GARMIN

G1000™

pilot's guide appendices
for the Mooney M20M & M20R

Record of Revisions			
Revision	**Date of Revision**	**Revision Page Range**	**Description**
A	05/16/05		Initial release.

SD CARD USE

The G1000 system uses Secure Digital (SD) cards to load and store various types of data. For basic flight operations, SD cards are required for terrain database storage as well as aviation database updates.

AVIATION DATABASE

Jeppesen aviation databases are released every 28 days, and are provided directly to the pilot by Jeppesen. Updates must be loaded to both the MFD and PFD using an aviation database update SD card provided by Jeppesen. The card reader downloads the aviation database files and stores them in the PFD and MFD internal memory.

***NOTE**: The display downloads the aviation database and stores it internally. The aviation database SD card is not required to remain in the display after the update.*

To update the Jeppesen aviation database:

1. With the G1000 system OFF, insert the aviation database update SD card into the top card slot of the PFD (Label of SD card facing left).
2. Turn the G1000 system ON. The following prompt is displayed on the upper left corner of the PFD:

```
DO YOU WANT TO UPDATE THE AVIATION DATABASE?
PRESS CLR FOR NO AND ENT FOR YES
YOU HAVE 30 SECONDS BEFORE NO IS RETURNED
```

3. Press the **ENT** key to confirm the database updated. The following prompt is displayed:

```
DO YOU WANT TO UPDATE THE AVIATION DATABASE?
PRESS CLR FOR NO AND ENT FOR YES
YOU HAVE 30 SECONDS BEFORE NO IS RETURNED
UPDATING AVIATION DATABASE
.
UPDATED 1 FILES SUCCESSFULLY!
```

4. After the update completes, the PFD starts in normal mode. Remove the aviation database update SD card from the PFD.
5. Turn the G1000 system OFF.
6. Repeat steps 1 through 4 for the MFD. The MFD and PFD aviation databases are now updated.
7. Verify that the correct update cycle is loaded during startup of the MFD.

TERRAIN DATABASE

G1000 topography and terrain data are stored on an SD card provided by Garmin. Since this database is not stored internally in the MFD or PFD, a terrain SD card must be kept in both displays to retain terrain and topography data. A terrain card should be inserted into the bottom card slot of the PFD and MFD.

***NOTE**: If the terrain SD card is removed from the display, the **TOPO** and **TERRAIN** softkeys are not functional and are grayed out on the MFD Map Page.*

This page intentionally left blank.

Abbreviation or Acronym	Definition
ADF	Automatic Direction Finder
AF	Arc to fix
AFM	Aircraft Flight Manual
AFMS	Aircraft Flight Manual Supplement
AGL	Above Ground Level
AHRS	Attitude and Heading Reference System
AIM	Airman's Information Manual
AIRMET	Airman's Meteorological Information
ALT	Altitude
AMPS	Amperes
ANNUNC	Annunciation
APPR	Approach
APR	Approach
APT	Airport
ARINC	Aeronautical Radio Incorporated
ARSPC	Airspace
ARTCC	Air Route Traffic Control Center
ARV	Arrival
AS	Airspeed
ASB	Aviation Support Branch
ATC	Air Traffic Control
ATCRBS	ATC Radar Beacon System
AUTOSEQ	Automatic Sequence
AUX	Auxiliary
B ALT	Barometric Altitude
BARO	Barometer
BKSP	Backspace
BRG	Bearing
C	Celsius
CA	Course to Altitude
CALC	Calculator
CD	Course to DME distance
CDI	Course Deviation Indicator
CDU	Control Display Unit
CF	Course to Fix
CHT	Cylinder Head Temperature
CHKLIST	Checklist
CHNL	Channel
CI	Course to Intercept
CLD	Cloud
CLR	Clear
COM	Communication Radio
CONFIG	Configuration
COPLT	Co-pilot
CR	Course to Radial
CRG	Cockpit Reference Guide
CRNT	Current
CRS	Course
CRSR	Cursor

Abbreviation or Acronym	Definition
CTRL	Control
CVR	Cockpit Voice Recorder
CVRG	Coverage
CYL	Cylinder
D ALT	Density Altitude
DB	Database
DBASE	Database
DBZ	Decibels 'Z' (Radar Return)
DEC FUEL	Decrease Fuel
DECLTR	Declutter
DEP	Departure
DF	Direct to Fix
DFLT	Default
DFLTS	Defaults
DIS	Distance
DME	Distance Measuring Equipment
DOP	Dilution of Precision
DP	Departure Procedure
DSBL	Disabled
DTK	Desired Track
ECU	Engine Control Unit
EGT	Exhaust Gas Temperature
EIS	Engine Indication System
ELEV	Elevation
EMI	Electromagnetic Interference
ENDUR	Endurance
ENGD	Engaged
ENR	Enroute
ENT	Enter
EPE	Estimated Position Error
ERR	Error
ESA	Enroute Safe Altitude
ETA	Estimated Time of Arrival
ETE	Estimated Time Enroute
EXPIRD	Expired
FA	Course From Fix to Altitude
FAA	Federal Aviation Administration
FAF	Final Approach Fix
FAIL	Failure
FC	Course From Fix to Distance
FCC	Federal Communication Commission
FCST	Forecast
FD	Course From Fix to DME Distance, Flight Director
FFLOW	Fuel Flow
FIS-B	Flight Information Services-Broadcast
FISDL	Flight Information Service Data Link
FM	Course From Fix to Manual Termination

Abbreviation or Acronym	Definition
FMS	Flight Management System
FOB	Fuel On Board
FPL	Flight Plan
FPM	Feet Per Minute
FREQ	Frequency
FRZ	Freezing
FSS	Flight Service Station
ft	Foot/feet
G/S	Glideslope
GAL	Gallon(s)
GDC	Garmin Air Data Computer
GDU	Garmin Display Unit
GEA	Garmin Engine/Airframe Unit
GIA	Garmin Integrated Avionics Unit
GL	Gallon(s)
GMU	Garmin Magnetometer Unit
GND	Ground
GPH	Gallons per Hour
GPS	Global Positioning System
GRS	Garmin Reference System
GS	Ground Speed
GTX	Garmin Transponder
HA	Hold Terminating at Altitude
HDG	Heading
HF	Hold Terminating at Fix
Hg	Mercury
HI	High
HI SENS	High Sensitivity
HM	Hold with Manual Termination
hPa	Hectopascal
HR	Hour
HSI	Horizontal Situation Indicator
HUL	Horizontal Uncertainty Level
Hz	Hertz
I	Inner Marker
IAF	Initial Approach Fix
IAT	Indicated Air Temperature
IAU	Integrated Avionics Unit
ICAO	International Civil Aviation Organization
ICS	Intercom System
ID	Identification/Morse Code Identifier
IDENT, IDNT	Identification
IF	Initial Fix
IFR	Instrument Flight Rules
IG	Imperial Gallon
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
INACTV	Inactive

Abbreviation or Acronym	Definition
INC FUEL	Increase Fuel
IND	Indicated
INT	Intersection(s)
IrDA, IRDA	Infrared Data Association
KEYSTK	Key Stuck
KG	Kilogram
KHz	Kilohertz
KM	Kilometer
KT	Knot
L	Left
LAT	Latitude
LBL	Label
LB	Pound
LCD	Liquid Crystal Display
LCL	Local
LED	Light Emitting Diode
LIFR	Low Instrument Flight Rules
LO	Low
LOC	Localizer
LON	Longitude
LRU	Line Replacement Unit
LTNG	Lightning
LVL	Level
M	Middle Marker
MAG VAR	Magnetic Variation
MAHP	Missed Approach Hold Point
MAN IN	Manifold Pressure (inches Hg)
MAN SQ	Manual Squelch
MAP	Missed Approach Point
MASQ	Master Avionics Squelch
MAX	Maximum
METAR	Meteorological Aviation Routine
MFD	Multi Function Display
MGRS	Military Grid Reference System
MIC	Microphone
MIN	Minimum
MKR	Marker Beacon
MOA	Military Operations Area
MOV	Movement
MPM	Meters Per Minute
MSA	Minimum Safe Altitude
MSL	Mean Sea Level
MT	Meter
mV	Millivolt(s)
MVFR	Marginal Visual Flight Rules
NAV	Navigation
NAVAID	NAVigation AID

Abbreviation or Acronym	Definition
NDB	Non-directional Beacon
Nexrad	Next Generation Radar
nm	Nautical Mile(s)
NRST	Nearest
O	Outer Marker
OAT	Outside Air Temperature
OBS	Omni Bearing Selector
P ALT	Pressure Altitude
PA	Passenger Address
PASS	Passenger(s)
PFD	Primary Flight Display
PI	Procedure Turn to Course Intercept
POSN	Position
P. POS	Present Position
PRES	Pressure
PRESS	Pressure
PROC	Procedure(s)
PSI	Pounds per Square Inch
PT	Procedure Turn
PTCH	Pitch
PTT	Push-to-Talk
PWR	Power
QTY	Quantity
R	Right
RAD	Radial
RAIM	Receiver Autonomous Integrity Monitoring
REF, REFS	References
REM	Remaining (fuel remaining above Reserve)
REQ	Required
RES	Reserve (fuel reserve entered by pilot)
RF	Constant Radius Turn to Fix
RMI	Radio Magnetic Indicator
RNG	Range
RNWY	Runway
RPM	Revolutions per Minute
RST FUEL	Reset Fuel
RSV	Reserve
RVRSNRY	Reversionary
RX	Receive
SA	Selective Availability
SAT	Static Air Temperature
SCIT	Storm Cell Identification and Tracking
SD	Secure Digital
SEC	Second(s)
SEL	Select
SFC	Surface
SIAP	Standard Instrument Approach Procedures
SID	Standard Instrument Departure
SIGMET	Significant Meteorological Information
Sim	Simulator
SLCT	Select
SLP/SKD	Slip/skid
SMBL	Symbol
SPD	Speed
SPI	Special Position Identification
SPKR	Speaker
SQ	Squelch
STAR	Standard Terminal Arrival Route
STATS	Statistics
STBY	Standby
STD	Standard
SUA	Special Use Airspace
SUSP	Suspend
SW	Software
SYS	System
T HDG	True Heading
TAS	True Airspeed
TAF	Terminal Aerodrome Forecast
TAT	Total Air Temperature
TCA	Terminal Control Area
TCAS	Traffic Collision Avoidance System
TEL	Telephone
TEMP	Temperature
TERM	Terminal
TF	Track Between Two Fixes
TFR	Temporary Flight Restriction
TIS	Traffic Information System
TKE	Track Angle Error
TMA	Terminal Maneuvering Area
TRG	Target
TRK	Track
TRUNC	Truncated
TX	Transmit
UNAVAIL	Unavailable
USR	User
UTC	Coordinated Universal Time
UTM/UPS	Universal Transverse Mercator / Universal Polar Stereographic Grid
V	Airspeed/Velocity
Vne	Never-exceed Speed
Vr	Rotate Speed
Vx	Best Angle of Climb Speed
Vy	Best Rate of Climb speed
VA	Heading Vector to Altitude

Abbreviation or Acronym	Definition
VD	Heading Vector to DME Distance
VERT	Vertical
VFR	Visual Flight Rules
VHF	Very High Frequency
VI	Heading Vector to Intercept
VLOC	VOR/Localizer Receiver
VM	Heading Vector to Manual Termination
VMC	Visual Meteorological Conditions
VNAV	Vertical Navigation
VOL	Volume
VOR	VHF Omnidirectional Range
VPROF	VNAV Profile
VR	Heading Vector to Radial
VS	Vertical Speed
Vspeed	Airspeed
WAAS	Wide Area Augmentation System
WGS-84	World Geodetic System - 1984
WPT	Waypoint(s)
WPTS	Waypoints
WW	World Wide
WX	Weather
XFER	Transfer
XPDR	Transponder
XTALK	Cross-talk
XTK	Cross-track

Navigation Term	Definition
Bearing	The compass direction from your present position to a destination waypoint.
Calibrated Airpseed	Indicated airspeed corrected for installation and instrument errors.
Course	The line between two points to be followed by the aircraft.
Course to Steer	The recommended direction to steer in order to reduce course error or stay on course. Provides the most efficient heading to get back to the desired course and proceed along your flight plan.
Crosstrack Error	The distance the aircraft is off a desired course in either direction, left or right.
Cumulative Distance	The total of all legs in a flight plan. The 'great circle' distance from your present position to a destination waypoint.
Dillution of Precision	A measure of GPS satellite geometry quality on a scale of one to ten (lower numbers equal better geometry, where higher numbers equal poorer geometry)
Desired Track	The desired course between the active "from" and "to" waypoints.
Efficiency	A measure of fuel consumption, expressed in distance per unit of fuel.
Endurance	Flight endurance, or total possible flight time based on available fuel on board.
Enroute Safe Altitude	The recommended minimum altitude within ten miles left or right of the desired course on an active flight plan or direct-to.
Estimated Position Error	A measure of horizontal GPS position error derrived by satellite geometry conditions and other factors.
Estimated Time of Arrival	The estimated time at which the aircraft should reach the destination waypoint, based upon current speed and track.
Estimated Time Enroute	The estimeated time it takes to reach the destination waypoint from the present position, based upon current groundspeed.
Fuel Flow	The fuel flow rate, expressed in units of fuel per hour.
Fuel On Board	The total amount of usable fuel on board the aircraft.
Groundspeed	The velocity that the aircraft is travelling relative to a ground position.
Heading	The direction an aircraft is pointed, based upon indications from a magnetic compass or a properly set directional gyro.
Indicated	Information provided by properly calibrated and set instrumentation on the aircraft panel.
Leg	The portion of a flight plan between two waypoints.
Left Over Fuel On Board	The amount of fuel remaining on board after the completion of one or more legs of a flight plan or direct-to.
Left Over Fuel Reserve	The amount of flight time remaining, based on the amount of fuel on board after the completion of one or more legs of a flight plan or direct-to, and a known consumption rate.
Minimum Safe Altitude	Uses Grid Minimum Off-Route Altitudes (Grid MORAs) to determine a safe altitude within ten miles of the aircraft present position. Grid MORAs are one degree latitude by one degree longitude in size. The Grid MORA clears the highest elevation reference point in the grid by 1000 feet for all areas of the grid.
Track	The direction of aircraft movement relative to a ground position. Also referred to as 'Ground Track'.
Track Angle Error	The angle difference between the desired track and your current track.
Vertical Speed Required	The vertical speed necessary to descend/climb from a current position and altitude to a defined target position and altitude, based upon current groundspeed.

This page intentionally left blank.

QUESTIONS & ANSWERS

This Appendix answers common questions regarding G1000 system operational capabilities. If a particular subject is not covered in this Appendix, the index may be used to find the appropriate section in this manual. If a sufficient answer is still not found, an authorized Garmin dealer or contact Garmin directly (see Copyright page). Garmin is dedicated to supporting its products and customers.

What is RAIM and how does it affect approach operations?

RAIM is an acronym for Receiver Autonomous Integrity Monitoring. RAIM is a GPS receiver function that performs the following functions:

- Monitors and verifies integrity and geometry of tracked GPS satellites.
- Eliminates a corrupt satellite from the navigation solution.
- Notifies the pilot when satellite conditions do not provide the necessary coverage to support a certain phase of flight.
- Predicts satellite coverage of a destination area to determine whether the number of available satellites is sufficient to satisfy requirements.

For RAIM to work correctly, the GPS receiver must track at least five (5) satellites. A minimum of six (6) satellites is required to allow RAIM to eliminate a single corrupt satellite from the navigation solution.

RAIM ensures that satellite geometry allows for a navigation solution calculation within a specified protection limit (2.0 nm for oceanic and en route, 1.0 nm for terminal, and 0.3 nm for non-precision approaches). The G1000 system monitors RAIM and issues an alert message when RAIM is not available (see Annunciation and Alerts Pilot's Guide). Without RAIM, GPS position accuracy cannot be monitored. If RAIM is not available when crossing the FAF, the pilot must fly the missed approach procedure.

NOTE: *If RAIM is not predicted to be available for the final approach course, the approach does not become active, as indicated by the "RAIM not available from FAF to MAP" message and the INTEG annunciation flagging.*

Why are there not any approaches available for a flight plan?

Approaches are available for the final destination airport in a flight plan or as a direct-to (keep in mind that some VOR/VORTAC identifiers are similar to airport identifiers). If a destination airport does not have a published approach, the G1000 indicates "NONE" for the available procedures.

What happens when an approach is selected? Can a flight plan with an approach, a departure, or an arrival be stored?

When an approach, departure, or arrival is loaded into the active flight plan, a set of approach, departure, or arrival waypoints is inserted into the flight plan – along with a header line showing the title of the selected instrument procedure. The original enroute portion of the flight plan remains active, unless the instrument procedure is activated. This may be done either when the procedure is loaded, or at a later time.

Flight plans can also be stored with an approach, a departure, or an arrival. Note that the active flight plan is erased when the system is turned off. Also, the active flight plan is overwritten when another flight plan is activated.

When storing flight plans with an approach, a departure, or an arrival, the G1000 uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the G1000 system automatically updates the information, provided the procedure has not been modified. Should an approach, departure, or arrival procedure no longer be available, the flight plan becomes locked until the procedure is deleted from the flight plan.

Can "slant Golf" ("/G") be filed using the G1000?

"/G" may be filed for a flight plan. The G1000 system meets the requirements of TSO-C129 Class A1 or A2 installation. Non-precision GPS approaches are not to be flown with an expired database. See the approved Aircraft Flight Manual Supplement (AFMS) as well as the Aeronautical Information Manual (AIM) for more information.

What does the OBS softkey do?

The **OBS** softkey is used to select manual sequencing of waypoints. Activating OBS mode sets the current active-to waypoint as the primary navigation reference and prevents the system from sequencing to the next waypoint in a flight plan. When OBS mode is cancelled, automatic waypoint sequencing is continued, and the G1000 automatically activates the next waypoint in the flight plan once the aircraft has crossed the present active waypoint.

Normal (OBS not activated)

- Automatic sequencing of waypoints
- Manual course change on HSI is not possible
- Always navigates 'TO' the active waypoint
- Must be in this mode for final approach course

OBS

- Manual sequencing - 'holds' on selected waypoint
- Manually select course to waypoint from HSI
- Indicates 'TO' or 'FROM' waypoint
- Cannot be set for final approach course or published holding patterns

When OBS mode is active, the G1000 allows the pilot to set a desired course to/from a waypoint using the **CRS/BARO knob** and HSI (much like a VOR).

One application for the **OBS** softkey is holding patterns. The **OBS** softkey is used to suspend waypoint sequencing and select the desired course along the waypoint side of the hold. For many approach operations, setting and resetting of waypoint sequencing is automatic. Holding patterns that are part of an approach automatically disable waypoint sequencing, then re-enable waypoint sequencing after one time around the holding pattern. To fly the holding pattern a second time, press the **OBS** softkey. An example of this operation is an approach which begins with a holding pattern at the initial approach fix (IAF).

The most common application for using the **OBS** softkey is the missed approach. The G1000 suspends automatic waypoint sequencing (indicated by a "SUSP" annunciation placed on the HSI) when the missed approach point (MAP) is crossed. This prevents the G1000 from automatically sequencing to the missed approach holding point (MAHP). During this time, the **OBS** softkey designation changes to **SUSP**. Pressing the **SUSP** softkey reactivates automatic waypoint sequencing. The **OBS** softkey then resumes its normal functionality.

WARNING: *The G1000 does not provide guidance to the missed approach hold point (MAHP). Always follow published missed approach procedures when flying a missed approach.*

Why does the G1000 not automatically sequence to the next waypoint?

The G1000 only sequences flight plan waypoints when automatic sequencing is enabled (i.e., no "OBS" or "SUSP" annunciation).

How can a waypoint be skipped in an approach, a departure, or an arrival?

The G1000 allows the pilot to manually select any approach, departure, or arrival leg as the active leg of the flight plan. This procedure is performed on the MFD, from the Active Flight Plan Page by highlighting the desired waypoint and pressing the **ACT LEG** softkey, then the **ENT** key to approve the selection. The GPS then provides navigation along the selected flight plan leg.

When does turn anticipation begin?

The G1000 smoothes adjacent leg transitions based upon a normal 15° bank angle (with the ability to roll up to 25°) and provides three pilot cues for turn anticipation:

1) A waypoint alert ("NEXT DTK ###°") flashes on the PFD 10 seconds before the turn point.
2) A flashing turn advisory ("TURN TO ###°") appears on the PFD when the pilot is to begin the turn. The HSI (GPS mode) automatically sequences to the next DTK value.
3) The To/From indicator on the HSI flips momentarily to indicate that the midpoint of the turn has been crossed.

When does the CDI scale change?

When 30 nm from the destination, the G1000 begins a smooth CDI scale transition from 5.0 nm (en-route mode) to 1.0 nm (terminal mode). When 2 nm from the FAF during an active approach, the CDI scale transitions to 0.3 nm (approach mode). When executing a missed approach, the CDI can be returned to the 1.0 nm scale by pressing the **SUSP** softkey. The CDI is also set to 1.0 nm (terminal mode) within 30 nm of the departure airport.

Why does the HSI not respond like a VOR when OBS mode is active?

Unlike a VOR, the CDI scale used on GPS equipment is based on the cross-track distance to the desired course, not on angular relationship to the destination. Therefore, the CDI deflection on the GPS is constant regardless of the distance to the destination and does not become less sensitive when further away from the destination.

What is the correct missed approach procedure? How is the missed approach holding point selected?

To comply with TSO specifications, the G1000 does not automatically sequence past the MAP. The first waypoint in the missed approach procedure becomes the active waypoint when the **SUSP** softkey is pressed AFTER crossing the MAP. All published missed approach procedures must be followed, as indicated on the approach plate.

To execute the missed approach procedure prior to the MAP (not recommended), select the Active Flight Plan Page and use the **ACT LEG** softkey to activate the missed approach portion of the procedure.

After a missed approach, how can the same approach be re-selected? How can a new approach be activated?

After flying the missed approach procedure, the pilot may reactivate the same approach for another attempt from the Procedures Page. Once the clearance is given for another attempt, activate the approach from the Procedures Page by highlighting "Activate Approach?", then pressing the **ENT** key. The G1000 provides navigation along the desired course to the waypoint and rejoins the approach in sequence from that point on.

To activate a new approach for the same airport, select the new procedure from the Procedures Page. To view the Procedures Page, press the **PROC** key and rotate the large **FMS** knob to highlight "Select Approach?". Select the desired approach from the list shown and press the **ENT** key. Select the desired transition, then activate the approach using the **ENT** key.

To activate a new approach to a different airport, press the **Direct-to** key and select the desired airport using the **small** and **large FMS** knobs. Press the **ENT** key to accept the selected airport, then follow the steps in the preceding paragraph to select an approach for the new airport.

NOTE: *Do not attempt to reactivate the current approach prior to crossing the missed approach point (MAP). If an attempt to do so is made, an alert message "Are you sure you want to discontinue the current approach?" appears. The G1000 directs you back to the transition waypoint and does NOT take into consideration any missed approach procedures, if the current approach is reactivated.*

G1000 MAP DATUMS

The G1000 system supports the following map datums.

WARNING: *WGS 84 is the default datum and should be used in all situations except when another datum is specifically required for safe navigation. Pilots using map datums other than WGS 84 do so at their own risk.*

ADINDAN	Ethiopia, Mali, Senegal, Sudan
AFGOOYE	Somalia
AIN El ABD 1970	Bahrain Island, Saudi Arabia
ANNA 1 ASTRO 1965	Cocos Islands
ARC 1950	Botswana, Lesotho, Malawi, Swaziland, Zaire, Zambia, Zimbabwe
ARC 1960	Kenya, Tanzania
ASCENSION IS 1958	Ascension Island
ASTRO B4 SOROL ATOLL	Tern Island
ASTRO BEACON "E"	Iwo Jima Island
ASTRO DOS 71/4	St. Helena Island
ASTRONOMIC STN 1952	Marcus Island
AUSTRALIAN GEOD 1966	Australia, Tasmania Island
AUSTRALIAN GEOD 1984	Australia, Tasmania Island
AUSTRIA NS	Austria
BELGIUM 1950	Belgium
BELLEVUE (IGN)	Efate and Erromango Islands
BERMUDA 1957	Bermuda Islands
BOGATA OBSERVATORY	Colombia
BUKIT RIMPAH	Indonesia
CAMP AREA ASTRO	Antarctica
CAMPO INCHAUSPE	Argentina
CANTON ASTRO 1966	Phoenix Islans
CAPE	South Africa
CAPE CANAVERAL	Florida, Bahama Islands
CARTHAGE	Tunisia
CH-1903	Switzerland
CHATHAM 1971	Chatham Island (New Zealand)
CHUA ASTRO	Paraguay
CORREGO ALEGRE	Brazil
DANISH GI 1934	Denmark
DJAKARTA (BATAVIA)	Sumatra Island (Indonesia)
DOS 1968	Gizo Island (New Georgia Islands)
EASTER ISLAND 1967	Easter Island
EUROPEAN 1950	Austria, Belgium, Denmark, Finland, France, Germany, Gibraltar, Greece, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland
EUROPEAN 1979	Austria, Finland, Netherlands, Norway, Spain, Sweden, Switzerland
FINLAND HAYFORD 1910	Finland
G. SEGARA	Borneo
GANDAJIKA BASE	Republic of Maldives
GEODETIC DATUM 1949	New Zealand
GGRS 87	Greece
GUAM 1963	Guam Island
GUX 1 ASTRO	Guadalcanal Island
HERAT NORTH	Afghanistan
HJORSEY 1955	Iceland
HONG KONG 1963	Hong Kong
HU-TZU SHAN	Taiwan
INDIAN BNGLDSH NEPAL	Bangladesh, India, Nepal
INDIAN MEAN VALUE	India
INDIAN THAILAND VIETN	Thailand, Vietnam
INDONESIA 74	Indonesia
IRELAND 1965	Ireland
ISTS 073 ASTRO 1969	Diego Garcia
JOHNSTON ISLAND 1961	Johnston Island
KANDAWALA	Sri Lanka
KERGUELEN ISLAND	Kerguelen Island
KERTAU 1948	West Malaysia
L.C. 5 ASTRO	Cayman Brac Island
LIBERIA 1964	Liberia
LUZON MEAN VALUE	Philippines
LUZON MINDANAO IS	Mindanao Island
LUZON PHILIPPINES	Philippines (excluding Mindanao Isl.)
MAHE 1971	Mahe Island
MARCO ASTRO	Salvage Islands
MASSAWA	Eritrea (Ethiopia)
MERCHICH	Morocco
MIDWAY ASTRO 1961	Midway Island
MINNA	Nigeria
NAD27 ALASKA	North American 1927 – Alaska
NAD27 BAHAMAS	North American 1927 – Bahamas
NAD27 CANADA	North American 1927 – Canada
NAD27 CANAL ZONE	North American 1927 – Canal Zone

G1000 MAP DATUMS (CONT.)

NAD27 CARIBBEAN	North American 1927 – Caribbean: Barbados, Caicos Islands, Cuba, Dominican Republic, Cayman Islands, Jamaica, Leeward and Turks Islands
NAD27 CENTRAL AMERICA	North American 1927 – Central America: Belize, Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua
NAD27 CONUS	North American 1927 – Continental United States
NAD27 CUBA	North American 1927 – Cuba
NAD27 GREENLAND	North American 1927 – Greenland (Hayes Peninsula)
NAD27 MEXICO	North American 1927 – Mexico
NAD27 SAN SALVADOR IS	North American 1927 – San Salvador Island
NAD83	North American 1983 – Alaska, Canada, Central America, CONUS, Mexico
NAHRWAN MASIRAH IS	Masirah Island (Oman)
NAHRWAN SAUDI ARABIA	Saudi Arabia
NAHRWAN UNITD ARAB E	United Arab Emirates
NAPARIMA BWI	Trinidad and Tobago
NETHERLAND TRIAG '21	Netherlands
NOU TRIAG FRANCE	France
NOU TRIAG LUXEMBOURG	Luxembourg
OBSERVATORIO 1966	Corvo and Flores Islands (Azores)
OLD EGYPTIAN	Egypt
OLD HAWAIIAN KAUAI	Kauai
OLD HAWAIIAN MAUI	Maui
OLD HAWAIIAN MEAN	Mean Value
OLD HAWAIIAN OAHU	Oahu
OMAN	Oman
ORD SRV GRT BRITAIN	England, Isle of Man, Scotland, Shetland Islands, Wales
PICO DE LAS NIEVAS	Canary Islands
PITCAIRN ASTRO 1967	Pitcairn Island
PORTUGUESE 1973	Portugal
POTSDAM	Germany
PROV SO AMERICA '56	Bolivia, Chile, Colombia, Ecuador, Guyana, Peru, Venezuala
PROV SO CHILEAN 1963	South Chile
PUERTO RICO	Puerto Rico and Virgin Islands
QATAR NATIONAL	Qatar
QORNOQ	South Greenland
REUNION	Mascarene Island
ROME 1940	Sardinia Island
RT 90	Sweden
SANTO (DOS)	Espirito Santo Island
SAO BRAZ	Sao Miguel, Santa Maria Islands (Azores)
SAPPER HILL 1943	East Falkland Island
SCHWARZECK	Namibia
SOUTH AMERICAN 1969	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Venezuela
SOUTH ASIAN	Singapore
SOUTHEAST BASE	Porto Santo and Madeira Islands
SOUTHWEST BASE	Faial, Graciosa, Pico, Sao Jorge and Terceira Islands
TANANARIVE OBSV 1925	Madagascar
TIMBALAI 1948	Brunei and East Malaysia (Sarawak and Sabah)
TOKYO	Japan, Korea, Okinawa
TRISTAN ASTRO 1968	Tristan da Cunha
VITI LEVU 1916	Viti Levu Island, Fiji Islands
WAKE-ENIWETOK 1960	Marshal Islands
WGS 72	World Geodetic System 1972
WGS 84	World Geodetic System 1984
YACARE	Uruguay
ZANDERIJ	Surinam

GENERAL TIS INFORMATION

INTRODUCTION

The Traffic Information Service (TIS) provides traffic advisory information in the cockpit of non-TCAS equipped aircraft. TIS is a ground-based service providing relative location of all ATCRBS Mode-A and Mode-C transponder equipped aircraft within a specified service volume. The TIS ground sensor uses real time track reports to generate traffic notification. The G1000 system displays TIS traffic information on the Traffic Map Page of the MFD. TIS information may be displayed for overlay on the default map page on the MFD, as well as on the PFD map inset. Surveillance data includes all transponder-equipped aircraft within the coverage volume. The G1000 system displays up to eight traffic targets within a 7.5 nautical mile radius, from 3,000 feet below, to 3,500 feet above the requesting aircraft.

NOTE: *Aircraft without an operating transponder are invisible to TIS.*

TIS VS. TCAS

The main difference between TIS and TCAS is the source of surveillance data. TCAS uses an airborne interrogator with a half-second update rate, while TIS utilizes the terminal Mode-S ground interrogator and accompanying data link to provide a five-second update rate. TIS and TCAS both have similar ranges.

TIS LIMITATIONS

This section describes basic TIS limitations and is not comprehensive. The pilot should review the Surveillance System section of the Aeronautical Information Manual (AIM) for a complete listsing of TIS limitations.

NOTE: *TIS is NOT intended to be used as a collision avoidance system and does not relieve the pilot of the responsibility to "see and avoid" other aircraft. TIS shall not be used for avoidance maneuvers during IMC or when there is no visual contact with the intruder aircraft.*

TIS is intended only to assist in visual acquisition of other aircraft in VMC conditions. No recommended avoidance maneuvers are given, nor authorized, as a direct result of a TIS intruder display or TIS advisory.

While TIS is a useful aid to visual traffic avoidance, system limitations must be fully understood to ensure proper use. Many limitations are inherent in secondary radar surveillance. Information provided by TIS is neither better nor more accurate than the information used by ATC.

TIS relies on surveillance of the Mode-S radar system, which is a "secondary surveillance" radar system similar to that used by ATCRBS. TIS operation may be intermittent during turns or other maneuvering. TIS is dependent on two-way, line-of-sight communications between the aircraft and the Mode-S radar antenna. Whenever the structure of the aircraft comes between the transponder antenna and the ground-based radar antenna, the signal may be temporarily interrupted. Other limitations and anomalies associated with TIS are described in the AIM.

WARNING: *Garmin is not responsible for Mode S geographical coverage. Operation of the ground stations is the responsibility of the FAA. Refer to the AIM for a Terminal Mode S radar site map.*

***NOTE:** TIS is unavailable at low altitudes in many areas of the United States. This is often the case in mountainous regions.*

TIS information is collected during a single radar sweep. Collected information is then sent through the Mode S uplink on the next radar sweep. Because of this, the surveillance information is approximately five seconds old. TIS ground station tracking software uses prediction algorithms to compensate for this delay. These algorithms uses track history data to calculate expected intruder positions consistent with the time of display. Occasionally, aircraft maneuvering may cause variations in this calculation and create slight errors on the Traffic Map Page. Errors affect relative bearing information and target track vector. This can cause a delay in the displayed intruder information. However, intruder distance and altitude typically remain relatively accurate and may be used to assist in spotting traffic.

The following errors are common examples:

- When the client or intruder aircraft maneuvers excessively or abruptly, the tracking algorithm may report incorrect horizontal position until the maneuvering aircraft stabilizes.
- When a rapidly closing intruder is on a course that intercepts the client aircraft course at a shallow angle (either overtaking or head-on), and either aircraft abruptly changes course within 0.25 nautical miles, TIS may display the intruder aircraft on the incorrect side of the client aircraft.

These are rare occurrences and are typically resolved within a few radar sweeps once the client/intruder aircraft course stabilizes.

Pilots using TIS can provide valuable assistance in the correction of malfunctions by reporting their observations of undesirable performance. Reporters should identify the time of observation, location, type and identity of the aircraft, and describe the condition observed. Reports should also include the type of transponder and transponder software version as well. Since TIS performance is monitored by maintenance personnel, not ATC, malfunctions should be reported in the following ways:

- By telephone to the nearest Flight Service Station (FSS) facility.
- By FAA Form 8000-7, Safety Improvement Report (Postage-paid card can be obtained at FAA FSSs, General Aviation District Offices, Flight Standards District Offices, and General Aviation Fixed Base Operators).

IDENTIFYING AVIATION MAP DATA

The following aviation data is displayed on the Navigation Map Page:

Airport Symbols:

- Non-towered airports (purple in color).
- Towered airports (blue in color).
- Non-serviced airports (displayed as solid circle icons).
- Serviced airports (displayed as circles with protruding tick marks pointing to the top, bottom, left, and right portions of the screen).

Classification:

- Unclassified airports (displayed with a question mark "?" character centered within the airport symbol).
- Restricted airports (displayed with the letter "R" centered within the airport symbol).
- Hard surface public airports (displayed with the airports longest runway oriented according to the direction in which it runs centered within the airport symbol).
- Heliports (displayed with the letter "H" centered within the heliport symbol).
- Soft surface public airports (displayed with a hollow circle in the center of the airport symbol).

Airspace:

The Navigation Map Page displays airspace as one of the following colors:

- **Blue**:
  ICAO control area
  Class B, Alert area
  Caution area, Danger area, Prohibited area
  Restricted area, Training area
  Unknown area, Warning area
  Terminal Zone Airspace (ATZ), Class D
- **Purple**:
  Class C
  ICAO terminal control area
  Terminal radar service area (TRSA)
  Mode C area
  Military operations area (MOA)
  Mode C
  Class A
  Class E

Line Style:

The Navigation Map Page displays airspace as one of the following line styles:

- **Solid line**:
  Class C
  ICAO control area
  ICAO terminal control area
  Class B, Terminal radar service area
  Mode C, Class A
- **Dashed line**:
  Mode C tower area
  Class D, Class E
- **Consecutive parallel lines forming a boundary defining the airspace**:
  Military operations area (MOA)
  Warning area, Alert area, Caution area
  Danger area, Prohibited area
  Restricted area, Training area
  Unknown area, Terminal Zone Airspace (ATZ)

MAP SYMBOLS

AIRPORT

Item	Symbol
Unknown Airport	
Non-towered, Non-serviced Airport	
Towered, Non-serviced Airport	
Non-towered, Serviced Airport	
Towered, Serviced Airport	
Restricted (Private) Airport	
Heliport	

NAVAIDS

Item	Symbol
Intersection	
LOM (compass locator at outer marker)	
NDB (Non-directional Radio Beacon)	
VOR	
VOR/DME	
VOR/ILS	
VORTAC	
TACAN	

BASEMAP

Item	Symbol
Interstate Highway – 2-digit drawn inside	
Interstate Highway – 3-digit drawn inside	
State Highway – 2-digit drawn inside	
State Highway – 3-digit drawn inside	
State Highway – 4-digit drawn inside	
State Highway – 5-digit drawn inside	
US Highway – 2-digit drawn inside	
US Highway – 3-digit drawn inside	
National Highway – 2-digit drawn inside	
National Highway – 3-digit drawn inside	
National Highway – 4-digit drawn inside	
National Highway – 5-digit drawn inside	
Small City or Town	
Medium City	
Large City	

TRAFFIC

Item	Symbol
Traffic	
Proximate Traffic	
Traffic Advisory, Out of Range	
Traffic Advisory	

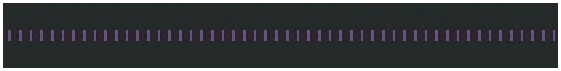
LIGHTNING STRIKE

Item	Symbol
Lightning Strike – Age is 0-6 Seconds	
Lightning Strike – Age is 6-20 Seconds	
Lightning Strike – Age is 20-60 Seconds	
Lightning Strike – Age is 60-120 Seconds	

MISCELLANEOUS

Item	Symbol
ARTCC Frequency or FSS Frequency	
Default Map Cursor	
Elevation Pointer Cursor	
Measuring Cursor	
Overzoom Indicator (map toolbar)	
Terrain Proximity Enabled (map toolbar)	
Traffic Enabled (map toolbar)	
User Waypoint	
Wind Vector	

LINE SYMBOLS

Item	Symbol
ICAO Control Area Class B Airspace	
Mode C Tower Area	
Warning Area Alert Area Caution Area Danger Area Prohibited Area Restricted Area Training Area Unknown Area	
Class C Terminal Radar Service Area Mode C Area	
Military Operations Area (MOA)	
State or Province Border	
International Border	
Road	
Railroad	
Lattitude/Longitude	

OBSTACLE DATABASE

Obstacle Color	Indication
RED	WARNING: Obstacle height is at or above 100 ft below the current aircraft altitude.
YELLOW	CAUTION: Obstacle height is between 100 ft and 1000 ft below the current aircraft altitude.
GRAY	SAFE: Obstacle height is lower than 1000 ft below the current aircraft altitude.

Unlighted Obstacle (Height is less than 1000 ft AGL)	Lighted Obstacle (Height is less than 1000 ft AGL)	Unlighted Obstacle (Height is greater than 1000 ft AGL)	Lighted Obstacle (Height is greater than 1000 ft AGL)
			

TERRAIN COLOR CHART

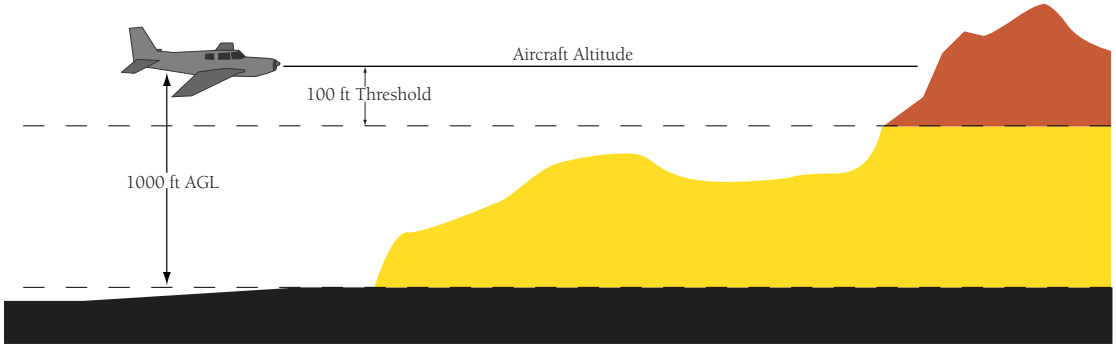


Figure F.1 Terrain Color Chart

G1000 SYSTEM SPECIFICATIONS

GDU 1040 MFD & PFD

Physical Specifications

Height:	7.70 inches (19.56 cm)
Width:	11.80 inches (29.97 cm)
Depth:	3.55 inches (9.02 cm)
Weight:	6.6 lb (2.99 kg)
Voltage Range:	9 – 33 Vdc
Display:	10.4-inch diagonal XGA 1024 x 768 pixels 262,144 colors

Environmental Specifications

Temperature Range:	-40º C to +55º C
Humidity:	95% non-condensing
Altitude Range:	-1,500 feet to 55,000 feet

GMA 1347 AUDIO PANEL

Physical Specifications

Bezel Height:	7.70 inches (19.56 cm)
Width:	1.3 inches (3.4 cm)
Depth:	7.79 inches (19.70 cm)
Weight:	1.7 lb (0.8 kg)
Voltage Range:	11 – 33 Vdc

Environmental Specifications

Temperature Range:	-20º C to +70º C
Humidity:	95% non-condensing
Altitude Range:	-1,500 feet to 55,000 feet

GIA 63 INTEGRATED AVIONICS UNITS

Physical Specifications

Height:	7.26 inches (18.44 cm)
Width:	3.83 inches (9.73 cm)
Depth:	9.73 inches (24.71 cm)
Weight:	4.9 lb (2.22 kg)
Voltage Range:	22 – 33 Vdc

Environmental Specifications

Temperature Range:	-40º C to +65º C
Altitude Range:	-1,500 feet to 55,000 feet

GPS Specifications

Receiver:	12 parallel channel PhaseTrac12™
Acquisition Time:	15 seconds (warm)
45 seconds (cold)	
Update Rate:	Once per second, continuous
Accuracy:	Position – 49 feet (15 meters)
Velocity – 0.1 knot RMS steady state	
Dynamics:	1,000 knots maximum velocity
6g maximum acceleration	

VHF COM Performance

Channels:	760 (25 kHz spacing) or 2280 (8.33 kHz spacing)
Frequency Range:	118.000 MHz to 136.975 MHz
Transmit Power:	16 watts

VHF NAV Performance

VOR Frequency Range:	108.00 MHz to 117.95 MHz
G/S Frequency Range:	329.15 MHz to 335.00 MHz
LOC Frequency Range:	108.10 MHz to 111.95 MHz

GDC 74A AIR DATA COMPUTER

Physical Specifications

Height:	3.23 inches (8.20 cm)
Width:	3.05 inches (7.75 cm)
Length:	6.45 inches (16.38 cm)
Weight:	1.69 lb (0.77 kg)
Voltage Range:	10 – 33 Vdc

Air Data Specifications

Pressure Altitude Range:	-1,400 feet to 50,000 feet
Vertical Speed Range:	-20,000 fpm to +20,000 fpm
Airspeed Range:	450 knots
Airspeed Mach Range:	<1.00 Mach
Total Air Temperature Range:	-85º C to +85º C

GTX 33 MODE S TRANSPONDER

Physical Specifications

Height:	6.30 inches (16.0 cm)
Width:	1.72 inches (4.4 cm)
Depth:	11.05 inches (28.1 cm)
Weight:	3.0 lb (1.36 kg)
Voltage Range:	11 – 33 Vdc

Environmental Specifications

Temperature Range:	-45º C to +70º C
Altitude Range:	-1,500 feet to 55,000 feet

GEA 71 ENGINE/AIRFRAME UNIT

Physical Specifications

Height:	6.30 inches (16.0 cm)
Width:	1.23 inches (3.12 cm)
Depth:	8.73 inches (22.17 cm)
Weight:	1.75 lb (0.712 kg)
Voltage Range:	9 – 33 Vdc

Environmental Specifications

Temperature Range:	-55º C to +70º C
Altitude Range:	-1,500 feet to 55,000 feet

GDL 69/69A WEATHER DATA LINK

Physical Specifications

Height:	6.15 inches (15.62 cm)
Width:	1.05 inches (2.66 cm)
Depth:	7.20 inches (18.26 cm)
Weight (GDL 69A):	1.86 lb (0.84 kg)
Voltage Range:	9 – 33 Vdc

Environmental Specifications

Temperature Range:	-20º C to +55º C
Altitude Range:	-1,500 feet to 55,000 feet

GRS 77 AHRS

Physical Specifications

Height:	3.25 inches (8.36 cm)
Width:	3.75 inches (9.53 cm)
Length:	8.5 inches (21.59 cm)
Weight:	2.40 lb (1.08 kg)
Voltage Range:	10 – 33 Vdc

Environmental Specifications

Temperature Range:	-55º C to +70º C
Altitude Range:	-1,500 feet to 55,000 feet

AHRS Performance

Bank/Pitch Error:	±1.25º within 30º roll, left or right and 15º pitch, nose up or down
Maneuvers Range:	360º pitch and roll
Rotation Rate:	±200º per second
Heading:	±2º straight and level flight

Initialization Limitations

For successful in-flight initialization of the GRS 77, the following attitude limitations must be met:

Primary AHRS operation:	±20º bank and ±5º pitch
Reversion AHRS operation:	±10º bank and ±5º pitch

Garmin International, Inc.
1200 East 151st Street
Olathe, KS 66062, U.S.A.
p: 913.397.8200 f: 913.397.8282

Garmin AT, Inc.
2345 Turner Road SE
Salem, OR 97302, U.S.A.
p: 503.391.3411 f: 503.364.2138

Garmin (Europe) Ltd.
Unit 5, The Quadrangle
Abbey Park Industrial Estate
Romsey, SO51 9DL, U.K.
p: 44/0870.8501241 f: 44/0870.8501251

Garmin Corporation
No. 68, Jangshu 2nd Road
Shijr, Taipei County, Taiwan
p: 886/2.2642.9199 f: 886/2.2642.9099

www.garmin.com

190-00606-00 Rev. A