MX20

Multi-Function Display

User's Guide

GARMIN

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History of Revisions

Date	Software Version	Manual Revision
January 2000	1.0	Capstone Release
February 2000	1.1	GA Release
April 2000	1.2	560-1026-00a
August 2000	2.0	560-1026-01
December 2000	2.2	560-1026-02
July 2001	2.3	560-1026-03
April 2002	3.0	560-1026-04
April 2002	3.1	560-1026-04a
June 2002	3.2	560-1026-04b
November 2002	4.0	560-1026-05
February 2003	4.1	560-1026-05a
June 2003	5.0	560-1026-05 Rev B
September 2003	5.0, 5.1	560-1026-05 Rev C
January 2004	5.2	560-1026-05 Rev D
May 2004	5.3	560-1026-06 Rev -

Ordering Information

To receive additional copies of the MX20 User's Guide, order part #560-1026-06. The MX20 Installation Guide is part #560-1025-xx. The MX20 Quick Reference Guide is part #561-0263-xx.

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Welcome…

Welcome to a new era of aviation navigation. Once again, Garmin has set new standards in features and ease of use for the general aviation public. The MX20 Multi-Function Display provides a focal point for integrating many of your navigation needs in an easy to use and convenient package.

The MX20 presents a wealth of information on its six-inch diagonal, 640x480 pixel, color display. The many features are organized as distinct functions and are designed to closely mimic the traditional instruments used in the standard cockpit. Each function allows varying degrees of customization. The custom map function is customizable so you can create a display for almost any configuration you require. The other functions provide more limited levels of customization so that they retain the look and feel of the instruments they reflect.

The MX20 is capable of creating powerful overlay views where information from a variety of sources can be presented simultaneously in proper relationship to each other, thus greatly increasing situational awareness for the pilot.

You can be confident in knowing that you are the owner of the state-of-the-art in aviation and navigation. The MX20 architecture is designed to support full expansion for both software and hardware enhancements. This flexibility protects your investment and allows for the ease of adding new features. Our products are built to last and to allow the flexibility to meet your needs as they change in the future.

About This Manual

This manual may be used as a summary, a reference, and a learning tool. Information is provided about all of the functions available to the MX20. Your specific installation may not include all of these functions.

Take a few moments to familiarize yourself with the various sections in this manual. The Getting Started section gives an introduction to the controls, basic operation, and organization of the functions in your MX20. Be sure to read the Getting Started section to learn the rules for using the MX20. The Detailed Operation section is the reference for each of the functions in the MX20. Refer to the Detailed Operation section when you want to get into the details on every function and option along with step-by-step instructions.

Not every function is available in all software versions or in every installations.

Limitations

The Traffic function is not a collision avoidance system. It is an aid to visual acquisition and does not relieve the flight crew of their responsibility to "see and avoid." There are no evasive aircraft maneuvers authorized, recommended, or provided for as a result of displayed traffic targets. Refer to the traffic sensor documentation for additional information.

The Terrain function shows you the general terrain elevations relative to your altitude and are advisory in nature. Individual obstructions may be shown if available in the database. Terrain is displayed from database information and may therefore contain errors. The Terrain function does not relieve the flight crew of their responsibility to "see and avoid." Do not use this information for navigation.

The moving map, weather information, and other displayed information are intended only as aids to situational awareness. The pilot should rely on the appropriate primary means of navigation.

Refer to your airplane flight manual supplement for more information.

Table of Contents

Getting Started

This section explains how to get started using the MX20. Information in this section describes the controls, data card, display, and basic operation. After reading this section, go to the Detailed Operation section for expanded explanations for each feature.

Functions

The MX20 contains thirteen major separate functions for the display of information. The function names are shown as "smart" keys at the bottom of the display. The "smart" key is the combination of a label above a triangle key at the bottom of the display. The labels above the triangle keys change to reflect the choices available to you for each function. Press the **FN** key to show the available functions. Press the "smart" key below the function label to go to the desired function. While in each function, press the **MENU/ENTER** key to show the options for each function. The options are shown on the right side of the display. Press the **LINE SELECT** key to manipulate the options. Some options toggle on/off, while some are tri-state (three choices). The functions are:

- MSG - Message Log (See page 20)
- MAP - Custom Map (See page 21)
- IFR - IFR Chart (See page 37)
- VFR - VFR Chart (See page 41)
- Split - Split Screen (See page 43)
- Traffic - Skywatch/TCAD (See page 45)
- Traffic - ADS-B TRAF (See page 50)
- Traffic - TIS-A (See page 59)
- FPL - Flight Plan (See page 63)
- TER - Terrain (See page 64)
- FIS-B - Flight Information Service - Broadcast UAT (See page 69)

- FIS - Flight Information Service (WSI InFlight) (See page 71)
- LT - Lightning Strikes (See page 81)
- CHART - Chart View (See page 86)
- RADAR - Weather Radar (See page 100)
- SYS - System Information (See page 105)

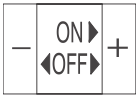
The Message Log displays information from the MX20 or reported to the MX20 by its external sensors. A flashing MSG annunciator notifies you of a new message that should be viewed. The Custom Map function allows you to completely customize the displayed map by overlaying selected information. The Custom Map can become "cluttered" if you choose every option, so use discretion. The IFR Chart function provides an IFR en route style map on the display. The VFR Chart function provides a VFR sectional style map for the display. The Split Screen function allows up to two of the other functions to be displayed side by side and an optional vertical profile across the bottom of the display. The Traffic function (when installed) shows nearby traffic and details about each target. The Flight Plan function provides details about your flight plan and each waypoint. The Terrain function shows a color coded map of terrain elevation in relation to your altitude. The Flight Information Services function, when installed, is capable of displaying text and graphic weather information with UAT- and WSI-equipped installations. The Lightning function, when connected to the Goodrich WX500 Stormscope, controls the overlay of lightning strike information on the map displays. The Chart View feature provides the capability to view Jeppesen Sanderson Inc. electronic charts. Two basic types of charts can be viewed: Approach charts and airport surface charts. The Radar Function allows weather radar from the ART2000, ART2100, or RS-181A to be displayed. The System Information function lets you set general preferences, show software version information, and test the display.

Controls

Power/Brightness

Two variations of the Power/Brightness control exist, a rotary knob or a rocker switch. Both are described here.

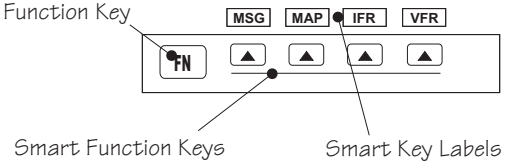
The power switch is located in the upper right corner of the MX20. Turn the power rotary knob clockwise past the detent to turn the power on. Turn the power knob fully counterclockwise to turn the power off. With the power knob pushed in, the brightness is set automatically according to ambient light by a photo sensor. Pull the knob out and turn the knob to adjust the display brightness manually.



The power switch is located in the upper right corner of the MX20. Press the "+" rocker switch to turn the power on. Press both the "-" and "+" rocker switches and hold them down to turn the power off. Press the "-" and "+" rocker switches individually to adjust the display brightness manually. Press the "-" and "+" rocker switches at the same time until the keys flash, then release to set the brightness automatically.

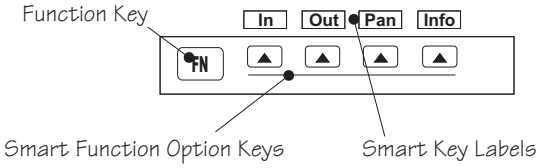
Function (FN)

The Function keys are made up of one dedicated key on the lower left side of the display and the four "smart" keys to the right of it. Press the function (**FN**) key repeatedly to scroll through the available functions. The functions will appear above the "smart" function keys in turquoise.



Use the **FN** key to display a list of the main functions, such as Map, IFR, Terrain, etc. Each time you press the **FN** key you will step through the list of functions. After you press

one of the function "smart" keys at the bottom of the display, the function keys change to provide options to control the display related to the current function.



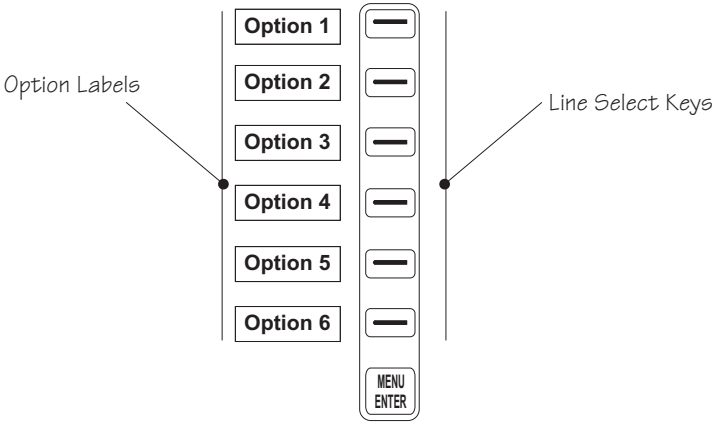
Change the function keys back to the function list by pressing the **FN** key.

Menu/Enter

The **MENU/ENTER** key is located on the bottom right corner of the MX20. Press the **MENU/ENTER** key to show a menu of options to modify the display of the current function. Press the **MENU/ENTER** key to hide the menu. If no action is taken, the menu will automatically extinguish in a few seconds.

Line Selection

The Line Selection keys are on the right side of the MX20. Press the **MENU/ENTER** key to see the options for the current function. Press the **LINE SELECT** key next to each option to scroll through the choices for each option. Some options support tri-state choices, such as in Map mode. When you select a tri-state option, the option label will change with each key press between completely filled, partially filled, and empty.

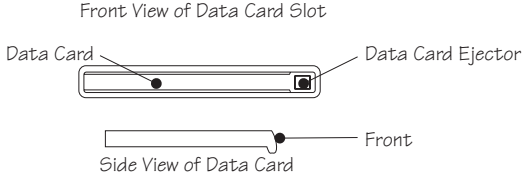


Data Card

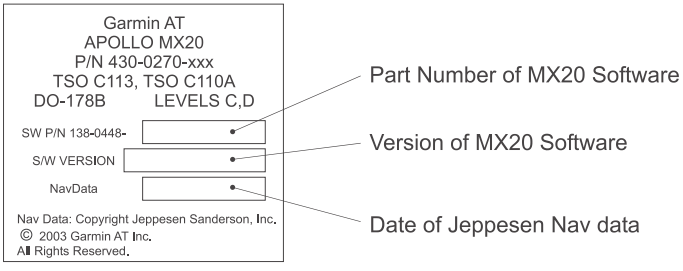
The Map database and other information is stored on a data card. The use of a data card allows you to easily update information.

Only change the data card when the power is turned off.

Handle your data card carefully. Do not touch the connector edge of the data card. To eject the card, use a soft blunt object to press the data card ejector. Gently pull the card straight out of the slot. Insert a data card by pushing the card straight into the slot. When fully inserted, the data card and eject button will be flush and slightly recessed into the bezel.

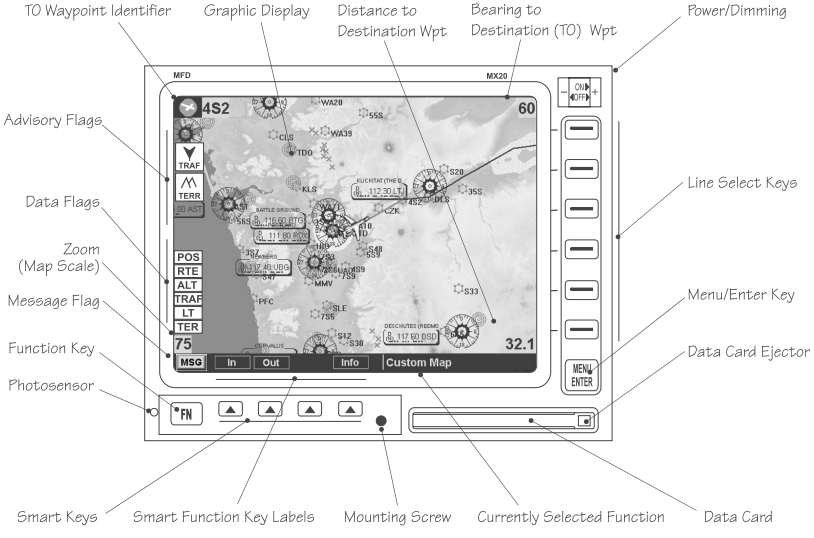


When contacting your dealer or the Garmin customer service department, eject the data card and write down the information shown on the label.



Display

The MX20 display provides text and graphic information to give a "picture" of your flight and surroundings. The display brightness may be set manually or allowed to automatically adjust to ambient light conditions. At the bottom of the display, labels above the function keys change to show the different choices for each function to allow access to commonly used actions. A typical Custom Map function display is shown below. See page 112 for details on display care.



MX20s with a rotary Power/Dimming knob will go into a pre-heat mode for a short period of time on start-up. During the pre-heat mode, the display will remain dark. The pre-heat mode is designed to extend the life of the LCD backlight.

Annunciations

Advisory flags, data flags, and messages appear on the display to give information about the status of the MX20 or to provide operating information.

Advisory Flags

Annunciations will appear on the upper left side of the display to provide advisories for Traffic, Terrain, and Lightning. Advisory information is monitored and displayed regardless of the selected function. Advisory flags will flash for approximately 10 seconds when they first appear and then turn solid while they are still valid. Advisory icons will reduce in size if more than two advisory conditions exist.

ADS-B Traffic

The Traffic advisory flag will appear on the left side of the display when traffic is reported to be within ±2000 feet of your altitude and 5 nm of your location. This Traffic advisory is only available when the ADS-B system with a UAT data link is installed and operational. Refer to page 17 for a description of TIS-A and TIS-B.

Skywatch/TCAD/TIS-A Traffic

The Traffic Advisory/Alert will appear in amber on the left side of the display when the traffic sensor indicates an alerting condition. Refer to page 17 for a description of TIS-A and TIS-B.

Terrain

The Terrain advisory flag will appear on the left side of the display when the terrain surface or obstacle altitude is within approximately 500 feet of your altitude and within approximately two minutes of flight in any direction.

Lightning

The Lightning advisory flag will show on the left side of the display when the WX500 sends an indication that lightning has been detected within 50 nm of your location. See the WX500 manual for details about range and other capabilities.

Data Flags

Data flags appear on the left side of the display to notify you when there is a loss of reported information. The data usually displayed, such as lightning or nearby terrain, may still exist, but may not be displayed for technical reasons. For instance, when the amber TRAF data flag appears it means that the MX20 is not receiving Traffic information from the sensor. So, traffic may exist in your vicinity, but will not be displayed on the MX20.

POS	No valid position information is available from the source. Do not expect a valid position representation on the maps. The Ownship symbol will have an “X” through it.
RTE	No valid route (flight plan) is available from the external navigation source. Route (flight plan) information will not be shown on the maps.
ALT	No valid altitude information is available from the external source. Altitude related functions will not operate, such as terrain awareness.
TRAF	No traffic information is received from the optional external source. Traffic will not be displayed. Your position information may not be broadcast in ADS-B capable systems.
ADSB	The GPS receiver in the GDL 90 UAT is not reporting a valid position. ADS-B broadcast will not include a position report.
LT	No valid lightning detection information is being received from the optional Stormscope sensor. Strike and cell information will not be displayed.
TER	Terrain coverage is not available for some part of the terrain advisory coverage area. Terrain advisories may not be provided.
NAV	When connected to the SL30, indicates the SL30 is not available or valid. ILS, OBS, and VORs will not be highlighted.
SKYW	No valid traffic information is being received from the optional Skywatch sensor. Traffic information will not be displayed.

TCAD	No valid traffic information is being received from the optional Ryan TCAD sensor. Traffic information will not be displayed.
RDR (Amber)	Indicates that radar status information is not available from the optional external radar transmitter head. Radar related functionality may not be available.
RDR (Green)	Indicates that the radar is ON and transmitting RF energy. Appropriate precautions should be taken.
RDR (Green - Flashing)	Indicates that the radar is in Hold and is transmitting RF energy. Appropriate precautions should be taken.
TAWS (amber)	No valid terrain information is available from the optional external source.
LINK	No valid datalink information is available from the optional external source.
XPDR	No valid TIS-A information is available from the optional external source. See page 59.

MSG

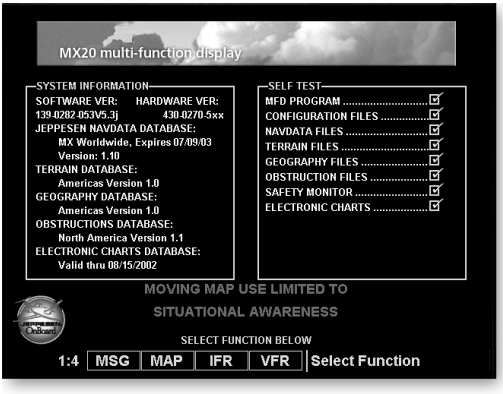
Message Flag

The Message flag will appear on the lower left side of the display when a new message is posted. Go to the Message function to view the information about the operation or status of the MX20.

Basic Operation

Use the following items to get a basic feel for the operation of the MX20. The basic steps for using any of the separate functions of the MX20 are:

- Turn the power on.
- Adjust the brightness or set it to automatic.
- Check that all tests pass on the Start Up screen.
- Press the **FN** key to view available functions. Each press of the **FN** key will step through the lists of functions.
- Press the key below the function label to select the desired function.
- Confirm or enter the current barometric pressure



- Press the **MENU/ENTER** key to display available options.
- Press the **LINE SELECT** key next to the displayed option to choose desired capabilities. Some options use multiple key presses for different states for the option. Press the **MENU/ENTER** key again to extinguish the option display.
- Refer to the Detailed Operation section for more details on each function.

Power On

Turn the power rotary knob clockwise past the detent to turn the power on **OR** press the "**+**" rocker switch to turn the power on. The MX20 will progress through a series of startup screens. The final startup screen shows System Information and the results of the Self-Test.

Pre-Heat Mode

MX20s with the rotary power/dimmer knob will go into a pre-heat mode for a short period of time on start-up. During the pre-heat mode, the display will remain dark. The pre-heat mode is designed to extend the life of the LCD backlight.

Brightness

Rotary Switch Model

With the Power knob pulled out, turn the knob in each direction to adjust the display brightness manually. Manual brightness mode may be selected to adjust the display for difficult lighting conditions. Push the knob in, and the brightness is adjusted automatically according to the ambient light. When the brightness is set automatically, the display will not dim below a pre-defined level.

Rocker Switch Model

Press the "-" and "+" rocker switches at the same time briefly to set the brightness automatically according to ambient light by th photo sensor. Press the "-" and "+" rocker switches alone to adjust the display brightness manually. When the brightness is set automatically, the display will not dim below a pre-defined level.

Start Up Screen

The Start Up screen is displayed while the MX20 goes through its initialization and testing routines. System information is shown that provides the MX20 software and database versions. The results of the self test are shown. A check mark shows that the test passed. If any of the Self-Tests fail (red "x"), contact your dealer or the factory (see page 112).

Confirm Current Baro Correction

A window may appear at startup, and then every 30 minutes, that displays the current barometric value. You must verify the current value or enter a new value. Press **BARO +** to increase the value. Press **BARO -** to decrease the value. Press **OK** to confirm the existing values or to accept changes you have just entered.

Function Selection

Press the **FN** key to view the different Functions. The functions are shown above the function "smart" keys on the lower part of the display in blue. Press the function key under the function label to activate that function. The labels above the function key will change to reflect the custom "smart" controls for that function. All of the described functions may not be available in each installation.

Function	Description
MSG	Message Log Function
MAP	Custom Map Function
IFR	IFR En Route Map
VFR	VFR Sectional Map
SPLIT	Split Screen (Displays Two Functions)
TRAF	Traffic Display
FPL	Flight Plan Information
TER	Terrain Depiction
FIS	Graphic and Text Weather
LT	Lightning Detection and Reporting
CHART	Chart View
RADAR	Weather Radar Function
SYS	System Information

Advisory Hot Key

The "Advisory Hot Key" feature allows advisory conditions to be quickly viewed with minimal effort by the pilot. This feature is comprised of three components:

1) An advisory condition is indicated by a white advisory flag on the left side of the screen and the corresponding Function label will also be highlighted in white when selecting a new Function with the **FN** key. This feature allows any Function with a pending advisory to quickly be recognized in the Function menu.

2) When a function is entered that has an advisory posted, the zoom level will be adjusted to show the advisory causing object (terrain for example), and the map orientation will be forced to "Track Up 360" to get a good view of what is around the aircraft.

3) When returning to the previous Function after viewing a Function with an advisory, the original zoom and map mode will be restored.

This feature is designed to allow the pilot to establish a preferred "cruise" map setup and quickly view an advisory, then return back to the previous setting. For example:

Normal Cruise Condition

Custom Map Function is being viewed at 5 nm in the ARC mode.

Terrain Advisory Occurs at 10nm in front of aircraft: The Terrain Advisory Indicator flashes then goes steady on the left side of the display.

Viewing the Advisory

The pilot presses the **FN** key and sees the TER Function highlighted in white, indicating it has an advisory condition. Pressing the **TER** key to enter the Terrain Function at this point will automatically adjust the zoom level to 10nm and place the unit in full "360" mode to show overall situational awareness.

Returning To Normal Condition

After evaluating the advisory, to return to normal viewing simply select the original Function that was being viewed before the advisory was viewed. When this is done, the zoom level will be set back to 5 nm and the display mode will be returned to ARC mode.

Alert Hot Key

Traffic alerts go one step further than the Advisory hot key feature and will automatically bring up the Function Menu showing the Traffic function. This is called the "prompt" mode. A single key press can then be used to switch the display to the Traffic function. The Alert hot key feature will automatically clear when the traffic alert condition no longer exists.

Also note that a pop-up mode can be enabled on the Traffic function, which makes the Traffic page pop-up when a Traffic Advisory occurs. The prompt or pop-up mode is selected in the Traffic function.

Options Menu

Most functions have a number of options available. Press the **MENU/ENTER** key to see the options for the current function. You change an option by pressing one of the Line Selection keys that are to the right of the displayed option. Many options have more than two choices. Press the same **LINE SELECT** key repeatedly to view or select the available choices. Some functions have several pages of options. The lower **LINE SELECT** key will allow you to reach the Next Page when multiple pages are available. Press the **MENU/ENTER** key a second time to remove the menu from view or wait a few seconds for the options to automatically extinguish.

Thumbnail Feature

The Thumbnail feature provides a small map depiction that is overlaid in the upper left corner of the MX20 display. It provides for enhanced traffic and terrain situational awareness when not specifically viewing traffic or terrain related functions. For example, both traffic and terrain situational awareness can be maintained while viewing the Flight Plan Function.

The Thumbnail is shown in both a small and large format, depending on the function currently being viewed. The Thumbnail is typically presented in the larger format when overlaid on a map. However, on some functions where the Thumbnail would overlay critical information, the smaller format is utilized.

The Thumbnail provides a fixed 5nm range view of conflicting traffic and terrain. The range depicted by the Thumbnail is not affected by the current zoom scale set on the main map functions.

Traffic on Thumbnail

TIS, TAS, or TCAS traffic is shown on the Thumbnail in the same symbology used within the Traffic Function. ADS-B traffic is not shown on the Thumbnail. Any traffic within sensor range and 5nm is shown, in addition to traffic causing an amber Traffic Alert (TA) traffic. Note that the MX20 supports one traffic sensor in any installation.

Terrain on the Thumbnail

Only “Red” terrain within the 5nm range is presented on the Thumbnail. This correlates directly to terrain that is rendered in red on the normal Terrain Function based on the internal terrain database. External TAWS-based terrain from the Goodrich Landmark is not shown on the Thumbnail.

Obstructions on the Thumbnail

Only "Red" obstructions within the 5 nm range are presented on the Thumbnail. This correlates directly to obstructions that are rendered in red on the other functions.

Thumbnail Activation

The Thumbnail incorporates logic that will either show or hide the thumbnail from view. It will only be shown when there is data to be presented and will be removed if not. For example, if there is no "Red" terrain or traffic within 5nm, the Thumbnail will be hidden from view.

The Thumbnail will not appear on the Traffic Function page if only traffic is presented in the Thumbnail. Correspondingly, it is not shown on the Terrain page if only terrain is presented in the Thumbnail. This logic eliminates redundant views that would be created by the Thumbnail and normal views of traffic and terrain.

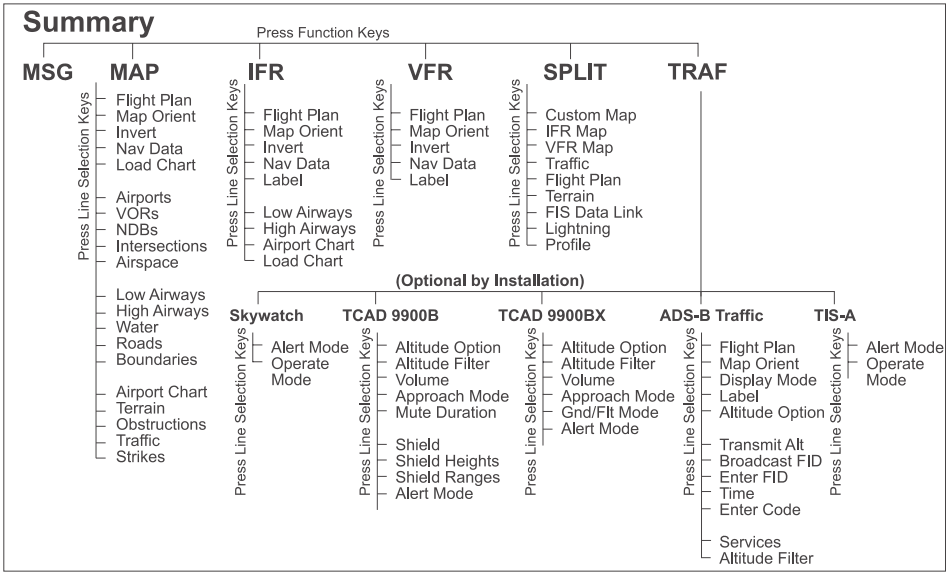
Additionally, the Thumbnail is disabled while operating on the ground. This state is determined by the 'En Route/Ground Transition Speed' set in the System Function page and is based on GPS ground speed.

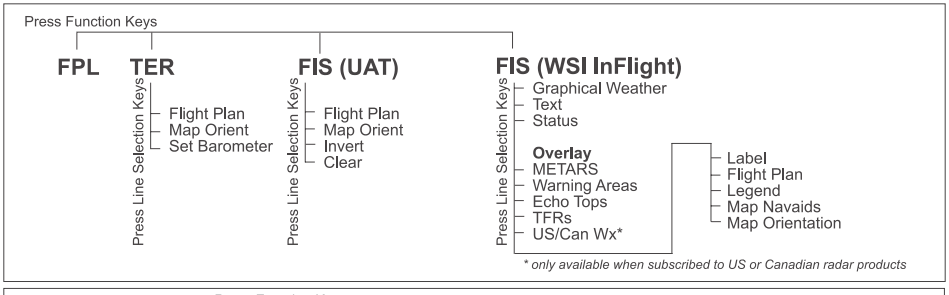
Traffic Information Services (TIS)

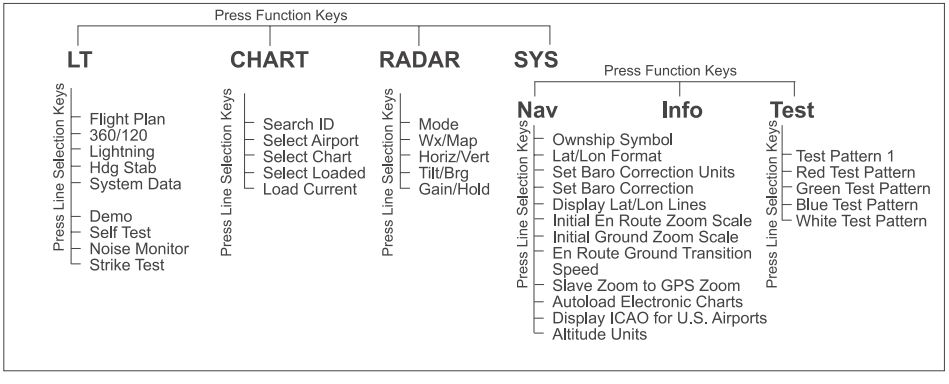
There are two versions of TIS: TIS-A and TIS-B. Both are described below.

In the TIS-A system, ground radar sensors collect target information. The ground radar sensor then determines the targets in the vicinity of your aircraft and their bearing relative to your track. Up to eight of the targets are transmitted by the ground radar sensor the next time it communicates with your TIS-A enabled transponder. See page 59 for TIS-A information.

In the TIS-B system, the ground radar sensors collect target information much the same as in the TIS-A system. However, with TIS-B, all targets collected by the ground radar sensor are broadcast to all aircraft equipped with UAT data link radios and that are within coverage of UAT ground broadcast stations. See page 51 for TIS-B information.


Summary
Press Function Keys
MSG
MAP
Press Line Selection Keys
Flight Plan
Map Orient
Invert
Nav Data
Load Chart
Airports
VORs
NDBs
Intersections
Airspace
Low Airways
High Airways
Water
Roads
Boundaries
Airport Chart
Terrain
Obstructions
Traffic
Strikes
IFR
Press Line Selection Keys
Flight Plan
Map Orient
Invert
Nav Data
Label
Low Airways
High Airways
Airport Chart
Load Chart
VFR
Press Line Selection Keys
Flight Plan
Map Orient
Invert
Nav Data
Label
SPLIT
Press Line Selection Keys
Custom Map
IFR Map
VFR Map
Traffic
Flight Plan
Terrain
FIS Data Link
Lightning
Profile
TRAF
(Optional by Installation)
Skywatch
Press Line Selection Keys
Alert Mode
Operate Mode
TCAD 9900B
Press Line Selection Keys
Altitude Option
Altitude Filter
Volume
Approach Mode
Mute Duration
Shield
Shield Heights
Shield Ranges
Alert Mode
TCAD 9900BX
Press Line Selection Keys
Altitude Option
Altitude Filter
Volume
Approach Mode
Gnd/Flt Mode
Alert Mode
ADS-B Traffic
Press Line Selection Keys
Flight Plan
Map Orient
Display Mode
Label
Altitude Option
Transmit Alt
Broadcast FID
Enter FID
Time
Enter Code
Services
Altitude Filter
TIS-A
Press Line Selection Keys
Alert Mode
Operate Mode


Press Function Keys
FPL
TER
Press Line Selection Keys
Flight Plan
Map Orient
Set Barometer
FIS (UAT)
Press Line Selection Keys
Flight Plan
Map Orient
Invert
Clear
FIS (WSI InFlight)
Press Line Selection Keys
Graphical Weather
Text
Status
Overlay
METARS
Warning Areas
Echo Tops
TFRs
US/Can Wx*
Label
Flight Plan
Legend
Map Navaids
Map Orientation
* only available when subscribed to US or Canadian radar products


Press Function Keys
LT
Press Line Selection Keys
Flight Plan
360/120
Lightning
Hdg Stab
System Data
Demo
Self Test
Noise Monitor
Strike Test
CHART
Press Line Selection Keys
Search ID
Select Airport
Select Chart
Select Loaded
Load Current
RADAR
Press Line Selection Keys
Mode
Wx/Map
Horiz/Vert
Tilt/Brg
Gain/Hold
SYS
Press Function Keys
Nav
Press Line Selection Keys
Ownship Symbol
Lat/Lon Format
Set Baro Correction Units
Set Baro Correction
Display Lat/Lon Lines
Initial En Route Zoom Scale
Initial Ground Zoom Scale
En Route Ground Transition
Speed
Slave Zoom to GPS Zoom
Autoload Electronic Charts
Display ICAO for U.S. Airports
Altitude Units
Info
Test
Press Line Selection Keys
Test Pattern 1
Red Test Pattern
Green Test Pattern
Blue Test Pattern
White Test Pattern

Detailed Operation

This section describes each operating function and the options available in each function. Each function operates independently. The Function “smart” keys and Line Selection keys are customized for each function and will appear while that function is selected. The functions are described in the order that they appear. A description of each function will be followed by an explanation of how the function “smart” keys operate for the function and then each menu option as selected by the Line Selection keys. All described functions may not be available in your particular installation. See your Airplane Flight Manual supplement for the details on your individual installation.

Message Log (MSG) Function

MSG

The Message function displays information about the status of the MX20. Messages may be logged by either the MX20 internal system or by one of the external sensors. The amber MSG flag will flash until the message is viewed. The MSG flag will remain in view while any messages remain in the message log. New messages that have not been viewed will be highlighted as bold text.

1. Press **FN** until you see the **MSG** function key.
2. Press the **MSG** key.
3. Use the **UP/DOWN** arrow "smart" keys to move to additional messages, if more than one page of messages exist.
4. Press **CLEAR** to remove the stored messages.

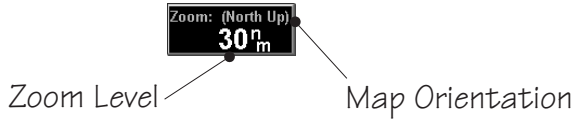
Custom Map (MAP) Function

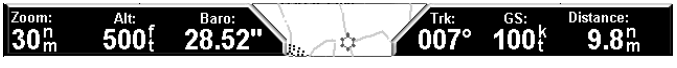
The Custom Map function provides a graphic display of map features in relation to the aircraft location to help improve your situational awareness. Review the Limitations section on page iv that apply to the use of data displayed on the moving map. The custom map function is unique in that it has the ability to selectively "overlay" all available types of information onto a single display. You can customize the map display by overlaying information selected from a menu of options. Press the **MENU** key to display a list of options on the right side of the screen. Press the **LINE SELECT** key next to the displayed option. Repeated presses of the **LINE SELECT** key will scroll through the available selections for each option.

The "smart" keys at the bottom of the display over the function keys control the map scale by zooming in or out, moving the map view around with the Pan feature, and viewing Info about the current destination waypoint.

Map Scale

The In and Out function keys control the map scale by zooming in and out. You can zoom in to 0.25 nm and zoom out to 250 nm. The scale distance is measured from the location of your aircraft symbol to the top of the screen. The Map Scale is shown in the lower left corner of the screen. The map orientation appears above the map scale on one of the three Nav Data options.





Auto Zoom

Auto Zoom is activated by adjusting the zoom level to the far extremes of the zoom range. When activated, the indicated zoom level will change from a number to the text "A," followed by the zoom scale.

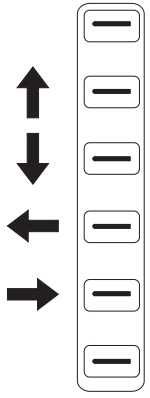
While in the Auto Zoom mode, the screen will automatically adjust the current zoom level to maintain the current "TO" waypoint on the screen. When approaching the waypoint, the zoom level will not drop below 1 nm. When the waypoint is reached and the next waypoint in the flight plan becomes active, the zoom level will automatically adjust to bring that waypoint on the map.

When installed with and CNX-series GPS receiver, the MX20 zoom level can be controlled by the CNX. This feature must be enabled in the System function with the "Slave Zoom to GPS Zoom" setting enabled.

To exit the autozoom mode, simply increase or decrease the current zoom level to re-enter the manual adjust mode.

Pan

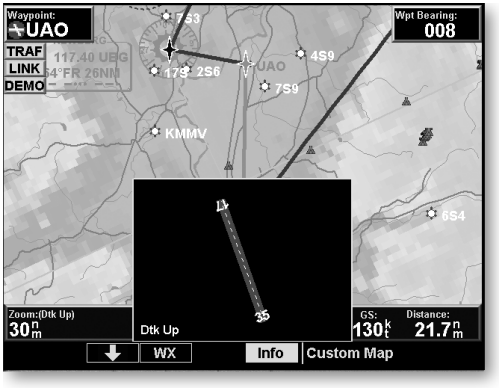
The Pan keys are used to move the display around so you can see beyond the initial boundaries of the screen. The **PAN** function key is one of the "smart" keys available at the bottom of the screen. When you select the Pan function, four "arrow" keys appear on the right side of the screen next to the **LINE SELECT** keys. Move the map in the desired direction by pressing the **LINE SELECT** key next to the arrow that shows you want the map to move. Press the **PAN** key again to exit the Pan mode. While panning, a green reference line is drawn from the center of the viewed area back to your current position.



Info

Press the **INFO** "smart" key to toggle viewing of information about the current "TO" waypoint. Press the **INFO** key again to hide the information.

Each press of the ↓ key will step through the available information for the current destination waypoint. The number of pages depends on the amount of information about the destination waypoint. Press the **WX** key to view any available METARs for the selected waypoint. Note that not all airports will have METARs available.



Runway diagrams of airports will be displayed in the same orientation as the main map (i.e., North Up, Track Up, or DTK Up).

Info In Pan Mode

The **INFO** smart key supports operation in conjunction with the PAN feature.

On any of the maps (Custom Map, IFR and VFR), entering the INFO mode while pan is active, will show information about the nearest airport to the center of the screen. This allows panning around the immediate area and obtaining information about airports in the vicinity without changing the current "TO" waypoint.

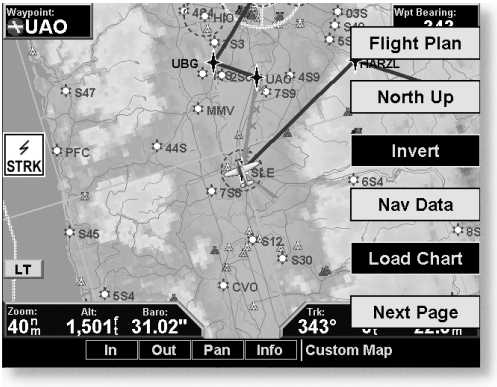
While in this mode, only the **INFO** smart key is highlighted. The **PAN** key is highlighted when exiting the Info mode. Only information about airports can be obtained with this feature.

Initial Zoom Level

The initial zoom level that is used on start-up is determined by a setting made in the System Function (see page 106).

Custom Map Menu Option Page 1

The first option page of the Custom Map function lets you select options for the choices of Flight Plan, map orientation, Invert, Nav Data, and Load Chart. The last option selection takes you to the next page of options. The options have tri-state choices that are also shown visually. When the option is clear, the icons and labels are not displayed. When the option is solid, icons and labels are all shown. When the option box is partially filled, only the icons are shown.



Flight Plan

The Flight Plan option controls the display of the Flight Plan course line. Pressing the **LINE SELECT** key next to the Flight Plan option toggles between showing or not showing the Flight Plan route line.

Map Orientation

This option controls the screen orientation in reference to the aircraft symbol. You may select from North Up, Track Up, Track Up Arc, Track Up 360, and Desired Track Up. **North Up** sets magnetic north as the top of the screen. **Track Up** sets the current track of the aircraft as the top of the screen. **Track Up Arc** sets the current track of the aircraft and a 120° arc at the top of the screen. **Track Up 360** sets the current track of the aircraft at the top of the screen and a 360° ring with the aircraft symbol position in the center. **Desired Track Up** sets the desired track to the next waypoint as the top of the screen. Press the **LINE SELECT** key next to this option to scroll through the options.

Invert

The Invert option changes the display of text and the background color. Depending on which layers are turned on, inverting the display may help readability for the current lighting conditions. For instance, when terrain is shown, the Invert option switches between white and black text. When terrain is turned off, the Invert option switches between a white background with black text and a black background with white text.

Nav Data

The Nav Data option allows to control the display of navigation data on the display. Subsequent presses of the **LINE SELECT** key for this option provides choices of no nav data, nav data in the corners (waypoint, bearing, zoom, and distance), or full nav data. The full nav data option includes the information in the four corners selection plus altitude, barometer setting, track, and

ground speed. Altitude and barometer setting information is not shown in TAWS installations.

Load Chart (Optional)

Once the airport is selected, the individual approach chart to be overlaid can be loaded from a list of geo-referenced approach charts available for that airport. Not all approach charts can be overlaid in this fashion and only geo-referenced charts will be presented for selection from the Custom Map. Because of this, it is possible that approach charts that are viewable under the Chart View Function may not be presented in this list.

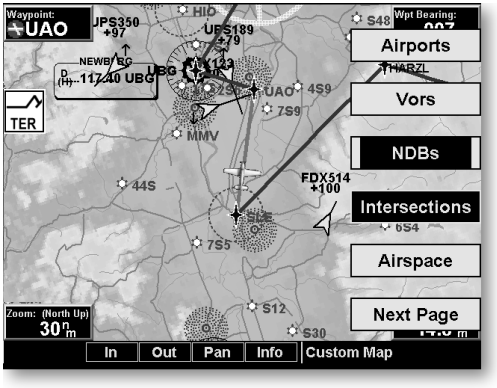
Note

The pilot must be aware that not all charts in the loaded database can be used as an overlay. The Chart function is automatic when connected to an CNX-series GPS receiver.

Press the Next Page **LINE SELECT** key to display the next page of menu items.

Custom Map Menu Option Page 2

The second option page of the Custom Map function lets you select options for the choices of Airports, VORs, NDBs, Intersections, and Airspace. The last option selection takes you to the next page of options.



Airports

The Airports option allows you to choose the level of airport information displayed on the Map screen. You may select the display of airport icon and identifier, icon only, or no information by each subsequent press of the Airport **LINE SELECT** option keys.

VORs

The VORs option allows you to choose the type of VOR information displayed on the Map screen. You may select the display of VOR icon and identifier, icon only, or no information by each subsequent press of the VOR **LINE SELECT** key.

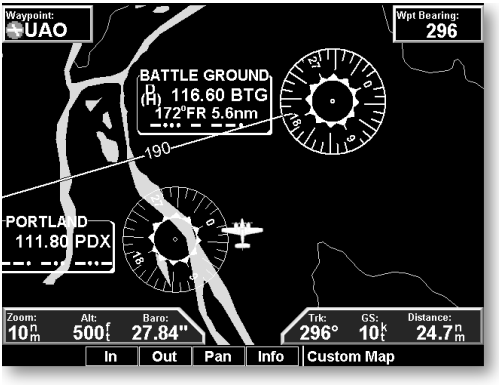
The MX20 supports full integration with the SL30 Nav/Com. This feature allows tuned VORs along with ILS and localizer approaches to be shown on the MX20 moving map. This high level of integration is designed to provide additional, simple to interpret situational awareness during high work-load phases of flight. The graphic display of Nav/Comm information on the MX20

provides another source to help make sure you are using the intended navigational aid and your To/From orientation to the reference station is as desired.

You can turn the display of VOR and ILS information in the Custom Map page on or off. VOR and ILS information is always shown in the IFR and VFR Chart functions.

VOR Highlight

The MX20 highlights the VOR in magenta on the moving map when the SL30 is either tuned to or monitoring a nearby VOR station. The highlighted VOR station is determined by using the tuned or monitored VOR frequency of the SL30 with the MX20 internal database.



The SL30 must be receiving a valid signal from the VOR.

The VOR information box for the selected VOR will show the distance and radial-from bearing between your present position and the VOR. The radial and distance information comes from your GPS, not the SL30.

The MX20 must have VOR symbols turned on for this feature to be active in the Custom Map function. VOR information is always shown in the IFR and VFR Chart functions.

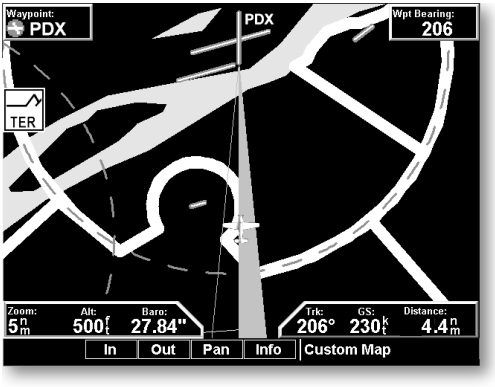
VOR OBS

The OBS (Omni-Bearing Selector) value selected in the SL30 will be shown as a line from the tuned VOR station in magenta on the MX20 display. The selected value will be shown on the line. This feature provides a quick view of your position relative to both the VOR and the tuned radial to help improve situational awareness. The OBS line will only be drawn from the active VOR, not the monitored VOR.

The SL30 must be receiving a valid signal from the VOR and the MX20 must have VOR symbols turned on for this feature to be active.

ILS/Localizer Depiction

When either an ILS or localizer is tuned on the SL30, the MX20 will display the currently tuned approach on the appropriate airport runway. The SL30 Nav function provides an overall graphic view of the selected airport and approach based on runway extensions and the selected frequencies. The standard ILS symbol is shown in magenta on the MX20 display.



Localizer Back Course Display

The MX20 will draw the "front course" on its display when a localizer frequency is tuned into the SL30. If you enable the localizer back course feature of the SL30, the MX20 will then draw a localizer "front course" graphic extending from the reciprocal runway.

The localizer front course graphic is shaded on the right side. The localizer back course graphic is shaded on the left side. Since the SL30 reverse-senses the needles, a standard "chase the needle" approach may be made and the localizer "front course" graphic is always used on the MX20.

A published localizer back course approach at the airport is not necessary to enable this feature.

The SL30 must be receiving a valid ILS, or localizer, and the MX20 must have airports turned on for this feature to be active.

NDBs

The NDBs option allows you to choose the type of NDB information displayed on the Map screen. You may select the display of NDB icon and identifier, icon only, or no information by each subsequent press of the NDB **LINE SELECT** key.

Intersections

The Intersections option allows you to choose the type of Intersection information displayed on the Map screen. You may select the display of the Intersection icon and identifier, icon only, or no information by each subsequent press of the Intersection **LINE SELECT** key.

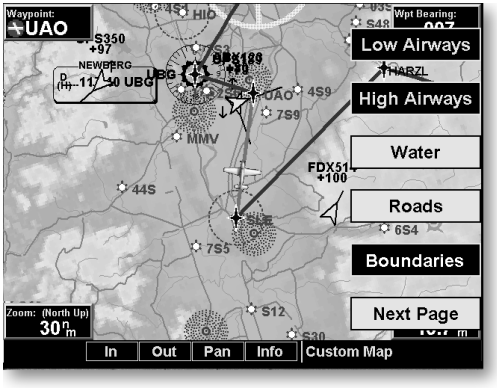
Airspace

The Airspace option allows you to control the display of airspaces. Pressing the **LINE SELECT** key next to Airspace toggles between either the display of airspace boundaries and altitude information, boundaries alone, or no display of airspaces.

Press the Next Page **LINE SELECT** key to display the next page of menu items.

Custom Map Menu Option Page 3

The third option page of the Custom Map function lets you select options for the choices of Low Airways, High Airways, Water, Roads, and political boundaries. The last option selection takes you to the next page of options.



Low Airways

The Low Airways option allows you to control the display of Low Airways. Pressing the **LINE SELECT** key next to Low Airways toggles between either the display of the airway and label, airway alone, or no display of Low Airways.

High Airways

The High Airways option allows you to control the display of High Airways. Pressing the **LINE SELECT** key next to High Airways toggles between either the display of the airway and label, airway alone, or no display of High Airways.

Water

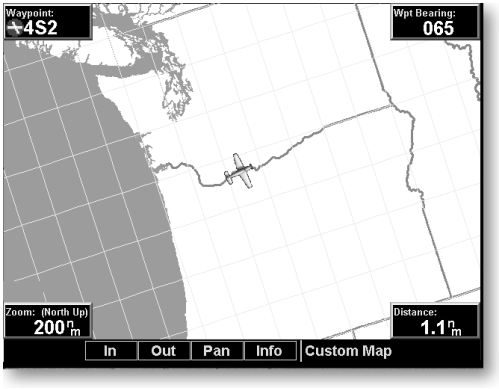
The Water option allows you to control the display of rivers and lakes. Pressing the **LINE SELECT** key next to Waters toggles between either the display or no display of the bodies of water.

Roads

The Roads option allows you to control the display of interstate and state highways. Pressing the **LINE SELECT** key next to Roads toggles between either the display or no display of the road features.

Boundaries

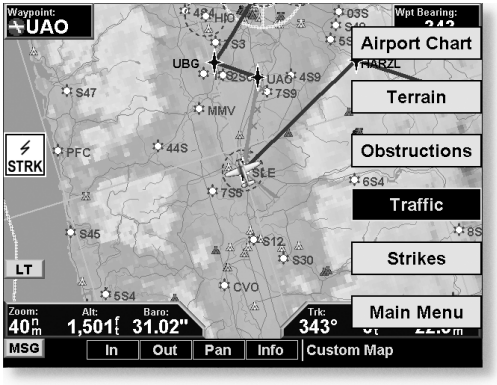
The Boundaries option allows you to select the display of political boundaries on the Map displays.



Press the Next Page **LINE SELECT** key to display the next page of menu items.

Custom Map Menu Option Page 4

The fourth option page of the Custom Map function lets you select options for choices of Airport Charts, Terrain, Obstructions, Traffic, and Lightning Strikes.



Airport Chart

Airport surface charts provide a graphical presentation of the airport surface area (runways, taxiways, buildings, towers and other objects), within the immediate airport vicinity.

From either the Custom Map or the IFR en route Map, airport surface charts will automatically be loaded and displayed as an overlay if the following conditions are met:

- The airport surface chart is within the loaded database
- The airport surface chart is geo-referenced by Jeppesen
- Airport Chart menu layer is turned on
- The aircraft position is within the coverage of the chart
- A loaded chart is not being “flown”

Terrain

The Terrain option allows you select the display of topographical features. Pressing the **LINE SELECT** key next to the Terrain option toggles between sectional (absolute), terrain awareness (relative), or no display of topographical features. The sectional (absolute) display shows a display similar to a sectional map. The terrain awareness (absolute) display shows a color coded view where the colors relate to terrain elevation relative to your altitude. For more information about the terrain awareness option, see the Terrain function section on page 64. When you turn the Terrain feature off, the background is either black or white depending on your selection in the Invert option. When no terrain data is available, the missing areas will be shown in light blue. Water will not be shown in relative mode. Review the Limitations section on page iv.

Obstructions

Obstructions, such as towers and other man-made objects, are part of the MX20 updateable database. Obstructions over 250 feet high are shown on the maps with tower symbols. The symbol is color coded to signify the relative altitude of the tower to your aircraft's altitude and follows the same conventions as the color coding for terrain. Objects that are at your altitude are shown in red; objects that are near your altitude are shown in yellow; objects with towers that are significantly below your altitude colored green. Obstructions are shown on the Custom Map and in the Terrain function. For info on color coding, see the section about the Internal MX20-Based Terrain on page 64. Review the Limitations section on page iv.

Current coverage for obstructions is North America only and are drawn only when the zoom level is below 50nm.

Traffic

The Traffic option turns the display of traffic information on or off. ADS-B Traffic information includes the location and identifier of a reporting aircraft, its direction of travel, elevation, and the estimated path for the selected time interval. See the section on the Traffic mode for more details on how traffic information is used.

For Skywatch/TCAD/GTX330 installations, a small thumbnail presentation of traffic is presented in the upper left corner of the display. In TCAD, Skywatch, and GTX330 installations, the traffic targets can also be overlaid on the Custom Map page.

The Traffic function is not available in all software versions. Check your Approved Flight Manual Supplement to verify if this feature is available. Review the Limitations section on page iv.

Strikes

The Strikes menu option controls the display of lightning strike information if the MX20 receives strike data from an external source, such as the WX500. Each reported lightning strike is shown as a red "x" on the display. Strikes are not shown if the zoom level is below 20 nm.

Press the Next Page **LINE SELECT** key to display the next page of menu items.

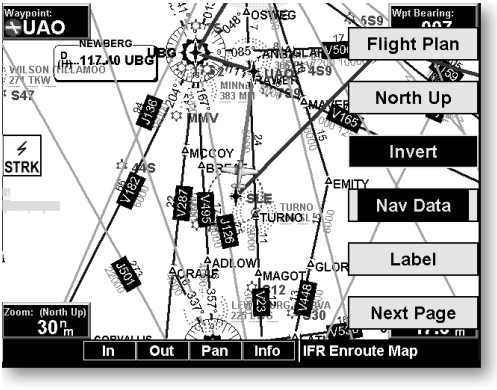
IFR En Route (IFR) Chart Function

The IFR En Route Chart function shows an IFR en route style map for the display. The IFR display shows navigational aid information and the flight plan course line. The "smart" keys on the bottom of the screen control zooming in and out, panning, and the display of information on the current TO waypoint. The menu of options available for the IFR mode include Flight Plan, map orientation, Invert, and turning labels on or off.

This data is advisory only and does not replace primary indicators, such as the CDI. Navigation should not be baesd on the data presented on the MX20. Review the Limitations section on page iv.

IFR Option Page 1

The first option page of the IFR Chart function lets you select options for the choices of Flight Plan, Map Orientation, Invert display, Nav Data, and Labels. The last option selection takes you to the next page of options.



Flight Plan

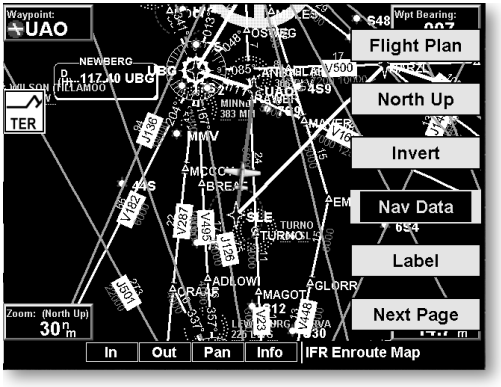
The Flight Plan option controls the display of the Flight Plan course line. Pressing the **LINE SELECT** key next to the Flight Plan option toggles between showing and not showing the Flight Plan route line.

Map Orientation

This option controls the screen orientation in reference to the aircraft symbol. You may select from North Up, Track Up, Track Up Arc, Track Up 360, and Desired Track Up. **North Up** sets magnetic north as the top of the screen. **Track Up** sets the current track of the aircraft as the top of the screen. **Track Up Arc** sets the current track of the aircraft and a 120° arc at the top of the screen. **Track Up 360** sets the current track of the aircraft at the top of the screen and a 360° ring with the aircraft symbol position in the center. **Desired Track Up** sets the desired track to the next waypoint as the top of the screen. Press the **LINE SELECT** key next to this option to scroll through the options.

Invert

The Invert option changes the display of text and the background color. The Invert option switches between a white background with black text and a black background with white text.



Nav Data

The Nav Data option allows you to control the display of navigation data on the Map displays. Subsequent presses of the **LINE SELECT** key for this option provides choices of no nav data, nav data in the corners (waypoint, bearing, zoom, and distance), or full nav data. The full nav data option includes the information in the four corners

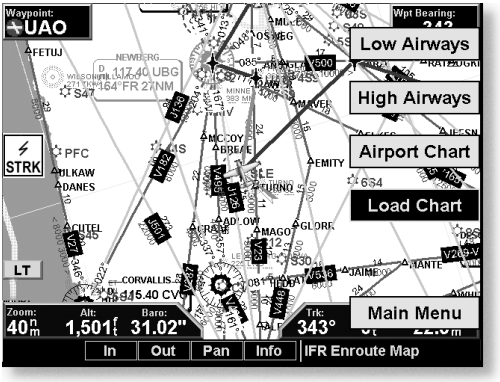
selection plus altitude, barometer setting, track, and ground speed.

Label

The **LABEL** key turns the labels for each item on or off for easy decluttering. When Labels are turned off, only the symbol for waypoints along the flight plan will remain in view when the flight plan is enabled.

IFR Option Page 2

The second option page of the IFR Chart function lets you select options for the choices of Low Airways, High Airways, Airport Chart, and Terrain. The last option selection takes you back to the first page of options.



Low Airways

The Low Airways option allows you to control the display of Low Airways. Pressing the **LINE SELECT** key next to Low Airways toggles between either the display of the airway and label, airway alone, or no display of Low Airways.

High Airways

The High Airways option allows you to control the display of High Airways. Pressing the **LINE SELECT** key next to High Airways toggles between either the display of the airway and label, airway alone, or no display of High Airways.

Airport Chart

Airport surface charts provide a graphical presentation of the airport surface area (runways, taxiways, buildings, towers and other objects), within the immediate airport vicinity.

From either the Custom Map or the IFR en route Map, airport surface charts will automatically be loaded and displayed as an overlay if the following conditions are met:

- The airport surface chart is within the loaded database
- The airport surface chart is geo-referenced by Jeppesen
- Airport Chart menu layer is turned on
- The aircraft position is within the coverage of the chart
- A loaded chart is not being "flown"

Load Chart

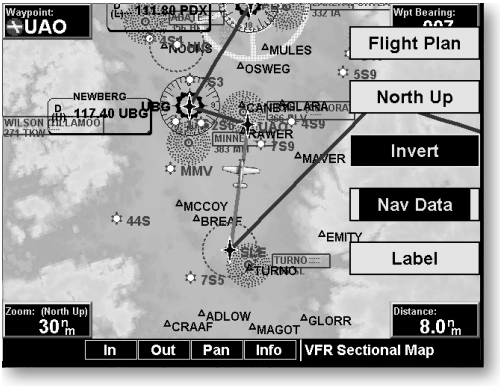
Once the airport is selected, the individual approach chart to be overlaid can be loaded from a list of geo-referenced approach charts available for that airport. Not all approach charts can be overlaid in this fashion and only geo-referenced charts will be presented for selection from the Custom Map. Because of this, it is possible that approach charts that are viewable under the Chart View Function may not be presented in this list.

Note

The pilot must be aware that not all charts in the loaded database can be used as an overlay. When enabled, a chart may be automatically loaded if installed with a CNX-series GPS receiver. See the System Function on page 109 to enable this feature.

VFR Chart (VFR) Function

The VFR Chart function shows an VFR sectional style map for the display. Topographic features are shown. The VFR display shows navigational aid information and the flight plan course line. The "smart" keys on the bottom of the screen control zooming in and out, panning, and the display of information about the current TO waypoint. The options available for the VFR mode include Flight Plan, screen orientation, Invert, and turning labels on or off. Review the Limitations section on page iv for the limitations that apply to the data displayed on the moving map.



Flight Plan

The Flight Plan option controls the display of the Flight Plan course line. Pressing the **LINE SELECT** key next to the Flight Plan option toggles between showing and not showing the Flight Plan route line.

Map Orientation

This option controls the screen orientation in reference to the aircraft symbol. You may select from North Up, Track Up, Track Up Arc, Track Up 360, and Desired Track Up. **North Up** sets magnetic north as the top of the screen. **Track Up** sets the current track of the aircraft as the top

of the screen. **Track Up Arc** sets the current track of the aircraft and a 120° arc at the top of the screen. **Track Up 360** sets the current track of the aircraft at the top of the screen and a 360° ring with the aircraft symbol position in the center. **Desired Track Up** sets the desired track to the next waypoint as the top of the screen. Press the **LINE SELECT** key next to this option to scroll through the options.

Invert

The Invert option changes the text and background color. Inverting the display may help readability for the current lighting conditions and the color of the terrain in a given area.

Nav Data

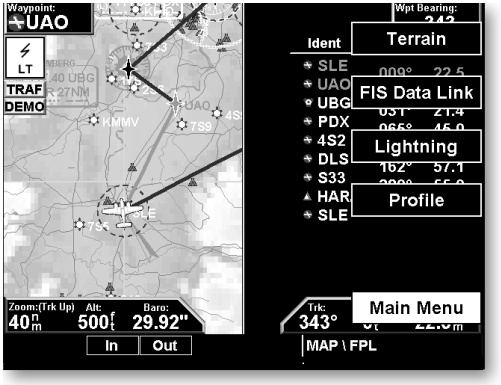
The Nav Data option allows to control the display of navigation data on the Map displays. Subsequent presses of the **LINE SELECT** key for this option provides choices of no nav data, nav data in the corners (waypoint, bearing, zoom, and distance), or full nav data. The full nav data option includes the information in the four corners selection plus altitude, barometer setting, track, and ground speed.

Label

The **LABEL** key turns the labels over each item of information on or off. When Labels are turned off, only the symbol for waypoints along the flight plan will remain in view when the flight plan is enabled.

Split Screen (SPLIT) Function

The Split Screen capability allows you to display up to two enabled functions side by side. Press the **LINE SELECT** key next to the desired map to highlight the selection. When two functions are displayed, you must first deselect a highlighted selection before selecting another function. Review the Limitations section on page iv for the limitations that apply to the data displayed on the moving map.

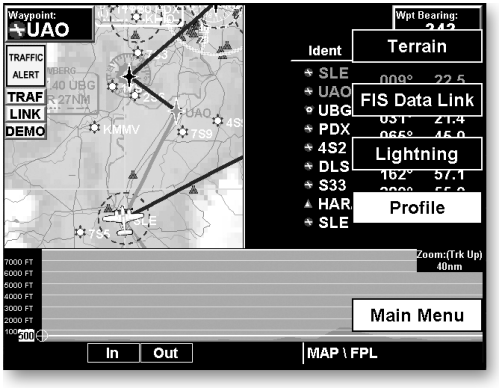


A vertical profile may be optionally selected to be shown on the lower portion of the display. The profile view is only available when there is no TAWS sensor enabled and the Terrain function is based on the internal terrain database. The profile display is always oriented in the Track-Up mode, where the depicted terrain is a cross-section of the terrain just below the aircraft's current track. Obstacles are not shown on the profile display and the aircraft current altitude is provided next to the ownship symbol. The altitude scale adjusts automatically with the aircraft altitude. The zoom scale and map orientation are displayed in the upper right corner of the profile display.

When two functions are displayed, the left and right quarter of each function is not displayed, leaving the center half of the original display. The image is not compressed from full width to half width.

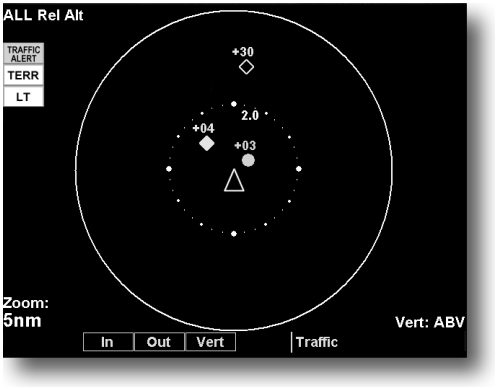
Functions with an ownship symbol are displayed in Track-Up map orientation and do not include the track line and compass rose.

Press the Main Menu Line Selection key to go to the next page of the Menu.



Skywatch / TCAD Traffic (TRAF) Function

The MX20 I/O Traffic model supports interfaces to third party traffic sensors. The traffic function, when interfaced to the Goodrich Skywatch or the Ryan TCAD is capable of displaying traffic targets as supplied by those sensors. Standard TCAS-type symbology is used and several menu options are available for adjusting the traffic presentation. Review the Limitations section on page iv for the limitations that apply to traffic data.



The traffic menu options vary depending on the traffic sources selected during the installation procedures but the display symbology is the same.

Traffic Depiction

Your position (ownship symbol) is located at the tip of the aircraft icon at center of the screen. The traffic function is always shown in heading mode, meaning that track based flight plan information is not overlaid. Traffic can also be shown on the Custom Map and in a small thumbnail view presented in the upper left corner of the screen. Note that a heading input is required to display Skywatch traffic on the Custom Map.

Alert Hot Key

Traffic alerts go one step further than the Advisory hot key feature and will automatically bring up the Function Menu showing the Skywatch/TCAD function. A single key press can then be used to switch the display to the Traffic function. The Alert hot key feature will automatically clear when the traffic alert condition no longer exists.

Traffic Alert Pop-Up

When a Traffic Alert occurs, the system can automatically switch to the Traffic function and the zoom level will be adjusted to view the traffic. The Alert Hot Key or Traffic Alert Pop-Up mode option is selectable in the Traffic menu and only occurs when the display is set to some function other than Traffic.

Symbology

- Traffic shown with an amber filled circle corresponds to traffic generating an alerting condition

- Traffic shown with a cyan filled diamond corresponds to traffic generating an advisory condition

- Traffic shown with a cyan open diamond is considered “other traffic”

Traffic is shown with either the relative or absolute altitude indicated above or below the target symbol. If the traffic is below or equal to your ownship altitude, the label is shown below the symbol. If the traffic is above your ownship altitude, the label is shown above the symbol. For traffic with no altitude information, the label will be shown as dashes (---).

Vert Smart Key (Skywatch)

The Vertical Mode (Vert) “smart” key is used to select the vertical filtering mode for the Skywatch unit. The following options are available and will allow traffic that is within the indicated range to be displayed:

- ABV (Above) +9000/-2700
- NRM (Normal) +2700/-2700
- BLW (Below) +2700/-9000
- UNR (Unrestricted) No Limit

Traffic Status Indicators

Off Scale

If a Traffic Alert target is not shown on the display because the zoom level is set too high, an amber Traffic Off Scale (OS) indicator will show on the display.

Standby (Skywatch)

If the traffic sensor is in the Standby Mode, a white TAS Standby message will show on the display.

Test (Skywatch)

TAS Test will be displayed if the Traffic sensor is in the Test Mode.

Not Displayed

An amber "Traffic Not Displayed" will be shown if the GPS position or the Traffic sensor has failed.

TAS Fail (Skywatch)

System Failure, shown in amber.

TAS Data Fail (Skywatch)

Label set sent by the Skywatch unit has failed the integrity check. Shown in amber.

TAS Time-Out (Skywatch)

MX20 is not receiving labels from the Skywatch unit. Shown in amber.

No Bearing Advisories

Traffic advisories without a valid bearing will be listed in text form below the ownship symbol.

Skywatch Menu Options

Traffic Alert Mode (Pop-Up/Prompt)

The Traffic Alert mode allows you to configure the currently selected Traffic Alert response. If Pop Up is selected, the Traffic function will automatically pop up when a Traffic Alert occurs. If the Prompt mode is selected, the Traffic Alert hot key prompt is shown when a Traffic Alert occurs. If the Traffic function is already being viewed, neither will occur.

Standby Mode

The Standby mode places the Skywatch unit into the standby mode. In this mode, the unit will not display traffic targets or generate traffic alerts. See the Skywatch Users Guide for additional information.

Self-Test

When in Standby Mode, a Skywatch Self-Test can be initiated by selecting this option.

TCAD 9900B Menu Options

Altitude Option (Relative/Pressure)

The Altitude option lets you select between relative and pressure altitude in hundreds of feet. The Altitude option choice is shown in the upper left corner of the screen. Relative altitudes are shown with a "+" or "-", while absolute altitudes are shown as just a number.

Filter

An altitude filter allows targets that are outside of a ±2000' vertical range to be filtered off the display. The current mode is shown in the upper left corner of the display as "ALL" (no filtering) or "±2000" when the filtering is active.

Volume

The volume of the TCAD voice alert can be adjusted by pressing the Volume button. This opens a text menu where a value from 0 – 10 can be entered.

Approach Mode

The Approach Mode sends the approximate elevation of the destination airport to the TCAD unit for Approach mode operations. See the TCAD operator's manual for additional details.

Mute Duration

The Mute Duration allows the duration of the mute command to be sent to the TCAD unit. See the TCAD operator's manual for additional details.

Shield

This allows the current shield to be selected from a pop-up window. En Route, Unrestricted, Terminal, Ground, and Standard are the available modes. See the TCAD operator's manual for additional details.

Shield Heights

This allows the shield heights to be adjusted for the En Route, Standard, and Terminal shield modes. See the TCAD operator's manual for additional details.

Shield Ranges

This allows the shield ranges to be adjusted for the En Route, Standard, and Terminal shield modes. See TCAD operator's manual for additional details.

TCAD 9900BX Menu Options

Altitude Option (Relative/Pressure)

The Altitude option lets you select between relative and pressure altitude in hundreds of feet. The Altitude option choice is shown in the upper left corner of the screen. Relative altitudes are shown with a "+" or "-", while absolute altitudes are shown as just a number.

Filter

An altitude filter allows targets that are outside of a ±2000' vertical range to be filtered off the display.

The current mode is shown in the upper left corner of the display as "ALL" (no filtering) or "±2000" when the filtering is active.

Volume

The volume of the TCAD voice alert can be adjusted by pressing the Volume button. This opens a text menu where a value from 0 – 10 can be entered.

Approach Mode

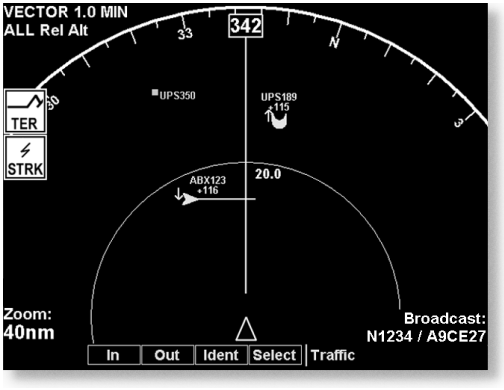
The Approach Mode sends the approximate elevation of the destination airport to the TCAD unit for approach mode operations. See the TCAD operator's manual for additional details.

Ground/Flight Mode

The GND/FLT mode commands the TCAD unit into the corresponding mode. See the TCAD operator's manual for additional details.

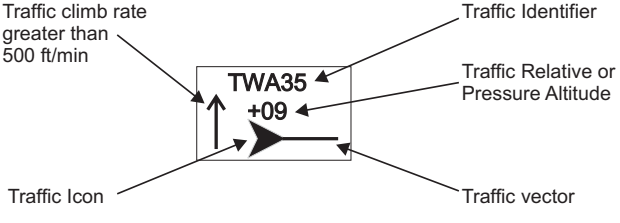
ADS-B Traffic (TRAF) Function

The Traffic Function allows you to view other traffic in the area, when installed with a UAT data link radio. One of two UATs may be installed in your aircraft. The term "UAT" refers to both unless specific models are identified as either the "legacy" UAT for the original Capstone installations or the "GDL 90" UAT. This screen can also show your flight plan. Traffic is shown in relationship to your aircraft. "Smart" keys allow you to zoom in and out, show traffic labels, and select an individual traffic target. The Traffic function is not available in all software versions. Review the Limitations section on page iv for the limitations that apply traffic data.



Traffic Description

Your position is located at the tip of the empty triangle (ownship symbol). The other traffic is shown as a large solid cyan (light blue) arrow pointing in its direction of travel. Next to the traffic arrow symbol is the traffic identifier, and altitude. Altitude is selected as either Pressure or Relative as noted in the upper left corner of the display.



A small up or down arrow next to the identifier indicates that the traffic is climbing or descending at a rate of at least 500 feet per minute. The end of the vector line that extends beyond the point of the traffic arrow indicates where it will be at the end of the selected time interval. The currently selected time interval is indicated in the upper left corner of the display.

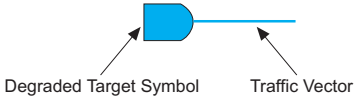
TIS-B Traffic

Traffic Information Service – Broadcast (TIS-B) is supported by displaying non ADS-B equipped aircraft that are received over the UAT data link radio. Non ADS-B equipped aircraft that are detected by ground based radar can be up-linked to all aircraft in the area that are UAT data link equipped.

As TIS target location is determined by ground based radar, coverage, range and target positional accuracy are highly dependent on relative location to the actual radar site. See page 59 for information on TIS-A.

Degraded Target

Degraded targets are shown with the "bullet" symbol, as shown below. A degraded target has limited positional accuracy and can either be an uplinked TIS-based target, or an ADS-B target who's GPS position has degraded. When a degraded target is selected via the **SELECT** key in the Traffic function, no distance to the target is displayed, as it cannot be computed accurately.



Target Color

Targets that are on the ground are colored in tan. Targets that are airborne are cyan in color.

Surface Targets

Surface targets, in addition to ADS-B targets, are supported and are shown as tan, rectangular ICONs. They are displayed both on the Traffic Function page, and on the Custom Map when traffic is turned on.

Surface Target

Traffic Altitude Values

Altitudes shown next to the traffic icon are in hundreds of feet (09 = 900 feet). Altitude values shown in all other locations and displays are the actual values in feet (+100 = 100 feet).

Ident (GDL 90 UAT only)

The **IDENT** smart key allows the pilot to initiate a sequence that is equivalent to a standard transponder "Ident," as requested by ATC. When pressed, the Ident flag will be displayed while the GDL 90 UAT broadcasts the ident.

Operation

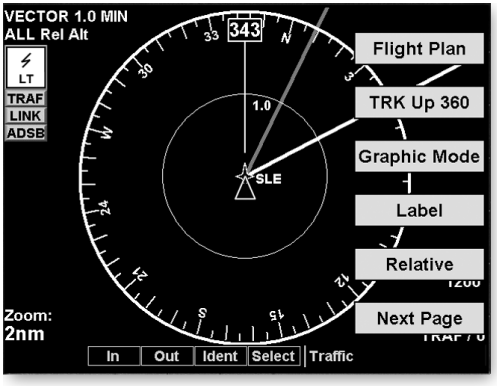
The controls at the bottom of the screen allow you to zoom in and out, initiate an Ident when connected to a GDL 90 UAT, and to select each traffic target on the screen.

1. Press the **FN** key to reach the Function page showing the **TRAF** (Traffic) "smart" key.
2. Press **TRAF**.
3. Press the **IN** key to zoom in. Press the **OUT** key to zoom out.
4. With the GDL 90 UAT only, press the **IDENT** key to initiate an Ident for ATC purposes. A green flag will appear on the left side of the display when the GDL 90 UAT reports that it is sending an ident over the air.
5. Press the **SELECT** key to step through each Traffic item that is shown on the display. When a target is selected, additional information about that target is shown in the upper right corner of the display. The selected target

will be highlighted in green on the display. Surface targets cannot be selected.

Traffic Option Page 1

The first option page of the Traffic function lets you select options for the choices of Flight Plan, Traffic Map Orientation, Display mode, Labeling, and Altitude. The last option selection takes you to the next page of options.



Flight Plan

The Flight Plan option controls the display of the Flight Plan course line. Pressing the **LINE SELECT** key next to the Flight Plan option toggles between showing and not showing the Flight Plan route line.

Traffic Map Orientation

The Traffic Map Orientation option lets you choose between a 360-degree compass rose or an arc that covers about 90 degrees over the top of the display. Your aircraft position is shown by an empty white triangle near the center of the display. The Traffic function display is always in the Track Up mode.

Display Mode

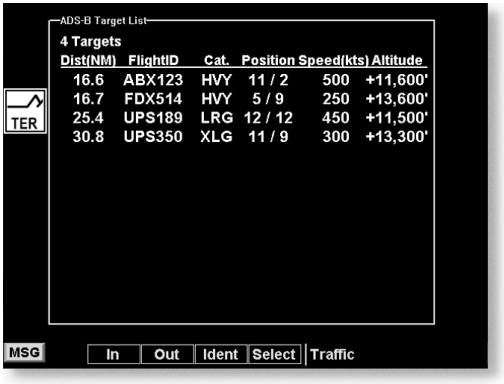
The display mode lets you select either a graphic or text version of traffic information.

Graphic

The graphic traffic display shows your location, nearby traffic, and information about the traffic.

Text

The text traffic display shows the distance to the traffic item, flight id, category, position, speed, and altitude. The currently selected target is shown in green. The traffic list is sorted by distance with the closest traffic to your current position shown on the top line. The total number of targets tracked is shown in the upper left corner. Up to 12 of the nearest targets are listed.



Label

The **LABEL** menu key toggles the state of the labels adjacent to the target symbols. Turning labels off will remove the Flight ID and flight vector.

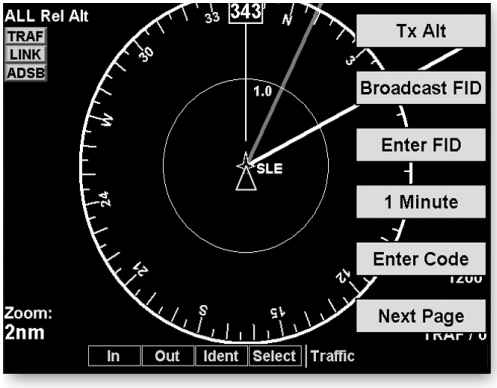
Altitude Option (Relative/Pressure)

The altitude option lets you select between relative and pressure altitude in hundreds of feet. The altitude option choice is shown on the upper left corner of the screen while in the graphic display option. When Relative Altitude is selected, the altitude value on the traffic is

shown relative to your altitude. A "+" indicates the target is above your altitude. A "-" indicates the target is below your altitude. For instance, if a value of +80 is shown, the value means that the indicated traffic is 8000 feet above your altitude. When Pressure Altitude is selected, if a value of 121 is shown, the value means that the indicated traffic is at 12,100 feet pressure altitude. Pressure altitude does not show a + or -. Remember that pressure altitude can be substantially different than the baro-corrected altitude shown on the altimeter in your aircraft.

Traffic Menu Option Page 2

The second menu option page of the Traffic function lets you select options for the choices of Transmit Altitude, Broadcast ID, Flight ID Editing, Time Interval, and Transponder Code.



Transmit Altitude

(ADS-B Broadcast Options - GDL 90 UAT only)

Selecting Tx Alt allows ADS-B position reports to be transmitted with altitude information. Tx Alt Off removes altitude information from the ADS-B position reports. Standby suspends ADS-B position reports, but displays other aircraft data when available. These modes are similar to the "ALT," "ON," and "Standby" on a standard transponder.

ADS-B Broadcast Mode Control

For ADS-B equipped installs, this feature allows the pilot to control the broadcast mode of their aircraft.

Broadcast options are controlled via the Traffic Function Menu and allow the pilot to toggle between Broadcast FID / Broadcast VFR / Standby. The Standby option is only available for the Legacy UAT.

Broadcast FID

Causes the currently set Flight ID and permanently assigned ICAO address to be broadcast with the aircraft's current position. The Flight ID and the ICAO address are shown on the lower right corner of the Traffic Function page (see page 50 for an example). The Flight ID is pilot-settable via the menu option "Enter FID" in alphanumeric characters. The ICAO address is a value set during system install by the installer.

Broadcast VFR

Causes a fixed Flight ID of "VFR" and a randomly generated ICAO address to be broadcast with the aircraft's current position. This mode is similar to anonymously squawking "VFR 1200" on a standard transponder.

Standby (Legacy UAT only)

Causes the transmit function of ADS-B to enter the standby mode. Other aircraft can be seen, but no data is transmitted. This mode is similar to setting a standard transponder to the "standby" mode.

Flight ID Editing

The Enter Flight ID option allows you to edit your broadcasted Flight ID. The Function "smart" keys at the bottom of the screen change to arrow keys. Use the **UP/DOWN** arrow keys to change the characters. Use the **LEFT/RIGHT** arrow keys to move between characters. Press the **MENU/ENTER** key to save the displayed Flight ID. The Flight ID is only sent when the Flight ID broadcast option is

enabled. Note that the GDL 90 UAT does not allow the space or period characters.

Time

The time interval option sets the amount of time to estimate the path and location of the traffic. The path of the traffic is shown by the line extending from the point on the end of the traffic arrow icon. The end of the line shows the point where the traffic item will be at the end of the selected time interval. Select 1, 1.5, 2-5, or 10 minutes.

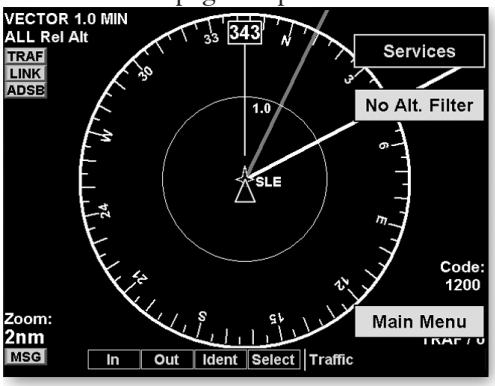
Press the Main Menu **LINE SELECT** key to display the next page of menu items.

Enter Code (GDL 90 UAT only)

This is where you enter the ATC-assigned transponder code. This code entered into the MX20 does not control the code on Mode A, C, or S transponders. It only sends the selected code to the GDL 90 UAT for inclusion into the position report.

Traffic Menu Option Page 3

The third menu option page of the Traffic function lets you select options for the choices of Service codes and Traffic Altitude Filter. The last option selection takes you back to the first page of options.



Services

The Services option allows emergency broadcast functions to be sent over the data-link radio. When pressed, a list of standard emergency/service codes will be presented. The desired broadcast function can be selected and broadcast by pressing the **TRANS** (Transmit) "smart" key or cancelled by pressing the **CANCEL** "smart key." When a special service code is being transmitted, the services label is illuminated. To terminate the broadcast, press the **SERVICES** option again. Once terminated, the code will revert back to the previously set code.

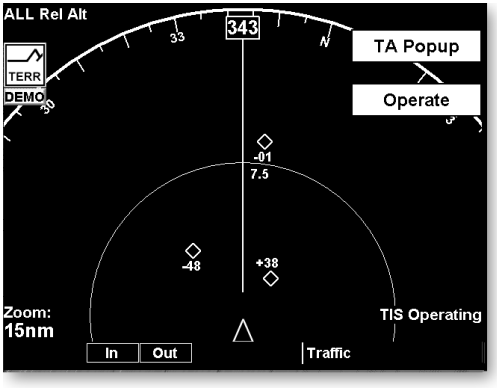
Traffic Altitude Filter

For ADS-B equipped installs, an altitude filter allows targets that are outside of a ±2000' vertical range to be filtered off the display.

This option is controlled via the Traffic Function Menu and causes the on-screen mode to change from "ALL" to "±2000"' in the upper left of the Traffic Function screen. In the "ALL" mode, all targets, regardless of their altitude, are shown. In ±2000' mode, only targets that are within 2000' above or below the ownship altitude are shown.

TIS-A Traffic (TRAF) Function

The MX20 I/O supports the Traffic Information Services – Addressed (TIS-A) function when interfaced to a third party TIS-A sensor. The traffic function, when interfaced to the Garmin GTX-330 is capable of displaying traffic targets supplied by that sensor. Standard TCAS-type symbology is used and several menu options are available for adjusting traffic presentation and sensor operation. Review the Limitations section on page iv for the limitations that apply to traffic data.



Important Note

TIS-A is not a collision avoidance system. It is an aide to visual acquisition and does not relieve the flight crew of their responsibility to "see and avoid." There are no evasive aircraft maneuvers authorized, recommended, or provided for as a result of displayed TIS-A targets. Refer to the TIS-A Sensor documentation for additional information.

Traffic Depiction

It is important to note that not all traffic may be displayed and that TIS-A is only an aide to visual acquisition. TIS-A is there to assist you to visually acquire other aircraft around you and does not provide any information other than making you aware of other aircraft around you that the Mode-S terminal radar can "see." This may not include all traffic around you. Only transponder-equipped aircraft that are visible to the terminal radar sensor will be broadcast to your aircraft. Up to eight (8) targets may be displayed at any given time. This is a limitation of the ground sensor since the ground sensor provides the data via the radar pulse.

Your position (ownship symbol) is located at the tip of the triangle icon at the bottom center of the screen. The traffic function is always shown in heading mode, meaning that track-based flight plan information is not overlaid. Traffic can also be shown on the Custom Map and in a small thumbnail view presented in the upper left corner of the screen.

Traffic targets are displayed relative to the ownship symbol and include a relative altitude in 100's of feet above (+) or below (-) your aircraft's altitude. Targets also include a climb (↑) or descent arrow (↓) next to the relative altitude when the climb or descent rates are greater than 500 feet per minute.

Targets are displayed at full brightness for the first six (0 to 6) seconds. If the TIS-A data is not refreshed, the targets will be displayed at a reduced brightness for the next six (6 to 12) seconds during an interval known as "coasting," and removed from the display after 12 seconds. "Coasting" usually results from the TIS-A sensor missing a radar sweep. This typically happens because the aircraft antenna line of sight to the radar has been obstructed, most likely by either terrain or because the aircraft is banking.

TIS-A Menu Options

The MX20 displays the current operating mode when the **MENU** key is pressed.

Alert Hot Key (TA Prompt)

When selected and viewing another function, this feature will automatically display the function menu at the bottom of the screen with the TRAF function highlighted when a Traffic Advisory (TA) alert is received from the TIS-A sensor. You may select the traffic function by pressing the corresponding Smart key or continue to view the currently displayed function.

Traffic Alert Pop-Up (TA Popup)

When selected and viewing another function, this feature will automatically display the traffic function screen when a Traffic Advisory (TA) alert is received from the TIS-A sensor. You may then view another function by pressing the **FN** key and selecting the desired function.

Operate/Standby

The MX20, when installed with a control wire to the GTX330, controls the TIS-A sensor operating mode. The TIS-A sensor defaults to "Operate" when turned on.

Symbology

TIS-A targets are categorized as either "Proximate Traffic" or "Traffic Advisories."

Proximate Traffic targets are depicted as hollow blue diamonds.

Traffic Advisory targets are depicted as solid yellow/amber circles.

Traffic Status Indicators

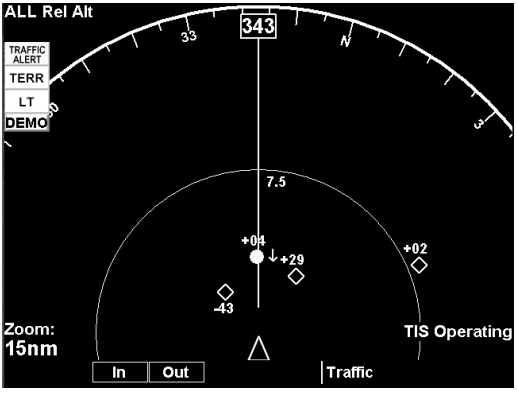
The following status indicators are displayed in the lower right portion of the display:

"TIS Operating" to indicate the TIS-A Sensor is operating and within TIS-A service coverage.

"TIS Coasting" to indicate that the target information is between 6 and 12 seconds old. This may happen if the TIS-A sensor has missed a radar sweep. Target brightness is also reduced to indicate this condition.

"TIS Unavailable" to indicate the TIS-A sensor is operating, but outside of TIS-A service coverage.

"TIS Standby" to indicate the TIS-A sensor is in standby mode and not processing TIS-A information, even if it is available.



Flight Plan (FPL) Function

Use the Flight Plan function to view details about your flight plan route. Press the **UP/DOWN** arrow "smart" keys to step through the waypoints in your flight plan. Press the **INFO** "smart" key to view information about the waypoint. The Flight Plan Function shows the Current Flight Plan that is active in the connected navigation source (i.e. GPS receiver). The Current To Waypoint box shows the current leg of the flight plan. The Current Flight Plan box shows all of the legs of your flight plan with the current leg indicated in magenta. Listed are each leg with the bearing and distance between the legs. The Current Nav Data box shows the aircraft current position in latitude and longitude, ground speed, and track. In the lower right corner information for the current waypoint is displayed in the Waypoint Info box. The Nearest Center frequency is shown just above the flight plan. The Flight Plan function does not have any options.

Runway diagrams of airports will be displayed in the same orientation as the main map (i.e., North Up, Track Up, or DTK Up).

Terrain (TER) Function

The Terrain Function shows a map of the terrain in the area relative to your airplane's position and altitude. The MX20 has a standard internal based terrain function. The MX20 also supports an external TAWS sensor. When the external TAWS sensor is connected, it replaces the MX20's internal Terrain function.

Terrain information can be supplied by one of two sources:

- Internal MX20-Based Terrain
- External TAWS-Based Terrain

Review the Limitations section on page iv for the limitations that apply to the terrain data.

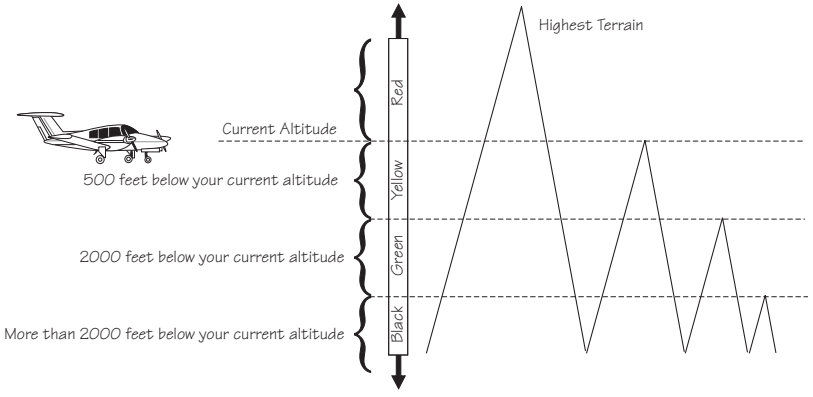
Internal MX20-Based Terrain

The altitude information comes from an external altitude encoder. The displayed altimeter setting has to be adjusted, or baro-corrected, just like the one in your aircraft's instrument panel.

The terrain screen has a 360-degree and a 120-degree display. Both screens will show terrain relative to your position. Colors used for terrain display are shown below.

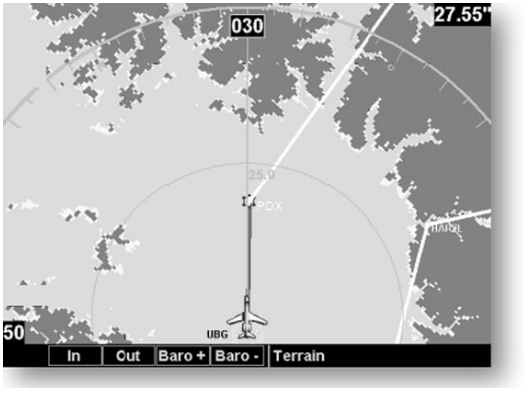
Note

The Terrain function shows you the general terrain elevations relative to your altitude and are advisory in nature. Individual obstructions may be shown if available in the database. Terrain is displayed from database information and may therefore potentially contain some degree of error. Do not use this information for navigation.



Use the **IN** and **OUT** keys at the bottom of the screen to zoom in and zoom out. The zoom range is shown in the lower left corner of the screen.

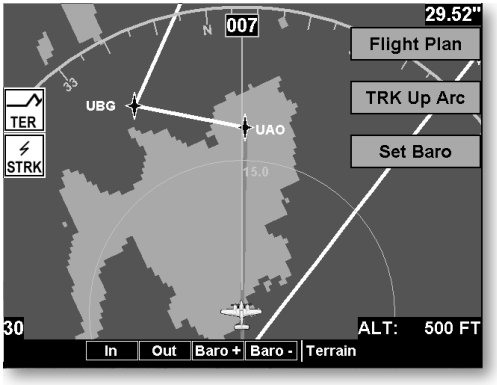
Use the **BARO+** and **BARO-** keys at the bottom of the screen to make minor adjustments to the barometric pressure value.



Color	Description
RED	Terrain that is at, or above, your current altitude
YELLOW	Terrain that is within 500 feet of your current altitude
GREEN	Terrain that is within 2000 feet of your current altitude
BLACK	Terrain that is more than 2000 feet below your current altitude
LIGHT BLUE	No terrain data is available

Terrain Option Page

The Terrain option page lets you select options for the choices of Flight Plan, Map Orientation, and setting the barometric pressure.

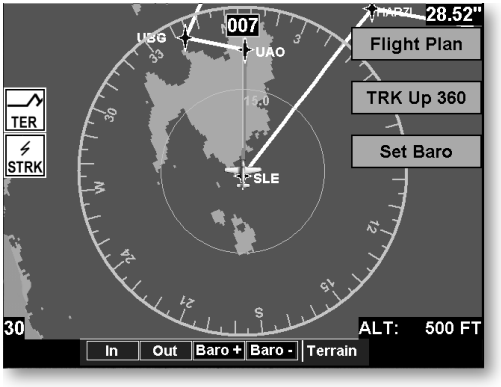


Flight Plan

The Flight Plan option controls the display of the Flight Plan course line. Pressing the **LINE SELECT** key next to the Flight Plan option toggles between showing and not showing the Flight Plan route line.

TRK Up Arc/TRK Up 360

This ring is marked in nautical miles from your airplane with the ring placed at one half the distance of the map scale. For instance if you have the map scales at 50 miles, the ring will be at 25 miles. The ring will change automatically as you change the map scale. The Terrain function display is always in the Track Up mode.



Set Barometer

Use the Set Barometer option to enter the correct barometric pressure for your area or adjust the current value. This option is best for making large changes. The **BARO +** and **BARO -** keys are more useful for minor corrections. Use the **UP/DOWN** arrow keys to increase or decrease the values. Use the **LEFT/RIGHT** arrow keys to move between characters. Press the **ENTER** key to save the displayed barometric pressure.

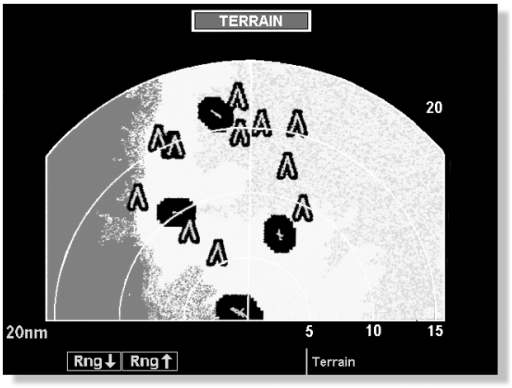
A "Confirm Current Baro" message is displayed at the initial power-up and again once every 30 minutes of operation as a reminder to check your baro setting.

TER Data Flag

The TER flag will appear if no terrain data is available for the advisory coverage area.

External TAWS-Based Terrain Display

The external TAWS-based Terrain feature shows terrain as provided by an external TAWS sensor when connected to and configured to receive that data from either the KGP-560 or Landmark 8000.



When displaying external TAWS-based terrain, the external sensor determines the color coding and graphical presentation of terrain in the proximity of the aircraft. See the Pilots Guide for the Goodrich Landmark for additional information on how to interpret this information.

Note

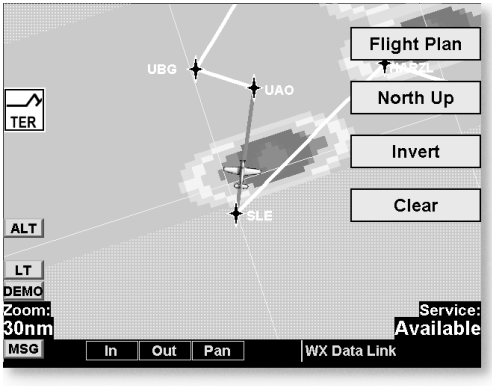
When the MX20 is configured for an external Terrain Awareness and Warning System (TAWS), the "Alt" and "Baro" fields normally present on the Navigational Bar will not be displayed.

TAWS Pop-Up Modes

The MX20 will detect TAWS based terrain alerts and will force a pop-up of the Terrain Function when required. Terrain based Pop-Ups have higher priority over traffic based pop-up functionality.

UAT Flight Information Service (FIS) Function

The FIS Function is capable of displaying graphical weather information on UAT equipped installations. Graphical data is overlaid on the map indicating the rainfall detected by ground based radar for a specific area. The colors indicating increasing levels of rainfall progresses from light green for light rainfall to magenta for heavy rainfall. Review the Limitations section on page iv for the limitations that apply to the FIS data.



Rainfall data is color coded as follows:

Brown/Blue	Zero rainfall (transparent color)
Light Green	Light rainfall
Dark Green	
Yellow	
Amber	
Red	
Magenta	Heavy rainfall
Cyan	No rainfall data available

A cyan checkerboard pattern indicates that no data is available for area, and rainfall in that area is unknown.

When weather data is received, the airborne system will display that data for 20 minutes, or until the power is cycled. If no new data has been received for a given area, the rainfall will be removed and the area will revert back to the cyan checkerboard pattern.

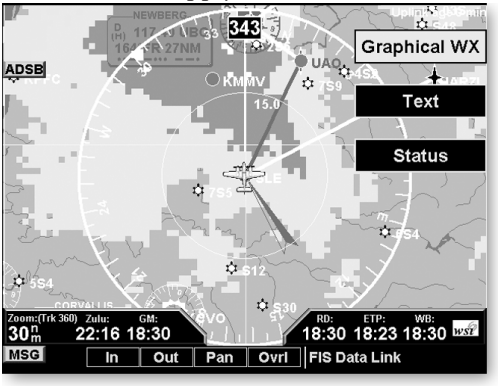
The FIS Function is based on a ground-to-air data link and requires that the appropriate ground systems are broadcasting weather data and the aircraft is within reception range of the Ground Broadcast Transceiver (GBT).

If any weather data has been received in the previous two minutes, the "Service" indicator in the lower left of the screen will display "Available." If no data has been received in this time period, "Not Available" will be shown. This indicator shows if the aircraft is currently within reception coverage of a ground station with weather broadcast capabilities.

The ground system determines the weather coverage area and extent of data that is transmitted by each ground station. The MX20 will display any weather received for the entire world.

WSI InFlight™ Flight Information Service (FIS) Function

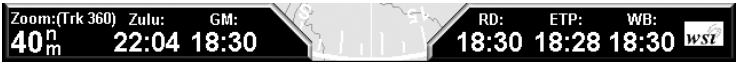
The Flight Information Service (FIS) Function allows access to graphic and text weather data messages on WSI InFlight-equipped installations. Graphical weather includes US and Canadian radar, METARs, and TAFs. You can select Graphical WX, Text, or Status information by pressing the **MENU/ENTER** key and then choosing the type of information with the **LINE SELECTION** keys. Review the Limitations section on page iv for the limitations that apply to the FIS data.



Product Times

Product times shown on the lower portion of the display are: **GM** for Graphical METARs, **RD** for weather radar, **ETP** for EchoTops, and **WB** for Warning Boxes. Times are Zulu times when the data was assembled on the ground, not the time the data was received by the FIS sensor.

For MX20s that have any GPS receiver that provides time, the Zulu time is the time reported by the GPS receiver. For MX20s that do not have time provided by a GPS receiver, this field is invalid and dashed out.



Product times are shown in white when they are 0 to 5 minutes old, gray when they are 5 to 10 minutes old, and yellow when they are older than 10 minutes. For MX20s

that have time available from a GPS receiver, age is based on the time reported by the GPS receiver. For MX20s that do not have have time available from a GPS receiver, age is based on the time the data was received from the FIS sensor. In this case, the age of the data may be older than what is shown by the color coding.

Graphical Weather (WX) Display

Weather radar images are available for display from the FIS sensor by selecting the Graphical WX option. A cyan cross-hatch pattern indicates no data has been received from the FIS sensor. Solid cyan areas represent areas where the ground based weather radars are unable to monitor weather. This is typically caused by terrain obstruction. When depicted, color coded weather intensity is presented and is an indication of radar echo return strength. The same colors are used for US and Canadian weather. Because of weather radar differences, do not assume that the same actual weather intensities are represented by the same colors. The intensities associated with the color codes are available by viewing the Legend Overlay Option. The legend associated with the weather radar image is shown for the depicted radar data, US or Canadian.

Graphical WX Overlay Options

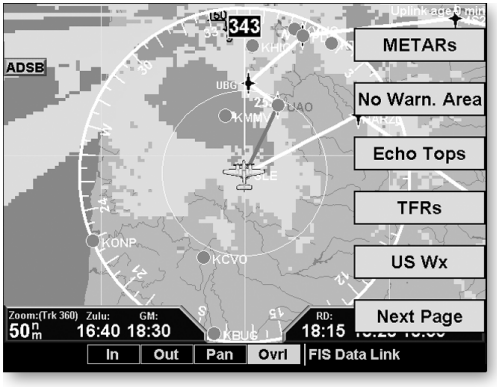
A variety of graphical information is available with the Overlay function that is available when viewing the Graphical WX display. Press the **OVRL** function key to view and select available options. Some or all of the following may be available, based on your FIS subscription.

- METARs, US, and/or Canadian (determined by subscription)
- SIGMETs & AIRMETs
- Echo Tops
- TFRs
- US and/or Canadian Weather Radar (determined by subscription)
- Label

- Flight Plan
- Legend
- Map Detail
- Map Orientation

Menu Options for Overlay Page 1

1. Press the **OVRL** function key to allow selection of the Overlay choices when viewing the Graphical WX option.
2. Press **MENU/ENTER** to display menu items for the Overlay. Press **NEXT PAGE** to see more options.



METARs

When enabled, METARs are available as colored circles or diamonds at airports that provide METAR reports. Press the METARs Line Select key to cycle through the options of circular, diamond, or no METARs. Refer to the Legend for a description of the color code. US and Canadian METARS use the same color coding and will be shown at the same time with a subscription to both products.

SIGMETs & AIRMETs

When enabled, the following SIGMETs and AIRMETs are available for display:

- "SIGMETs" are for Convective SIGMETs
- "T AIRMET" is for Surface/Aloft Turbulence AIRMETs

- "Z AIRMET" is for Icing AIRMET
- "S AIRMET" is for an IFR condition, such as a mountain obstruction
- "Other" is for other types of AIRMETs
- "No Warn. Area" is to turn off all SIGMETs and AIRMETs

These are collectively known as Warning Boxes and are displayed as color coded outlines of the affected area. Refer to the Legend for a description of the color coding.

Echo Tops

Echo Tops indicate the location, elevation, and direction the highest radar echo. This is typically associated with storms. This may not indicate the top of a storm or clouds, only the highest radar return echo. Refer to the Legend for a description of the Echo Tops coding.

Temporary Flight Restrictions (TFRs)

Temporary Flight Restrictions (TFRs) indicate areas where flight restrictions have been imposed. They are depicted as areas with reddish-brown outlines and a cross-hatch pattern. The area may also contain the TFR identifier. The TFR identifier includes the TFR number and upper altitude.

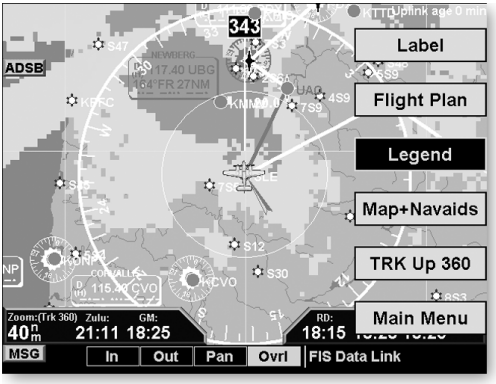
US or Canadian Weather Radar

This option is only available when subscribed to both radar products. WSI offers subscriptions for US and Canadian radar data. Because of differences in radar technology, both data types cannot be displayed at the same time. When subscribed to both weather radar products, you can alternate between the two with the Overlay option.

Menu Options for Overlay Page 2

1. Press the **OVRL** function key to allow selection of the Overlay choices when viewing the Graphical WX option.
2. Press **MENU/ENTER** to display menu items for the Overlay.

Press **MAIN MENU** to return to the Main Menu.



Label

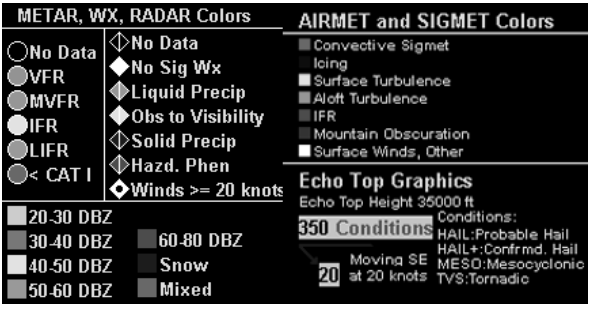
Press **MENU/ENTER** key and then press the **LABEL** Line Selection key to toggle the station labels on and off.

Flight Plan

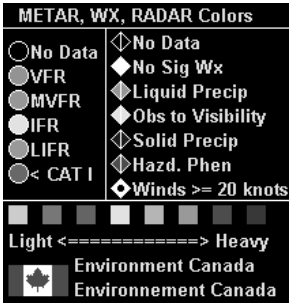
Press **MENU/ENTER** key and then press the **FLIGHT PLAN** Line Selection key to toggle the Flight Plan course line on and off. The magenta line is the active leg.

Legend

Press **MENU/ENTER** key and then press the **LEGEND** Line Selection key to display the legends describing the graphic display colors. Press the **LEGEND** Line Selection key once to display a legend for the Metar, Weather, and Radar colors. Press the **LEGEND** key a second time to display a legend for AIRMET and SIGMET colors and EchoTop graphics.



When viewing the Canadian radar data, the following legends will appear. Only the lower portion of the legend changes for Canadian radar data.

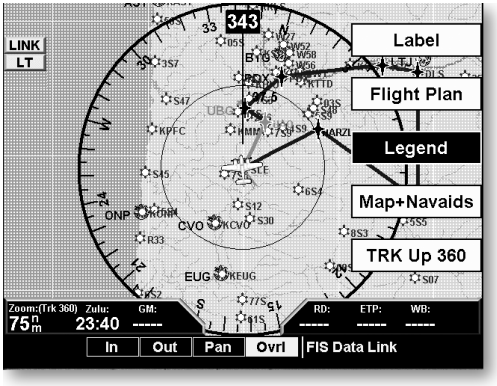


Map Detail

Press **MENU/ENTER** key and then press the Map Detail Line Selection key to choose between the display of No Overlays, the Base Map, or Map and Nav Aids.

Map Orientation

Press **MENU/ENTER** key and then press the Map Orientation Line Selection key to choose the configuration of the map orientation of DTK Up, North Up, TRK Up, TRK Up Arc, or TRK Up 360.



Text Display

FIS text messages are available on the text display and include METARs, TAFs, AIRMETs, SIGMETs, and TFRs. Individual text messages are updated every five minutes and composed of four parts: message type, location, time and message body.

Text Information Examples:

TYPE	LOCATION	TIME	MESSAGE BODY
METAR	KSLE	191534Z	METAR TEXT
METAR	KMMV	181423Z	METAR TEXT
TAF	KSLE	171423Z	TAF TEXT

The upper portion of the FIS Function page is used for displaying the contents of an individual FIS message while the lower portion of the screen is used for categorization and sorting of different message types, such as METARS, TAFs, SIGMETS, etc.

The lower portion of the screen is divided into three distinct columns to provide simple categorization of received text messages. The columns are loosely defined

as message type, location and time stamp to handle the most common type of FIS up-link data.

The different message types and data content are fully controlled by the ground broadcast systems. The airborne system will automatically display any message type that is received.

US and Canadian text METARs, text and graphical TAFs are available at the same time when subscribed to both US and Canadian products. US and Candian METARs and TAFs use the same format as described below.

Selecting Text Data

Green colored Selection Pointers above the smart keys can be used to select an alternate message for display. The selected line in the section above the smart keys is noted by a green circle with an "I" inside. The pilot is able to move the green Selection Pointer within the lower portion of the page to select the desired category, location and time that is of interest with the use of the arrow keys.

Using this interface, the pilot can easily select the desired message type (such as METAR), then select the airport of interest (such as KPDX), then select a specific METAR report by time (such as 141512Z).

At all times, the message displayed in the upper FIS Message area on the screen matches the highlighted entry in the FIS Category area below.

The system shows text METAR and TAF data for the 25 locations nearest the present position and up to the 25 locations nearest to the destination in the flight plan that are reporting weather information. The system will show all other data provided by the FIS sensor.

Smart Key Function

The fourth "smart" key performs special functions within the FIS Function:

When the Selection Pointer is located in the first of the three columns, the fourth "smart" key displays the label "Clear". When pressed, all messages for the currently selected category will be flushed from the MX20. This feature can be used to clear old, bad or corrupted data received over the data link.

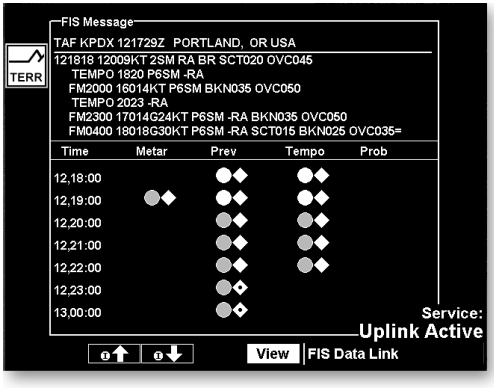
When the Selection Pointer is in the center-most column, the fourth "smart" key displays the label "Sort." See below for how the sort option works.

When the Selection Pointer is in the right most column, the fourth "smart" key displays the label "View." When pressed, the currently viewed message is presented in a full screen mode. This feature provides a mechanism to view large textual messages that do not fit within the upper half of the display area. Some messgaes may be longer than can be displayed in the full screen mode. These are indicated by a small arrow at the bottom of the area. Press the arrow keys to scroll the information.

Viewing Text TAFs

Pressing the "View" key when highlighting TAFs will display a full screen with the text TAF at the top and a graphic representation in the lower portion of the screen. The **Time** column includes both date and time. The **METARs** column displays active METAR information. The **Prev** column displays prevailing conditions. The **Tempo** column displays termporary conditions. The **Prob** column displays probable conditions. Press the arrow keys

to scroll the information and the View key to exit this view.



Sorting FIS Messages

Special sorting capabilities are provided for in the central "location" column. This sorting allows weather reports to be sorted by location based on different criteria.

When the green Selection Pointer is located in the second column, the fourth "smart" key changes to read "Sort." When consecutively pressed, the sorting of the messages toggle with the following options:

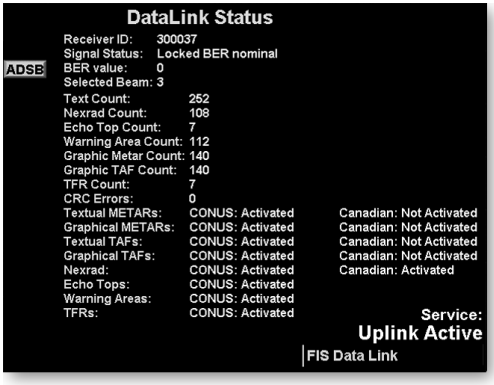
- (Distance to) Nearest Present Position
- (Distance to) Nearest Final Waypoint
- (Distance to) Nearest Next Waypoint Alphanumerically

When the sorting is based on distances from current ownship to a given airport, the system must be able to correlate a Jeppesen airport that matches the location field of the received message. If this lookup is successful, a distance shall be presented adjacent to the location text. If no corresponding location can be determined, no distance is assigned but the message is presented at the end of the list.

The default sorting method is "Nearest Present Position" and is reset when the FIS Function is re-entered.

Status Information

Status information shows satellite signal reception status, the amount of data received, and the weather products that have been activated. Contact your FIS service provider to activate and deactivate products.



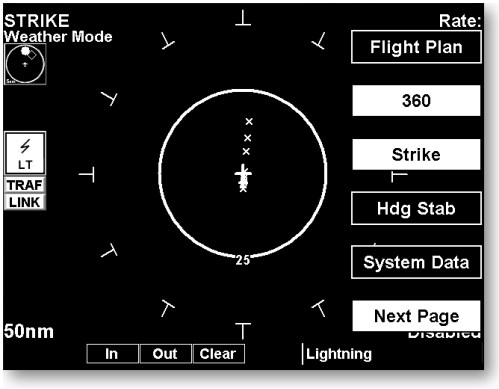
Lightning Strikes (LT) Function

The Lightning Strike mode allows you to view lightning strikes that are reported by a Goodrich WX500 Stormscope Weather Mapping Sensor. The “T” marks are used as reference marks to aid in locating strikes in reference to your position. The Lightning function is not available in all software versions. Your display range must be selected to be greater than 25 nm to display lightning strikes. The display range is shown in the lower left corner of the display. For instance, if you zoom In to a range of 20 nm, no strikes will be shown, but if you zoom Out to 30 nm strikes will be shown. Review the Limitations section on page iv for the limitations that apply to the Lightning data.

Lightning Menu Option Page 1

The first option page of the Lightning function lets you select options for the choices of Flight Plan, Display view, Lightning groups, Heading Stabilization, and Stormscope

(System Data) info. The last option selection (Next Page) takes you to the next page of options.



Flight Plan

The Flight Plan option controls the display of the Flight Plan course line. Pressing the **LINE SELECT** key next to the Flight Plan option toggles between showing and not showing the Flight Plan route line.

360/120

Two display views of the lightning information may be selected. The 360 view shows a 360° view the airspace surrounding your aircraft. The 120 view shows a 120° forward view from your aircraft's position and the display is divided into three segments.

Lightning

The WX500 detects electrical discharges within a range determined by the installation of your Stormscope. These discharge locations are noted as Lightning strikes and displayed as a red "x." You may select either single strike or cell (groups)of lightning representations.

Strike

Individual strikes are noted.

Cell

Only lightning strikes associated with a group, or cell, of strikes are displayed.

Heading Stabilization

The Heading Stabilization function of the WX500 can be turned on or off with this selection.

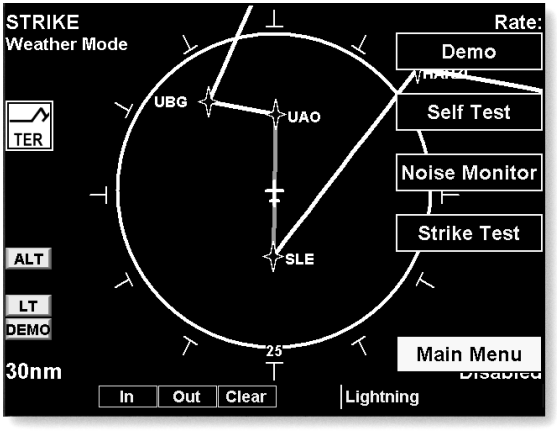
System Data

Select the System Data option to display information about the WX500.

Press the Next Page **LINE SELECT** key to display the next page of menu items.

Lightning Menu Option Page 2

The second option page of the Lightning function lets you select options for the choices of Demo, Self-Test for the Stormscope, Noise Monitor, and Strike Test. The last option selection takes you back to the first page of options.



Demo

The Demo option places the WX500 sensor in a demonstration mode that simulates lightning strikes.

Self-Test

The Self-Test option performs a number of tests on the operation of the WX500 and provides a report of its status.

Noise Monitor

The Noise Monitor feature is a function of the WX500. For details about using this feature refer to the WX500 owner's documents.

The Noise Monitor displays reports of electrical noise, whether they are from lightning or other noise sources within the range of the system. This function is used to help determine if electrical noise is present that may affect normal system operation.

Strike Test

The Strike Test feature is a function of the WX500. For details about using this feature refer to the WX500 owner's documents.

The Strike Test feature is used by installers to verify proper operation of the WX500. Test strikes are sent to the antenna. The received test strike is then visually presented on the screen.

Antenna Change Message

When an "Antenna Change" message is shown, the lightning sensor may have failed. When this message is displayed, the sensor is automatically shut down for the remainder of the flight. The installation should be inspected before the lightning function is used again.

Chart View (CHART) Function (Optional)

The optional MX20 Chart View feature provides the capability to view Jeppesen Sanderson Inc. electronic charts. Two basic types of charts can be viewed: Approach charts and airport surface charts.

Approach charts can be manually loaded and overlaid on the moving map during flight, while airport surface charts are automatically overlaid while on the ground. Both types of charts are also viewable from the Chart View Function in a chart manual fashion. Approach charts may also be loaded automatically when installed with a CNX-series GPS receiver.

The electronic chart data is generated from the standard Jeppesen CD ROM product, which is distributed and updated by Jeppesen on a two-week schedule. The in-flight data resides on the pilot removable front-loading data card and is updated by the pilot using a home PC-based data loader.

The MX20 Chart View feature does not currently represent a sole replacement for the paper chart within the cockpit. The presentation of the chart data is intended for supplemental use and to provide additional situational awareness. The pilot must still have access to the printed chart as required by FAA regulations.

Overview

- Charts are viewed either as a dynamic overlay on the Custom/IFR Map, or as a static page through the dedicated Chart View Function ('Chart' on the function menu).
- When viewed as a dynamic overlay on the Custom/IFR Map, the chart will be properly geo-referenced with respect to the base map. Orientation (track up, north up, etc..), zoom scale, and aircraft position will all be properly presented

relative to the chart data, using the standard map controls.

- When viewed under the Chart View Function, more selection options are available for locating a specific chart among the charts in the database, and the chart is displayed similar to a standard chart manual (north up) with no position overlay.
- A given approach chart must be "loaded" for map overlay usage by first selecting the airport of interest, then selecting the individual chart for that airport. Approach charts can be loaded from either the Custom/IFR Map or from the Chart View Function.
- Pressing the **INFO** key while a chart is loaded or being viewed will bring up the header, profile and minimums associated with the chart.

Chart Data Source

The same set of charts that are available in electronic form from the Jeppesen JeppView™ product are available for loading onto the MX20 platform. These consist of approaches, SIDS, STARS, airspace charts, and airport surface diagrams. The MX20 can display all of these charts from the Chart View Function, or a more limited sub-set as dynamic overlays on the "Custom Map" when the corresponding chart has been "Geo-Referenced" by Jeppesen.

Data Card

As there are more charts available from Jeppesen than will fit on the physical data card, predetermined coverage areas are loaded instead of the entire contents of the Jeppesen CD ROM. This process is performed using the data loader software tool provided by Jeppesen. The MX20 Chart View data card can hold approximately 10,000 charts at a given time.

Chart Geo-Referencing

For the ownship position to be overlaid on the chart (as viewed from the Custom/IFR Map), the chart must be available in a "Geo-Referenced" version, as supplied by

Jeppesen. Currently not all charts and airport surface charts are geo-referenced.

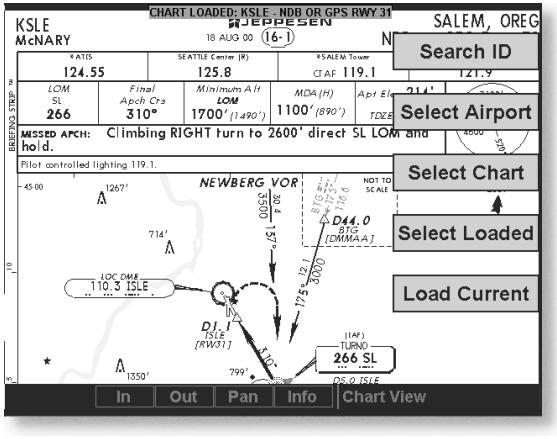
When a chart is viewed and a red "X" is present on the earth symbol (to the left of the chart name), the chart is NOT geo-referenced and thus cannot be "loaded."

Chart Overlay in the Custom/IFR Map

On the Custom Map or the IFR En Route Map, approach charts (not airport surface charts) must be manually "loaded" as there are multiple approach charts that can apply for a given region (i.e. multiple approach charts for the same airport). An approach chart will be displayed as an overlay when the following conditions are met:

- The approach chart is within the database residing on the card
- The approach chart is geo-referenced by Jeppesen
- The approach chart has been loaded
- The aircraft position is within the coverage of the approach chart
- The aircraft speed is above the air/ground threshold (aircraft is in flight)

Load a specific approach chart for use as an overlay by first selecting the airport and then selecting the approach chart.



Selecting the Airport

Pressing the **LOAD CHART** key on the Custom or IFR Map menu will present a list of airports that have geo-referenced approach charts available. The first airport within the list is the final destination waypoint as selected on the external GPS navigator, with additional airports listed based on nearest to present position search. Airports and approach charts that are not geo-referenced will not be shown for selection on this menu.

Note

Prior to loading an approach chart, there is operational benefit to selecting the desired airport on the GPS navigator as the final destination waypoint, as the MX20 can then detect this and place the corresponding airport at the top of the airport list menu for convenience.

The remaining number of airports within the list will vary depending on the complexity of the database within the current region and the number of geo-referenced approach charts associated with the airports in the area. The MX20 performs a complex filtering that eliminates airports and associated approach charts that are not geo-referenced, based on present position. This task is time limited to three seconds, meaning that if extensive filtering is required, the nearest based list may be shorter in some circumstances than in others.

Loading the Approach Chart

Once the airport is selected, the individual approach chart to be overlaid can be loaded from a list of geo-referenced approach charts available for that airport. Not all approach charts can be overlaid in this fashion and only geo-referenced charts will be presented for selection from the Custom Map. Because of this, it is possible that approach charts that are viewable under the Chart View Function may not be presented in this list.

Note

The pilot must be aware that not all charts in the loaded database can be used as an overlay.

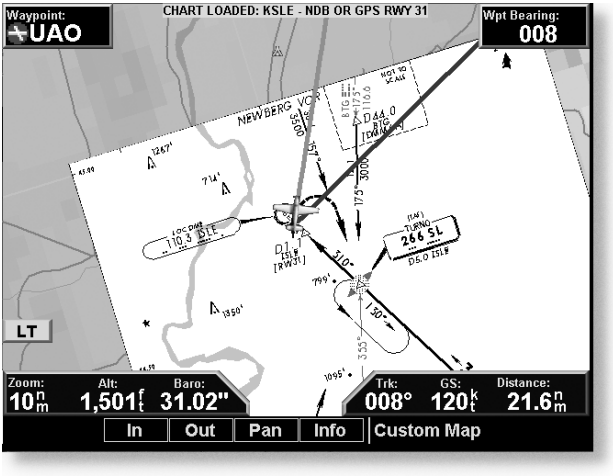
Once the approach chart is loaded, a green Annunciator will illuminate at the top of the screen indicating the airport name and specific chart that has been loaded.

Overlay Chart Loading Example

1. Press **FN** and then **MAP** or **IFR**.
2. Press **MENU** and then the **LOAD CHART** Line Select key.
3. Highlight the desired airport with the arrow "smart" keys and then press the **SELECT** "smart" key.

4. Highlight the desired approach with the arrow "smart" keys and then press the **LOAD** "smart" key.

5. Adjust the zoom level using the **IN** or **OUT** "smart" keys.



Viewing the Chart as an Overlay

Display of Coverage Area

Once the desired approach chart has been loaded, a green Annunciator bar with the approach name is illuminated at the top of the Custom and IFR maps. If the aircraft is outside the coverage area of the approach chart, a black rectangular box will be presented that shows the coverage of the chart itself.

Once the aircraft has entered the coverage area, the chart contents will be displayed on the screen. Note that a loaded approach chart is only viewable from the maps when the aircraft is in flight, otherwise, the airport surface chart has priority and the approach chart must be viewed from the Chart View function.

Chart Zooming

Auto zoom mode is supported from the Custom Map and is recommended to reduce the workload associated with maintaining an appropriate zoom level. In auto zoom mode (entered by zooming all the way down or all of the way up), the zoom scale will be calculated to maintain the current destination waypoint of your GPS receiver on the

screen at all times. The displayed zoom scale can be determined from the range rings on the arc and 360 displays, or from the distance to the displayed destination waypoint.

When an approach chart is loaded and being displayed, the auto zoom mode will limit the low-end zoom level to 5 nm as the current waypoint is being approached. This prevents the display from zooming into a level where the overall situational awareness relative to the approach as a whole is lost. This can be over-ridden by taking the unit out of auto zoom mode. This limit does not apply when the auto-zoom mode is tied to the CNX-series GPS receiver.

Chart Panning

Panning on the loaded chart is currently not supported. Entering the panning mode will disable the display of the chart and allow the underlying map layers to be presented.

Chart Orientation

When the chart overlay is presented, the orientation is identical to the currently selected orientation of the map itself (North up, track up or desired track up) with ownship position correctly geo-referenced and presented on the chart. Note that rotation of the text on the charts themselves is not supported, meaning that text may not be oriented horizontally when displayed in track-up fashion.

Chart Info

Pressing the **INFO** key when a chart is loaded will change the smart key labels to Header, Profile, Mins, and Info. Pressing the corresponding keys will allow the different parts of the chart to be presented along the bottom of the screen. Pressing the **INFO** key will disable this mode and return the menu to the normal map controls.

Chart View Function

The Chart View Function is accessed by pressing the **FN** Function key and selecting the Chart View (**CHART**) function.

The Chart View Function incorporates five menu items that control two basic operations:

- Selecting a chart (for static viewing)
- Loading a chart (for map overlay)

The term "Selecting a chart" is used to designate that a given chart is selected for static viewing on the screen. This is typically done by first specifying the airport, then the specific chart for that airport.

The term "Loading a chart" is used to designate that a given chart is loaded for flight operations and can be used as an actual overlay on the maps. Loading a chart through the Chart View Function is identical to loading a chart from the Custom/IFR map as described in previous sections.

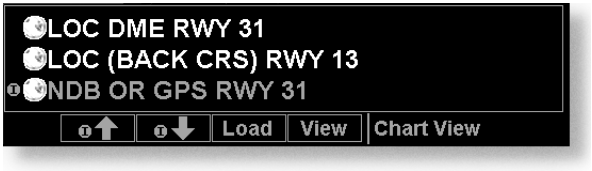
All charts within the database, geo-referenced or not, can be statically viewed from the Chart View Function. Only geo-referenced charts can be loaded for map overlay purposes.

The Chart View Function will retain the last view set and will not change the chart, zoom level, or pan setting when the function is exited and re-entered, allowing it to operate similar to a physical chart manual. An exception to this is when a chart is loaded in the Custom or IFR Map functions. When this is done, the loaded chart is set as the currently selected chart in the Chart View function.

Chart View Example:
1. Press **FN** and then **CHART**.
2. Depending on Chart status last used:

Press **MENU** and then the **SELECT AIRPORT** Line Select key; or

Highlight the desired airport with the arrow "smart" keys and then press the **SELECT** "smart" key.
3. Highlight the desired chart with the arrow "smart" keys and then press the **LOAD** or **VIEW** "smart" key.



4. View the chart. Adjust the zoom level using the **IN** or **OUT** "smart" keys. Press the **PAN** "smart" key and use the movement Line Select keys on the right side of the display. Use the **INFO** "smart" key to step through the different details of the chart.

Menu Items

Search ID

The Search ID menu option within the Chart View Function allow you to search for a specific airport identifier. As this operation requires multiple key-strokes to look up a specific chart, it is not recommended as the primary mechanism for accessing the charts, but does allow for flexibility. When an airport is located, it will be set as the currently selected airport. Airport identifiers can be entered with or without the "K" prefix.

Select Airport

The Select Airport operation allows the airport of interest to be selected from a pop-up list. The airports presented in the list are determined based on the final destination waypoint as the first entry, and a nearest type search for the remaining entries. This method allows the airport to be quickly located based on the current flight plan on the external GPS navigator.

Once the airport is located, the Select Chart menu is presented (see below), allowing a specific chart for that airport to be either loaded or simply viewed.

Select Chart

The Select Chart operation allows the list of charts for the currently **selected** airport to be listed in a pop-up list. Within this list, a circular earth symbol indicates that the chart is geo-referenced and therefore can be loaded for use as an overlay on the maps. If a red "X" is presented through the earth symbol, then that specific chart is not geo-referenced and can be viewed, but not loaded as a map overlay.

Select Loaded

The Select Loaded operation allows the currently **loaded** chart to be **selected** for viewing. This is typically done if a given chart was **LOADED** from the Custom/IFR Map, and viewing it from the Chart View Function is desired. Note that loading a chart from the Custom/IFR Map will also load and select the chart for viewing.

Load Current

The Load Current operation allows the current (viewed) approach chart to be set as the **loaded** approach chart. When this operation is performed, any previously loaded chart is replaced with the chart that is currently being viewed.

Airport Surface Charts

Airport surface charts provide a graphical presentation of the airport surface area (runways, taxiways, buildings, towers and other objects), within the immediate airport vicinity.

From either the Custom Map or the IFR en route Map, airport surface charts will automatically be loaded and displayed as an overlay if the following conditions are met:

- The airport surface chart is within the loaded database
- The airport surface chart is geo-referenced by Jeppesen
- Airport Chart menu layer is turned on
- The aircraft position is within the coverage of the chart
- A loaded chart is not being "flown"

In typical operation, the above conditions are met when the unit is turned on, meaning that the airport surface map is displayed as soon as GPS position is acquired. Note that the Zoom Scale Auto-Transition feature determines the initial zoom scale that is set when the aircraft is on the ground, which is important when working with surface charts.

Viewing Surface Charts

The airport surface charts are treated similarly to approach type charts in that they can be viewed through both the Chart View Function and on the Custom Map/IFR Map as an overlay. However, as there is only one unique surface chart for a given airport, it does not need to be manually loaded for display. The nearest available airport surface chart will always be used. When viewed from the Chart View Function, the airport surface chart shows up as the first available chart for the selected airport of interest. Thus, after selecting the airport of

interest, the list of charts will have an "Airport" entry as the first item in the list. As with standard approach charts, when viewed from the Chart View Function, the aircraft's ownship position is not shown on the airport surface chart.

If an approach chart is currently loaded and being displayed (aircraft is in the air), it will take priority over displaying the airport surface chart. Once the aircraft touches down and the speed drops below the air/ground threshold, it is assumed that a missed approach procedure is not needed. At this point, the approach chart is un-loaded and the airport surface chart is displayed. While on the ground, airport surface charts will take priority over any loaded approach chart.

Operational Considerations

When to Load a Chart

An approach chart can be loaded at any point during the flight, including on the ground before takeoff. Note that the approach will not be shown on the map itself until the aircraft's speed is above the air/ground speed threshold. The approach will be automatically un-loaded when the aircraft's speed goes below the air/ground speed threshold.

Flying an Approach

It is important to recognize that the charts function is not intended to provide guidance information for flying an approach. Its intended function is to provide basic situational awareness as to your current position relative to the approach as a whole. Standard instruments MUST be used to actually provide the navigational information required under IFR conditions.

Approach to Surface Map Transitions

Logic is incorporated that will automatically transition the display from an in-flight approach chart display to a zoomed in view of the airport surface chart upon landing. The intent is to provide a hands-free transition from the approach phase of flight to the airport surface navigation

phase without having to manually un-load the approach and adjust the zoom scale.

The transition logic is based solely on aircraft ground speed.

When an approach chart is loaded and being flown, and the aircraft ground speed drops below the air/ground threshold (set from within the SYS Function), it is assumed that a landing has been performed. At this point, the loaded approach chart is automatically unloaded and the airport surface chart will be presented on the screen showing runways, taxiways, etc.

However, if approach chart is loaded and being flown and the aircraft crosses the missed approach point without slowing, it is assumed that a missed approach procedure is being performed. In this case, the automatic transition to surface maps does not occur and the approach is not automatically un-loaded. See the Initial Zoom and Transition Speed selection in the System Function (Page 106).

Chart NOTAMS

Any applicable NOTAMS that apply for a given chart are shown under the **INFO** key when that chart is selected. The chart should be viewed for NOTAMS before use.

Important System Limitations

Note that while on the ground and viewing airport surface charts, the display can be oriented in the "Track Up" mode. In this mode, the last known GPS-based track as obtained from the external GPS navigation system is used to orient the map. GPS track is typically not accurate at low speeds and does not reflect the actual heading of the aircraft at all times.

Invert Option

As with the basic maps, the chart image can be inverted using the standard invert key.

Typical Operational Scenario

The following scenarios makes the assumption that:

- The appropriate charts are available and geo-referenced
- The default ground zoom level is set to 0.5nm
- The default air zoom level is set to "AUTO"

Typical Taxi Scenario

On power up and GPS position acquisition, the Custom Map Function will show the aircraft on the surface chart at a zoom level of 0.5nm. The aircraft will be shown relative to taxiways and runways throughout the taxi procedure.

Typical Takeoff Scenario

On takeoff roll, when the aircraft reaches the air/ground speed threshold, the display will automatically transition to the en route zoom mode of "AUTO" and adjust the display to show the current destination waypoint.

Typical Approach Scenario

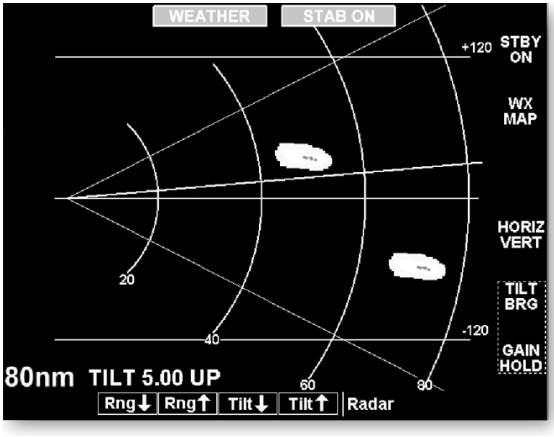
Setting the destination waypoint to the destination airport on the GPS navigation system and pressing **LOAD CHART** from the Custom/IFR Map will present the destination airport in the selection list. Selecting this airport will then bring up the approach charts that are available for that airport, which can then be loaded by pressing the **LOAD** "smart" key.

Typical Landing Scenario

With an approach chart being "flown," upon touchdown and rollout, the chart will be unloaded and the map will automatically switch to the airport surface chart with the zoom level set to 0.5nm.

Radar (RADAR) Function

The MX20 I/O Radar product supports an interface for the Allied Signal/Bendix-King ART2000/2100 and RS-181A weather radars. The ART2000 weather radar is seamlessly integrated with the other functionality of the MX20 with a "RADAR" option available from the main function menu. Note that auto-tilt is not supported for the ART2000/2100. The ART2100 must be configured to emulate the ART2000. As a result, only the ART2000 functions are available with the ART2100.



The MX20 operates as both a display and radar control head, allowing direct replacement of older display systems. Multiple modes and features of the ART2000 are supporting including Weather Mode, Ground Mapping Mode, Horizontal Display Mode, Vertical Display Mode, Hold Mode, Tilt Control, Bearing Control, Range Control, Bearing Cursor support, Tilt Cursor support, and Radar Stabilization. Bearing and Vertical mode are only supported in the ART2000/2100. Review the Limitations section on page iv for the limitations that apply to the radar data.

On initial power-up and entry to the Radar Function, the radar unit may be completing its self-test procedure and may display test data on the MX20. The radar unit will go to the Standby mode once it has completed the self-test procedure. Selections can be made to command the unit into one of the following initial modes:

- STBY
- ON
- TEST
- OFF

Once activated, the different operating modes of the radar are selected by pushing the corresponding line select keys. Descriptions of the different modes are as follows, with the currently selected mode being highlighted in green:

Off Mode

On MX20 power-up, the radar antenna is placed in the OFF mode. In this mode, the radar antenna head is not energized and is not transmitting.

Standby Mode

In the standby mode, the radar head is powered up, but is not transmitting. Placing the unit into standby mode initiates the warm-up sequence that is required by the transmitter within the radar head assembly.

Weather Mode

In the weather (WX) mode, the antenna is transmitting and painting reflected returns on the screen. This mode is intended for painting airborne weather and is the normal operating mode for the unit. Radar returns are painted in the following colors:

- Black
- Green
- Yellow
- Red
- Magenta

Black is the weakest return while Magenta shows where the strongest returns were obtained. While in the weather mode (or any other time the radar is transmitting), a green RDR indicator is presented in the upper left corner of the display.

MAP Mode

The Map (MAP) mode is used for obtaining returns from the ground. In this mode, the return data is rendered in the following colors:

- Black
- Cyan
- Green
- Yellow
- Magenta

While in the Map mode, the gain can be adjusted (see below).

Horizontal Mode

The Horizontal Mode (HORIZ) commands the radar head to scan in the horizontal plane at a pilot selectable tilt angle. In this mode, the current Tilt angle is shown on the lower half of the display in green.

Vertical Mode (ART2000/2100 only)

The Vertical Mode (VERT) commands the radar head to scan in the vertical plane at a pilot selectable bearing off of the nose of the aircraft. In this mode, the current Bearing angle is shown on the lower half of the display in green.

Tilt Control

The Tilt (TILT) control is used to adjust the current tilt angle of the radar head when horizontal sweeping is being performed. The value can be adjusted from a +15 to –15 degree range.

Bearing Control (ART2000/2100 only)

The Bearing (BRG) control is used to adjust the current bearing angle of the radar head when vertical sweeping is being performed. The value can be adjust from 45L to 45R.

Gain Control

Available only when the MAP mode is current, the gain is used to adjust the sensitivity of the radar receiver. It can be used in map mode to adjust the characteristics of the returns from the surface.

Hold Control

The Hold mode is used to freeze the display. While in the hold mode, the green RDR indicator flashes, indicated that the display is not being updated.

Radar Smart Key Operations

Range Smart Keys

The range can be adjusted using the **RNG UP** and **RNG DOWN** keys. Values of 10nm to 240 nm can be selected.

Tilt

While in the Horizontal mode, the tilt is adjusted using the **TILT UP** and **TILT DOWN** “smart” keys.

Bearing (ART2000/2100 only)

While in the Vertical mode, the bearing is adjusted using the **BRG RIGHT** and **BRG LEFT** “smart” keys.

Gain

While in the Ground mode, the gain is adjusted using the **GAIN UP** and **GAIN DOWN** “smart” keys.

Cursor Pre-Select Operation (ART2000/2100 only)

Cursor pre-select option can be used to pre-select a bearing or tilt angle prior to switching the vertical or horizontal scan mode of the display. The cursor is a cyan line extending along the Radar's projected path and can be displayed in both the horizontal and vertical modes.

For example, if horizontal scanning is occurring, a cursor line can be activated to pre-select a specific bearing to a weather cell of interest. Once selected, changing the scan mode to vertical will automatically set the bearing of the vertical sweeps to the bearing previously indicated by the cursor line.

Conversely, if vertical scanning is occurring, a cursor line can be activated to pre-select a specific tilt to a weather cell of interest. Once selected, changing the scan mode to horizontal will automatically set the tilt angle of the horizontal sweeps to the tilt angle previously indicated by the cursor line.

The bearing cursor is activated any time the Tilt/Bearing control is changed from its default position.

Radar Menu Functions

Pressing the **MENU** key while in the Radar Function allows the stabilization to be turned on or off. The currently selected mode is displayed at the top of the radar screen during normal operations.

Additional status information is also shown while the radar menu is active.

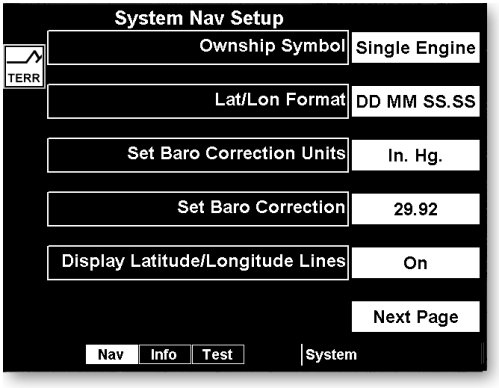
Radar Return Signals

Interpreting radar return signals is beyond the scope of this manual. Please refer to the radar user's guide for details on interpreting radar data.

System (SYS) Function

The System function allows you to set general Nav preferences, obtain version information, and perform tests on the operation of your MX20.

System Nav Pages



Ownship Symbol

The Ownship Symbol option allows you to choose the type of icon that will represent your aircraft on the display. You can make selections of Single, Twin, Jet, or Helicopter .

Lat/Lon Format

The Lat/Lon format option allows you to select between two choices for the display of Lat/Lon coordinates. Choose between degrees-minutes-seconds-seconds decimals (DD MM SS.SS) or degrees-minutes-minutes decimals (DD MM.MM).

Set Baro CorrectionUnits

Baro-Correction (QNH) can now be entered in Millibars in addition to Hg. This preference is set under the SYS function.

Set Baro Correction

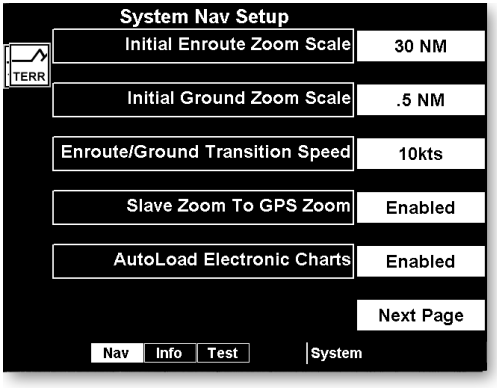
You may enter the corrected barometric pressure so that the proper pressure altitude will be displayed.

1. Press the **LINE SELECT** key for Set Baro Correction.
2. The Function "smart" keys at the bottom of the display will have direction arrows above them. Press the **UP/DOWN** arrow keys to change the value of the highlighted number. Press the **LEFT/RIGHT** arrow keys to move to another number.
3. Press **MENU/ENTER** to save the changed values and leave the Set Baro Correction option.

Display Latitude/Longitude Lines

Use this option to choose to display or not display Lat/Lon lines on the map displays.

Initial En Route Zoom and Initial Ground Zoom Transition Speed



A zoom scale auto-transition point is supported that helps to reduce the pilot workload by automating the selection of the zoom scale based on the phase of flight. The two transitions are:

- Ground-to-Air mode (Takeoff)
- Air-to-Ground mode (Landing)

When the aircraft transitions from Ground-to-Air, the zoom scale is automatically set to a user selected "en

route" zoom scale. When the aircraft transitions from Air-to-Ground, the zoom scale is automatically set to a user selected "Ground" zoom scale. The transition point is based on a user selected En Route/Ground Transition Speed and is based on GPS ground speed.

The Auto-Transition feature allows for optimal close-in viewing while on the ground and optimal long range viewing while in flight, without the user having to make manual zoom scale adjustments while in the takeoff and landing phases of flight. The Zoom scale is shown in the lower left corner of the display.

The En Route and Ground zoom scales and the transition point are adjusted under the SYS Function.

"En Route/Ground Transition Speed" – 10-100 kts

"Initial En Route Zoom Scale" – Auto, 0.25 – 250 nm

"Initial Ground Zoom Scale" – 0.25 – 5 nm

The recommended settings for the initial zoom scales are Auto for the en route mode and 0.5 nm for the ground mode.

1. Press **FN** until you see the **SYS** function key.
2. Press the **SYS** function key.
3. With the "NAV" selection highlighted press **MENU**.
4. Press the **NEXT PAGE** Line Selection key.
5. Press the Line Selection keys as needed to select the settings. Press **ENT** to save your settings.

Slave Zoom to GPS Zoom

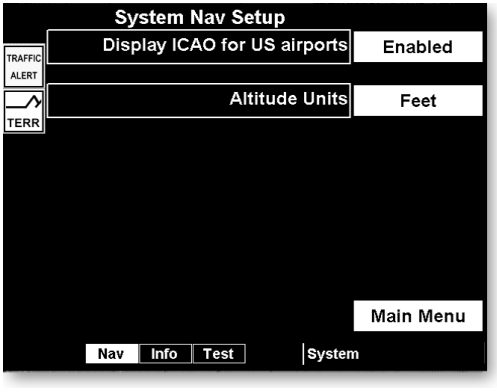
This is only available when installed with a CNX-series GPS navigator. When enabled and the MX20 is in Auto Zoom mode, the MX20 will automatically set the zoom scale to that used on the CNX-series navigator.

AutoLoad Electronic Charts

This is only available when installed with an CNX-series GPS navigator. This feature must be disabled when the MX20 is connected to a GPS navigator other than an CNX-series navigator. It allows the CNX-series equipment to instruct the MX20 to load a selected approach chart.

Display ICAO for US Airports

Press the Line Selection key to toggle on/off the display of ICAOs for US airports. When enabled, the leading "K" character for United States airports is displayed according to the ICAO format. When disabled, the leading "K" is not displayed.

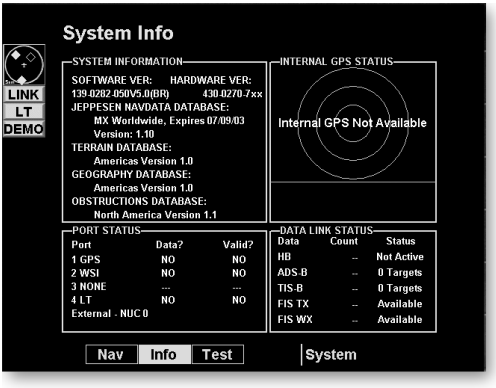


Altitude Units

Press the Line Selection key to set the display of altitude in either feet or meters.

System Info

The System Info page includes information about the software and database versions of the MX20. The data port status is also displayed. The Data port status description allows you to verify correct system installation and to monitor the health of each of the devices sending information to the MX20. Use this information when you contact your dealer or the factory.



GPS and Datalink Status

For GPS/UAT equipped installs, the SYS/INFO page shows additional details for both the internal GPS engine and the data-link status. When the MX20 is connected to a legacy UAT, the ADS-B and TIS-B Data Link Status lines are displayed. When the MX20 is connected to a GDL 90 UAT, only the ADS-B Data Link Status line is present because there is no differentiation between ADS-B and TIS-B target data.

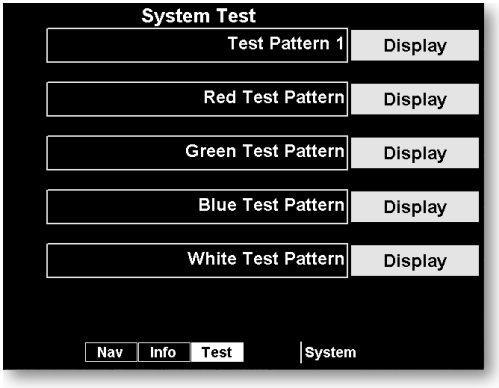
GPS satellite usage and signal strength are presented in the upper right of the info page in addition to each satellite's position in the sky. If no GPS is installed in the MX20, the text "Internal GPS Not Available" will be shown.

Data-link information is monitored as follows:

HB	Heart-Beat from the UAT data-link radio
ADS-B	ADS-B broadcast packets received
TIS-B	TIS-B broadcast packets received (legacy UAT only)
FIS TX	Textual weather data packets received
FIS WX	Graphical weather data packets received

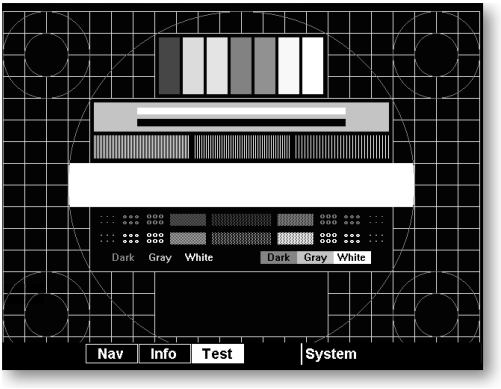
System Test Page

The System Test Page allows you to test the display of the MX20 to ensure proper operation.



Test Pattern 1

The Test Pattern option displays a number of patterns and colors to test the MX20 display. Use this option to verify proper operation of the display or when contacting Customer Service.



Red, Green, Blue, White Test Pattern

Choosing the Red, Green, Blue, or White options floods the screen with the selected color. Use this option to verify proper operation of the display or when contacting Garmin Customer Service.

Caring For Your MX20

Display Care and Cleaning

Your MX20 has a durable display, but reasonable care must be taken to maintain its performance and life. To remove stains, smudges, fingerprints, and so forth, we recommend these cleaning methods. If the first method fails to remove the problem, try the next method.

- Wipe with a clean, dry, non-abrasive fabric (for example, cotton or handi-wipes). Do NOT use paper products, such as paper towels or facial tissues.
- Blow on the area to condense moisture on the display and then wipe the area with the clean fabric.
- Moisten a clean fabric with a small amount of water and wipe the display area.
- Apply a small amount of glass cleaner (without ammonia) to the fabric and wipe the area.
- Apply a small amount of isopropyl alcohol and wipe the area (this is your last resort).

Contacting the Factory

If efforts to resolve the problem fail, contact your dealer or the factory for technical assistance. The Garmin customer service staff will gladly assist you.

Garmin International, Inc.
Customer Service Department
1200 East 151st Street
Olathe, KS 66062-3426 USA

(913) 397-8200
FAX (913) 397-8282

Troubleshooting

This section contains information to troubleshoot the MX20 when improper operation is observed. The following table lists possible problems you could encounter. Examine the possible causes of the problem and take the action listed to correct the problem. If you cannot correct the problem, contact your dealer. If your dealer is unavailable, contact the Garmin factory at the address and phone number listed in the preceding section. Be sure to have the information from the System Info page (see page 109) and the data card available before you contact your dealer or the factory.

Problem	Possible Cause	Action
Unit does not power on or blank screen	Wiring problem	Check for proper wiring or. Check the fuse/circuit breaker
	Improper brightness setting	Check the display brightness setting
	Low temperature	Allow the MX20 to heat up for approx. 60 seconds
	Data card	Make sure the data card is fully inserted
Unit fails during start up test	Data card	Make sure the data card is fully inserted
	System failure	Contact your dealer or the factory

Problem	Possible Cause	Action
POS data flag shows	Antenna or wiring	Check the antenna and wiring
	Position source wpt	Ensure that a waypoint is selected as the current destination and a Nav flag is not shown
	Position source serial data	Ensure that the serial data output is configured properly
	Interference	Have dealer/installer check for any interference sources
	Installation setup	Have dealer/installer check for proper MX20 setup
RTE (Route) flag	Position source route	Ensure that the external position source has an active route engaged
ALT (Altitude) flag	Serial altitude source	Ensure the serial altitude encoder is powered up and working properly
		Have dealer/installer check for proper installation and setup of the encoder
		If altitude data is provided by an Apollo GX product, ensure that the GPS position has been acquired and a waypoint is selected as the current destination

Problem	Possible Cause	Action
LT (Lightning) flag	WX500 installation	Have dealer/installer check for proper installation of the WX500
TER (Terrain) flag	Terrain database	Ensure that the proper database is used for your location and it passed the startup test
	Altitude source	Have dealer/installer check for proper altitude input
No traffic display	ADS-B system installation	You must have the ADS-B system installed If you do have an ADS-B system, check the antennas and other components for proper operation Have dealer/installer check for proper MX20 setup
“Special Terrain” message	Capstone/General Aviation setup	This is normal for the Capstone installation Have dealer/installer check for proper MX20 setup
TCAD flag	TCAD Installation	Ensure that the TCAD unit is installed and functional.
SKYW flag	Skywatch Installation	Ensure that the Skywatch unit is installed and functional.
RDR (Amber) flag	Radar Installation	Ensure that the Radar unit is installed and functional.

Problem	Possible Cause	Action
LINK flag	FIS Sensor Installation	Ensure that the FIS unit is installed and functional.
XPDR flag	TIS-A Sensor Installation	Ensure that the TIS-A unit is installed and functional.
ADSB flag	GDL 90 is reporting that its internal GPS is not reporting a position or is reporting an invalid position. Note that ADS-B broadcasts do not include position reports when this flag is present.	Ensure the GDL 90 is installed and functional. Ensure the GDL 90 GPS antenna has a clear view of the sky to receive GPS signals.
IDENT (green) flag	This is not a problem. This flag appears when the GDL 90 is in the Ident mode.	None required.

See the Installation Manual for additional troubleshooting procedures.

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Part #560-1026-06 Rev -
May 2004