TRANSPAK

GPS Personal Navigator

Operation & Maintenance Guide

*Trimble*Navigation

WARRANTY

As an expression of confidence in our products to continue meeting the high standards of reliability and performance that our customers have come to expect, Trimble Navigation products are covered by the following limited warranty.

Limited Warranty

Trimble Navigation Limited warrants its products to be free from defects in material and workmanship for a period of one year from the date of sale by our authorized dealers to an original purchaser or subsequent owner.

This warranty covers repair and/or replacement, at our option, of any part or parts found to be defective, provided such defects, in our opinion, are due to faulty material or workmanship and are not caused by unauthorized or improper repair or abuse, or normal wear. Buyer shall be responsible for shipping and insurance of all products returned for repair under this warranty. Trimble Navigation will pay shipping and insurance for all TNL products returned to buyer provided that the products returned prove defective under this warranty.

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MANUAL IMPROVEMENT

Please help improve our manuals by sending comments and suggestions to our headquarters in Sunnyvale, California *(see address on the rear cover)*. Thank you.

TRANSPAK

GPS Personal Navigator

Operation & Maintenance Guide

Part Number TNL 16141

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GLOSSARY

The following abbreviations are used in this manual:

ALT	Altitude
AUTO	Automatic 2D/3D
BRG	Bearing
CDI	Crosstrack distance indicator
CLR	Clear
COG	Course over ground
DEC	Decrement
DEG	Degrees
DIST	Distance
DM.	Degree, Minutes, Decimal Minutes coordinate system
EDT	Edit
English	English units of measure
ETA	Estimated time of arrival
ETE	Estimated time enroute
EXT	External
FIX	Position fix
GMT	Greenwich Mean Time
GPS	Global Positioning System
GS	Ground Speed
HDG	Heading
INC	Increment
INT	Internal
Km	Kilometers
KPH	Kilometers per hour
KTS	Knots
LAT	Latitude
LCD	Liquid Crystal Display
LOC	Local time
LON	Longitude
m	Meters
M	Magnetic north reference
Metric	Metric units of measure
MG	Magnetic north reference
MI	Miles
MPH	Miles per hour
NAD	North American Datum
Nautical	Nautical units of measure
NM	Nautical mile
POS	Position
R/B	Range and bearing
REM	Time remaining
RNG	Range
SOG	Speed over ground
SV	Space vehicle or satellite
STS	Status
T	True north reference
Tr	True north reference
TTG	Time to go
UTC	Universal Coordinated Time (same as GMT)
VEL	Velocity
WPT	Waypoint
XTE	Crosstrack error
2D	Two dimensional
3D	Three dimensional

Months of the year: JAN FEB MAR etc.

Days of the week: SUN MON TUE WED THU FRI SAT

Latitude and Longitude hemispheres:

N (north) S (south) E (east) W (west)

Great Circle: The shortest distance between two points on the surface of a sphere.

INTRODUCTION

Congratulations on your selection of the Trimble Navigation TRANSPAK GPS Personal Navigator! The TRANSPAK is a rugged, portable navigation device which receives and uses signals from the Global Positioning System (GPS) satellites to determine the time of day and your position, velocity, distance from locations, and time of arrival at a destination.
The TRANSPAK is a three-channel receiver that can track two satellites on two channels while sequencing on the third channel. This provides very stable velocity, heading and position solutions under acceleration. In addition, LAND, SEA, or AIR modes can be selected to optimize the receiver dynamics for land, sea, or air navigation situations.

Your TRANSPAK was fully tested at the factory and will provide years of trouble-free operation.

ABOUT THIS MANUAL

This manual provides information to quickly familiarize you with the TRANSPAK and enable you to use it to perform positioning and navigation functions.

The manual is arranged in three main parts:

Description: describes the Global Positioning System (GPS) and the TRANSPAK receiver, identifies the controls, indicators, and connectors, and defines basic operations.

Operation: describes how to prepare the TRANSPAK for use, defines the functions it can perform, and provides essential information for each of the display formats.

Maintenance and Reference: describes operator maintenance and provides a list of the reference datums built into the unit. The manual is organized for ease of use. In most cases, example screens or figures are presented on the left-hand page, and the corresponding text is located on the right-hand page. In the Operation section, the descriptions of the operations are arranged in the same order as the rotary switch positions which select them.

For clarity, the same abbreviations displayed by the unit are used throughout the manual; refer to the Glossary for their meanings.

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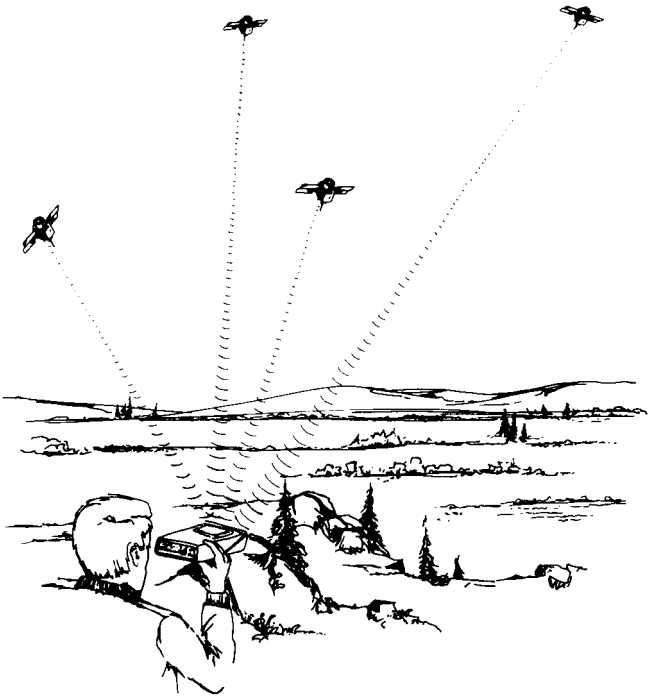
GPS and the TRANSPAK



GLOBAL POSITIONING SYSTEM (GPS)

GPS is a satellite-based radio navigation system. The system ultimately will be a constellation of 21 active satellites and 3 spares in orbits around the earth. This configuration will ensure worldwide operation with 24-hour, all-weather coverage. Each satellite transmits data that enables GPS receivers to provide precise position and time.

NOTE

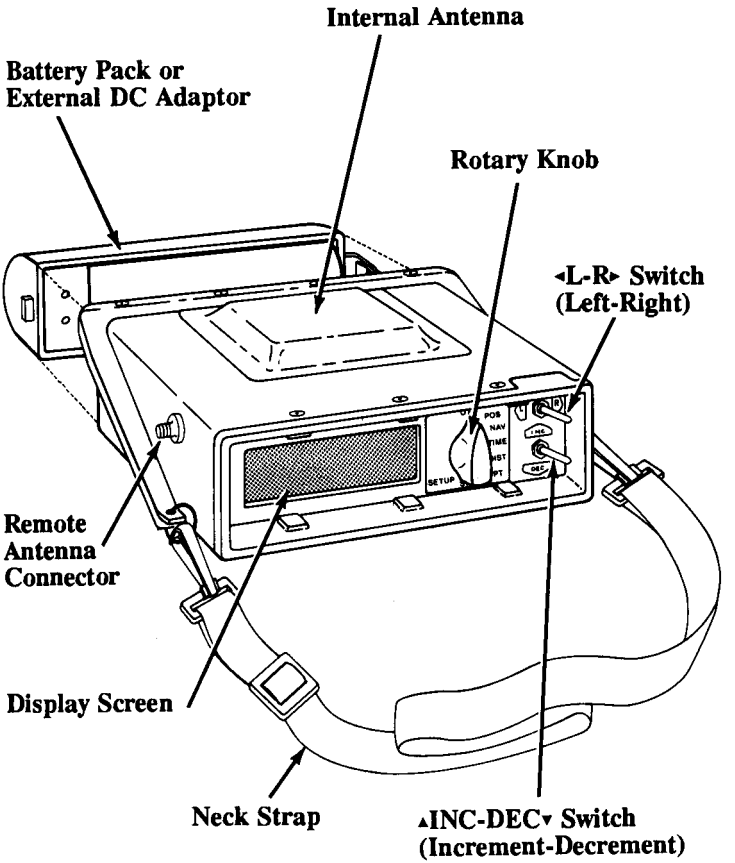
Until the constellation is complete, coverage may be limited to specific hours of each day in certain areas of the world.

TRANSPAK

The **TRANSPAK** GPS Personal Navigator is a hand-held, battery-powered navigation set that receives data from GPS satellites and calculates and displays position, velocity, time, and navigational data in any one of three operational modes: land, sea, and air. Three-dimensional fixes are obtained when tracking 4 or more satellites; 2-dimensional fixes can be obtained from 3 satellites plus user-entered altitude.

The **TRANSPAK** receiver requires line-of-sight access to the satellite signals. Hold the unit level, with its intemal antenna facing toward the sky. GPS navigation signals are similar to light, so anything that blocks light will block or reduce the effectiveness of the signals. The more unobstructed view of the sky you have, the better your **TRANSPAK** will perform. Avoid placing your hands an or over the antenna when the **TRANSPAK** is in operation.

CONTROLS and INDICATORS



Display Screen
The TRANSPAK displays information on the backfit 4-line LCD screen. The screen contents are determined by the rotary knob and user-selected options.

Rotary Knob
This 8-position switch selects the type of operation that the TRANSPACK will perform—for example: "POS" (positioning) operations.

◀L-R▶ (Left-Right) Switch
This 2-way switch is used to select items on the screen (indicated by a flashing box). Momentarily pressing the switch to the left or right selects different screen items.

▲INC-DEC▼ (Increment/Decrement) Switch
This 2-way switch is used to walk through numbers, letters of the alphabet, or options (as on a list). Momentarily pressing the switch upward or downward changes the value of the selected item on the screen.

The ▲INC-DEC▼ switch is also used as a trigger when the selected screen item represents an action to be performed (indicated by brackets: <action>).

Both switches automatically repeat at a rapid rate when held on. This feature can be used to quickly roll up to high numbers or to scan past many screen items to select one farther on.

Low Battery
A battery symbol will blink in the lower right corner of thescreen in all knob positions to indicate a low battery condition. The TRANSPAK should be powered down and the batteries replaced or recharged when this symbol appears.

OTHER PARTS AND ACCESSORIES

Battery Packs

Two types of battery packs are currently available to support specific user requirements.

Standard:

Non-rechargable alkaline battery pack. This pack holds eight AA batteries and provides over 3-1/2 hours of continuous operation.

Optional:

Rechargable nickel-cadmium battery pack. This pack also provides over 5 hours of continuous operation; it can be recharged in about 16 hours.

Refer to Section 3, *Maintenance* (page 40), for procedures to remove or install battery packs, recharge the nickel-cadmium battery pack, and replace batteries in the alkaline battery pack.

External DC Adaptor

This adaptor enables the TRANSPAK to be powered by an external, 9- to 32-volt, 5-watt DC supply, such as a cigarette lighter outlet in your vehicle.

Refer to Section 3, *Maintenance* (page 40), for procedures to remove or install the adaptor.

OTHER PARTS and ACCESSORIES

Increased Storage Option

The standard **TRANSPAK** can store up to 99 waypoint descriptions in its internal memory. An optional configuration is available that will store up to 999 waypoint descriptions.

External Antenna Option

An optional external antenna with mounting hardware and cable is available for stationary mounting of the receiver antenna up to 50 feet (15 meters) from the TRANSPAK. The external antenna can be mounted to provide unobstructed satellite coverage if the **TRANSPAK** must be operated indoors or in a vehicle. When not in use, the antenna connector dust cover should be installed to keep the connector clean.

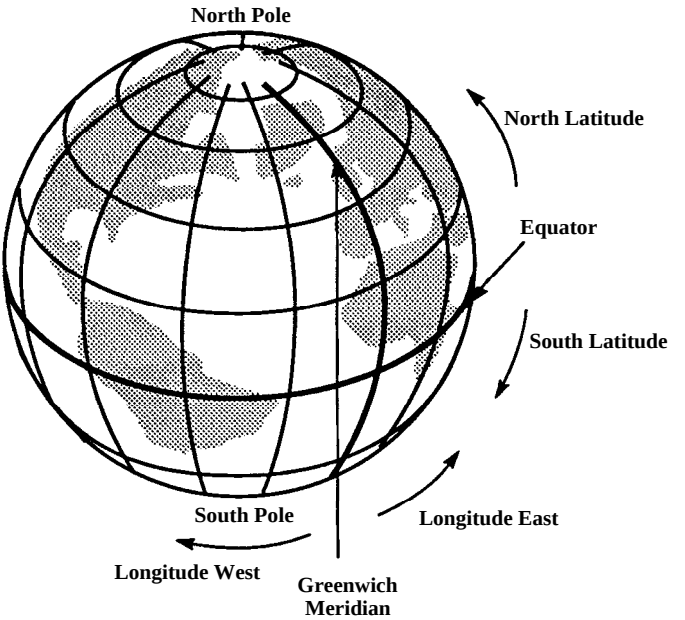
Other Items

- The camera-type neckstrap can be attached by clipping it to the rings on both sides of the **TRANSPAK**.
- Optional vehicle mounting brackets are available for the **TRANSPAK.**

COORDINATE SYSTEM

```
26AUG89  14:32:45UTC
LAT   27°  21.566'  N
LON  121°  55.265'  W
ALT  +      65ftAUTO-3D
```

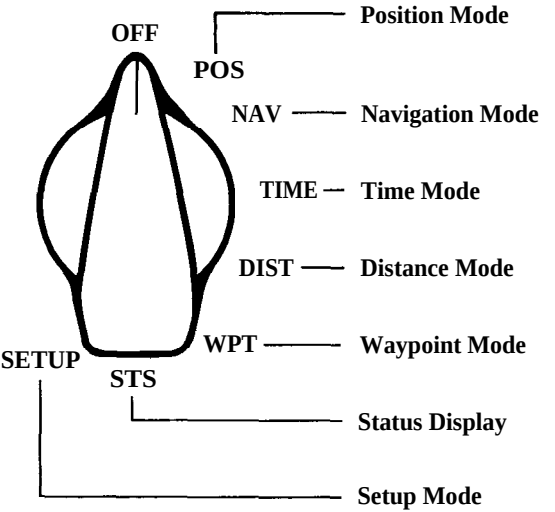
Typical POS screen; LAT and LON in DM. format.



COORDINATE SYSTEM

The **TRANSPAK** displays position information in the Degree, Minutes, Decimal Minutes (DM.) coordinate system. This is a latitude/longitude-based system, with position expressed in degrees and minutes. Minutes are displayed to one-thousandth of a minute in decimal form.

ROTARY KNOB POSITIONS



ROTARY KNOB POSITIONS

To select the type of operation that the TRANSPAK will perform, rotate the knob to:

OFF: The TRANSPAK powers down after a 15-second delay

POS: Displays time, date, latitude, longitude, altitude, and mode of operation.

NAV: Provides navigation data to a selected destination waypoint.

TIME: Displays time, date, and time enroute information.

DIST: Displays the distance and bearing between any two waypoints.

WPT: Edit, define, or clear up to 999 waypoints.

STS: Provides operating status information.

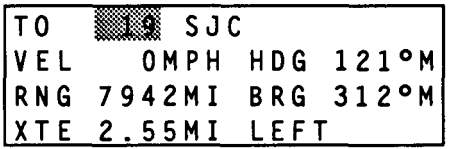
SETUP: Allows selection of display options.

Safety Information

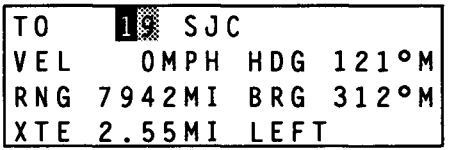
Be sure to read the important safety information on the inside rear cover before operating the TRANSPAK.

HOW TO CHANGE DATA

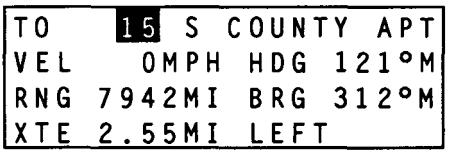
Typical Screens



Waypoint number selected by ◄ L-R ► switch.



Waypoint units digit selected by initial ▲INC-DEC ▼ switch toggle.



Waypoint digit modified by subsequent ▲INC-DEC ▼ switch toggles.

CAUTION

The ◄L-R► switch only selects screen items; it does not affect their values. However, ▲INC-DEC▼ alters the value of the selected item. Before using ▲INC-DEC▼, make sure the correct item is selected.

HOW TO CHANGE DATA

Most screens contain some user-alterable items. These may include numbers, letters, or options that can be changed, or "triggers" that cause an action. In this manual' s example screens, the alterable items are shown in reverse type.

On the screen, a flashing box indicates the selected item. The box is represented by a gray shading in the example screens. Use the ◄L-R► switch to select a different item. Pressing the switch once to the right selects the next screen item; left selects the previous item. At the last item, the next selection returns to the first item on the screen.

Using ▲INC-DEC▼ alters the value of the item or triggers the action. Pressing the switch upward once changes the value of the selected item on the screen to the next level; downward changes to the next lower value. At the highest value, the next step returns to the lowest value.

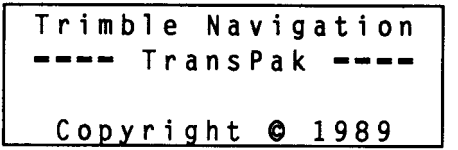
For example, to change the waypoint identifier from 19 to 15 in the TO line of the top screen (opposite page), use the ◄L-R► switch to move the flashing box to the waypoint number (19 on second screen). Press the ▲INC-DEC▼ switch once to open the item for modification; the digit 9 will flash. Then press the ▲INC-DEC▼ switch down four times to change the value to 5 (third screen).

Safety Timer

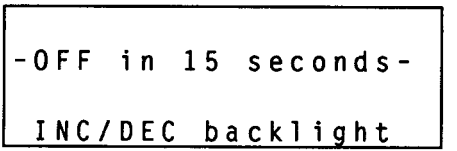
If no switches are pressed for 25 seconds, the selected item stops flashing and ▲INC-DEC▼ has no effect, thus preventing accidental changes. After this occurs, the ◄L-R► switch must be used to once again select an item to be changed.

TURN ON/OFF

Turn-On



Turn-Off



Turn-On

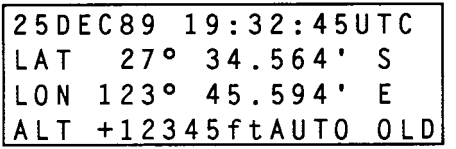
Turn the TRANSPAK on by tuming the rotary knob to any one of the operating positions. A brief sign-on message is displayed, while the TRANSPAK performs a self-test. No switches are active during this time. When the power-on sequence is completed, the rotary knob position determines the type of operation.

Turn-Off

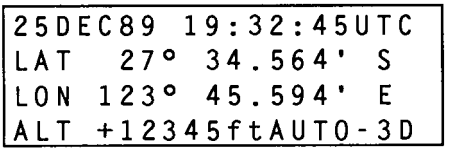
When you turn the rotary knob to OFF, the screen displays a 15-second countdown before power is turned off. During the countdown, you can return the TRANSPAK to full operation instantly by turning the rotary knob to another position.

Backlight Control

Pressing ▲INC-DEC▼ during the turn-off countdown varies the screen backlight level. The backlight is off when the TRANSPAK is first turned on. Increasing the backlight level increases battery wear.



Typical POS screen after the TRANSPAK is powered on but does not have a fix.



The TRANSPAK has locked onto four SVs and is getting position fixes.

GETTING STARTED: YOUR FIRST GPS FIX

To turn the TRANSPAK on, rotate the knob from the OFF position to the POS position. Your TRANSPAK was initialized at the factory with the date, time, and the location of Trimble Navigation. Initially, the POS screen will display the current date and time, and the LAT, LON, and ALT for Trimble Navigation. Once the TRANSPAK locks onto three SVs, the LAT, LON, and ALT fields are updated to reflect your position.

The operating mode is displayed in the lower right corner of the screen. OLD indicates that the TRANSPAK is not performing position fixes. This is to be expected when die TRANSPAK is first powered on.

Your TRANSPAK can provide a fix in as little as 1 second, assuming that at least three SVs are "visible" to it. However, it may take as long as 5 minutes to get that first fix if the unit has been moved thousands of miles while powered off. You can expect to get your first position fix within 5 minutes with subsequent fixes at 1-second intervals. Refer to *Troubleshooting The TRANSPAK* (page 44) if you are not getting fixes after 5 minutes of operation.

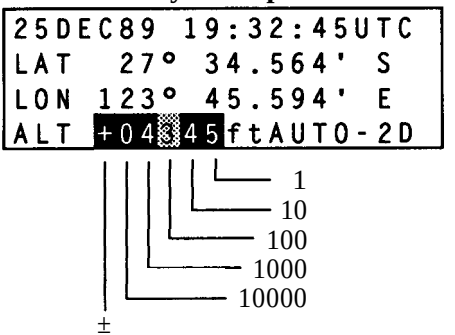
The screens on the opposite page are typical for the POS position.

POS

```
25DEC89 19:32:45UTC
LAT   27° 34.564' S
LON 123° 45.594' E
ALT  02345ftAUTO-2D
```

Altitude can be modified when AUTO is selected in the SETUP position and the TRANSPAK *drops into 2D operation. A blinking ALT field must be updated.*

Altitude Entry Example



Example:
To set altitude to 4345 feet:

- move to ± position and toggle to +
- move to 10,000 position
  - if it already contains a value, set it to 0
  - if it is already at 0, ignore it
- move to 1,000 position and set it to 4
- move to 100 position and set it to 3
- move to 10 position and set it to 4
- move to 1 position and set it to 5

Position information is displayed when the rotary knob is set to POS. If position fixes are not being performed (as when the TRANSPAK is first turned on), the word OLD will appear in the lower right corner of the display, indicating that the position is old.

Line 1 of the display shows the date and the time (a 24-hour clock is used) in either UTC, GMT (or Zulu), or local time. Local time is not labeled. Lines 2 and 3 show the position coordinates in degrees and minutes. Line 4 shows the altitude in either meters or feet and the mode of operation of the TRANSPAK (AUTO, 3D or 2D).

Entering Altitude

If the TRANSPAK is providing 2D fixes, you must manually enter an altitude. The altitude contains a 5-digit number preceded by a sign to indicate above (+) or below (-) sea level. Select the item by using the ◄L-R► switch.

Change to the proper sign by pressing the ▲INC switch, then use the R► switch to move to the first non-zero digit and toggle in the desired value. If the remaining digits are zeroes, you are done; if other values are required, continue with the R► and ▲INC switches until all non-zero values are displayed.

Only altitudes between -500m (-600ft) and +20000m (65000ft are allowed.

Altitude also can be entered in the SETUP Position.

Auto/2D/3D Operation

The TRANSPAK provides either 3D or 2D fixes. In AUTO mode, TRANSPAK uses signals from 4 SVs to provide position fixes in 3 dimensions including altitude. If only 3 SVs are available, 3D fixes are not possible; the TRANSPAK then performs 2D fixes (no altitude). The TRANSPAK uses the last altitude either calculated by a 3D fix or entered by the user. **The accuracy of the 2D fix depends on the accuracy of the estimated altitude.** The lower right corner of the screen shows either AUTO-3D or AUTO-2D if the TRANSPAK is performing position fixes, or AUTO-OLD if no fixes are being made.

If the TRANSPAK is in AUTO mode and has been receiving signals from 4 SVs and loses contact with one of them, it switches from 3D to 2D operation. If you do not enter a new altitude value within 30 minutes, or if you move more than 1 mile from the position of the last 3D fix, the altitude field flashes, indicating that you should enter a new altitude. When 3D fixes resume, the TRANSPAK resumes display of the GPS-calculated altitude.

Your TRANSPAK typically is accurate to within 25 meters horizontally. Selective availability, a Department of Defense program to deny full GPS accuracy to unauthorized users, deliberately corrupts the GPS satellites' radio signals. When obtaining a 3-dimension position fix, vertical (altitude) errors are 2 to 3 times worse than the horizontal errors (e.g., if your longitude is off by 25 meters, your altitude may be off by 50 meters).

Manual 2D/3D Operation

Manual 2D

Manual 2D operation is intended for boating and other applications in which the altitude is not of concern. It provides for entering a fixed altitude once and having the TRANSPAK perform 2D fixes without the need to update the altitude.

NOTE

It is vitally important that the altitude entered in manual 2D operation be correct to obtain accurate 2D fixes.

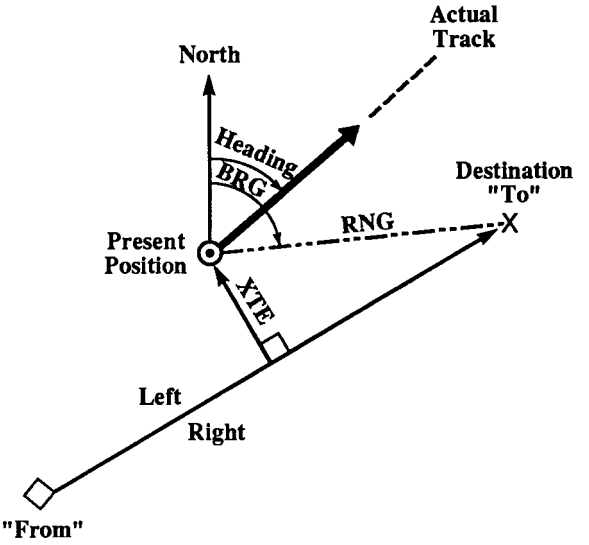
The best way to ensure a correct altitude is to take a series of AUTO-3D fixes and use the GPS-calculated altitude when running in manual 2D.

Manual 3D

This mode is intended for the aviator and applications where an estimate of altitude is just not good enough. Manual 3D operation provides for 3D fixes only. When 3D fixes are no longer possible, TRANSPAK will blink OLD until 3D fixes resume.

NOTE

Manual 2D/3D Operation is selected in the SETUP position.



TO	21 SFO		
VEL	55MPH	HDG	33°M
RNG	62MI	BRG	41°M
XTE	0.34MI	RIGHT	

(Screen shown in Land mode)

The NAV knob position displays data to help you navigate from your present position to another position. In the NAV position, the TRANSPAK presents the Land, Sea, or Air screen format selected in the SETUP position.

A typical Land screen is shown on the opposite page. The NAV screen uses two waypoints to establish the great circle course between them. The NAV screen displays your velocity and heading, the range and bearing to the TO waypoint, and your distance (XTE) from the optimal course between the FRM waypoint and the TO waypoint. The TO field can be toggled between TO and FRM using the ▲INC-DEC▼ switch to display the TO and FRM waypoints, respectively. Another TO or FRM waypoint can be selected from the waypoint library by modifying either the waypoint number or the waypoint label.

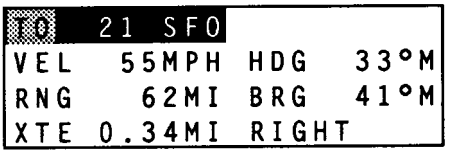
For example, to change the TO waypoint from 0 to 1, press the ◀L-R▶ switch one time to the right. The waypoint number field will blink. Press the ▲INC-DEC▼ switch once to open the number field for modification; press it a second time to change the 0 to a 1. Whenever the TO waypoint is changed, the FRM waypoint is reset to your present position, thus defining an optimal course from where you are now to the TO waypoint.

Navigating with TRANSPAK

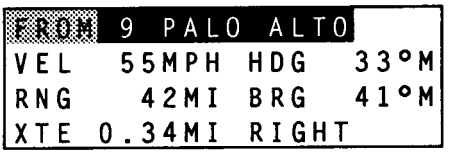
The figure on the opposite page shows how the present position is used to derive the range (RNG) and bearing (BRG) to the destination and how the velocity is used to find the heading (HDG). When a FRM waypoint is specified, the cross-track error (XTE) is calculated as the perpendicular distance from the unit's position to the straight line track between the source and destination.

NAV

Land Mode

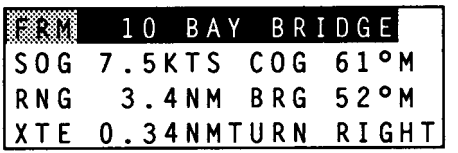


The ◄ L-R ► key selects the TO field.The ▲INC-DEC ▼ key toggles between the TO and FRM waypoints.



Sea Mode

The ◄ L-R ► key selects die TO field. The ▲INC-DEC ▼ key toggles between the TO and FRM waypoints.



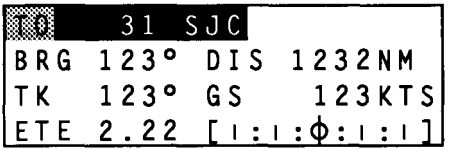
LAND Mode

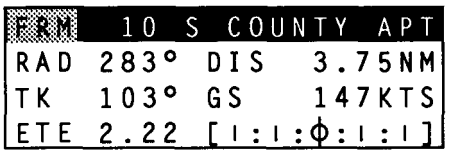
This display provides the information required when you are traveling to your destination on foot or by car. Velocity, heading, range, bearing, crosstrack error, and direction are displayed. Right crosstrack error indicates that the track between the FRM and TO waypoints is to your right.

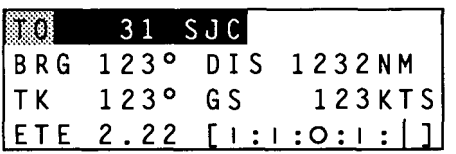
SEA Mode

This display provides the information required when you are at sea. Speed over ground, course over ground, range and bearing, crosstrack error, and direction are displayed. The crosstrack error tells you which way to turn to reduce the crosstrack error.

Air Mode







Turn right; 2 NM left of course.

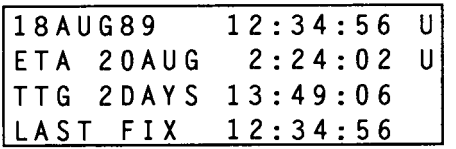
AIR MODE

This display provides the information required when flying to a waypoint. Bearing, distance, track, ground speed, estimated time enroute, and a course deviation indicator (CDI) are displayed. The CDI is calibrated to 1 unit (kilometer, statute mile, or nautical mile) of crosstrack error between vertical bars on the CDI. To reduce the crosstrack error, turn in the direction of the blinking vertical bar on the CDI.

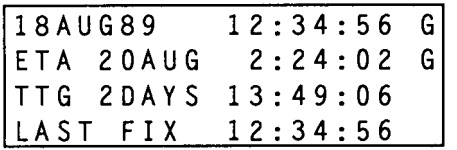
In all three modes (Land/Sea/Air), if the TRANSPAK is not doing position fixes, the numbers displayed in VEL, RNG, BRG, etc. are replaced by asterisks. The units of measure for the display fields are selected by the METRIC/ENGLISH/NAUTICAL field of SETUP.

In the AIR mode, when the TO field is toggled to FRM, the BRG field changes to RAD and displays the radial from the displayed waypoint. The DIS field also displays the distance from the displayed waypoint. This is useful when you are flying away from a VOR.

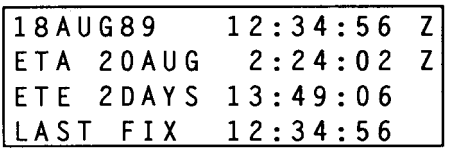
TIME



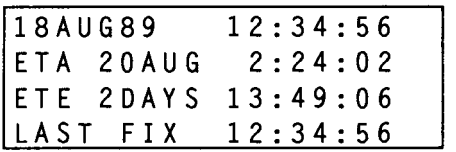
Land mode; local time offset is zero.



Sea mode; local time offset is zero.



Air mode; local time offset is zero.



All modes with a local time offset.

The TIME knob position displays the date and time (24 hours, UTC or local), the estimated time of arrival (ETA), the time to go (TTG), and the time of the last fix (LAST FIX). Date of arrival is not indicated. In AIR mode, estimated time enroute (ETE) is displayed rather than TTG.

The time of arrival and time to go are based on data entered in the NAV knob position. If the TO waypoint on the NAV screen is changed, ETA and TTG/ETE change accordingly.

The ETA and TTG/ETE fields are filled with asterisks if the **TRANSPAK** is not performing position fixes, or if you are moving away from the TO waypoint.

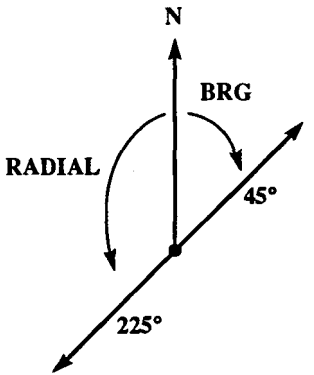
DIST

TO	31 SJC
FRM	15 S COUNTY APT
BRG	92° DIS 5.15NM

The distance screen in Land and Sea modes.

TO	31 SJC
FRM	15 S COUNTY APT
BRG	92° DIS 5.15NM
RADIAL	272°

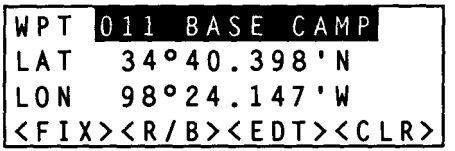
The distance screen in Air mode.



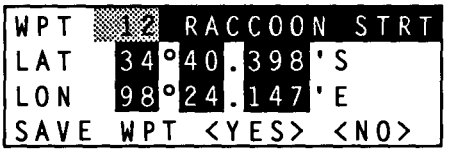
DIST

The DIST knob position calculates the range and bearing between any two waypoints, using a great circle route. The TO and FRM waypoints are selected by modifying either the wayoint numbers or waypoint labels to find the desired waypoints. It is not possible to modify the contents of a waypoint from the DIST knob position. The distance units (Km/MI/NM) and the bearing (T/M) are selected by the SETUP field (METRIC/ENGLISH/NAUTICAL) and (TR/MG).
The radial to the FRM waypoint is supplied in the Air mode.

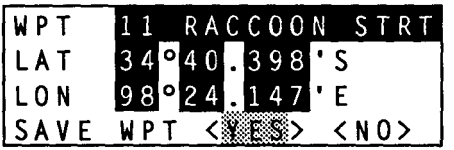
WPT



The Waypoint screen.



The initial Edit Waypoint subscreen.



Copying waypoint 12 into waypoint 13.

The WPT (Waypoint) knob position enables you to display, edit, and clear up to 99 waypoints (999 in optional configuration). Rotating the knob to WPT displays the waypoint selection screen. You can search for a waypoint, or enter one of the modes defined by the triggers (<FIX>, <EDT>, <R/B>, <CLR>) on the bottom of the display. You cannot modify or erase waypoints from the initial waypoint screen.

You may select a waypoint from the waypoint library by number, by label, or by alphabetic search.

Selecting a Waypoint by Number

To select a waypoint by number, press the ◄L-R► switch until the waypoint numeric field is highlighted. Then press the ▲INC-DEC▼ switch to open the numeric field for modification and use the ▲INC-DEC▼ switch to modify the number. Once the field has been opened for modification, use the ◄L-R► switch to move between the units, tens, and hundreds digits.

Selecting a Waypoint by Label

To select a waypoint by label, use the ◄L-R► switch to highlight the waypoint label field. Press the ▲INC-DEC▼ switch once to open the field for modification. Then use the ▲INC-DEC▼ switch to select characters within the label field and the ▲INC-DEC▼ switch to alter the selected characters.

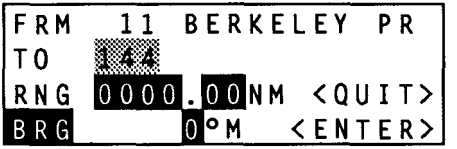
When the ▲INC-DEC▼ switch is pressed, the highlighted character is modified to either the next or prior character and the waypoint library is searched for a match on the character string to the left of and including the modified character. If no match is found, the character is incremented or decremented again and another search is performed. If a next higher/lower label is found in the waypoint library, it is displayed. If the character string to the left of the selected character is unique, the label field will not change.

Selecting a Waypoint by Alphabetic Search

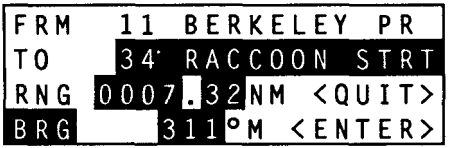
The alphabetic search field is located between the numeric field and the label field. When the alphabetic search field is selected using the ◄L-R► switch, a character is displayed in the space between the numeric field and the waypoint label. Pressing the ▲INC-DEC▼ switch up displays the next alphabetic waypoint label; pressing it down displays the prior alphabetic waypoint. This provides a quick method of scanning the waypoint library.

Triggers

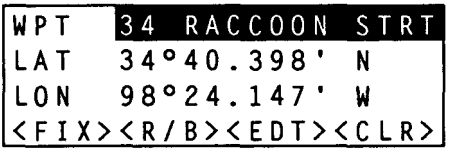
The <FIX> trigger stores the current fix into the next empty waypoint. The search for an empty waypoint begins with the displayed waypoint and is stored in that waypoint if it is empty. After the fix is stored, the waypoint into which the fix was deposited is displayed. The waypoint label field is filled either with the time if the fix was current or with the designator OLDFIX if the fix was old. You can edit the waypoint to rename the time. Time is stored as hours minutes seconds in six digits. The <EDT> trigger opens the currently selected waypoint for modification. The waypoint number can be modified, which will copy the waypoint data into a new waypoint (copy a waypoint). The waypoint label field can be modified by moving into the label field and using the ▲INC-DEC▼ keys to scroll through the alphabet and numbers. The LAT and LON fields can be modified by selecting the field to alter and using the ▲INC-DEC▼ switch to scroll the numeric field. The newly altered waypoint is saved by selecting the <YES> field and pressing ▲INC-DEC▼ in either direction. The edits can be discarded and the waypoints left unchanged by selecting the <NO> field and pressing the ▲INC-DEC▼ switch.



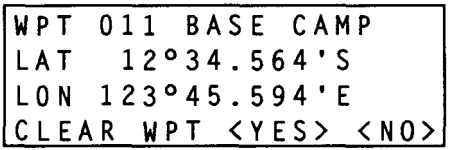
The initial Range/Bearing subscreen.



The Range/Bearing subscreen just prior to creating the Raccoon Strt. waypoint.



Waypoint 12, Raccoon Strt., has been created.



Clear Waypoint subscreen.

The <R/B> trigger defines a second waypoint with a range and bearing offset from the selected waypoint. The R/B screen displays the selected waypoint on the first line. The second line displays the number of the next empty waypoint. The waypoint number and the label field can be modified to name the new waypoint and to deposit it into any waypoint number. Modify the range and bearing to define the new waypoint.

The <ENTER> trigger stores the new waypoint and returns to the waypoint screen with the LAT/LON of the new waypoint displayed.

The <QUIT> trigger returns to the waypoint screen with no modifications made to the waypoints. Note that the distance units of the range are selected by the METRIC/ENGLISH/ NAUTICAL field of SETUP and that the bearing units are either magnetic (M) or true (T), based on die MG/TR field in SETUP. The <CLR> trigger is used to clear a waypoint. You can clear the selected waypoint by moving the blinking cursor to the <CLR> trigger with the ◄L-R► switch and pressing the ▲INC-DEC▼ switch in either direction. The currently selected waypoint is displayed with the prompt CLEAR WAYPOINT <YES> <NO>; <YES> is highlighted. Pressing the ▲INC-DEC▼ switch clears the waypoint and the next sequential waypoint is displayed. A range of waypoints is cleared by pressing the ▲INC-DEC▼ switch a number of times. To return to the Waypoint screen, select the <NO> field using the ◄L-R► switch and press the ▲INC-DEC▼ switch.

In the Air mode, the BRG field can be toggled between BRG and RAD to enter either a bearing to or a radial from a waypoint.

STS

```
TRACKING 3 SV's
GPS/AUTO2D OK ±100FT
NEXT FIX 14:34 2:40
INT ANTENNA
```

```
TRACKING 3 SV's
CALCULATING WINDOW.
CYCLE:  0014
    ANTENNA
```

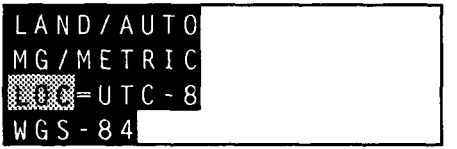
The STS knob position displays the status of **TRANSPAK**. Line 1 presents the number of satellites that the **TRANSPAK** is tracking. Four SVs are required for 3D fixes. Three SVs are required for 2D fixes.

Line 2 presents the current state of the GPS receiver: OK indicates the **TRANSPAK** is making position fixes; N/A indicates that insufficient satellites are visible to make a fix; BAD indicates either that sufficient SVs are available but they are positioned such that a fix is not possible or that a receiver error has occurred; see page 44. The estimated accuracy of the fix is displayed if the **TRANSPAK** is making position fixes.

Line 3 indicates the window of satellite availability. 24-hour GPS coverage will be possible when the full complement of satellites has been launched. Until that time, there will be windows of GPS availability. If you are presently within a window of availability (sufficient SVs are visible), line 3 presents the amount of time remaining in the current GPS window and the start of the next window (REM 1:30 NEXT 14:14). If you are not now within such a window, line 3 shows the starting time of the next window and its duration (NEXT FIX 18:45 6:20). Time is displayed as local or UTC, as selected in the SETUP position.

Line 4 lists the operable antenna (INT or EXT for the internal or external antenna, respectively).

SETUP



Setup screen: Land mode, AUTO 2D/3D, magnetic heading, metric units of distance, local time, WGS-84 datum.

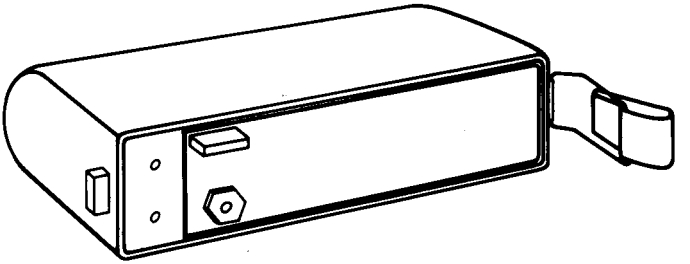
Setup screen: Land mode, 2D, ALT = 00, magnetic heading, metric units of distance, local time, WGS-84 datum.

The Setup screen.

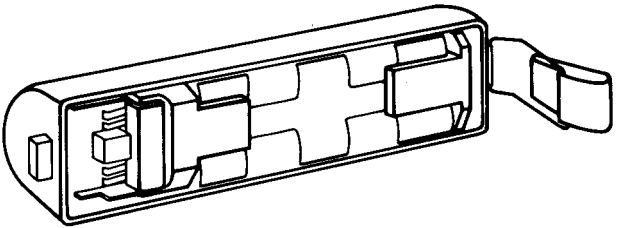
The SETUP knob position displays the current display options. Each of the SETUP fields can be modified.
Time can be displayed in UTC, GMT, Zulu, or 24-hour local time. When in the SETUP position, to adjust **TRANSPAK** time to local time, use the ◄L-R► switch to move the blinking cursor to the UTC field. Use the ▲INC-DEC▼ switch to set the local time offset from UTC time. When you return to another position of the rotary knob, the correct local time will be displayed.

The LAND/SEA/AIR field tailors the **TRANSPAK** for land, sea, or air operation. The AUTO/2D/3D selects the type of fix provided by the **TRANSPAK**. For a more detailed description of AUTO/2D/3D, see the POS section (pages 18 and 19). MGR/TR selects either magnetic or true north for all heading information. NAUTICAL/METRIC/ENGLISH selects the distance units.

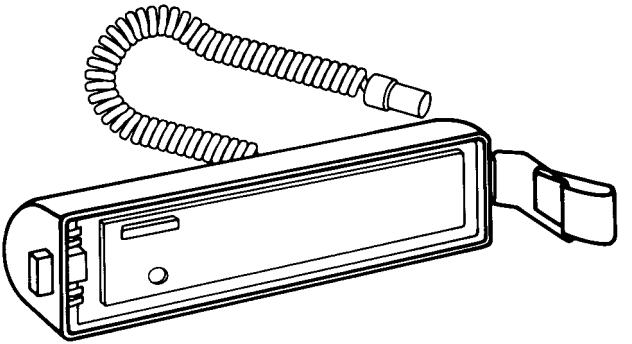
The last field selects the datum for LAT/LON display. All maps have a reference earth model, or datum, relative to which the information on the map is accurate. By selecting a datum, you select a LAT/LON correction which is applied to all LAT/LON displays. The correction is the difference between the GPS location of the datum and the survey's location of the datum. The LAT/LON displayed in POS and WPT will vary as the datum is varied. It is important to select the correct datum for the map you are using to have fixes that agree with the map you are using. A list of the datums included in the **TRANSPAK** is provided on page 46.



Rechargeable NiCad Battery Pack



Alkaline Battery Pack
(Holds 8 AA Batteries)



External DC Adaptor

Operator-level maintenance of the TRANSPAK is limited to recharging the NiCad battery pack or replacing the AA batteries in the non-rechargeable battery pack.

Recharging the NiCad Battery Pack

The NiCad battery pack provides more than five hours of continuous operation when it is fully charged. The battery pack charges to 85% of capacity in 16 hours and to full capacity in 24 hours. The battery pack slowly discharges when not in use and should be recharged prior to use if it has been stored for two weeks or more.

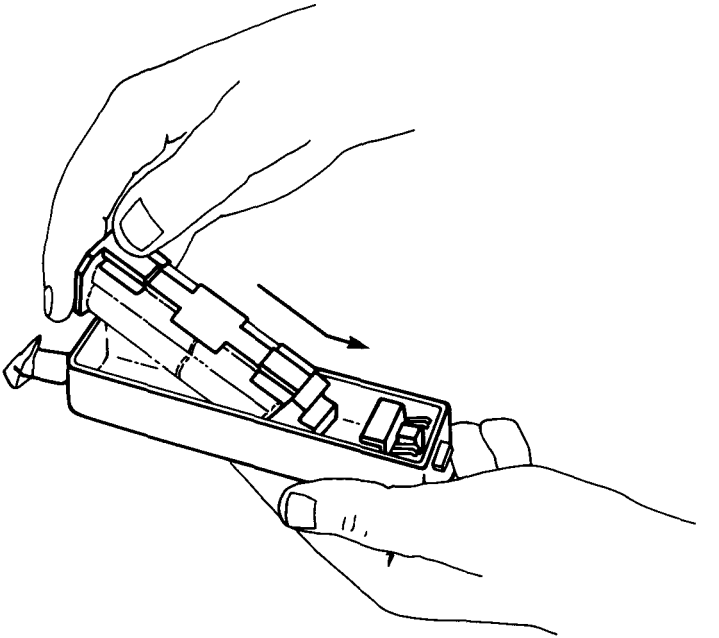
Removing and Replacing the Battery Pack or DC Adaptor

To remove the battery pack or DC adaptor:

1. Loosen latch at right-hand rear of TRANSPAIC.
2. Pull latch end of battery pack or adaptor away from back of TRANSPAK, and slide other end out of the retaining clip.

To reinstall the battery pack or DC adaptor:

1. Make sure the edge of the battery pack or adaptor and the mating O-ring in the unit are free of dirt.
2. Slide the end of the battery pack or adaptor into the retaining clip on the left-hand side of the TRANSPAK case.
3. Carefully seat the pack onto the case and push it into place.
4. Secure the latch on the right-hand side of the case.



Removing/Installing the Battery Pack Insert

Replacing the AA Batteries

Be sure to follow the polarity labels on the battery pack insert when installing new batteries. The TRANSPAK will not function properly and could be damaged if batteries are improperly installed.

To remove old batteries:

1. Remove the battery pack from the TRANSPAK unit.
2. Remove the battery pack insert from the battery pack.
3. Remove the batteries from the insert.
4. Dispose of the old batteries.

To install fresh batteries:

1. Install the batteries in the battery pack insert.
2. Reinstall the insert into the battery pack.
3. Reinstall the battery pack onto the TRANSPAK unit.

TROUBLESHOOTING THE TRANSPAK

IF:

1. The TRANSPAK fails to power on.

- Batteries are not connected.
- Batteries are dead.
- AA batteries are inserted incorrectly; check polarity.

2. The TRANSPAK fails to perform a fix.

- The antenna may be blocked.
  - Ensure that there are no obstructions between the antenna and the horizon.
  - If you are using an external antenna, ensure that it is connected and that EXT is displayed on line 4 of the STS screen.
- There may be too few SVs visible to obtain a position fix.
- Turn the rotary knob to the STS position. If NEXT FIX and a time are displayed, there will be enough SVs visible at the displayed time. If NEXT FIX: NO ALMANAC is displayed, the TRANSPAK must collect an almanac from an SV, which takes 15 minutes.
- The satellite almanac may be bad.
  - Turn the knob to the STS position. If NEXT FIX: NO ALMANAC is displayed on line 3, the TRANSPAK must collect an almanac from an SV.

3. A receiver fault number is displayed.

If the TRANSPAK detects internal errors, it displays them on line 3 of the STS screen. These are "never should happen" conditions. Some of these errors are mere nuisances; others indicate a serious problem which requires service — see next page.

3. Receiver faults (continued)

Fault Number	Failure
01	The contents of the battery-backed memory have been lost. The almanac and waypoints are cleared. To recover, collect an almanac and re-enter your waypoints. (The battery backup should not fail for the life of the internal battery, which is approximately 7 years. If a failure does occur, the internal battery must be replaced.
04, 06 07, 08	Channel alignment error. This is an internal processing error which may be transient. Turn the **TRANSPAK** off and then back on to clean the error. If the error reoccurs, the **TRANSPAK** should be returned for service.
16	Antenna feed line fault. This indicates an open or a short on the external antenna input. Check the external antenna cable for contamination (dirt, salt spray) or for an open or a short. A feed line fault should not occur when the internal antenna is in use. If it does, return the **TRANSPAK** for service.
32	Excessive bias dot. This indicates that the internal oscillator has drifted. The **TRANSPAK** will continue to operate, but should be returned for service if acquisition times become excessive.

DATUM SELECTIONS

Maps are drawn based on a mathematical model of the earth's shape. This is called a datum. For the displayed position to agree with corresponding positions on a map, the datum must be selected on the TRANSPAK Setup Screen (see page 38) to be the same as the datum used to draw the map. The map's datum is usually indicated in the map legend or title block.

The following datums are included in the TRANSPAK. Each name is shown as displayed on the screen.

WGS-84
WGS-72
Adindan
Alaska/Canada+
ARC 1950
Australian '66
Bukit Rimpah
CampAreaAstro
Djakarta
European 1950
Geodetic 1949
Ghana
G.Britain '36*
Guam 1963
G. Segara
G. Serindung
Herat North
Hjorsey 1955
Hu-Tzu-Shan
Indian
Ireland 1965
Kertau Malay**
Liberia 1964
Local Astro
Luzon
Merchich
Montjong Lowe
Nigeria (Minna)
NAD-27, CONUS
NAD-83
Maui, Old HI (Hawaiian)
Oahu, Old HI (Hawaiian)
Kauai, Old HI (Hawaiian)
Oornoq
SierraLeon'60
S.America '56 (provisional)
CorregoAlegre (S.American)
Campolnchausp (S.American)
Chua Astro (S.American)
Yacare (S.American)
Tananarive'25++
Timbalai
Tokyo
Voirol

*** Ordnance Survey of G. Britain 1936**
*** * Kertau (Malayan Revised Triangulation)**
+ North American 1927 (Alaska and Canada)
++ Tananarive Observatory 1925

TRANSPAK
WARRANTY RETURN PROCEDURES

1. Call Trimble Navigation
   - 800-334-9595 from outside California, or
   - 408-737-6940 from inside California

   to request a Return Material Authorization (RMA) number. Please have the TRANSPAK serial number ready to give to the Customer Service representative.
2. Write the RMA number here: _____
3. Name/Organization/Address/Phone:

   _____

   _____

   _____

   _____

4. Complete the Warranty Return Form on the reverse side of this page.
5. Package the equipment and ship prepaid with this page to:

   Service Department
   Trimble Navigation
   617 North Mary Avenue
   Sunnyvale, CA 94086

TRANSPAK
WARRANTY RETURN FORM

RMA No.: _____
Serial No.: _____
Model/Part No.: _____

Physical Damage: _____
Software:
Screen in Use: _____
Operation Attempted: _____
_____

Problem: _____
_____

Operation/Electrical:
Turn-on/Power: _____
Improper Solution: _____
Specify Position: _____
Datum in Use: _____
Operating Conditions: _____
Other: _____

Full description of problem (please be as specific as possible):

_____
_____
_____
_____
_____

The case of the TRANSPAK conducts electricity, even though it is made of plastic. When connecting the unit to an external power source, be careful to avoid electrical shock just as if the case were metal.

The TRANSPAK is designed for rugged use in difficult field environments. It will operate continuously in air temperatures from 0° to 60°C (32° to 140°F) and in environments with up to 100% humidity. However, take reasonable care of the unit as with any other piece of high-precision equipment.

*Trimble*Navigation

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