Stormscope®

Series II Weather Mapping Sensor

WX-110 Owner's Manual

This manual contains installation and operating instructions for the WX-110 (WX-110/220) *Stormscope*® Weather Mapping System.

GOODRICH

78-8060-6052-7 (Rev. C)

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10 January 2002

FOREWORD

If you encounter problems that you are unable to resolve with the WX-110 product documentation, please contact our Field Service Engineering Department at:

Goodrich Avionics Systems, Inc.
Attn: Field Service Engineering
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Grand Rapids, MI 495812 USA
Tel. (800) 453-0288 or (616) 949-6600

We welcome your comments concerning this manual. Although every effort has been made to keep it free of errors, some may occur. When reporting a specific problem, please describe it briefly and include the manual part number, the paragraph/figure/table number, and the page number. Send your comments to:

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Dates of original and changed pages are:

Original .....19 June 1992
Revision 01 .....01 November 1996
Revision C .....10 January 2002

NOTE

The portion of the text affected by the change is indicated by a vertical line in the outer margins of the page. Changes to illustrations (other than diagrams and schematics) are identified with a miniature pointing hand. Shading is used to highlight the area of diagrams and schematics containing a change.

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1.0 INTRODUCTION

1.1 General Information

The Goodrich Avionics Systems Model WX-110 *Stormscope®* Weather Mapping System provides you with the finest thunderstorm detection/warning system available. You can now prepare for approaching thunderstorms long before the thunderstorm is upon you. The WX-110 is a unique thunderstorm detection/warning instrument. It allows you to "see" where electrical discharge activity (lightning) associated with those storms is occurring so you can take appropriate action before the danger arrives.

This Owner's Manual will help you install and operate your *Stormscope* Weather Mapping System. Be sure to read this manual carefully and completely to fully understand how this important instrument works and how to use its full capacity.

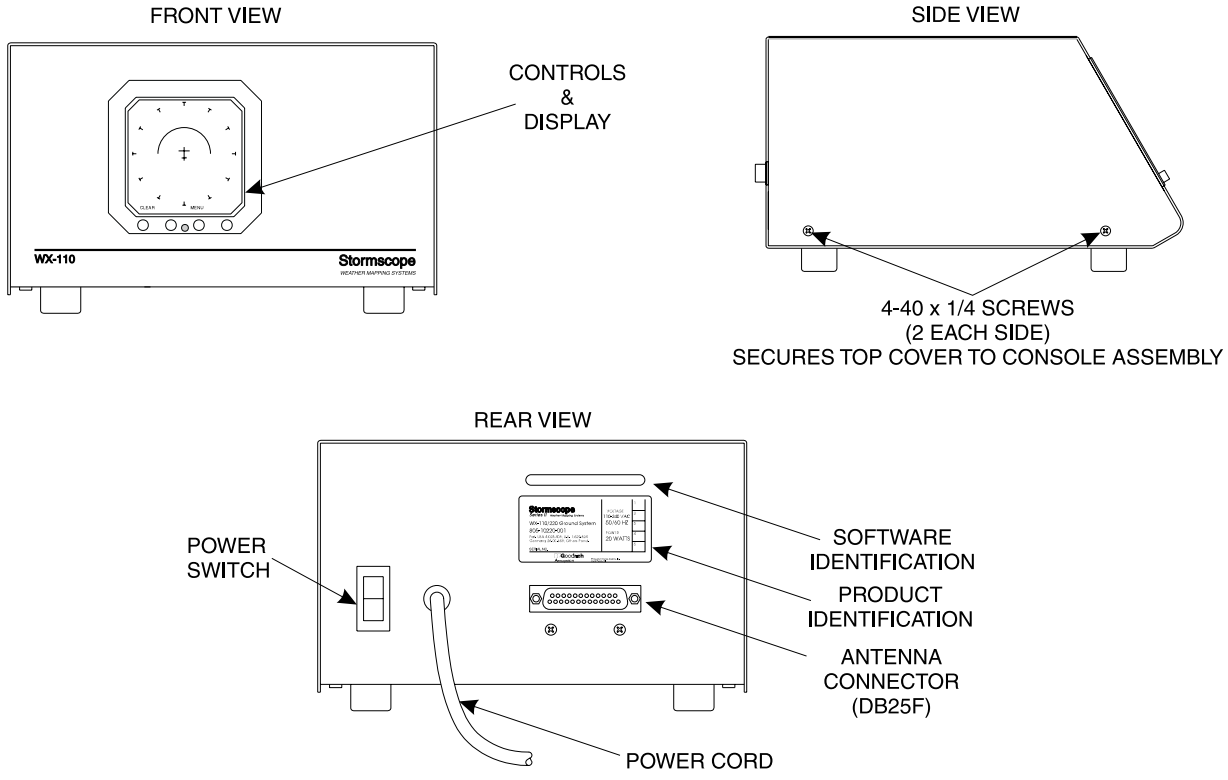


Figure 1. WX-110 Console

1.2 Unpacking and Inspecting

CAUTION

The console assembly and antenna are sensitive to electrostatic discharge (ESD) and may be damaged if not handled correctly. Do not remove protective covers from electrical connectors during unpacking. Touching an exposed connector may cause electrostatic damage to equipment.

Carefully unpack the system and note any damage to shipping containers or equipment. Visually inspect each component for evidence of damage. Compare the equipment received with that noted on the packing list. Your WX-110 system includes the following items:

QTY	DESCRIPTION	PART NUMBER
1	WX-110/220 Console	805-10220-001
1	Antenna	78-8060-5970-1
1	Antenna Gasket	78-8060-5977-6
1	Antenna Plate (16" x 16")	78-8060-6050-1
2	Antenna Bracket	78-8060-6057-6
1	Antenna Cable, 100 feet long	78-8060-6051-9
1	Literature Package	78-8060-6054-3
1	Hardware Package	78-8060-6053-5

NOTE

If additional antenna cable is required, extension cables (P/N 78-8060-6056-8) can be ordered in fifty-foot lengths, up to a maximum of three extensions. This allows for a maximum of 250 feet total cable length.

Immediately report any missing items or evidence of damage to the carrier making the delivery. To justify a claim, retain the original shipping container and all packing materials.

Every effort should be made to retain the original shipping containers for storage. If the original containers are not available, a separate cardboard container should be prepared that is large enough to accommodate sufficient packing material to prevent movement. The ambient temperature of the storage area should not fall below -55° C (-65° F) or rise above 70° (158° F).

1.3 AC Voltage Selection

The WX-110 console operates from 110-120 VAC or 220-240 VAC. All current production units are shipped from the factory set for 110-120 VAC. If the power at your location requires 220-240 VAC, voltage selection must be changed by setting an internal switch. This selection must be set before power is applied to the equipment. To operate the console on 220-240 VAC:

WARNING

Ensure that power is removed from the unit before removing the top cover.

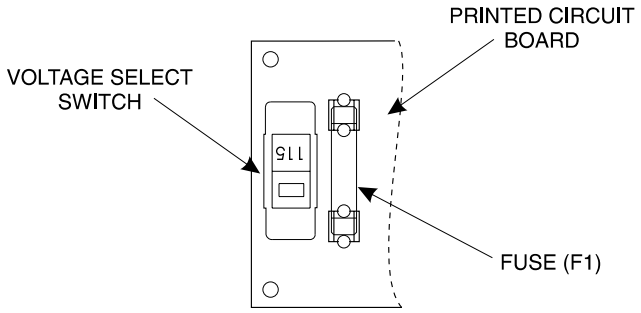


Figure 2. Voltage Select Switch/Fuse (F1) Location

1. Remove the four phillips-head screws securing the top cover to the case.
2. Separate the cover from the case.
3. Locate the voltage select switch (see figure 2). The switch is readily accessible. It is mounted on a printed circuit board next to fuse (F1).

NOTE

If a voltage select switch is not installed on your unit, contact our Field Service Engineering department (at 1-800-253-9525 or 1-616-949-6600) for further assistance.

4. Use a screw driver to slide the switch sideways to the correct setting (115-230).
5. Remove fuse F1 (a 3AG ½ Amp "Slo Blo') and replace it with a standard 3AG ¼ Amp "Slo Blo" fuse.
6. Replace top cover.
7. Secure top cover to case with screws removed in step 1.
8. Tag the power cord on the back of the console to indicate the unit is set for 220-240 VAC with a standard 3AG ¼ Amp "Slo Blo" fuse installed at F1.

2.0 SYSTEM DESCRIPTION

2.1 Features

Your WX-110 *Stormscope* Weather Mapping System offers the following convenient features:

- Self contained system including antenna, requiring minimal installation.
- Three operator-selectable ranges to 100 nautical mile radius.
- Self tests (user initiated and automatic) to ensure proper operation of system at all times.
- Audio alarm alerting you to the threat of approaching thunderstorms.
- Reliable, power-conserving liquid crystal display (LCD).
- 64 x 64 dot matrix display providing excellent resolution.
- User adjustable display backlighting for comfortable viewing.

2.2 Controls

The controls for the WX-110 *Stormscope* Weather Mapping System are described in the following paragraphs. See figure 3 for details. The push buttons on the console provide operational control of the system. The function of each button is dependent on the mode in which the unit is operating. As the operational mode changes, the WX-110 displays the functions of the push buttons at the bottom of the screen, above the buttons.

Power Control	A rocker switch on the rear of the console is used to turn the system on. After a comprehensive self test sequence, the system will display the Weather Mode in the 100 mile range.
Range Select Button	Pressing this button cycles the selected range from 100 to 50 to 25 and back to 100 nautical miles. For best results, the system should be initially set to the 100 nautical mile range to give a broad overview of thunderstorm activity; then closer ranges can be selected as required. (100 nautical miles equals 115 statute miles)
Clear Button	Pressing this button erases all stored "strike points" (+ symbols) that were displayed on the screen. This function is useful in determining the severity of a thunderstorm by observing the rate at which strike points reappear.
Menu Button	Pressing this button selects the menu of other available functions such as user-initiated self test, view adjustment, and alarm selection.

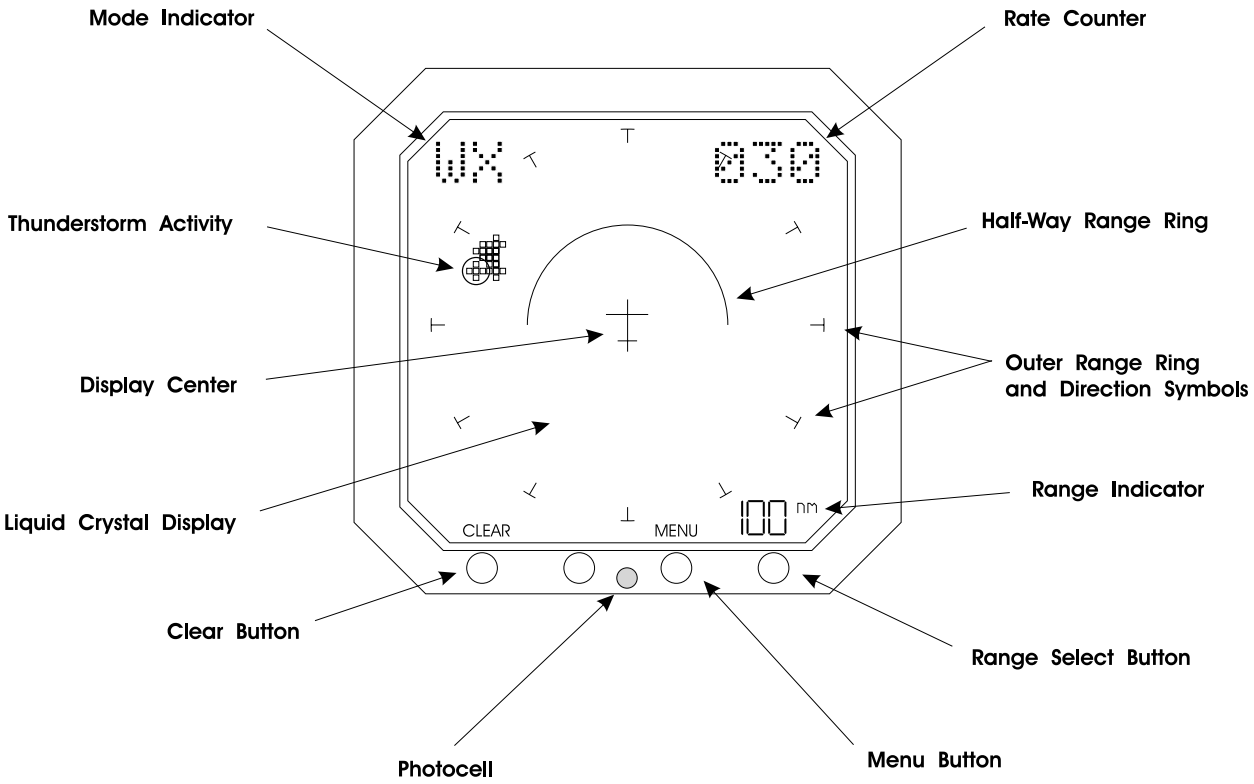


Figure 3. WX-110 Controls

2.3 Displays and Legends

The displays and legends for the WX-110 *Stormscope* Weather Mapping System are described in the following paragraphs. See figure 3 for details.

Liquid Crystal Display	The 64 x 64 dot matrix LCD displays thunderstorm activity relative to bearing and range coordinates from the antenna location. Also displayed are text and other symbols depending on the operating mode.
Display Center	Represents the geographical location of the Weather Mapping System.
Thunderstorm Activity	Shown by multiple strike points clustered on the display. Points are plotted corresponding to the range and bearing from the geographical location of the Weather Mapping System.
Mode Indicator	Displays the selected mode of operation. "WX" represents the Weather Mapping Mode.
Rate Counter	Displays the average number of strikes per minute that the WX-110 is processing. The WX-110 processes strikes within the 100 mile range, regardless of the selected range being viewed. The counter is updated every 5 seconds and will increase/decrease with thunderstorm intensity. The counter can display a maximum of 999 strikes per minute. You can reset the counter to zero at any time by pressing the CLEAR button.
Direction Symbols	Twelve symbols, spaced every 30° around the perimeter of the display, denote the orientation of thunderstorm activity relative to the location of the antenna. The symbol at the top of the display represents True (geographic) North if the antenna is properly aligned during installation.
Outer Range Ring	Represents the outer limit of the selected range.
Half-Way Range Ring	Represents one-half of the selected range.
Range Indicator	Displays the range selected, corresponding to the radius of the outer range ring.
Photocell	Automatically adjusts the display backlighting level from a preset level to compensate for changes in ambient light.

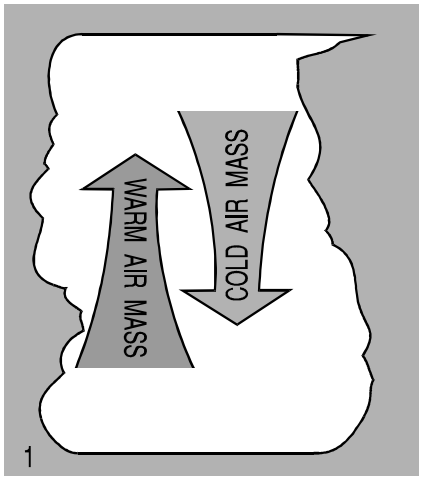
2.4 Alarm

The WX-110 *Stormscope* Weather Mapping System is equipped with an audio alarm which sounds a short beep each time an additional strike point is plotted on the display. This feature can be enabled or disabled through the Menu feature.

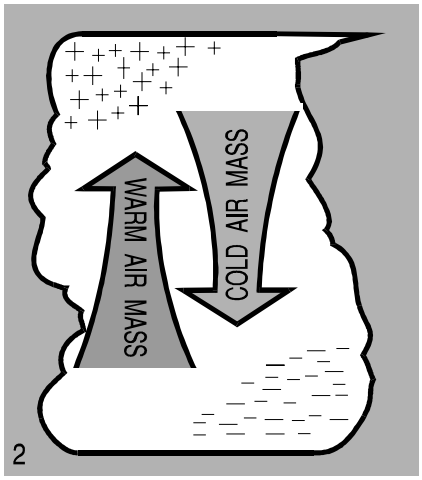
3.0 OPERATION

3.1 Principles

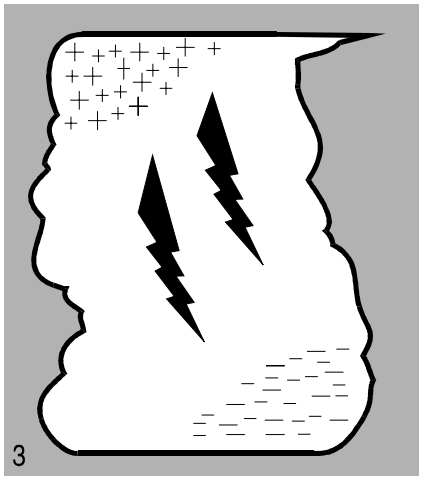
1. The convective flow of air currents associated with thunderstorm development leads to friction in the space between the opposing air currents.



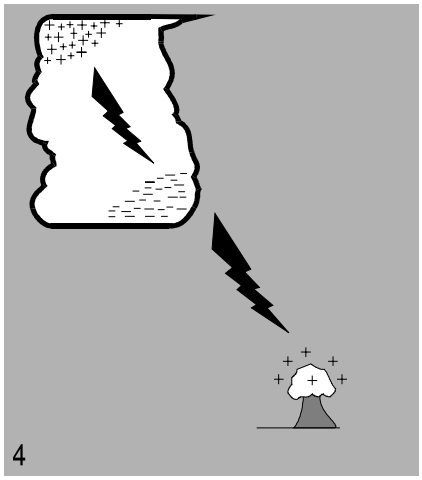
2. The friction between these convective currents causes electrical charges to separate. As positive and negative electrical charges separate, they accumulate and congregate in masses of similar charges.



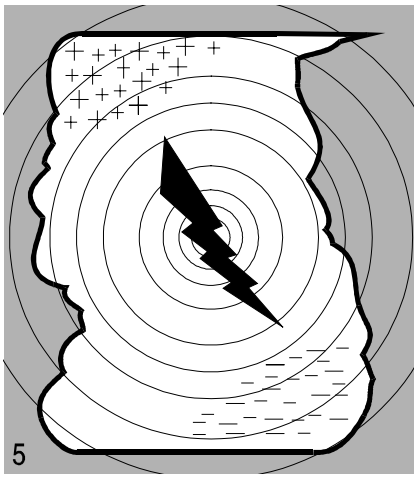
3. Electrical discharges occur as the accumulated masses of segregated positive and negative charges try to balance and reunite.



4. A few of the discharges are visible as lightning. For every discharge that can be seen, however, there may be a hundred more that cannot be seen.



5. All discharges, whether visible or not, radiate electromagnetic radio frequency energy in all directions at the speed of light. The electrical discharge signals have unique characteristics and varying rates of occurrence which, along with the strength of the signals, can be monitored to learn the location and intensity of the thunderstorms that generated the discharges.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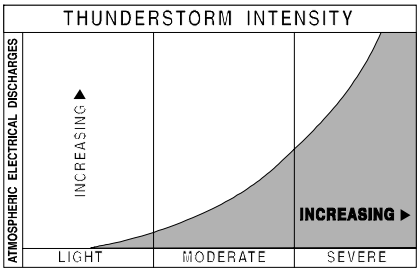
6. The intensity of the thunderstorm can be determined by the rate at which the data is received. The greater the rate of electrical discharge, the more intense the thunderstorm activity.



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The WX-110 System processes and displays information from the electromagnetic signals received from electrical discharges.

The WX-110 picks up electromagnetic radio frequency signals from electrical discharges 360 degrees around the unit, out to more than 100 miles.

The signals are received by the antenna and run through a computer processor to organize and map their location. The computer-processor information is stored in the order the signals are received and the information is presented in polar form (range and bearing) on the display. With active thunderstorms, information on the screen may be completely updated and replaced every 25 seconds. Obsolete information (i.e., data more than a four minutes old) is automatically cleared from the display.

3.2 A Closer Look

Locating electrical discharge activity is the key to locating thunderstorms. Thunderstorms, by definition, contain electrical discharges. It has been well established that as electrical discharge activity increases in thunderstorms, the potential for severe convective activity also increases. Locate the electrical discharges and you'll find the thunderstorms!

Within the thunderstorm, strong updrafts and downdrafts occurring close together produce a separation of positive and negative charges. When enough of these charges accumulate, electrical discharges occur. It is estimated that about 1% of these discharges are visible as lightning. The rest are intra-cloud discharges.

All electrical discharges send out radio frequency electromagnetic energy which radiates in all directions at the speed of light.

The *Stormscope* Weather Mapping System picks up signals from electrical discharges 360 degrees around the unit, out to a distance of more than 100 miles. The signals are low frequency and therefore are not limited by line-of-sight. Even with minimal elevation of the antenna, the system is usable to its maximum range. The system receives the discharge signals and records only those that meet certain criteria. These signals are routed from the antenna to the computer processor within the console for determination of the discharge location. Many discharges in close proximity (clusters of strike points) show the location of a thunderstorm. The severity of the thunderstorm is related to the rate of strike point occurrence. The higher the rate of occurrence, the more severe the thunderstorm.

Up to 256 discharges can be shown at over 4,000 locations on the display. Each discharge is stored in the order it is received. The information is presented on the display as strike points. When the 257th discharge occurs, the oldest strike point is removed from the display, and the newest one is displayed. Any strike point more than four minutes old is removed from the display automatically. In addition, the CLEAR button can be used to clear the display of all strike points at any time.

3.3 System Start Up

At power up, your Model WX-110 will run a comprehensive series of self tests to ensure that all functions are operating properly. As each group of self tests is completed, a message such as "MEMORY TEST OK" appears. After completing all power-up self tests, the message "ALL TESTS OK" appears, along with the software version number. If an error is detected, an error message will appear. For information about error messages, refer to the checkout instructions in Paragraph 5.10 of this manual.

After successful completion of the self tests, the system will default to the Weather Mode in the 100 mile range and the alarm will be enabled.

3.4 Weather Mode

In the Weather Mode a "WX" symbol is displayed in the upper left corner of the screen and the selected range in miles is displayed in the lower right corner of the screen (above the RANGE SELECT button).

The system will plot the location of thunderstorm activity as clusters of strike points (+ symbols) relative to the geographical location of the system. The system location is represented by the symbol at the center of the screen (see figure 3).

3.5 Range Selection

The WX-110 System can display thunderstorm activity within a radius of 100 miles. As thunderstorms approach the station, you can reduce the viewing radius to 50 or 25 miles by pressing the RANGE SELECT button. This allows viewing nearby thunderstorms in better detail. The system simultaneously gathers and stores thunderstorm information on all three ranges, providing an instant display of stored data when a new range is selected.

3.6 Mode Menu

The Mode Menu can be addressed from the Weather Mode by pressing the MENU button.

Displaying the Mode Menu allows access to four other functions:

"TEST"
"BRT ADJ"
"VIEW ADJ"
"ALARM ON"

Push button functions:

↑ Moves the selector up the menu list.
↓ Moves the selector down the menu list.
GO Goes to the selected mode.
WX Returns to the Weather Mode.

3.7 Test

The user initiated test allows you to run the full system test that the WX-110 runs automatically at power-up.

To run a user test from the Mode Menu:

Select: "TEST"
Press: "GO"

As each group of self tests is completed, a message such as "MEMORY TEST OK" appears for approximately three seconds. The system then returns to the Mode Menu.

Press: "WX" to return to Weather Mode

If an error is detected during the self test, an error message will appear. For information about error messages refer to the checkout instructions in Paragraph 5.10 of this manual.

3.8 Brightness Adjust

The brightness adjust feature allows adjustment of the LCD backlight for optimum viewing, especially in dimly lighted rooms.

To select the brightness adjust mode from the Mode Menu:

Select: "BRT ADJ"
Press: "GO"

To change the backlighting brightness:

Press: ↑ to increase the brightness.
or
Press: ↓ to decrease the brightness.

The Brightness Adjust indicator, displayed as a bar graph near the top of the screen, shows your changes to the brightness setting.

Press: "MENU" to return to the Mode Menu.
or
Press: "WX" to return to Weather Mode.

The selected brightness setting is saved in memory even when the system is turned off.

A photocell mounted in the front panel senses ambient light and automatically adjusts the backlight brightness based on the selected setting.

A "screen saver" will automatically dim the backlight after 5 minutes if no strikes are detected or no keys are pressed during that time. Pressing any key reactivates the backlight.

3.9 View Adjust

View adjust allows adjustment of the viewing angle/contrast of the liquid crystal display (LCD).

To select the view adjust mode from the Mode Menu:

Select: VIEW ADJ
Press: "GO"

To adjust the LCD viewing angle/contrast:

Press: ↑ to increase the viewing angle/contrast.
or
Press: ↓ to decrease the viewing angle/contrast.

The View Adjust indicator, displayed as a bar graph near the top of the screen, shows your changes to the contrast setting.

Press: "MENU" to return to the Mode Menu.
or
Press: "WX" to return to Weather Mode.

The selected view adjust setting is saved in memory even when the system is turned off.

3.10 Alarm

An audio alarm is automatically enabled each time the system is powered up. The alarm sounds a short tone each time additional strike points are plotted on the screen, alerting you of approaching thunderstorms.

NOTE

The alarm will sound only for strike points plotted within the radius of the selected range.

The audio alarm feature can be disabled (or re-enabled) by selecting "ALARM" from the Mode Menu:

Select: "ALARM ON"

Press: "OFF" to disable the alarm

Press: "ON" to enable the alarm

Press: "MENU" to return to Mode Menu
or
Press: "WX" to return to Weather Mode

The alarm feature is enabled each time power is applied to the system.

4.0 INTERPRETATION

4.1 Typical Patterns

Thunderstorms are identified by clusters of strike points representing the electromagnetic discharges received by the system. The clusters formed will vary in number of strike points and the concentration (or spread) of strike points. The more discharges per minute, and the more concentrated the pattern, the more intense the thunderstorm.

Clusters of strike points are used to locate the thunderstorm activity. A few strike points appearing on the screen can be used as an early warning of potential thunderstorm activity.

Figure 4 shows a typical example of cellular activity. You are viewing three clusters of electrical discharges with the Model WX-110 Stormscope set at the 100 nm range. The storm cells are located at the following directions and ranges.

CLUSTER	DIRECTION	RANGE
1	11:00 (North Northwest)	80 nm
2	4:00 (East Southeast)	50 nm
3	4:00 (East Southeast)	80 nm

The (+) symbol indicates thunderstorm activity. Clusters 2 and 3 located to the East Southeast are producing the greatest number of discharges. This indicates more active thunderstorms. The bridge between the two clusters at the 4:00 position indicates some activity between the two cells. All three clusters are potentially dangerous.

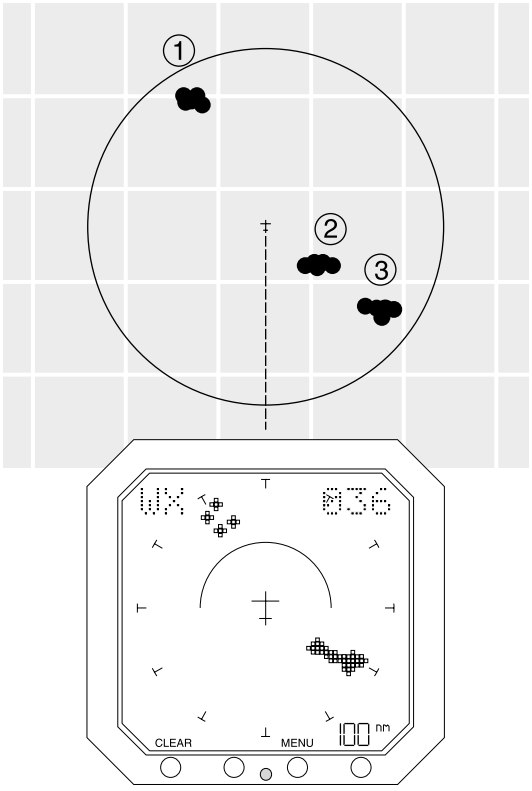

Figure 4. Typical Thunderstorm Display

When the Model WX-110 viewing range is changed to 50 nm, only the thunderstorm that is 50 miles away at the 4:00 position continues to appear. The other two cells are beyond the 50 nm viewing range and, therefore, no longer appear on the display (see figure 5).

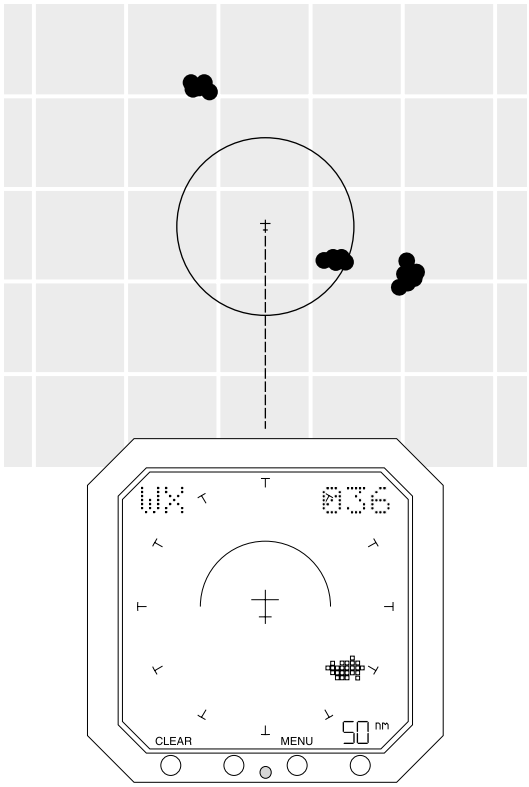

Figure 5. Same Clusters Viewed in the 50 nm Range

4.2 Two Thunderstorms Within 100 NM

This example shows a small thunderstorm cell to the North Northeast at the 1:00 position about 60 nm away. A second, more active cell appears to the South at the 5:30 position about 75 nm away refer to figure 6). Fewer (+) symbols at the 1:00 location indicate a smaller, but not necessarily weaker cell. Both are examples of clusters - and *all* clusters represent a potential hazard.

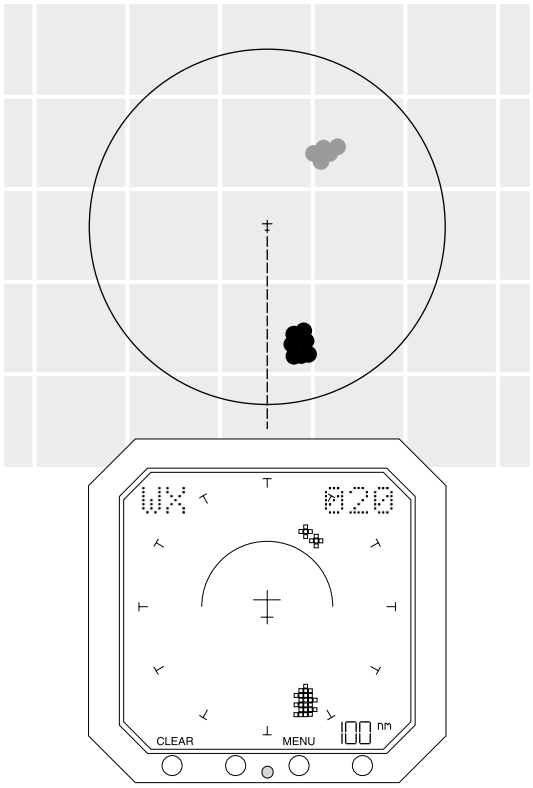

Figure 6. Two Thunderstorms Viewed in the 100 nm Range

4.3 Data Refresh and Clear Function

Each strike point will be stored and displayed for a maximum of four minutes before it is automatically erased. The CLEAR button can be used to erase all stored strike points, allowing you to observe the rate and location of new strike points as they are plotted. The system can display a maximum of 256 strike points. In a severe thunderstorm situation, 256 strike points may be plotted in less than four minutes. In this case, the 257th strike point replaces the first one, and so on, thereby keeping the displayed information fresh. You can be assured that the displayed data is never more than four minutes old.

5.0 INSTALLATION

5.1 General

The installation of the WX-110 can easily be accomplished with a minimum of tools. It is best to review the entire Installation section of this manual before beginning the installation. The installation procedure consists of the following:

- Inventory Checklist
- Antenna Location and Mounting
- Cable Requirements
- Cable Routing and Connections
- Console Location and Connections
- Checkout

5.2 Inventory Checklist

Ensure your WX-110 System includes all the items listed in paragraph 1.2 of this manual. Besides the items included with the system, you will need:

ITEM	USAGE
Magnetic Compass	To orient the antenna to True North
Phillips Screwdriver	To attach the antenna to its mounting plate

5.3 Antenna Location

Normally, the antenna is mounted on the rooftop of the building. The antenna does not need to be elevated except to avoid being "enclosed" by a metal building or shielded by a nearby metal structure. Because the system operates at a low frequency, the antenna is not limited to line-of-sight reception. However, to avoid distortion of the received signal, the antenna should be at least one building's width away from large metal buildings or have a line-of-sight angle of 30° (or less) to the top of adjacent buildings (see figure 7).

NOTE

- **For proper operation, the antenna must be mounted on the aluminum antenna plate provided. If a substitute plate is used, it must be at least as large as the one provided with the system.**

- The antenna and plate must be positioned well away from strong electromagnetic interference (EMI) producing devices. Large electric motors, air conditioning units, power distribution boxes or stations, or high power transmitters can cause interference with the proper operation of the antenna. A minimum of 10 feet separation between the antenna and such equipment should be sufficient to prevent electromagnetic interference.

The antenna and plate may be mounted inside the gables of a wood frame structure (such as in an attic space). This affords additional protection from the elements without interfering with signal reception.

Since the antenna cable provided with the system is 100 feet long, the antenna location should be near enough to the console to permit cable connection. If this is not possible due to location constraints, extension cables (P/N 78-8060-6056-8) may be ordered in 50-foot lengths. However, the total cable run should not exceed 250 feet.

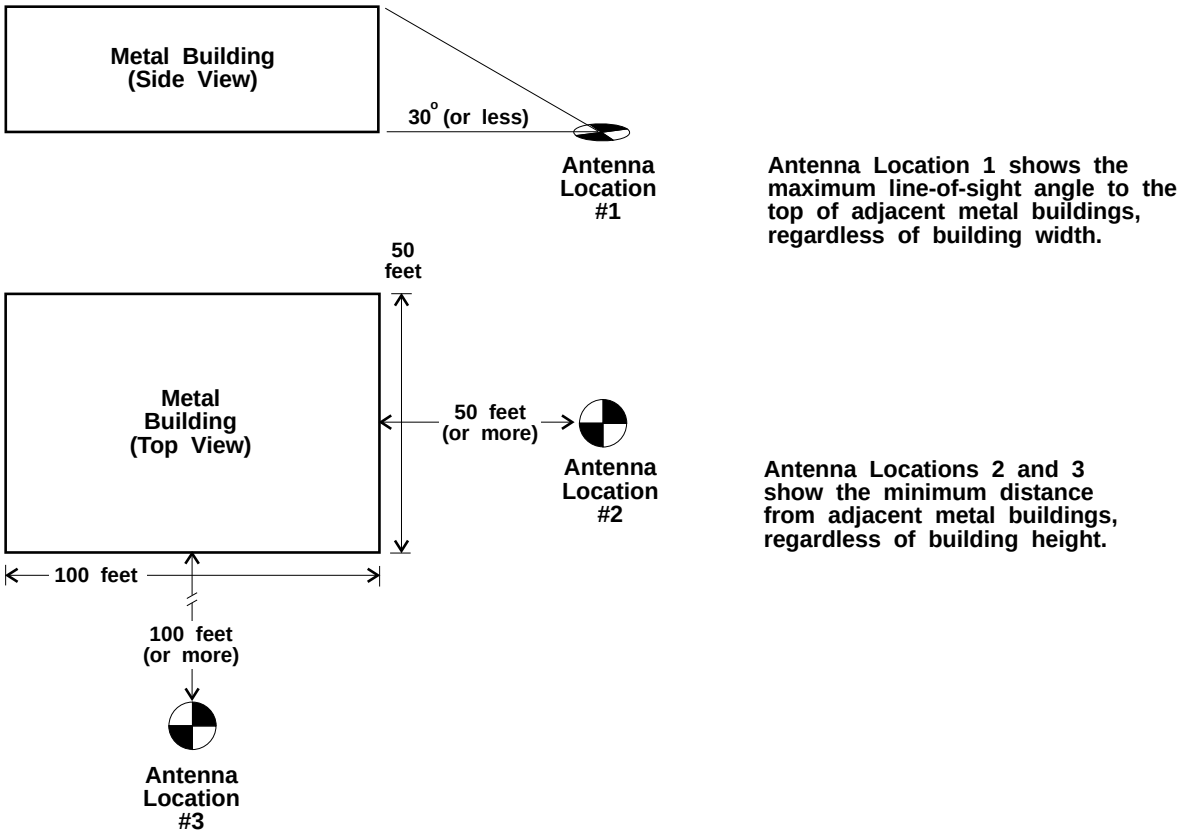

Figure 7. Antenna Location Requirements

5.4 Antenna Plate Mounting

After a suitable location is found, the antenna plate can be secured in place. It may be mounted on a flat or sloped rooftop, in an attic space, or on the ground. It may also be mounted on a vertical surface such as a wall or a chimney, as long as the plate is positioned within 15° of horizontal. Because of the wide variety of possible mounting locations, it is left to the installer to secure the antenna plate in a way that prevents wind or other forces from dislodging it.

If mounting on a rooftop with more than 15° of slope, a bracket must be fabricated to mount the plate horizontally. Orientation of the *plate* to True North is not critical since the antenna may be rotated in 10° increments on the plate.

5.5 Antenna Mounting

After the antenna plate is securely mounted to the structure, the antenna may be mounted onto the plate. The WX-110 antenna must be aligned to True North in order for the displayed thunderstorm data to be properly positioned on the display. Any misalignment of the antenna will result in an equal misalignment of displayed thunderstorm data relative to the direction of the antenna.

In many municipalities, streets and buildings are constructed in a North/South and East/West orientation. In this case, the antenna may be oriented relative to a building or street direction. A more accurate method of determining True North is with a magnetic compass , then applying a correction factor known as magnetic variation. Magnetic variation is the difference in degrees between True North and Magnetic North. The magnetic variation value depends on your geographic location. Figure 8 provides the magnetic variation values for the Continental United States.

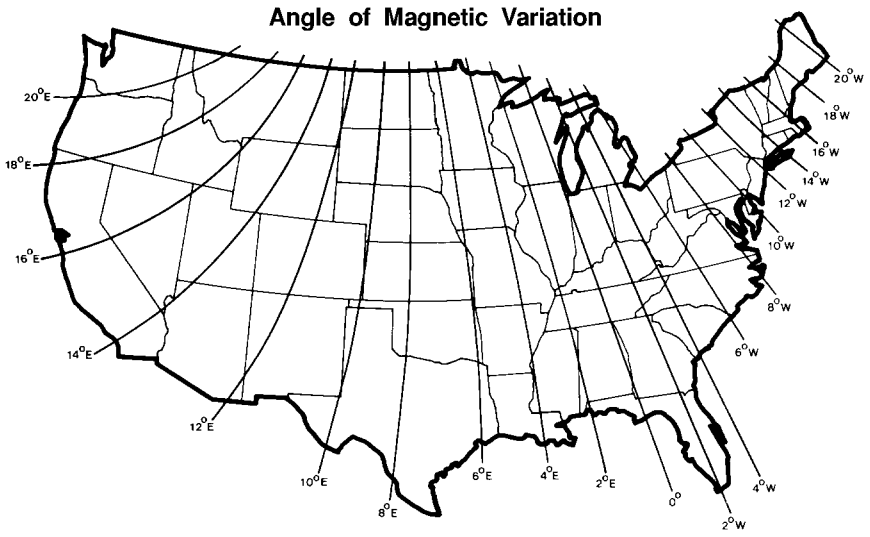

Figure 8. Magnetic Variation Map of the U.S.

Perform the following steps to determine True North using a magnetic compass. (The example shows an installation in eastern New York State.)

1. Using the magnetic compass, take a reading to determine Magnetic North.

2. On the map (refer to figure 8), note that the magnetic variation for eastern New York is 14° W.

NOTE

If the Magnetic Variation is W (West), then *add* the value to the compass reading.
If the Magnetic Variation is E (East), then *subtract* the value from the compass reading.

3. Rotate the antenna so the arrow points North, plus 14° (i.e., arrow points to 014°). See figure 9. The antenna is now pointing toward True North.

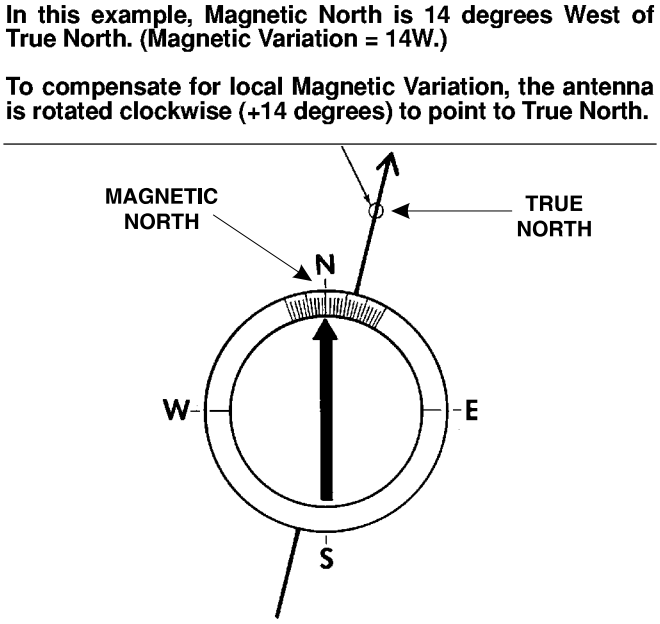

Figure 9. Sample Compass Reading

4. Mount the antenna to the plate using the #10 stainless steel hardware. Use the pre-punched mounting holes corresponding closest to the True North antenna orientation. In this case, you would mount the antenna at 010°. (The mounting holes are drilled in 10° increments.) See figure 10.

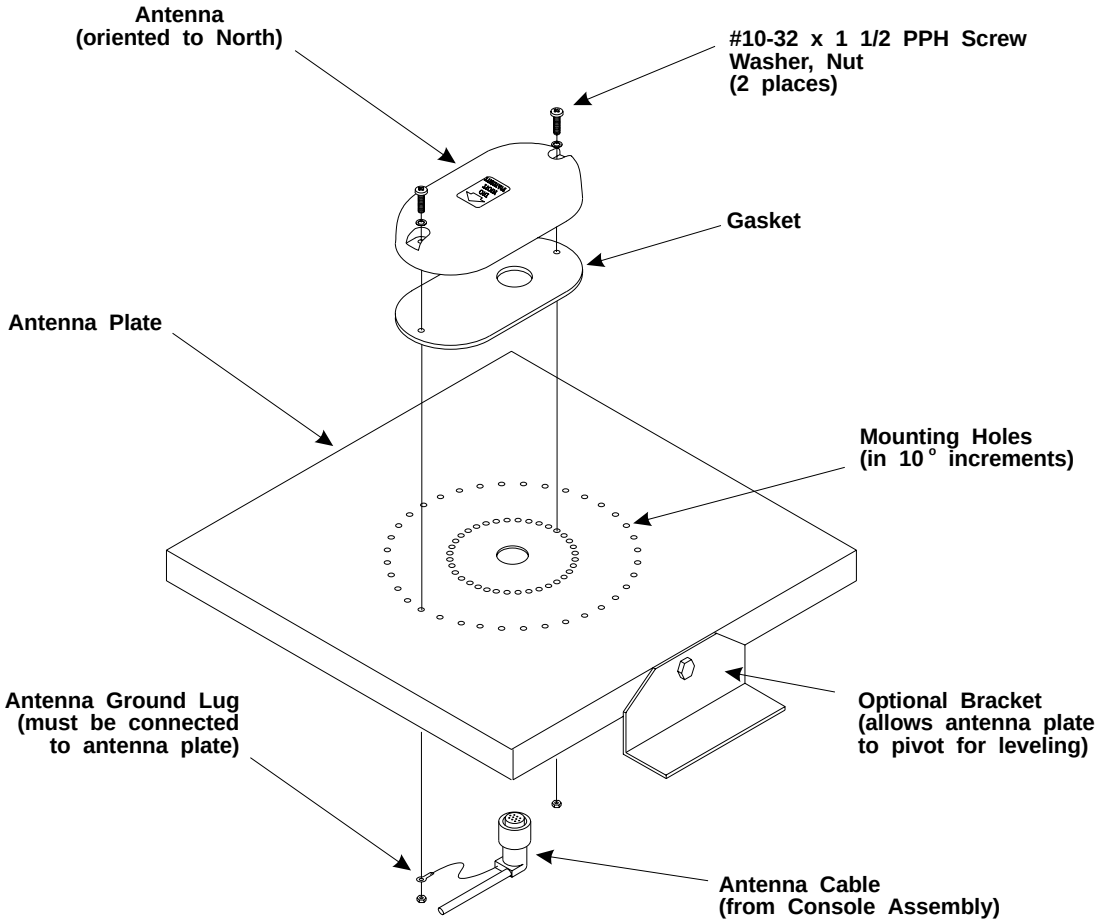

Figure 10. Mounting the Antenna

5.6 Cable Requirements

The WX-110 Weather Mapping System is shipped with 100 feet of antenna cable to connect the remotely located antenna to the console. The cable is terminated on one end with a round weatherproof antenna connector. On the other end is a standard DB25F computer-style connector for the console. See figure 11.

If additional cable is required, extension cables may be ordered (P/N 78-8060-6056-8) in 50-foot increments. Extension cables are terminated on the console end with a DB25 female connector. The antenna end is terminated with a DB25 male connector.

If using an extension cable, the DB25 connectors must be mated, then bolted together. The connectors should be located inside a structure. If not, they must be protected from weather.

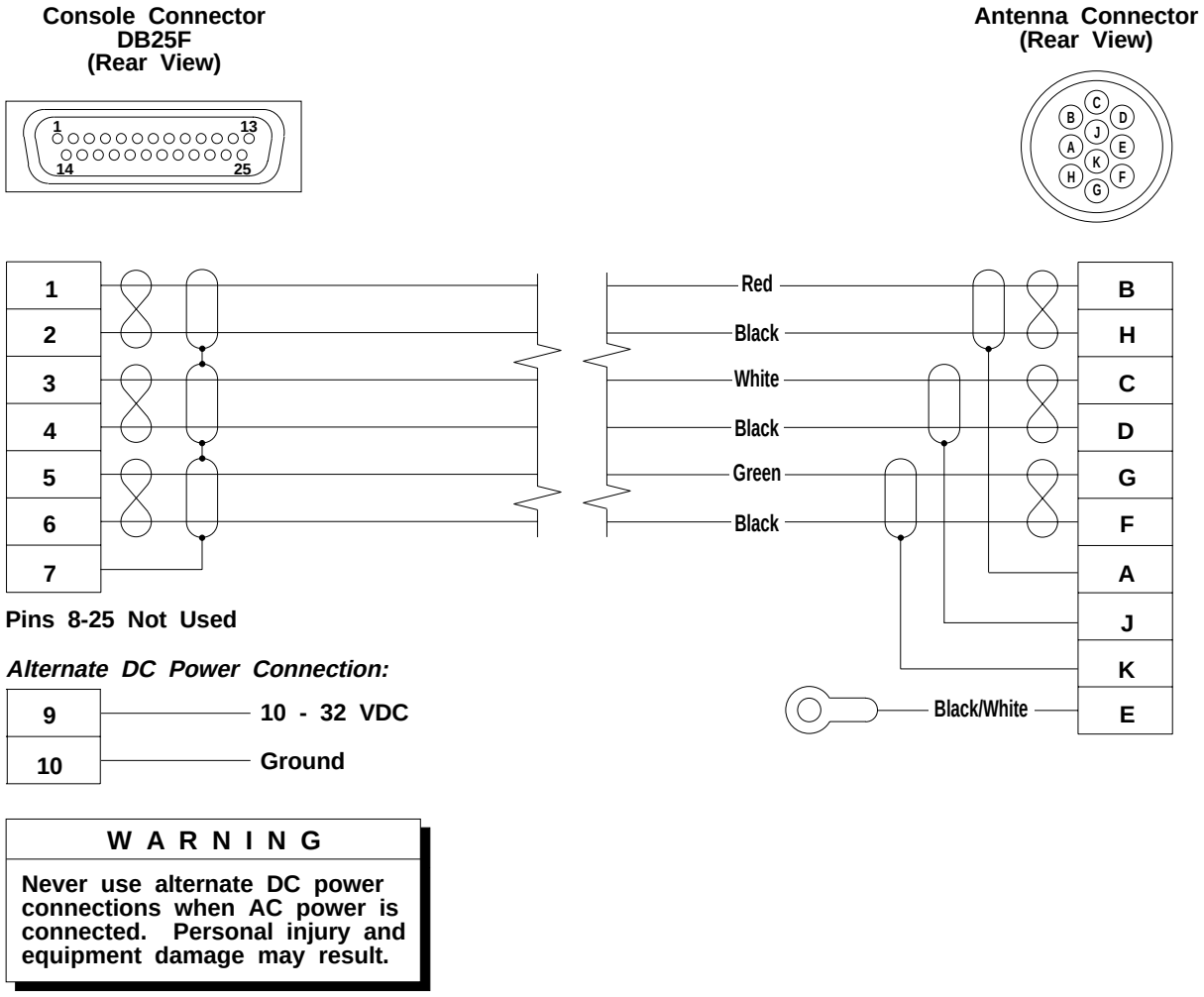

Figure 11. WX-110 Antenna Cable Interconnect Diagram

5.7 Cable Routing

The antenna cable should be routed between the antenna plate and the console by the most direct routing. Although the cable is electrically shielded, it can be susceptible to interference from sources such as AC power wires, etc. For this reason, the WX-110 antenna cable should not share a conduit with AC power wires or be tied together with AC power wires. The antenna cable, however, is plenum rated and may be routed through ducting.

If the 25-pin connector on the console end of the cable inhibits routing through restricted areas, the connector may be removed by cutting the cable. After the cable has been routed, a new connector can be soldered to the cable. Refer to the antenna cable interconnect diagram in figure 11 for details.

5.8 Cable Connections

After the antenna plate has been positioned and the antenna secured to the plate, the antenna connector may be mated to the antenna. It may be necessary to temporarily release the antenna plate from its brackets to accomplish this.

Mate the antenna connector to the antenna by rotating it on the antenna until the positioning pins are aligned. The connector can then be pushed onto the antenna until fully seated. Once seated, rotate the knurled locking ring 1/4 turn clockwise until it locks.

Strain relief is provided by securing the antenna cable to the plate, using the cable clamps and hardware provided. The clamp may be affixed to any vacant hole in the plate that prevents a sharp bend in the cable where it enters the connector.

The antenna ground lug must be connected to the plate using the hardware provided. See Figure 8. Once again, it may be affixed to any vacant hole in the plate.

5.9 Console Location and Connections

NOTE

All current production units are shipped from the factory set for 110-120 VAC. If the power at your location requires 220-240 VAC, voltage selection must be changed by setting an internal switch. This selection must be set before power is applied to the equipment. Refer to paragraph 1.2.

The location of the console is not critical, as long as the alarm can be heard when the console is not being monitored visually.

The 25-pin subminiature-D connector on the antenna cable mates to the connector on the rear of the console. Side screws secure the connector. Excess antenna cable may be coiled, as necessary.

The console is powered from a three-wire grounding-type plug. For safety reasons, ensure that a properly grounded outlet is used. Do not defeat the safety purpose of the grounding-type plug.

5.10 Checkout and Troubleshooting

After the system is installed and all connections are checked, it can be tested for proper operation.

Switch the system on using the rocker switch on the rear panel. The system will run a comprehensive series of self tests to ensure that all functions are operating properly. As the system completes each test, a brief message will appear on the display showing the software version and the status of each function as it is tested. Messages will appear in the following sequence:

"Self Test in Progress"

"Digital Processor OK"

"Memory Test OK"

"All Tests OK"

An error message will appear on the screen if a fault is discovered during any of the three system tests (start-up, user, or continual). Errors are classified into two groups - recoverable errors and non-recoverable errors. Refer to the following paragraphs to interpret the error codes.

If no signs of power are present, check power source, AC voltage selection, and internal fuse (refer to paragraph 1.3). If defective, replace internal fuse with a standard 3AG ½ Amp (110-120 V System) or ¼ Amp (220-240 V System) "Slo Blo" fuse.

5.10.1 Recoverable Errors

Some error messages indicate states that may automatically recover under restored conditions. If the system displays one of the following error codes, press the CLEAR button. The system will automatically attempt to recover. If the WX MAPPING FAULT message is displayed after pressing CLEAR, turn the WX-110 off. The system is inoperable and should be serviced as soon as possible.

ERROR 0	ANTENNA	WEATHER DISPLAY WILL NOT OPERATE
ERROR 5	WX PROCESSING	WEATHER DISPLAY WILL NOT OPERATE
ERROR 6	WX PROCESSING	WEATHER DISPLAY WILL NOT OPERATE
ERROR 12	PROCESSOR	WEATHER DISPLAY WILL NOT OPERATE

5.10.2 Non-Recoverable Errors

Other error messages indicate states that cannot recover automatically. If the system displays one of the following error codes, reset the system by switching the power OFF, then ON. If the error message is redisplayed, press the CLEAR button. The system will attempt to recover. If the WX MAPPING FAULT message is displayed after pressing CLEAR, turn the WX-110 off. The system is inoperable and should be serviced as soon as possible.

ERROR 1	ANTENNA	WEATHER DISPLAY WILL NOT OPERATE
ERROR 2	PROCESSOR	NEW VIEW AND BRIGHTNESS ADJUSTMENTS WILL NOT BE SAVED
ERROR 3	PROCESSOR	ALL FUNCTIONS INOPERABLE
ERROR 7	PROCESSOR	ALL FUNCTIONS INOPERABLE
ERROR 8	PROCESSOR	WEATHER DISPLAY WILL NOT OPERATE
ERROR 9	PROCESSOR	WEATHER DISPLAY WILL NOT OPERATE
ERROR 10	PROCESSOR	WEATHER DISPLAY WILL NOT OPERATE
ERROR 11	PROCESSOR	WEATHER DISPLAY WILL NOT OPERATE

NOTE

Occasional processing errors do not necessarily indicate a fault in the WX-110 System.

If error messages persist which cannot be cleared by cycling power to the system, or if clusters of strike points appear continuously in the same area of the display (but are not caused by actual thunderstorms) a possible cause is electrical interference.

Interference from an electrical apparatus or AC wiring in the building can radiate to the WX-110 antenna or the antenna cable. This interference can cause "false storms" on the display, or it may cause error messages to appear on the display. You may need to relocate the antenna or reroute the antenna cable away from other wiring in order to eliminate the interference.

For additional assistance contact the Goodrich Avionics System Field Service Engineering at 1-800-453-0288 or 1-616-949-6600. If the system must be returned for repair, include a brief description of the problem, your name, return address, and phone number, and ship the unit to the following address:

Goodrich Avionics Systems, Inc.
Attn: Field Service Engineering
5353 52nd Street, S.E.
Grand Rapids, MI 49512 USA

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6.0 SPECIFICATIONS

Standard Dimensions

Console	8.25 in. Wide x 9.25 in. Deep x 5.00 in. High (20.96 cm Wide x 23.50 cm Deep x 12.70 cm High) *Note: Allow 2.0 in. (5.08 cm) behind console for cable connection.*
Antenna	3.50 in. Wide x 7.0 in. Long x 1.0 in. High (8.89 cm x 17.78 cm x 2.54 cm)
Antenna Plate	16 in. x 16 in. x 1 in (0.050 in. Aluminum) (40.64 cm x 40.64 cm x 0.127 cm)

Weight

Console	7.5 lb. (3.40 kg)
Antenna	0.92 lb. (0.42 kg)
Antenna Plate	2.0 lb. (0.91 kg)

Cable Requirements

Antenna Cable Length	100 ft. (30.48 m) provided - pre-wired, ready for installation *Note: Extension cables available in 50 ft. (15.24 m) lengths.* *Maximum cable length should not exceed 250 ft. (76.2 m).*
Minimum Specifications	Plenum rated, three shielded pair cable

Operational Specifications

Operating Range	25, 50 and 100 nautical miles - operator selectable
Maximum Range	100 nautical miles
Operating Azimuth	360°
Operating Temperature	32° to 122°F (0° to 50°C)
Storage Temperature	-22° to 149°F (-30° to 65°C)

Inputs

Alternating Current	70 - 130 VAC, 50 - 60 Hz, 15 W 220-240 VAC, 50 - 60 Hz
Direct Current	10 - 32 VDC , 10 W

Outputs

Display	2.5 in. x 2.5 in. LCD display, backlit by electroluminescent panel. CD photocell brightness control.
Audio	Piezo alarm beep upon display of new strike data.

7.0 WARRANTY

The *Stormscope*® WX-110 Weather Mapping System is warranted for two years from the date of installation (not to exceed 30 months from the date of shipment from Goodrich Avionics Systems) subject to the following limitations.

7.1 Warranty Statement

Goodrich Avionics Systems warrants each item of new equipment manufactured or sold by Goodrich Avionics Systems to be free from defects in material and workmanship, under normal use as intended, for a period of 30 months from date of shipment by Goodrich Avionics Systems to an authorized facility, or 24 months from date of installation by an authorized facility, whichever occurs first. No claim for breach of warranties will be allowed unless Goodrich Avionics Systems is notified thereof, in writing, within thirty (30) days after the material or workmanship defect is found.

The obligation of Goodrich Avionics Systems shall be limited to replacing or repairing at its factory the equipment found defective under terms of this warranty certificate; providing that such equipment is returned in an approved shipping container, transportation charges prepaid, to Goodrich Avionics Systems, Grand Rapids, Michigan, or such other location as Goodrich Avionics Systems may authorize. Goodrich Avionics Systems reserves the right to have necessary repairs performed by an authorized agency.

This warranty shall not apply to any unit or part thereof which has not been installed or maintained in accordance with Goodrich Avionics Systems instructions, or has been repaired or altered in any way so as to adversely affect its performance or reliability, or which has been subjected to misuse, negligence or accident.

This warranty is exclusive and is accepted by buyer in lieu of all other guaranties or warranties express or implied, including without limitation the implied warranties of merchantability and fitness for a particular purpose. Buyer agrees that in no event will Goodrich Avionics Systems liability for all losses from any cause, whether based in contract, negligence, strict liability, other tort or otherwise, exceed buyer's net purchase price, nor will Goodrich Avionics Systems be liable for any special, incidental, consequential, or exemplary damages.

Goodrich Avionics Systems reserves the right to make changes in design or additions to or improvements in its equipment without the obligation to install such additions or improvement in equipment theretofore manufactured.

7.2 Related Policies and Procedures

1. Notice of a claimed product defect must be given to Goodrich Avionics Systems or a designated Goodrich Avionics Systems Service Agency within the specified warranty period.
2. A product which is defective in workmanship and/or material shall be returned to Goodrich Avionics Systems with transportation charges prepaid. After correction of such defects, the equipment will be returned directly to the customer, transportation prepaid by Goodrich Avionics Systems via surface transportation. Any other means of transportation must be paid by the customer.

   The risk of loss or damage to all products in transit shall be assumed by the party initiating the transportation of such products. All items repaired or replace hereunder shall be warranted for the unexpired portion of the original warranty.
3. *Stormscope* Weather Mapping Systems are susceptible to excessive electrical noise. Goodrich Avionics Systems is in no way obligated or responsible for supporting or participating in the costs of the installation warranty. The entire responsibility lies with the agency making the installation. Goodrich Avionics Systems is only responsible for the product warranties outlined in the Warranty Statement of this manual.

FCC RADIO FREQUENCY INTERFERENCE STATEMENT FOR THE WX-110

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.