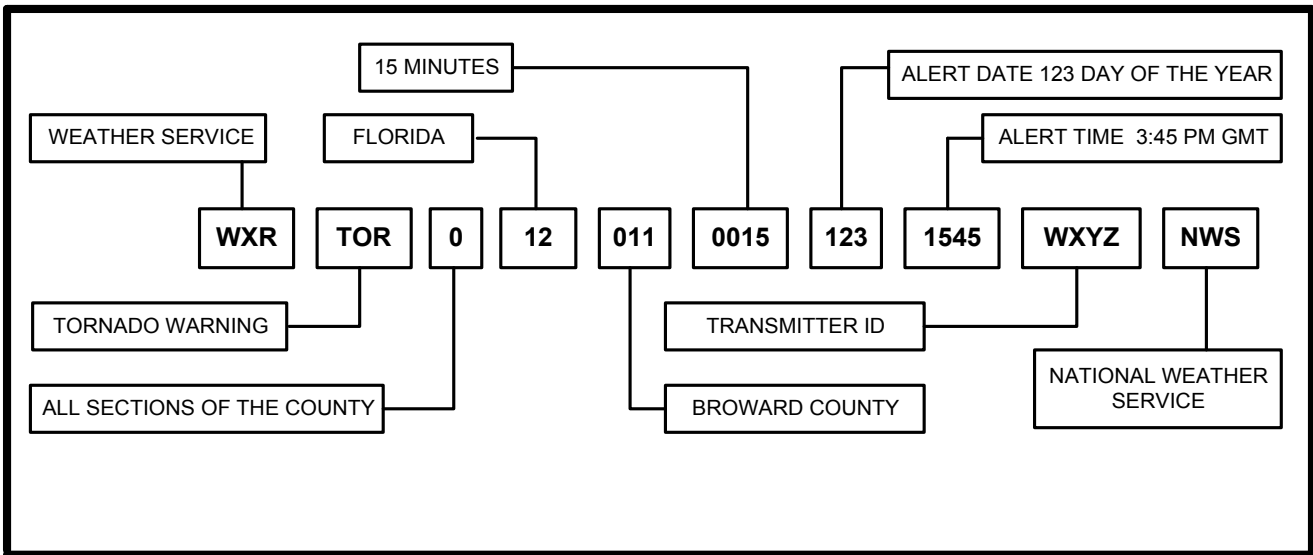


Figure 3-8

# Chapter 4 – Drawing

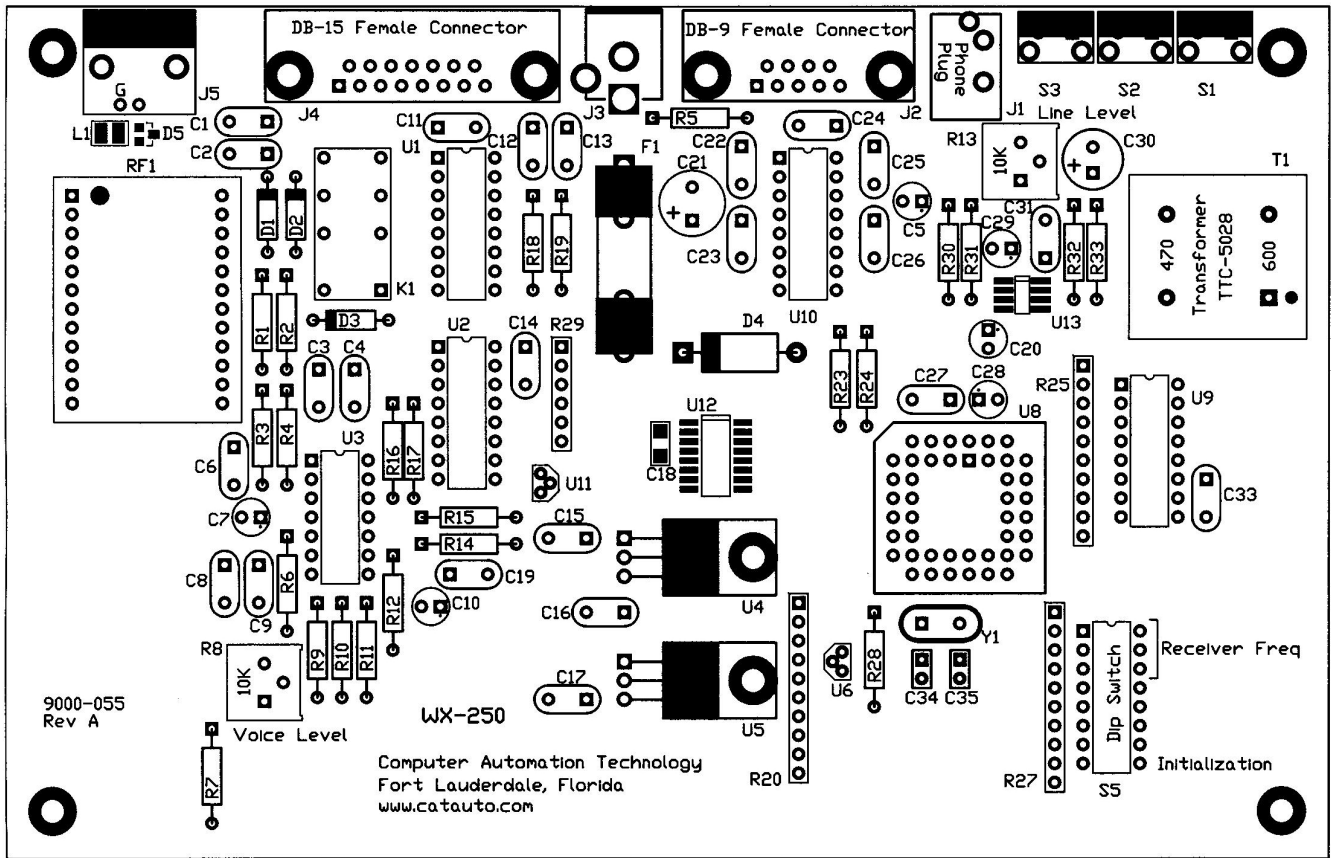
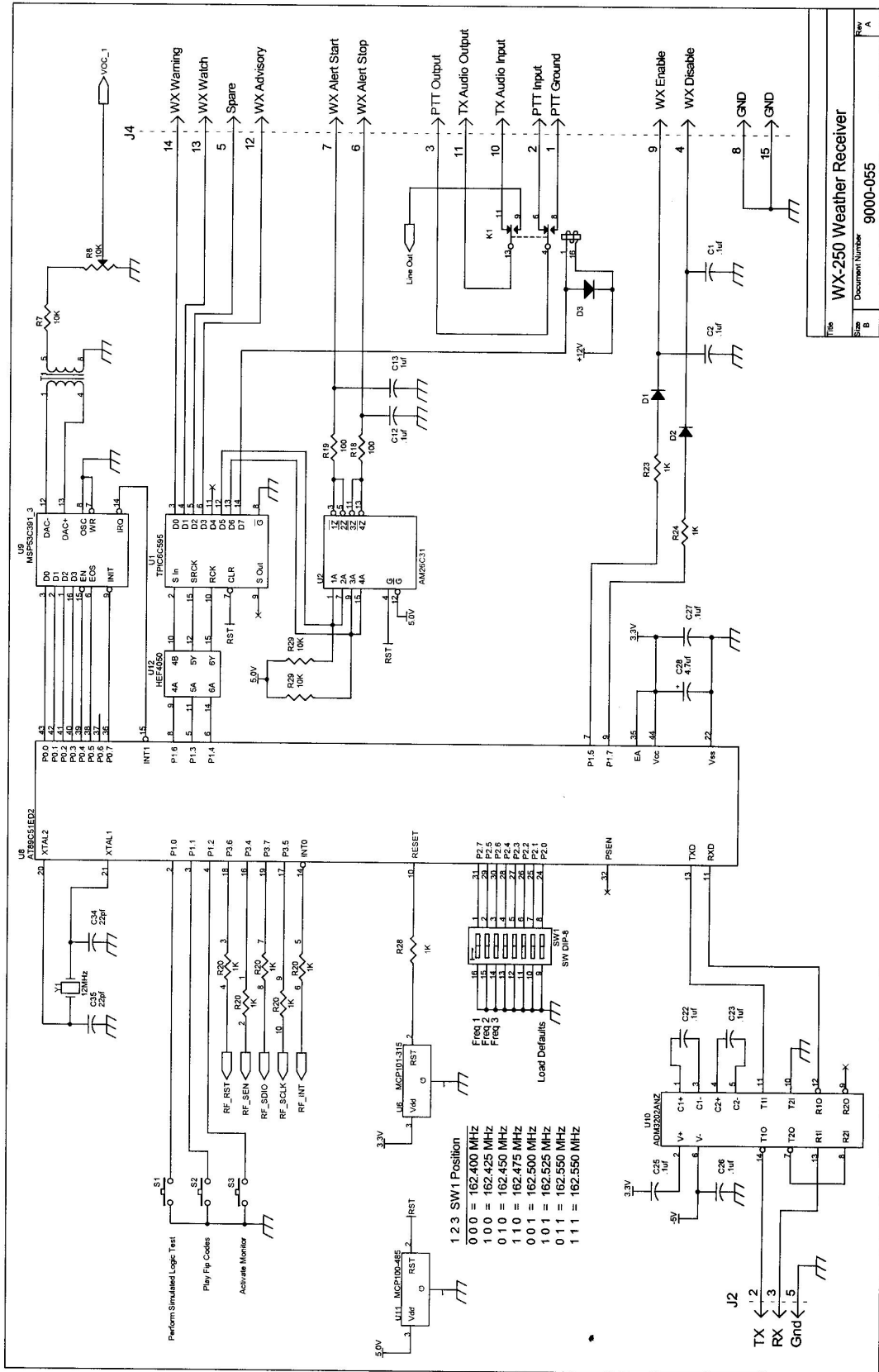


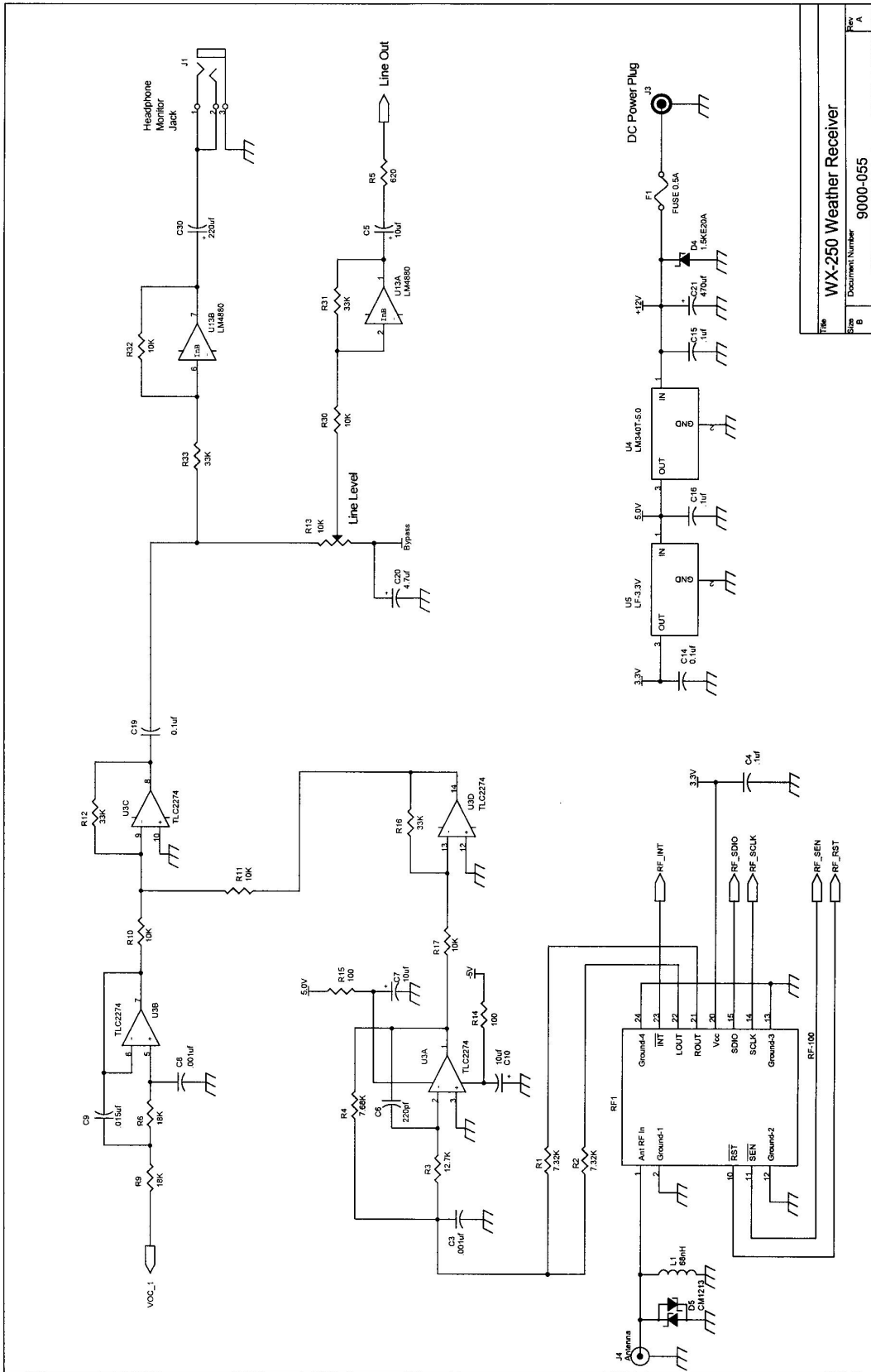
Figure 4-1

# WX-250 Schematic Sheet 1 OF 2



Title	WX-250 Weather Receiver
Size	B
Document Number	90000-055
Date	1 Tuesday, July 26, 2005
Sheet	1 of 2

# WX-250 Schematic Sheet 2 OF 2



File	WX-250 Weather Receiver
Size	Document Number 9000-055
Rev	B
Date	Tuesday, July 28, 2009
Sheet	2 of 2



## Chapter 5 - Part List

2	Capacitor	22pf	C34,C35
1	Capacitor	220pf	C6
2	Capacitor	.001uf	C3,C8
1	Capacitor	.015uf	C9
19	Capacitor	.1uf 50V	C1,C2,C4,C11,C12,C13,C14,C15,C16,C17,C18,C19,C22,C23,C24,C25,C26,C27,C31,C33
2	Capacitor	4.7uf 16V	C20,C28
4	Capacitor	10uf 16V	C5,C7,C10,C29
1	Capacitor	220uf 16V	C30
1	Capacitor	470uf 25V	C21
1	Connector	9D (F)	J2
1	Connector	15D (F)	J4
1	Connector	DC Power	J3
1	Connector	Antenna	J5
1	Connector	Headphone	J1
1	Crystal	12MHz	Y1
3	Diode	1N4148	D1,D2,D3
1	Diode	1.5KE20A	D4
1	Diode	CM1213	D5
1	Fuse	0.5 Amp	F1
1	I.C.	TPIC6C595N	U1
1	I.C.	AM26C31	U2
1	I.C.	TLC2274ACN	U3
1	I.C.	LM340-T5.0	U4
1	I.C.	LF-33CV	U5
1	I.C.	MCP101-315	U6
1	I.C.	AT89C51ED2-SLSUM	U8
1	I.C.	MSP53C391N	U9
1	I.C.	MAX2323	U10
1	I.C.	MCP100-485	U11
1	I.C.	HEP4050B2	U12
1	I.C.	LM4880	U13
1	Inductor	68uh	L1
1	Module	Weather Receiver	RF1
1	Relay	12V DPDT	K1
4	Resistor	100	R14,R15,R18,R19
1	Resistor	620	R5
3	Resistor	1.0K	R23,R24,R28
6	Resistor	10K	R7,R10,R11,R17,R30,R32
2	Resistor	18K	R6,R9
4	Resistor	33K	R12,R16,R31,R33
2	Resistor	7.32K 1%	R1,R2
1	Resistor	7.68K 1%	R4
1	Resistor	12.7K 1%	R3
2	Resistor	10K Network 10P	R25,R27
1	Resistor	10K Network 6P	R29
1	Resistor	2.7K Network 10P	R20
2	Resistor	10K Variable	R8,R13
3	Switch	Push Button	S1,S2,S3
1	Switch	8 Position Dip	S5
1	Transformer	TTC-5028C	T1