HORITA GPT-50

GPS Video Titler

USER MANUAL

For Models GPT-50, RM-50/GPT, SR-50/GPT

Doc. 071950
Rev. C

HORITA®

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1 INTRODUCTION

1.1 Introduction

This manual provides installation and operating instructions for the HORITA GPS Video Titler (GPT-50). The GPT-50 connects directly to popular GPS receivers with RS-232 serial data output and provides an on screen video display of time, date and LAT/LON position information, as well as other information, depending on the GPS receiver.

1.2 GPT-50 Revisions

This manual applies to HORITA GPS Video Titler GPT-50 versions 2.00 and above (serial numbers GVT 925650 and up). Earlier GPT-50 versions not only have different firmware but also have a different input output connector configuration. The earlier versions were configured to connect directly to a 9-pin PC serial port. When the earlier GPT-50's are used with GPS receivers which have cables designed to plug into a PC serial port, a gender changer and null modem adapter are required.

GPT-50 versions 2.00 and up are configured to emulate a 9-pin PC serial port and connect directly to the cables provided with many current GPS receivers. These cables cannot be used with earlier GPT-50's.

1.3 Features

Either a one line display of position only, or a two line display of both position and time/date can be selected. A line has up to 20 characters and is usually updated by the GPS receiver at 1-second (or less) intervals.

If other information is desired to be included with the GPS data display, up to seven lines of additional information can be manually added to the GPS time/position display by operation of switches on the GPT-50 for character selection, position, and insert/delete functions. The character set includes alphabet, numbers, punctuation, and math symbols.

The GPT-50 has a setup menu to change character attributes such as contrast, black or white, background, etc., and also contains its own battery backed up real time clock/calendar that operates independent of the GPS time and date information.

2 CONNECTING

2.1 Connecting

Refer to Figure 2-1.

a. Connect a video source to the GPT-50 VIDEO IN. This input is looped to the output when power is OFF, terminated when power is ON.

b. Connect the GPT-50 VIDEO OUT to a video monitor or recorder.

NOTE:

If your GPS Video Titler has "S" connectors you need to use "S" type cables.

c. Connect the GPT-50 SERIAL IN DB9M (pins) connector to the serial out port on your GPS receiver. Pin 2 is data input to the GPT-50, Pin 3 is data output from the GPT-50, Pin 5 is ground. See Fig. 2-2.

NOTE:

The serial out connector (DB9F, sockets) provides a loop through of the GPS data so that multiple GPT-50 units can be connected to the same GPS receiver. GPT-50 units with serial number _____ and below have a different connector configuration and do not use the cables described in this manual. Depending on your GPS equipment, a gender changer and null modem adapter may be required when using the earlier GPT-50's.

d. Connect power to the GPT-50 using the 9-Volt, 500mA power adapter supplied. The GPT-50 operates from 9V to 14V DC.

WARNING:

The GPT-50 is not fused and depends on the AC power adapter to provide input power protection. When operating the GPT-50 directly off DC power systems, be sure they are appropriately fused or protected.

e. Switch the GPT-50 POWER to ON. The front panel LED should light.

The GPT-50 has several operating modes which are selected using the front panel MODE (TITLE/SETUP) switch as described in Section 3.

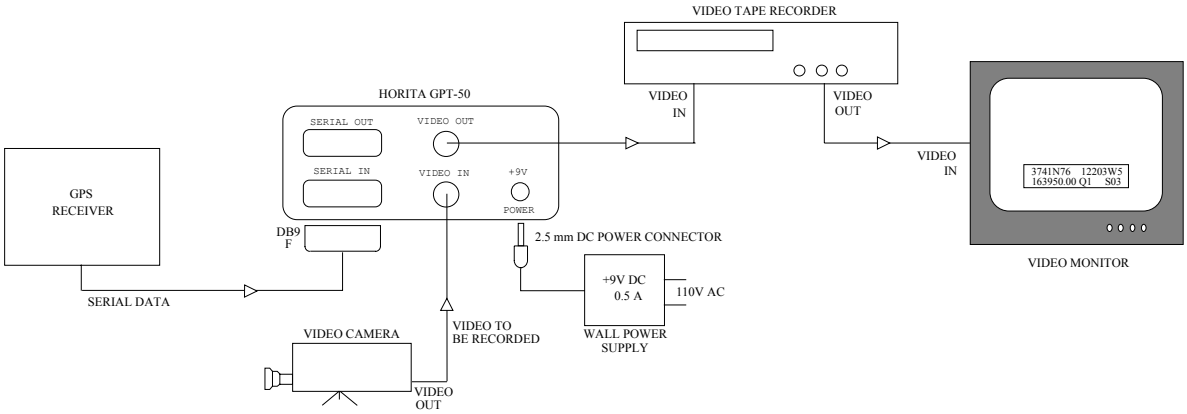


Figure 2-1
GPT-50 Connection Diagram

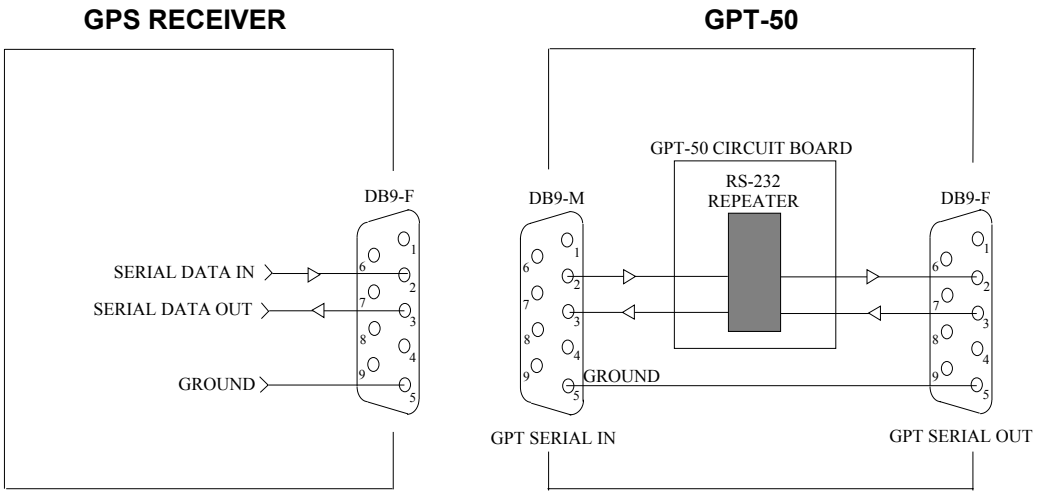


Figure 2-2
GPT-50 Serial Interface

3 OPERATING THE GPS VIDEO TITLER

3.1 Titler Modes

The Horita GPS Video Titler (GPT-50) has three basic operating modes:

1. GPS Title Mode
2. Setup Mode
3. Manual Title Mode

The GPS Title Mode is the actual operating mode in which GPS position and time inputs are automatically displayed in the video as soon as received.

The Setup Mode provides an on-screen video display of the current setup conditions and a means to select and change them. The setup conditions are stored in non-volatile memory.

The Manual Title Mode allows the operator to manually create titles which will be inserted into the video. The manual titles are also stored in non-volatile memory.

The GPT-50 automatically powers up in the GPS Title Mode and restores all previous setup conditions and any previous manual title data. GPS data inputs will immediately be inserted in the video without operator action.

3.2 Titler Controls

The GPT-50 has 3 switches on the front panel for operator control of the mode and operator input when in the Setup and Manual Modes. The switches are 3-position momentary-operation toggle switches which return to the center position when released. In the normal center position, the switches are inactive.

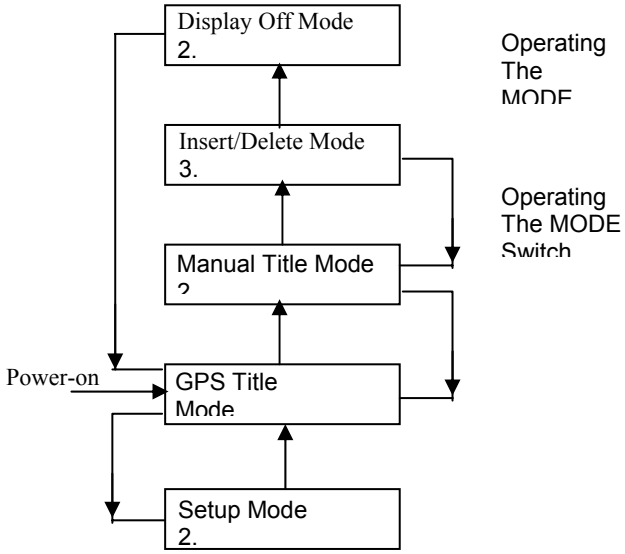
1. MODE switch
2. POSITION switch (sub titled left arrow/right arrow)
3. CHAR switch (sub titled “+/-“)

When the MODE switch is activated up or down, the GPT-50 operating mode is changed. (A flow diagram of the modes and changes between modes using the MODE switch is shown in Fig. 3-1.)

The POSITION switch has different uses in different GPT-50 modes. When the POSITION switch is activated up or down in the GPS Title Mode, the vertical position of the display is changed. When activated in the Setup Mode, the position of a blinking cursor is moved though the on-screen display to select the parameter which the operator wishes to change. When activated in the Manual Title Mode, the position of the blinking cursor is moved though each of the 20 character-positions on each of the 9 lines of the display.

The CHAR switch also has different uses in different GPT-50 modes. When activated up or down in the GPS Title Mode, the horizontal position of the display is changed. When activated in the Setup Mode, the parameter selection at the blinking cursor is changed. When activated in the Manual Title Mode, the display character at the cursor position is sequenced through an alphabet to select the character to be displayed at that position.

3.3 Mode Diagram



Associated Led Action:
1. LED mostly on, flashes off briefly for each GPS serial input
2. LED flashing slowly at 2 flashes per second
3. LED flashing faster at 4 flashes per second

Figure 3-1, Mode Flow Diagram

At power turn on, the GPT-50 automatically enters the GPS Title Mode as shown near the bottom-left of the diagram. Operating the MODE switch (down) will change from the GPS Title Mode to the Setup Mode. Operating the MODE switch (up) while in the Setup Mode will return to the GPS Title Mode. Operating the MODE switch (up) while in the GPS Title Mode will enter the Manual Title Mode, etc.. The flow diagram also shows that the Manual Title Mode is composed of three sub-modes:

1. The Character Selection Mode
2. The Insert/Delete Mode
3. The Display Off Mode

The flow diagram provides a map of the modes and shows how to get into and out of each of the GPT-50 operating modes. More detailed descriptions of the modes are in the following sections.

3.4 Operational Indicators

The GPT-50 has several operational indicators:

1. A front panel LED above the POWER switch
2. A cursor in the on-screen displays in both the Setup Mode and the Manual Title Mode.
3. A dot which momentarily appears between the latitude and longitude displays when a new position fix has been received.

3.5 LED Indicator

The LED indicates when power is actually on and it is used to show mode information plus GPS message activity.

In the GPS Title Mode, the LED is lighted continually except for brief interruptions as serial input data is received. Typically the LED "blinks" off once per second as a new message from the GPS receiver is detected. This indication occurs whether or not the message is decoded by the GPT-50.

In the Setup Mode, the LED flashes equally on and off at a steady rate of 2 times per second. The steady on/off flashing is visual indication that the GPT-50 is not in the GPS Title Mode.

In the Manual Title Mode, the LED also flashes equally on and off at a steady rate. When selecting characters or if the display is switched off, the steady rate is 2 times per second. When inserting/deleting characters the rate is 4 times per second. In all the Manual Title Modes, the steady flashing indicates that the GPT-50 is not in the GPS Title Mode.

3.6 Cursor Indicator

The cursor in the Setup Mode is indicated by flashing the selected setup parameter on and off. When the CHAR switch is operated, the parameter that is flashing is the one that will be changed.

In the Manual Title Character Selection Mode, a "box" cursor is at the position the currently selected character. The flash rate is 2 times per second.

In the Manual Title Insert/Delete Mode, the cursor flashes at a rate of 4 times per second.

3.7 Description of the GPT-50 Display Page

The GPT-50 video display is an array of 9 lines of 20 characters each. The array of 180 possible character positions forms a virtual page superimposed on the video. The top line of 20 character positions out of the 9 possible lines is called L1 (line 1) in the GPT-50 setup screen. The bottom line is called L9.

The GPT-50 displays GPS information on one or two lines. These lines can be vertically positioned to the top of the video, to the bottom, or anywhere in between. Horizontal position can also be set to move the display to the left or right on the video screen.

The horizontal position of the display can be moved left (+) or right (-) using the CHAR (+/-) switch in the GPS Title Mode. The vertical position of the display is controlled by the POSITION (up-arrow/down-arrow) switch. The up-arrow splits the display page between lines 5 and 6 and moves lines 1 to 5 upward while moving lines 6 to 9 downward at the same time. This allows titles to be displayed at the top and bottom of the video screen simultaneously. When display line 1 has reached the top of the screen, line 9 has also reached the bottom of the video and the split is at a maximum limit. Operating the down-arrow switch will reduce the split until it reaches a minimum split of zero. The split screen makes it possible to display the latitude longitude position at the top of the screen and the time and date at the bottom of the screen. The magnitude of the split is displayed for reference in the setup screen. With the smallest size characters (VSIZ=SML), the split is in the range 00 to 80. The larger characters (VSIZ=LRG) have a split range from 00 to 40.

NOTE:

Immediately after power up, the POSITION switch provides manual control of the vertical split and the CHAR switch moves the display horizontal left or right.

4 SETUP MODE OPERATION

4.1 Setup Mode

The Setup Mode is used to select the operating parameters which will determine the size and appearance of the video display, plus select the GPS serial message format which will be received. Once selected, the operator setup choices are stored in non-volatile memory for automatic recall each time that power is turned on.

4.2 Entering The Setup Mode

The Setup Mode is entered by operating the MODE switch in the down direction, once from the GPS Title Mode, twice or three times from the Manual Title Mode, (ref. Mode Diagram, Section 3.3). The video display will show the Setup Mode screen with a flashing cursor and the LED will flash at a slow rate. The cursor can be moved up and down the screen with the POSITION switch. The selected setup parameter can be cycled through the possible settings with the CHAR switch.

4.3 Saving The Setup

The parameter settings displayed when you exit the Setup Mode are the settings which are stored in non-volatile memory.

4.4 Setup Selections

Line #	Typical Setup Screen Display	
1	CHAR=WHT	BACK=ON
2	CONT=MED	HPOS=15
3	VSIZ=LRG	SPLT=00
4	MODE=NMEA GPRMC	
5	COMM=4800	DISP=NOR
6	POSN=L1	DATA=L2
7	TIME=LFT L8	00:00:00
8	DATE=RHT L9	MM-DD-YY
9	SCRN=1 RESET=N	V200N

Figure 4-1, Typical Setup Screen Display

The GPT-50 setup parameter selections are:

1. CHAR=BLK (WHT)

The GPT-50 will insert black (white) captions.

2. BACK=ON (OFF)

The contrasting background box around each character is on (not on).

3. CONT=HI (LO,MED)

The GPT-50 caption titles will have high (low, medium) video contrast.

4. HPOS=19 (01-64)

The reference number for the GPT-50 title page horizontal position is 19.

5. VSIZ=SML (LRG)

The GPT-50 will insert small (large) size characters.

6. SPLT=00 (00-40),(00-80)

The GPT-50 title page can be split between character lines 5 and 6. Lines 1 through 5 move upward and lines 6 through 9 move downward with increasing split reference numbers. No split = 00, maximum split for large characters is 40. Maximum for small characters is 80. At maximum split, GPT-50 display character line 1 is at the top of the video while line 9 is at the bottom of the video. Using the split, captions can be placed simultaneously at the top and bottom of the video image.

7. MODE=NMEA GPGGA

The GPT-50 mode is set for NMEA format serial message sentence GPGGA. Other mode selections are:

NMEA GPGGA/VTG	NMEA sentences GPGGA and GPVTG
NMEA GPRMC	NMEA sentence GPRMC
NMEA GPGLL	NMEA sentence GPGLL
TNL ASCII BASIC	Trimble Pathfinder ASCII format
TNL TAIP	Trimble TAIP ASCII format
TNL 2000R-K 0-1	Trimble 2000R0, R1, K0, K1 format
TNL 2000X W/ALT	Trimble 2000 extended format
TNL TSIP	Trimble single precision binary lat/long
APOLLO 2001 MP	II Morrow ASCII map format
NVS GPS2D/3D	Navstar ASCII lat/long
NVS UTM	Navstar Universal Transverse Mercator

8. COMM=4800 (1200,9600)

The serial communications rate is set to 4800 (1200, 9600) baud.

9. DISP=NOR (NOR, ASC, HEX)

The GPT-50 will display the normal form of the GPS data. The ASCII display form shows the received data as ASCII characters to assist the identification and confirmation of the input data format and content. The hex display form shows the input as 2 hexadecimal values (0-9, A-F) per byte.

10. POSN=L9 (1,2,3,4,5,6,7,8,OFF)

The GPS position information will be displayed on line 9. Other selections are lines 1 through 8 or off.

DATA=L1 (2,3,4,5,6,7,8,9,OFF)

The GPS time and additional data will be displayed on line 1. Other selections are lines 2 through 9 or off (position and data must be on different lines and also must not conflict with internal time and date display, if enabled).

11. TIME=RHT (LFT,CEN,OFF)

The GPT-50 internal clock time will be displayed at the right. Other positions are in the center or at the left on the designated line.

L9 (1,2,3,4,5,6,7,8)

The GPT-50 internal clock time will be displayed on line 9. Other selections are lines 1 through 8 or off.

Note: When the internal clock time is displayed, a suffix letter I is added to the display to assure that it is not confused with time from the GPS receiver.

HH:MM:SS I

The GPT-50 internal clock time is currently set at HH hours, MM minutes and SS seconds. The cursor can be moved so each of these numbers may be independently set to a new time.

12. DATE=LFT (RHT,CEN,OFF)

The GPT-50 internal clock date will be displayed at the left. Other positions are in the center or at the right on the designated line.

L9 (1,2,3,4,5,6,7,8)
The GPT-50 internal clock date will be displayed on line 9. Other selections are lines 1 through 8 or off.

Note: When the internal clock date is displayed, a suffix letter I is added to the display to assure that it is not confused with the date from the GPS receiver.

MM-DD-YY I
The GPT-50 internal clock date is currently at month MM, day DD, and year YY. The cursor can be moved so each of these numbers may be independently set to a new date.

13. SCRN=1 (2)

Setup screen #1 is currently selected. Two independent setups are stored in non-volatile memory. Alternatively setup #2 could be selected and changed.

The two independent setups can be used to quickly alternate between two GPS receivers with different formats and/or two different GPS data display layouts.

14. RESET=N

The reset to default setup is controlled here. This location is always no (N) until the cursor is placed here and the CHAR switch is actuated and held for 2 seconds. After the 2 second delay, the setup is reset to the factory default settings. Each setup screen (1 or 2) is reset independently.

15. V200 N

The GPT-50 firmware is version 2.00 and the internal jumper is set for NTSC video (N=NTSC, P=PAL).

5 GPS TITLE MODE OPERATION

5.1 GPS Title Mode

The GPS Title Mode is the normal working mode for the GPT-50.

The GPS Title Mode is the power-on default mode for the GPT-50. The previously selected setup conditions stored in non-volatile memory are recovered and the GPT-50 is ready to receive GPS data and insert captions into the video. The GPS Title Mode can also be entered from the Setup Mode (click Setup switch up) or from the Manual Title Modes (click Setup switch down).

5.2 Setting Up for the GPS Title Mode

The most important setup is to set the MODE equal to the input data format and the COMM equal to the input baud rate. If you are displaying position data, select POSN equal to a line number (else OFF). If you are displaying other GPS data, select DATA equal to a different line number (else OFF). Normally the GPT-50 internal time is not used and TIME equals OFF. If the GPT-50 internal date is to be used, set the DATE equal to LFT, CEN or RHT (else OFF), and set the date line to a line not already used (if date is not OFF). Visually verify and correct the date (if date is not OFF).

When you have the basic settings listed above, it may be helpful to switch to the GPS Title Mode to verify that you are receiving data and to help visualize where you want to place the captions in your video and make choices as to white/black captions, contrasting background on/off, display contrast low, medium or high, size of the display characters, and whether to split the screen to caption both top and bottom of the video.

While in the GPS Title Mode, you can split the screen by operating the POSITION switch down to increase the split and up to decrease the split. The CHAR switch moves the entire display page left or right. You will need to change back to the Setup Mode to make the other changes. Once

the GPT-50 has been set to your conditions, exit the Setup Mode by clicking the SETUP switch up. Your setup will be saved to non-volatile memory as you exit the Setup Mode.

5.3 Communicating with the GPS Receiver

The GPT-50 receives the caption information via a RS-232 Serial Input connector on the rear panel. The 9-pin Serial Input connector has been configured to match an IBM compatible PC. Many GPS receivers have adapter cables to communicate directly with a PC. These cables will plug directly into the GPT-50 Serial Input. The pin assignments are:

pin 2 = data input to the GPT-50 (GPS receiver data output)
pin 3 = data output from the GPT-50 (used by GPT-50 only with TSIP)
pin 5 = ground

The GPT-50 Serial Output connector is configured to be connected to a PC with a pin to pin cable (standard 9-pin male to a 9-pin female computer cable). This same cable can alternatively connect to a second GPT-50 to title a second independent video channel. Each GPT-50 has an RS-232 repeater and up to 99 GPT-50's can be chained from one GPS receiver. The last GPT-50 in the chain can also be connected to a PC.

Communication with the GPS receiver is indicated when the GPT-50 LED flashes off shortly once per second. This simply means that some input has been detected, not necessarily that it has been recognized by the GPT-50. If in doubt about the flashing, unplug the Serial Data Input and the LED should be steady on (this verifies that the GPT-50 is in the GPS Title Mode). Then reconnect the Serial Input and the flashing should resume.

If the LED is not flashing when serial data is connected, either the GPS receiver output is not enabled (check receiver setup menu) or the cable connections to the GPS receiver are not correct.

Clear all old data from the screen by going temporarily to the Manual Title Mode (click MODE switch up once) and then simultaneously actuate both the POSITION switch and the CHAR switch for a few seconds. Then return to the GPS Title Mode. If the LED does indicate that something is being received, but no new data is being displayed, the format or the baud rates are not matching between the GPT-50 and the GPS receiver.

5.4 Using The HEX and ASC Selections

Selecting DISP equals ASC will show the GPS serial data on the video screen exactly as received. This form of display is useful to identify the messages actually being sent and to confirm the baud rate. Although the NMEA standard is 4800 baud, some GPS receivers can be set to transmit at 9600 and other baud rates.

Selecting DISP equals HEX will show the input data stream in hexadecimal form appropriate for binary code formats. This selection is useful to observe the actual binary packets being sent when using the Trimble Standard Interface Protocol (TSIP) format. The GPT-50 is programmed to receive packets 4A and 56.

Packet 4A will have a header of 10 4A followed by single precision latitude-longitude data and a trailer of 10 03. Packet 56 will have a header of 10 56 followed by single precision velocity data and a trailer of 10 03.

5.5 GPS Data Formats

The following paragraphs describe the GPS receiver data formats supported by the GPT-50. Some are particular to a specific manufactures model, while others are more universal. For each format, either a 1 or 2-line video display can be selected, as well as different baud rates.

MODE	position line	data line
NMEA GPRMC	lat * long	time,date
NMEA GPGGA	lat * long	time,qual,#sats,alt
NMEAGPGGA/VTG	lat *long	time, qual, #sats, alt,hdg,speed
NMEA GPGLL	lat * long	time
TNL TSIP	lat * long	time,alt
TNL2000X W/ALT	lat * long	time,alt
TNL2000R-K 0-1	lat * long	time,date
TNLASCII BASIC	lat * long	time,hdg,alt
TNLTAIP	lat * long	time,qual,speed,hdg
APOLLO 2000 MP	lat * long	hdg,speed
NVS GPS2D/3D	lat * long	time,qual,date
NVS UTM	north/east,zz	time,date,hemisphere

Table 5-1, GPT-50 Display Summary Table

5.6 GPS Data Format Details

GPS captions are displayed on two independently selectable lines of the GPT-50 virtual page. The position line displays GPS latitude and longitude (or UTM coordinates). The data line displays additional data from the GPS message (time, number of satellites, quality, altitude, etc.). Each of the two lines (position line, data line) can independently be assigned to one of the 9 display lines or turned off.

In addition to the time display derived from GPS input, the GPT-50 internal clock time (and/or date) can selectively be assigned to any available display line or turned off. Internal time and date displays have the suffix “I” to clearly identify the non-GPS source.

All the formats listed below have the following common characteristics:

1. latitude * longitude is ddmmNmmmm*dddmmWmmmm
   latitude is degrees, minutes, N or S, and fraction of minute
   longitude is degrees, minutes, E or W, and fraction of minute
   the momentary dot (*) between lat. and long. marks a new fix
2. time is hh:mm:ss from GPS input (Internal time hh:mm:ssI)
3. date is mm-dd-yy from GPS input (Internal date mm-dd-yyI)
4. for NMEA altitude is in meters, heading (hdg) is in degrees true,
   speed is in knots, quality 0 = no fix, 1 = ordinary fix, 2 = differential fix

NOTE

In the following Video Titler Display descriptions, upper case letters are fixed characters that are inserted by the GPS video titler.Lower case letters are part of the GPS receiver data stream.

5.7 NMEA Sentence $GPRMC

Video Titler Setup

MODE: NMEA GPRMC
COMM: 4800

Video Titler Display	Meaning
ddmmnmmmm*dddmmwmmmm	position: latitude, fix dot, longitude
hh:mm:ss mm-dd-yy	data: UTC hrs, min, sec, mo., day, year

5.8 NMEA Sentence $GPGGA

Video Titler Setup
MODE: NMEA GPGGA
COMM: 4800

Video Titler Display			Meaning
ddmmnmmmm*dddmmwmmmm			position: latitude, fix dot, longitude
hh:mm:ss	QqSs	aaaaa	data: UTC hours, min, sec Quality number q Satellites s altitude in meters

5.9 NMEA Sentences $GPGGA & GPVTG

Video Titler Setup
MODE: NMEA GPGGA/VTG
COMM: 4800

Video Titler Display			Meaning
ddmmnmmmm*dddmmwmmmm			position: latitude, fix dot, longitude
hh:mm:ss	QqSs	aaaaa	1st data: UTC, quality, satellites, alt.
hhh.h		ssss.s	2nd data: heading, speed

(Note: 2nd line of data is displayed immediately below the 1st line)

5.10 NMEA Sentence $GPGLL

Video Titler Setup
MODE: NMEA GPGLL
COMM: 4800

Video Titler Display	Meaning
ddmmnmmmm*dddmmwmmmm	position: latitude, fix dot, longitude
hh:mm:ss	data: UTC hours, min, sec

5.11 Trimble TSIP

Video Titler Setup
MODE: TNL TSIP
COMM: 9600

Video Titler Display			Meaning
ddmmnmmmm*dddmmwmmmm			position: latitude, fix dot, longitude
hh:mm:ss		aaaaa	data: UTC hours, min, sec altitude is in feet

Note: When TSIP time is first displayed and identification of UTC has not yet been received, a suffix letter G is added to the display to indicate that it might be GPS time and not UTC. When UTC has been identified, the display is assured to be UTC and the G suffix is removed.

GPS time leads UTC by an integer number of seconds. In 1998 GPS leads by 12 seconds and the lead tends to increase by 1 second approximately every 1.5 years. (for example 08:00:12 GPS = 08:00:00 UTC)

5.12 Trimble 2000X with altitude

Video Titler Setup
MODE: TNL 2000X W/ALT
COMM: 4800

Video Titler Display		Meaning
ddmmnmmmm*dddmmwmmmm		position: latitude, fix dot, longitude
hh:mm:ss	aaaaa	data: UTC hours, min, sec altitude in feet

5.13 Trimble 2000 R0, R1, K0, K1 formats

Video Titler Setup
MODE: TNL 2000R-K 0-1
COMM: 4800

Video Titler Display		Meaning
ddmmnmmmm*dddmmwmmmm		position: latitude, fix dot, longitude
hh:mm:ss	mm-dd-yy	data: UTC hrs, min, sec, mo., day, year

5.14 Trimble ASCII Basic

Video Titler Setup
MODE: TNL ASCII BASIC
COMM: 4800

Video Titler Display			Meaning
ddmmnmmmm*dddmmwmmmm			position: latitude, fix dot, longitude
hh:mm:ss	hhh.h	aaaaa	data: UTC hours, minutes, seconds heading in degrees, altitude in feet

5.15 Trimble TAIP

Video Titler Setup
MODE: TNL TAIP
COMM: 4800

Video Titler Display				Meaning
ddnddddd*dddwdddddd				position: latitude, fix dot, longitude
sssss	q	vvv	hhh.h	data: UTC seconds, quality, speed, and heading in degrees

TAIP latitude/longitude is in decimal degrees
TAIP time is seconds of the day

TAIP quality number 0=2D, 1=3D, 2=2D differential, 3=3D differential
TAIP speed is miles per hour

5.16 APOLLO 2000 MAP

Video Titler Setup
MODE: APOLLO 2000 MP
COMM: 4800

Video Titler Display		Meaning
ddmmnmmmm*dddmmwmmmm		position: latitude, fix dot, longitude
hhh.h	sss.s	data: heading in degrees magnetic speed is in knots

5.17 NAVSTAR GPS2D/3D

Video Titler Setup
MODE: NVS GPS2D/3D
COMM: 4800

Video Titler Display:			Meaning
ddmmnmmmm*dddmmwmmmm			position: latitude, fix dot, longitude
hh:mm:ss	q	mmm-dd	data: UTC hours, min, sec, quality month (eg. JUL), day

5.18 NAVSTAR UTM

Video Titler Setup
MODE: UTM
COMM: 4800NP or 1200NP

Video Titler Display:	Meaning
e1234567 n7654321 zz	position: eastings, northings, zone
hh:mm:ss mm-dd-yy h	data: time, date, hemisphere

For UTM eastings and northings are in meters, zone is a 2-digit number, hemisphere is N or S.

5.19 GPS/Video Titling Accuracy

The position accuracy of the caption titles depends on:

1. The accuracy of the GPS receiver computed positions.
2. The movement in the video image from moment of a position fix to the moment when the GPT-50 receives data and inserts the caption.
3. The geometric relation between the pointing spot of the video and the position of the GPS antenna (for example, the video is pointed vertically down to a point on the ground exactly under the antenna).

A GPS receiver with real-time differential correction is normally used to achieve position accuracy. When the video camera and GPS receiver are moving (on a vehicle or aircraft), the dynamic tracking performance of the receiver is important. The latency delay of the receiver data output is also of increasing importance as the rate of movement increases (fast vehicle or aircraft speeds).

The GPT-50 video input is passed to the video output with the GPS position and/or other data inserted as a caption. Each new GPS caption appears in the video very shortly after being received by the GPT-50. The maximum delay after reception is one video field (1/60th second in NTSC and 1/50th second in PAL). The new caption remains in the video until it is overwritten by the next GPS serial data input. New position data is typically received once per second. The arrival of new GPS position data is marked by a dot between the latitude and longitude for 1/10th second.

In addition to differential correction and dynamic tracking, a GPS receiver well suited to providing position captions to rapidly moving video is one in which the data is output consistently and occurs a short time after the position fix (small and constant latency delay). For a good receiver, the latency might be 0.25 second after the fix and normally within limits of 0.20 second to 0.30 second. When used to caption video from a moving vehicle, the point on the video record which corresponds exactly to the position shown in the caption actually occurs 0.20 seconds (6 NTSC video frames, 5 PAL video frames) before the caption appears.

The uncertainty in the delay described above is no more than one video frame. At an airspeed of 150 miles per hour for example , the uncertainty in position due to 1 video frame of latency variation is approximately 9 feet.

The GPS position given in the caption is the latitude/longitude of a point directly below the receiver antenna. If the video camera is not pointed vertically down, an additional position error will be introduced. For example, at 1000 feet altitude with the video camera pointed vertically down with an error of only 0.5 degree, the resulting position error will be 9 feet. The 9 foot position error due to 0.5 degree pointing error or due to one video frame of data latency variation are on the same order as the real-time differential accuracy currently provided (1 to 5 meters).

Not all GPS receivers have small and consistent latency delays. Some have delays exceeding

one second with variability on the order of one second. For applications requiring accurate video

positions, the latency effect must be taken into consideration. Receivers with long and variable

latency delays will significantly degrade the GPS/Video position accuracy.

6 MANUAL TITLE MODE OPERATION

6.1 Manual Title Mode

The Manual Title Mode allows operator entry of alphanumeric static titles inserted in the video by the GPT-50. The unchanging titles can be added to unused character positions for additional annotation to be included in the GPS Title Mode, or used by themselves, for example, to provide a titled header to the video recording. The Manual Title Mode also provides a way to erase all characters displayed on the screen, to insert and delete characters on the screen, and to shut off the GPS title insertion without shutting off power to the GPT-50.

6.2 Entering the Manual Title Mode

Manual Title Mode is entered by actuating the MODE switch up after power turn-on (or any time in the GPS Title Mode). Characters can then be entered locally using the GPT-50 front panel POSITION and CHAR switches. Serial data from your GPS receiver is ignored when in the Manual Title Mode.

NOTE:

Immediately after power up, the POSITION and CHAR switches operate to allow manual horizontal and vertical positioning of the display, rather than local entry of characters.

6.3 Local Character Entry

When Local Character entry is selected, the LED and cursor flash at 2 times per second. Characters are locally entered and displayed using the front panel POSITION and CHAR switches. These switches operate in much the same manner as those found on the simple titlers on many VCR camcorders. The POSITION switch selects a character's position, and the CHAR switch selects a particular character from various numeric, alpha, punctuation, and math symbols. You can actuate a switch for a single selection at a time, or hold it down for 2-seconds and cause automatic and rapid selection.

6.4 Character Set

When starting in the "+" direction, the character set goes from A-Z, 0-9, punctuation, math symbols, back to A-Z, etc. Starting "-" goes in exact reverse, proceeding from 9-0, then Z-A, math symbols, punctuation, etc.

These operations avoid having to go through the alphabet to get to the numbers, or go through the numbers to get to the alpha characters. A blank space character is placed between each group of characters for added convenience.

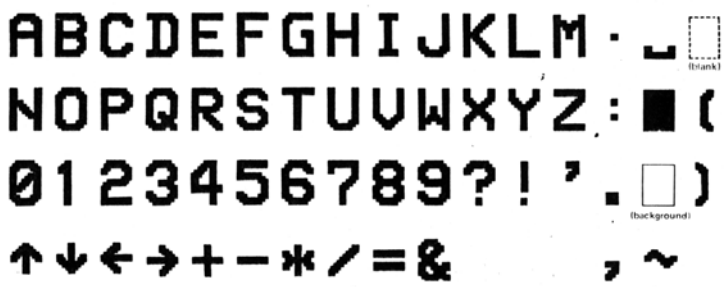


Figure 6-1, Character Set

6.5 Character Insert and Delete

Actuating the MODE switch again after already in Manual Title Mode changes operation of the POSITION and CHAR switches so that they can be used to insert and delete characters. In this mode the cursor and LED flash rapidly, at 4 times per second. The POSITION switches move the cursor, the CHAR switches insert spaces and delete spaces and characters. "+" inserts a space, "-" deletes a space or character. This function is especially useful for centering text or placing spaces between already entered text.

6.6 Display Off

Actuating MODE again after in the insert/delete mode turns the display off. Refer to Section 3.3 for additional information about entering and leaving the Manual Title Mode.

6.7 Clearing the Display

The display screen is cleared if the (up-arrow) and (+) switches are actuated together after Manual Title Mode is first selected (cursor blinking 2 times per second). The combined actuation of the two switches is labeled as CLR (clear) on the front panel.

7 MAINTENANCE

7.1 Cleaning

1. Do not attempt to disassemble your GPT-50 to clean it.
2. Clean your GPT-50 using only a damp cloth.
3. NEVER use water or solvents such as alcohol, window cleaner, etc., to clean your GPT-50.

7.2 Service and Troubleshooting

If you suspect your GPT-50 is not operating properly, check the following:

1. Check all coaxial cables for opens or shorts.
2. If using an AC power adapter different from the one supplied with the GPT-50, make sure it supplies the GPT-50 with at least 9 volts (maximum of 14 volts) when the GPT-50 is switched on.

You may return your GPT-50 to HORITA for service. Please contact HORITA first, either by phone or mail, before returning your unit.

7.3 Adjustments

Adjustments are provided for video amplitude and horizontal character size. These adjustments do not normally require service. The GPT-50 should be powered up for 1/2 hour before any adjustments are performed.

Access to the video LEVEL and horizontal size adjustments are made by removing the two front panel screws, then the front panel and bezel, then sliding the bottom cover off towards the front. The video LEVEL and H-SIZE adjustments are labeled and are located on the circuit board.

If you have a Rackmount or Shortrack packaged GPT-50, remove the four screws from the top cover and remove the cover.

All adjustments are located on the circuit board as shown in Figure 7-1.

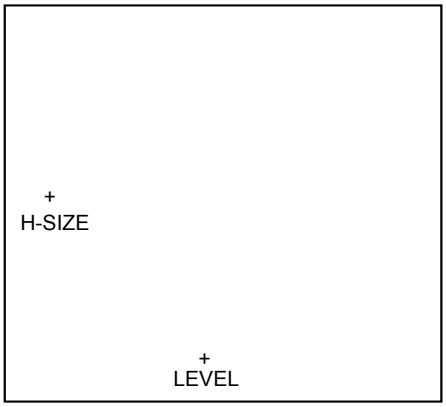


Figure 7-1, Adjustment Locations

7.4 Video Level Adjustment

Note that the video LEVEL control permits minor adjustment of the video level and is set at the factory for an output amplitude of 1 volt out with 1 volt in (unity gain). Although not recommended unless you have ready access to a NTSC waveform monitor (or oscilloscope) for re-calibration, the VIDEO LEVEL control can be used to compensate for slight amplitude variations resulting from cabling and termination values in your system.

NOTE:

If your GPT-50 has "S" connectors, use the appropriate "S" video signal generators, cables and other equipment.

1. Input a composite video signal of 1 volt p-p to the GPT-50 VIDEO IN connector.
2. Using a coaxial cable of not more than 6' of RG-59/U, connect a NTSC video waveform monitor (or oscilloscope) to VIDEO OUT and terminate at 75-Ohms +/-1%.
3. Adjust video LEVEL control for a peak-to-peak video level of 1 Volt +/-7 IRE (.05 volt).

7.5 Horizontal Size Adjustment

1. Switch the GPT-50 MODE to SETUP to display the setup screen.
2. Adjust H-SIZE control for a horizontal size that fills the screen and leaves equal borders on the left and right sides.
3. If smaller size characters are desired, the H-SIZE can be adjusted to make them smaller, although this will move the setup screen off center to the left.

7.6 NTSC or PAL Selection Jumper

The GPT-50 will operate in either NTSC or PAL television standard video formats. The video format selection is made with an internal shorting jumper plug on the circuit board inside the GPT-50. The internal jumper is factory set to the standard specified at the time of order. When the jumper is in the NTSC position, the version number displayed on line 9 of the setup screen has a N suffix (V200N). When the jumper is in the PAL position, the version number has a P suffix (V200P).

Access to the jumper in the desk-top chassis is obtained by removing the front cover (2 screws) and sliding out the bottom cover. For the rackmount chassis remove the top cover (4 screws). Viewing the internal circuit board with the GPT-50 back panel on your right the NTSC/PAL jumper is one of two (HD2) adjacent to the 40 pin IC (U8). The jumper (shorting pins 1-2) nearest the adjacent 10 contact connector is always required. Do not change it. The jumper further away from the 10 contact connector is moved to a storage position contacting only pin 4 when PAL is selected. To select NTSC, place the jumper plug shorting pins 3 and 4.

8 SPECIFICATIONS

Power

Operation	9-to-14V DC, 250 milliamperes
Connector	2.5mm coax DC power plug
AC Adapter	9 Volt, 500 milliamperes

Video

Standard Input	NTSC 525 line, 60 field, RS-170A PAL 625 line, 50 field
Level	1-Volt p-p
Impedance	75-Ohm

Connectors

Video In	BNC (or "S")
Video Out	BNC (or "S")

Serial In	DB9 Male
Serial Out	DB9 Female
Power	2.5mm coax DC power jack

Switches and Controls

Power	On/Off Toggle Switch with Red LED
Mode	Toggle
Position	Toggle
Char	Toggle

Environment

Operating	5C to 40C (41F to 104F)
Storage	-10C to 60C (14F to 140F)

Dimensions

1.75"H, 3.5"W, 4.5"D

Weight

Approximately 13 Oz. (shipping weight approx. 29 Oz., including power adapter)

Specifications subject to change without notice.