

Operating Manual

MT-ULTRA Professional JTSO

MTUP / 16 - 02 Rev. B



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16.01.2000	Spelling mistakes / Waypoints	B	71 of 71

Welcome to the Moving Terrain System

Congratulations on your purchase of MT-ULTRA Professional JTSO with Moving Terrain software version 3.6. The purpose of this manual is to familiarize you with the equipment, the program, its installation and use, as well as the many features which will enable you to customize your copy of Moving Terrain.

The Moving Terrain (=MT) system is breaking new ground in the field of navigation: and users have already confirmed that it's the most natural way. The chart section displayed by Moving Terrain on the computer screen changes at the same pace as the terrain slips by outside the aircraft.

MT functions without you having to dial up a radial or think about whether a needle should be drifting to the left or the right. Once the system is running, you no longer need to adjust the frequencies. Your GPS receiver is intelligent and seldom passes out of range of the transmitter! The system is seductively convenient to use, but for that very reason we feel obliged to draw your attention to the associated hazards.

Important instructions for the use of Moving Terrain and possible risks involved:

You have purchased a high-performance navigational support system which offers ease of flying as never before experienced. We feel obligated, however, to point out all the hazards connected with this system as determined by our test pilots.

We have made every effort to carefully develop the Moving Terrain System and offer a reliable product. The system was tested on a variety of instruments and under all conceivable flight conditions.

We cannot accept any liability for the performance of this system, since it is intended to serve only as a secondary navigation display.

Even with a 100% error-free system, hazardous situations can still arise due to **incorrect operation**, defects in the hardware and particularly **manipulation of GPS accuracy** by the operator, the US Defense Ministry. We are unable to make any forecasts or provide any warranties concerning **future licensing policies of GPS operators**.

The Moving Terrain system is a VFR device. Under no circumstances is it safe to fly with this navigational aid under instrument-assisted conditions unless all the prescribed navigation instruments are in operation and you are flying according to instrument flight rules on instrument routes.

A non-IFR-trained and licensed pilot flying in IMC is in danger, either with or without Moving Terrain!

Under aviation regulations, you are required to carry all the

current charts in printed form on board your aircraft.

Our own pilots also keep the latest ICAO charts available at all times, even though we place considerable confidence in this system.

1. MT-ULTRA Professional JTSO Basics

The warranty becomes void if the device has been opened or the safety seal broken! The screws have been coated with tamper-proof lacquer. Only the interface cover plate at the rear of the device (secured by three blank screws) may be removed.

1.1 Switching on the equipment

Above the display you will find a double row of keys. The top left-hand button is the ON/OFF button.



1.2 Basic operation

Beneath the display you will see a row of ten blank keys. When the Moving Terrain program has been launched, a menu bar with ten rectangular boxes will appear at the lower edge of the display. These main functions are normally selected using the ten buttons on the chassis and are display-actuated. The button functions thus change according to the designations in the boxes above them. It is important to remember that each box refers to the button immediately below it.

For the purposes of simplification, in this manual we refer to a button as though it were marked with its current function. Since the selection of certain options on the display functions as a constant system, we recommend you to read the first chapters with care and "practice" the procedure a few times in succession. Once you have understood the principle, operation will appear very simple.

The alphanumeric key pad above and to the right of the display enables you to enter names (e.g. user waypoints or routes) or coordinate points.

1.3. Quitting Moving Terrain and switching off the equipment

One basic rule should be observed when shutting down:

- At the extreme left of the double row of buttons above the display you will find a button marked:



Press the button for approximately 5 seconds. Moving Terrain will be shut down (appropriate message appears on the display) and the last position transmitted by the GPS will be saved. Upon restart, this position will be assumed as starting point and the chart positioned accordingly

- The equipment may now be shut down at the mains switch.



1.4. Using the external keyboard

You may also connect a standard keyboard to your unit. To do this, remove the three blank screws holding the cover plate over the interface connector. Plug the keyboard with a PS/2 keyboard adapter into the jack on the far left. This changeover may also be carried out with the equipment switched on.

The row of keys below the display, used for operating Moving Terrain, correspond to keys F2 - F11 on the external keyboard. F12 is for quitting the Moving Terrain program. For operation with the external keyboard we recommend switching over to keyboard mode (Chapter 3.2.4).

1.5. Operating modes

Moving Terrain may be operated in two different modes: Flight Mode or Map Mode.

The **Flight Mode** shows the actual Moving Map for navigation, whereby the GPS controls the chart.

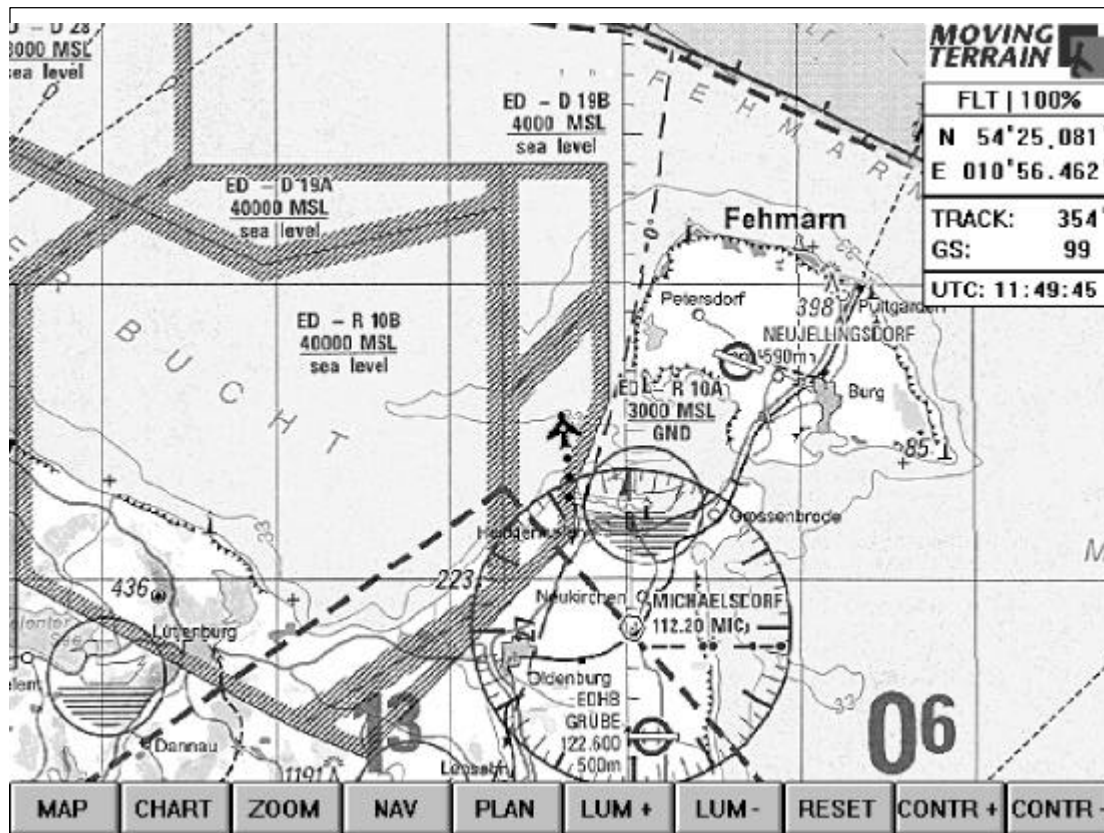
The **Map Mode** is used when working with charts. The chart is moved to the points you wish to study or use as waypoints or route points. In this mode, the chart is not positioned by the GPS receiver.

Various functions can be performed in the same way in both modes - you will find instructions at the appropriate points in this manual. Other functions make sense in only one of the modes. Here again, you will find instructions in the manual.

It is possible at any time, even during flight, to switch over to the chart working mode (see Chapter 2.5). You then interrupt the GPS positioning and can perform the functions supported only by the map mode. When finished, return to the flight mode. Since the GPS has already received satellite signals, an immediate positioning of the chart should take place.

1.6. Explanation of keyboard commands

1.6.1. Flight Mode



MAP Change over to map mode

CHART Change between various chart bases in running system, call up a user defined chart (custom chart)

ZOOM Enlarge or reduce chart

NAV Call up the Nav page

PLAN Call up or save a route

LUM + Increase display brightness

LUM - Reduce display brightness

RESET Return display to original brightness

CONTR + Increase display contrast

CONTR - Reduce display contrast

1.6.2. Nav Page

MOVING TERRAIN

Nav

Waypoints: APT

KIEL (HOLTENAU)	EDHK
KETTINGSKOV	----
KIEL (HOLTENAU)	EDHK
KIELCE (MASLOW)	EPKA
KIIKALA	EFIK
KILKENNY	EIKL
KINLOSS (MIL)	EGQK
KINNELL	----
KINROSS (PORTMOAK)	----
KIRCHDORF / INN	EDNK
KIRKENES (HÖYBUKTMOEN)	ENKR
KIRKWALL	EGPA
KIRUNA	ESNQ
KISKUNFELEGYZHAZA	LHKH
KITEE	EFIT
KITHIRA	LGKC

Route:

DCT: << not defined >> DIST MC

☒ N 54° 22' 700" 119.97 TWR/INFO, 121.9 APRON, 125.10 Bremen FIS | ELEV 101ft / RWY
☐ S 08° 08' 700" 08-26 1260m Asphalt, ILS26 109.5, ILS08 109.5, / Tel. Luftaufsicht 322604,
☒ E 010° 08' 700" 3291914, FAX 324876, Apt opr 329190, FAX 323621
☐ W

APT VOR NDB INT USR

CANCEL

MOVING TERRAIN

Nav

Waypoints: APT

AACHEN (MERZBRÜCK)	EDKA
AACHEN (MERZBRÜCK)	EDKA
AALBORG	EKYT
AALEN-HEIDENHEIM (ELCHINGEN)	EDPA
AARHUS	EKAH
AARS	EKVH
AAVAHELUKKA	EFAA
ABBEVILLE	LFOI
ABBEYSHRULE	EIAB
ABERDEEN (Dyce)	EGPD
ABERPORTH (Aberporth MOD PE)	EGUC
ABINGDON	EGUD
ABLITAS (MIL)	----
ACHMER	EDXA
ADANA SAKIRPASA	LTAF
AERA	----

Route:

DCT: << not defined >> DIST MC

☒ N 50° 49' 400" 122.87 INFO, 118.65 Düsseldorf RADAR | ELEV 623ft / RWY 08-26 520m /
☐ S 006° 11' 200" Tel.(02405) Apt opr 73597, FAX 73390, OPS + PPR 72587, FAX 74764
☒ E 006° 11' 200"
☐ W

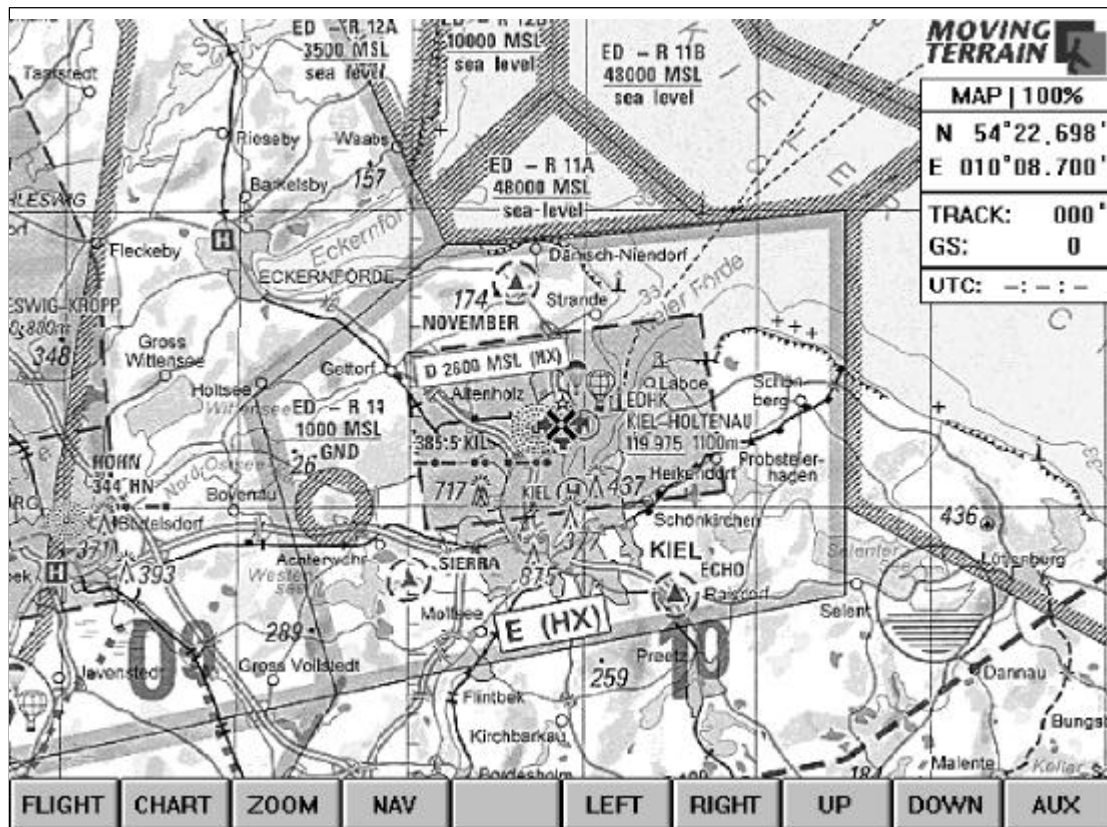
WPT GTO DCT INS DEL PREV NEXT UP DOWN MAP

WPT	Select waypoint type (APT/VOR/NDB/INT/USR)
GTO	Go To: Position the chart on the selected waypoint (function in flight mode inactive, return to chart)
DCT	Plot a direct vector
INS	Insert a waypoint in the route or plot a USR waypoint
DEL	Delete a waypoint from the route, delete a USR waypoint
PREV	Move to previous field in window
NEXT	Move to next field in window
UP	Up- or reverse movement within a field
DOWN	Down or forward movement within a field
MAP	Return to chart

1.6.3. Nav Page: The various databases

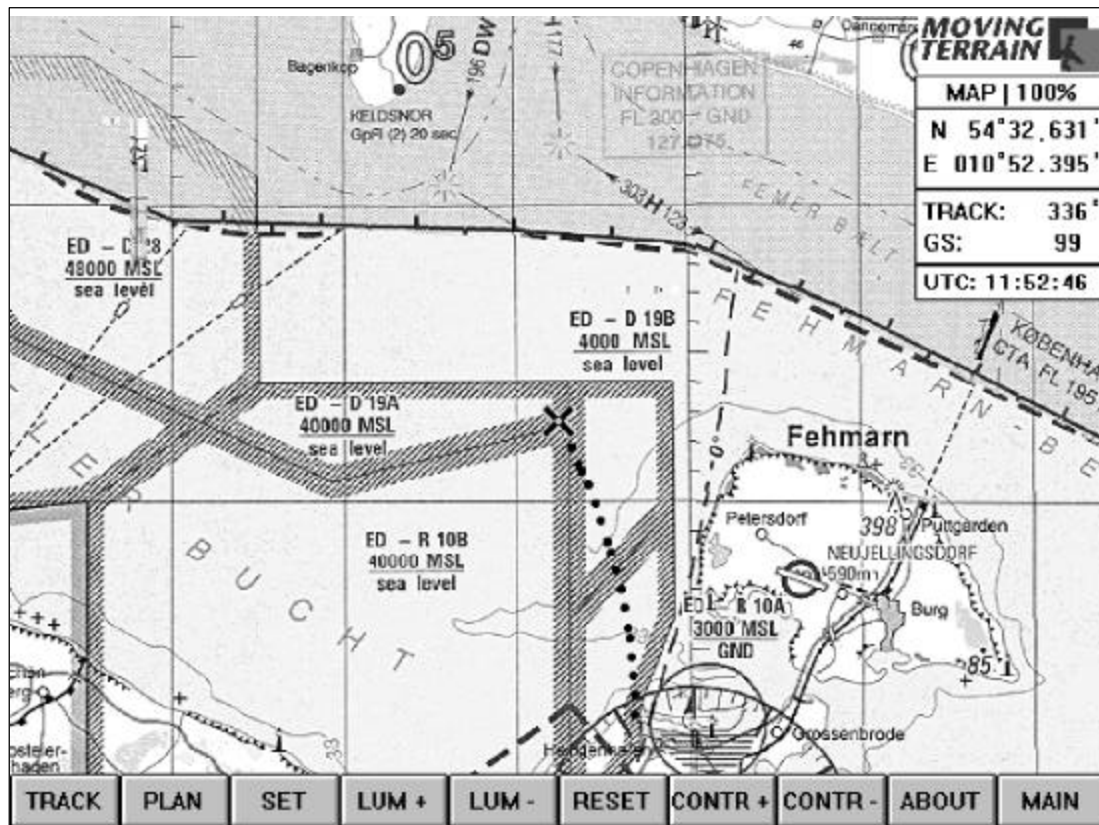
APT	Database of European airports with additional information
VOR	VOR database (rotating radio beacons)
NDB	NDB database (non-directional beacons)
INT	Database of IFR intersections
USR	Database of user-defined waypoints
CANCEL	Abort operation and return to Nav page

1.6.4. Map Mode (MAIN)



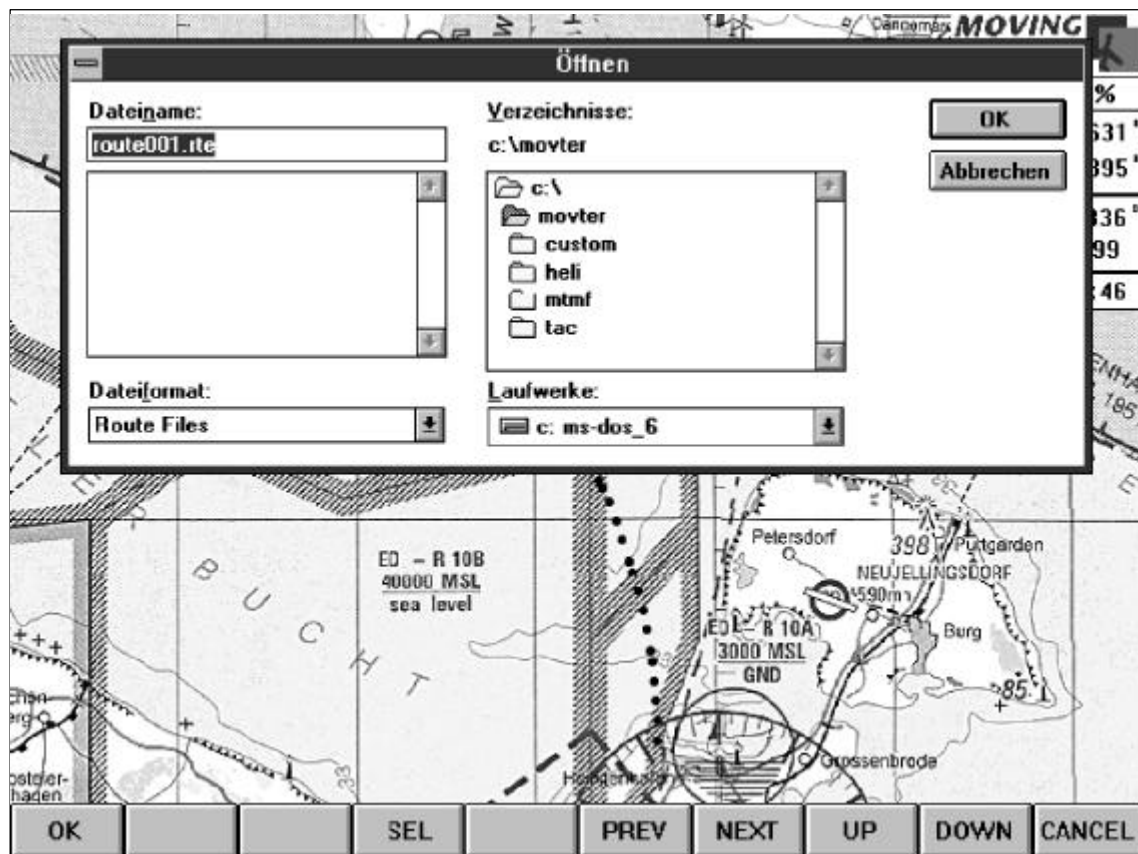
FLIGHT	Change-over to flight mode
CHART	Change-over between different chart bases in running system, load a custom chart
ZOOM	Enlarge or reduce the chart
NAV	Load the Nav page
LEFT	Move location symbol on chart towards the left
RIGHT	Move location symbol on chart towards the right
UP	Move location symbol on chart upwards
DOWN	Move location symbol on chart downwards
AUX	Change-over to further chart working options

1.6.5. Map Mode (AUX)



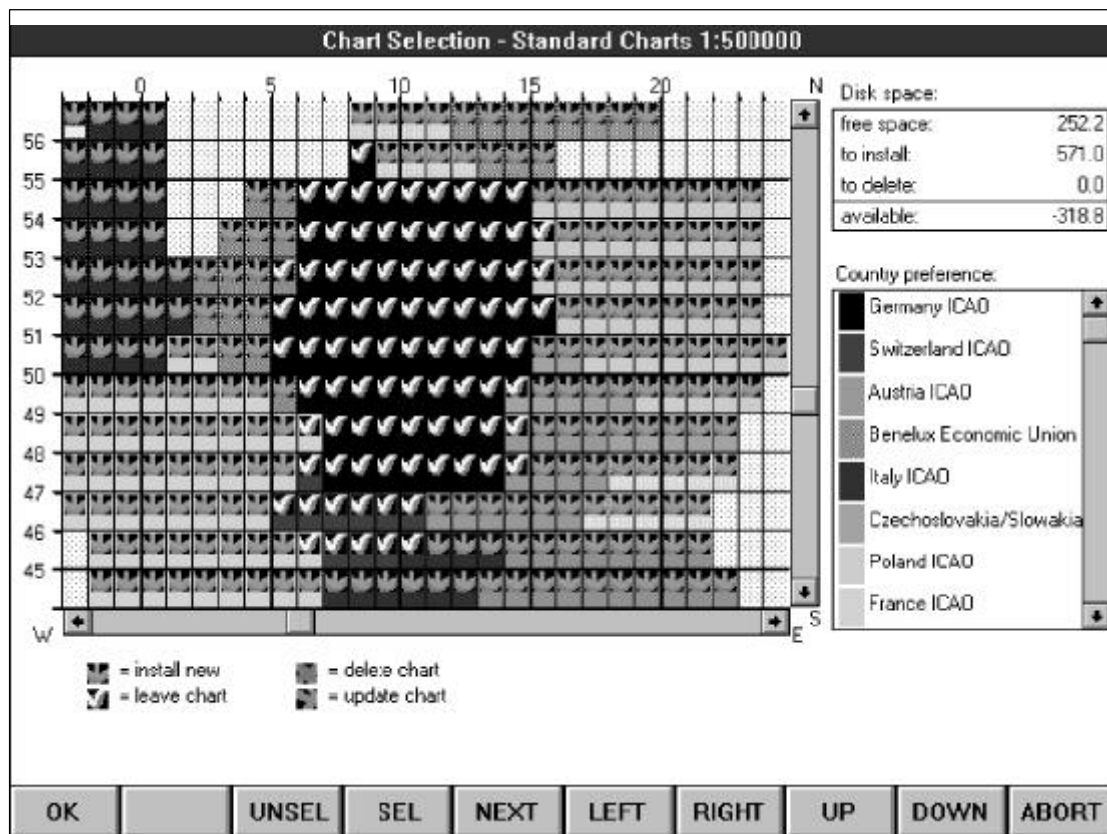
TRACK	Work with a completed flight path (replay)
PLAN	Load and save a route
SET	Display settings
LUM +	Increase display brightness
LUM -	Reduce display brightness
RESET	Return display to original brightness
CONTR +	Increase display contrast
CONTR -	Decrease display contrast
ABOUT	About Moving Terrain®
MAIN	Change over to other chart working options

1.6.6. Input keys



OK	Confirm a selection, execute a command
SEL	Select or de-select an option (cf. Chapter 3.2.4)
PREV	Move to previous field in window
NEXT	Move to next field in window
UP	Upward or reverse movement within a field
DOWN	Downward or forward movement within a field
CANCEL	Abort without result and return to chart

1.6.7. Chart installation (program setup)



OK	Confirm a selection, execute a command
UNSEL	De-select all default charts available on CD-ROM (important for installing individual chart sections)
SEL	Select desired chart operation (installation, update, delete or leave)
NEXT	Move between chart and country preference windows
LEFT	Move marker to the left in chart selection
RIGHT	Move marker to the right in chart selection
UP	Move marker upwards in chart selection
DOWN	Move marker downwards in chart selection
ABORT	Abort chart installation

1.7. Introduction to the main functions

The following contains a list of the most common operations. For complete details please read the following chapters.

1.7.1. Getting started

- ☒ Switch on and wait a few moments until the "Agree" text appears
- ☒ AGREE
- ☒ FLIGHT
- ☒ After about 3 seconds you will notice that in the box at the top-right of the Navdata window MAP has changed to FLT. Your position is now being determined by GPS.
- ☒ During this interval, please do not press keys at random. MT-ULTRA Professional JTSO is busy and thus unable to accept any further commands!
- ☒ Once your aircraft is moving faster than 2 knots, the cross-hair cursor (which marks your location when stationary) will turn into an

1.7.2. How to enter a waypoint (yellow diamond symbols)

- ☒ Go to the point on the Moving Map you wish to save as user waypoint (in map mode) or save the position currently supplied by the GPS (flight mode).
- ☒ NAV
- ☒ WPT
- ☒ USR
- ☒ PREV
- ☒ Enter name on frame-type keyboard
- ☒ INS

There are other ways of plotting a waypoint (e.g. by coordinates). Please refer to the following chapters.

1.7.3. How to plot a direct vector (Red diamond symbols)

- ☒ NAV
- ☒ WPT
- ☒ Select endpoint
- ☒ DCT
- ☒ The display immediately switches back to the chart. MC, EET and DME are displayed.

1.7.4. How to delete a direct vector

- ☒ NAV
- ☒ Press NEXT repeatedly until the direct endpoint appears in the DCT field with a colored background.
- ☒ DEL
- ☒ MAP

1.7.5. How to plot a route (Green diamond symbols)

- ☒ NAV
- ☒ WPT
- ☒ Select the required database APT / VOR / NDB / INT / USR
- ☒ Select the route point (enter name on keyboard, selection by identification also possible).
- ☒ INS
- ☒ Repeat above steps in NAV window until the route has been plotted
- ☒ MAP

1.7.6. How to save a route

- ☒ Plot the route
- ☒ MAP, green diamonds mark the plotted route
- ☒ PLAN
- ☒ 'Save as' (DOWN, ENTER)
- ☒ Enter the name on the keyboard
- ☒ ENTER

1.7.7. How to retrieve a route

- ☒ PLAN
- ☒ 'Load', ENTER
- ☒ Select a previously saved route (NEXT, DOWN, UP)
- ☒ ENTER

1.7.8. How to save a completed flight path

- ☒ TRACK
- ☒ 'Save as', ENTER
- ☒ Enter name on the keyboard
- ☒ ENTER
- ☒ Analog:
 - 'Replay' (re-run of completed track in fast motion)
 - 'Clear' (delete a track)
 - 'Load' (load a previously saved flight path)

2. The GPS-controlled Moving Map (FLIGHT)

2.1. Switch on and fly off

When the MT-ULTRA Professional JTSO is switched on, it will take about one minute to load the Moving Terrain map mode.

First of all, a number of remarks on limited liability and distinctive features of Moving Terrain will appear on the display. To read the entire text, press the button below the menu item DOWN. The text will be scrolled down. To return to the beginning, press the button below the menu item UP. If you agree to the conditions, press **AGREE** and the program will continue.

The Moving Terrain chart will appear. At the lower edge of the display you will see a menu bar with ten items. Beneath these, ten corresponding buttons are located on the frame itself. These buttons are used for entering commands as shown in the menu bar.

Since the primary purpose of Moving Terrain is to determine your current position, this manual will begin with a description of the alternatives available to you in the flight mode. Please plug in your GPS receiver and ensure that the external antenna is correctly connected.

Press the FLIGHT button.

Communication with the GPS receiver starts immediately. MT-ULTRA Professional JTSO is waiting for useable position data. Once these are transmitted, chart positioning begins and - as soon as you begin to move - your aircraft will be shown.

At the upper edge you will see the Moving Terrain warning, to inform you that although your GPS was connected correctly, it is not yet receiving enough satellite information for positioning.

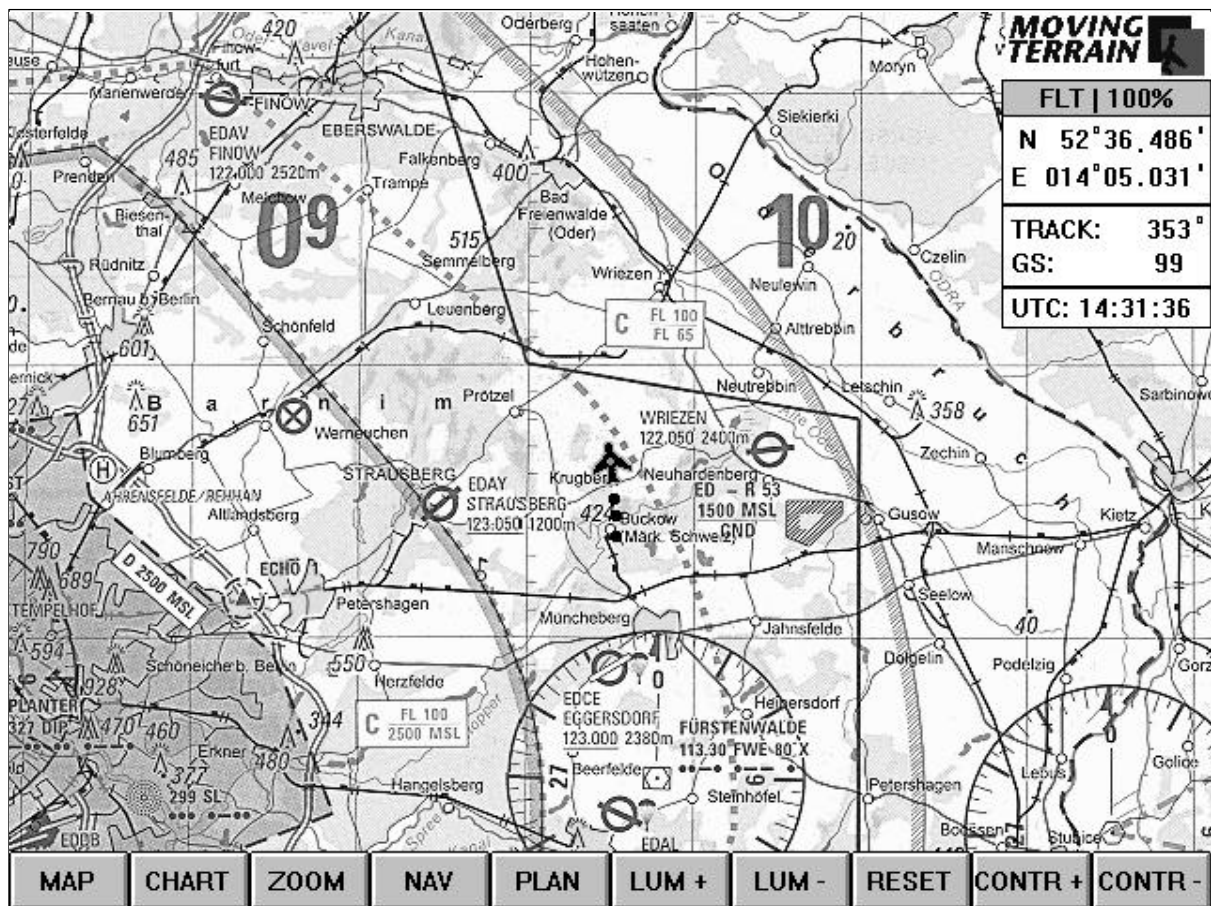
As soon as enough satellites are being received, Moving Terrain will begin to position the chart according to your actual movement.

Your current position is always the center point of the display.

North is always at the top.

Once you are moving at a speed of more than 2 knots, the cross-hair cursor (which marks your position when stationary) will become an aircraft symbol. The direction in which the nose of the aircraft is pointing is your actual course. In order to follow the course you have covered, every ten seconds the aircraft symbol "drops" a point. On the north-orientated charts this gives you a perfect view of the track already flown and the way that still lies ahead.

In addition, you will receive information in the window with current flight path displays (Navdata).



2.2. The NAV Data display

1. Mode display
 - **FLT** Flight mode (indication) or
 - **MAP** Map mode (indication).

The menu bar displays the command, the Navdata the indication.

Please do not confuse the two!

2. Scale
 - **100%** displays charts at normal scale, or
 - **200%** displays charts at reduced scale, or
 - **50%** displays charts at enlarged scale
3.
 - **Position**
4.
 - **Track** shown in degrees
5.
 - **GS** ground speed in knots
6.
 - **UTC**

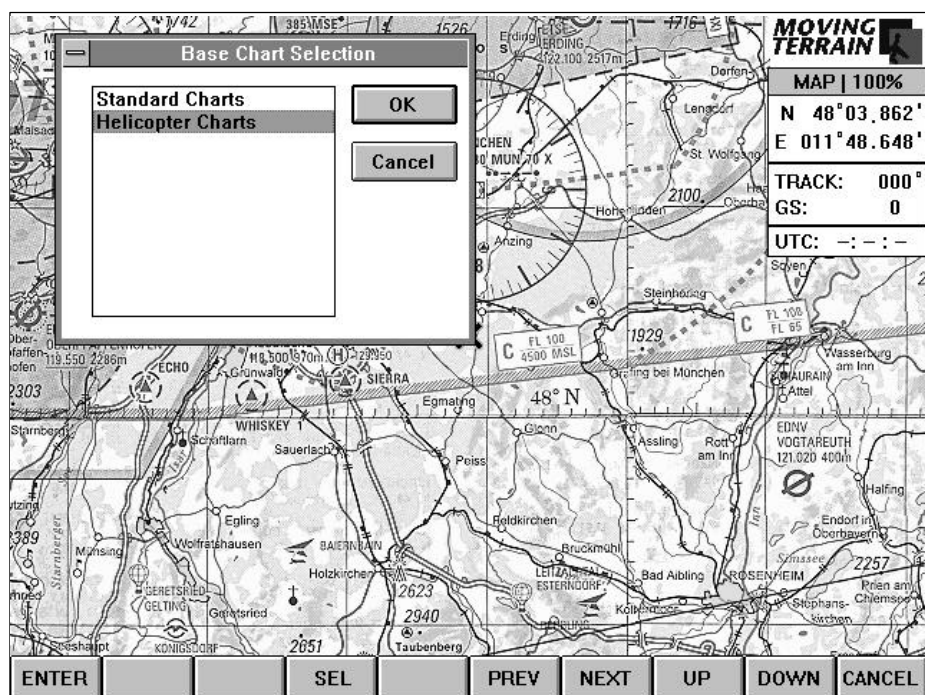
2.3. Adjusting display brightness and contrast LUM+ / LUM- / RESET / CONTR+ / CONTR-

Brightness (luminosity) and contrast of the display can be adjusted quickly and easily to suit your momentary requirements. Brightness is adjusted by means of the buttons below the LUM+ and LUM- menu items. Contrast is adjusted by means of the buttons below CONTR+ and CONTR-. Press RESET to return to the original settings. The settings for brightness and contrast depend entirely on current weather conditions and can be adjusted simply at any time if the display is too bright or too dark, or if lighting conditions change.

2.4. Changing over to other charts(CHART)

2.4.1. Changing over to other base charts(BASE)

In flight you may change to different base charts, e.g. to charts of another continent or to scale 1:200 000 helicopter charts. These charts are then available to you in the running system to determine your correct position. Press CHART, select BASE and then the desired base chart by moving UP and DOWN and confirming with ENTER. After a few seconds the selected chart material will appear on the display.

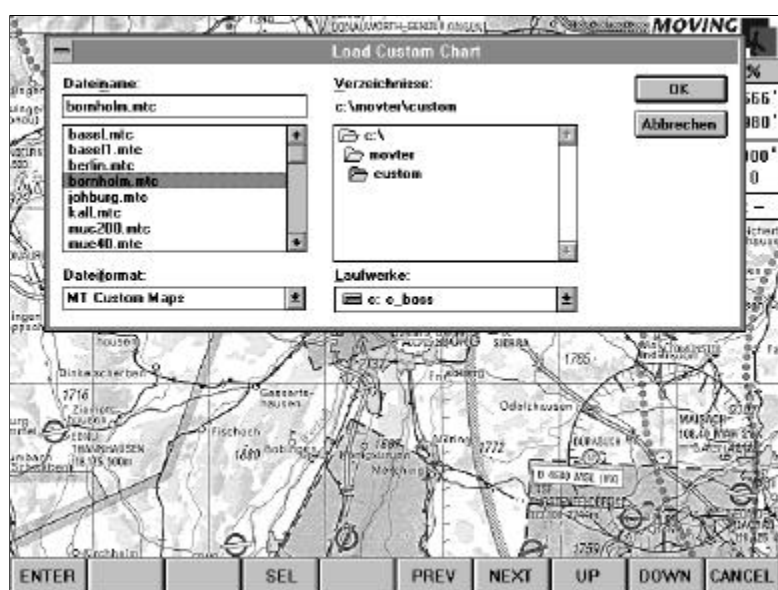


2.4.2. Loading a custom chart(CUSTOM)

In flight you may also load an additional chart at any desired scale for a special region.

Please refer to the general instructions on preparation, i.e. plotting, referencing and using custom charts later on in this manual.

If you select the option CHART, then CUSTOM, a dialog box titled "Load Custom Chart" will appear on the display. In order to load a chart, you must first of all select it. You must know in which directory on the hard drive the charts are stored. We recommend storing them on drive C: in the directory C:\MOVTER\CUSTOM. If you have ordered charts from us, you will also find them stored according to this system. You will now see rectangular fields of different sizes on the display :



On the left, under "File name" you will find a single field which currently contains the item *.mtc. The box below it contains a list of all the files located in the opened directory and which end with the suffix .mtc (Moving Terrain Chart). The single-line rectangular field below it contains the words "MT Custom Maps" as the activated file type, identifiable by its suffix .mtc. In the large rectangular box to the right of this you will find the directory structure with the current directory path above it. Below the large rectangular box there is a further individual field telling you which drive you are currently working on.

Remember: use the UP and DOWN buttons to move within a rectangular box. If you wish to move to the next box, press the NEXT button. If you wish to move to the previous box, press the PREV button.

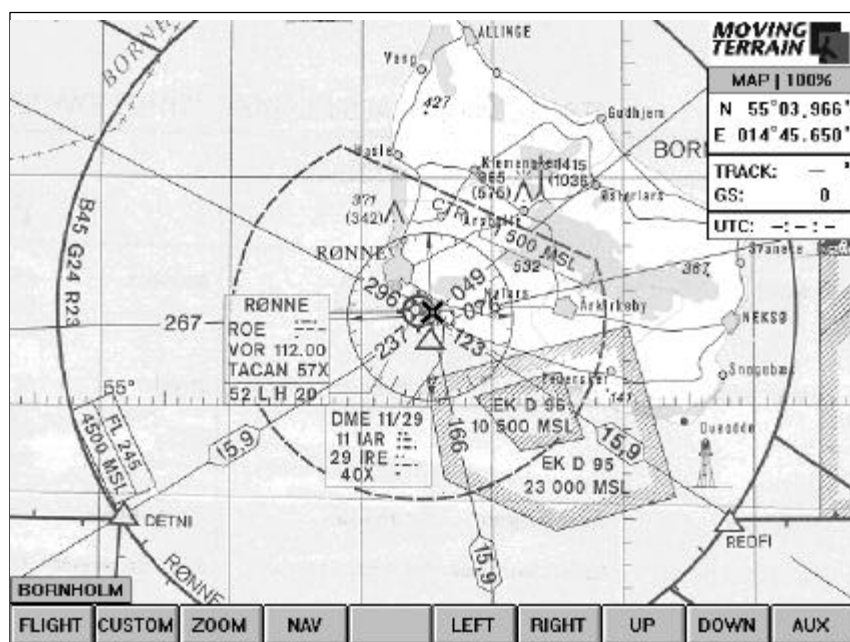
This will all become clearer if we use an example: currently no custom chart has been selected; *.mtc is displayed under file name. Press NEXT. A transparent bar will appear in the large rectangular box on the left-hand side. Press DOWN. The file upon which the bar is located is now highlighted and the name has been entered in the name field above. This chart has now been selected. Now press the ENTER

button to return to the main program and view the custom chart. However, if you wish to abort the operation without loading a custom chart, press CANCEL .

Should you not find the desired chart in the directory which is currently open, you must change directories. Press the NEXT button repeatedly until you are in the "Directories" box; now use the UP and DOWN buttons to highlight the required directory name and open the directory by pressing the ENTER button .

Should you wish to change drives, e.g. in order to load a chart from a floppy disk, highlight the rectangular "Drives" box. Press button A (to select the floppy disk drive), then press PREV to return to the box below the file name and use DOWN and UP to select your chart. Press ENTER to load the chart.

The selected custom chart has now been activated. If you are already over territory for which this chart is referenced, your position will be displayed immediately. Otherwise you will see a message that although the chart is ready for use, it is currently out of visible area. However, once you enter the territory for which this chart is referenced, it will appear automatically. At the bottom left above the menu bar you will see the name under which the chart has been filed.



If you wish to view the standard ICAO chart or the helicopter chart, press the buttons CHART / CUSTOM. This will deactivate the user-defined chart. You will return to a familiar environment and the entry with the name of the custom chart will extinguish. If you press the CHART / CUSTOM buttons once again, Moving Terrain will prompt the chart last activated. Instead of starting from the beginning, you can load the chart immediately by pressing ENTER. This enables you to easily switch back and forth between the main chart and your custom chart. If the BASE charts are changed, the custom chart will be automatically switched off.

How to load a custom chart

- ☒ CHART
- ☒ Select CUSTOM (DOWN)
- ☒ ENTER
- ☒ NEXT
- ☒ Select *.mtc with the UP / DOWN buttons
(desired chart must appear at top!)
- ☒ OK

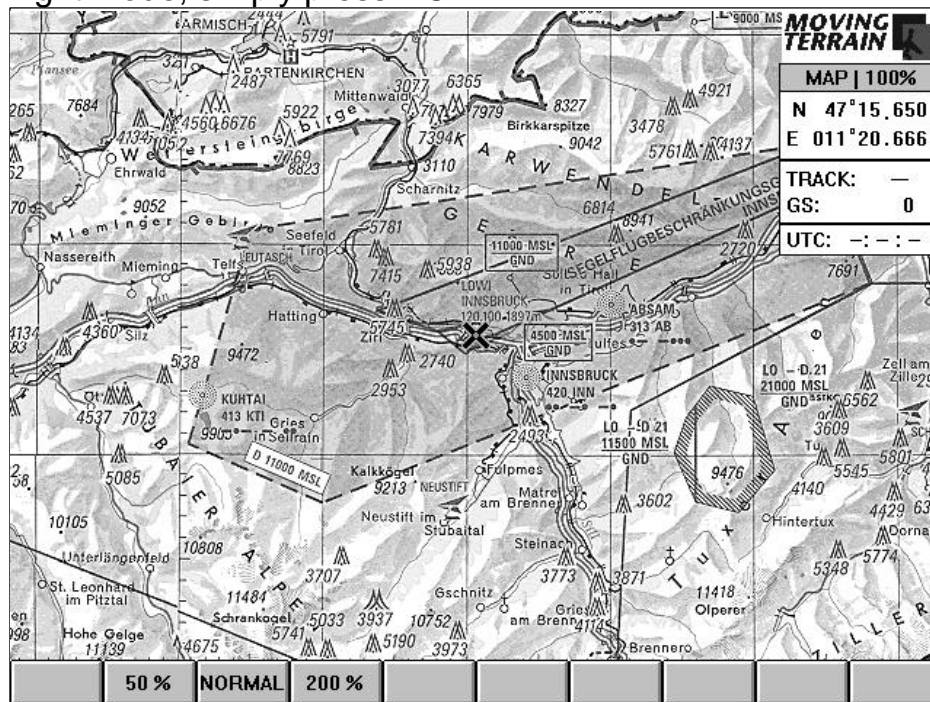
How to deactivate a custom chart

- ☒ CHART
- ☒ CUSTOM

2.5. The zoom function (ZOOM)

Pressing the ZOOM button changes the lettering on the menu bar, where you will now find 50%, NORMAL and 200%. In the normal mode the charts will appear at the usual size, 50% reduces them by one half and 200% enlarges them by a factor of two. The Navdata window tells you which mode of presentation you are currently in. The ZOOM function can be used in the same way for custom charts. To return to

flight mode, simply press NORMAL.



2.6. The Nav page (NAV)

You can access the clearly arranged data in the Nav window without interrupting GPS positioning. Here you will find at a glance everything you need for navigation and flight planning. Press the NAV button :

Waypoints: APT

Waypoint Name	ICAO Code
AACHEN (MERZBRUECK)	EDKA
AALBORG	EKYT
AALEN-HEIDENHEIM	EDPA
AARHUS TIRSTRUP	EKAH
AARS	EKVH
AAVAHELUKKA	EFAA
ABBEVILLE	LFOI
ABBEYSHRULE	EIAB
ABERDEEN	EGPD
ABERPORTH	EGUC
ABINGDON	EGUD
ACHMER	EDXA
ADANA SAKIRPASA	LTAF
AELMHULT (MOECKELN)	ESMU
AELVDALEN	

Route:

DCT : << not defined >>

DIST MC

☒ N ☐ S 50 49 450
☒ E ☐ W 006 11 216

122.87 INFO, DÜSSELDORF RADAR 118.65 | ALT 623ft / 08-26 520m / Tel.(02405) OPS 73597, PPR 72587

WPT
GTO
DCT
INS
DEL
PREV
NEXT
UP
DOWN
MAP

Move the selection bar by pressing the UP / DOWN and PREV / NEXT buttons. Here again: use the UP and DOWN buttons to move within a rectangular box, use the PREV and NEXT buttons to move from one rectangular box to another.

First of all a brief description of the page:

At top left you will see the word "Waypoints", followed by the abbreviation APT, VOR, NDB, INT or USR to denote which database has been selected. Beneath this is located a single rectangular box containing the activated waypoint in gray lettering. In the large rectangular box on the left you will see the first entries of an alphabetical list of European airports and in the column to the right the corresponding four-letter codes.

Below this you will find the coordinates: these relate to the location of the airport highlighted in the list. The box to the right of the coordinates contains WPT (waypoint) information.

The large rectangular box on the right is reserved for route planning; if you have plotted a direct "hot" vector, the endpoint will be shown in the single-line box following DCT.

2.6.1. Selecting the waypoint type(WPT)

Five different waypoint databases are available: press the WPT button.

Nav

Waypoints: APT

MUEHLDORF EDMY
MUEHLHAUSEN EDEQ
MUEHLDORF EDDM
MUNSTER (TELGTE) EDLT
MUNSTER-OSNABRUECK EDDG
MUGLA DALAMAN LTBS
MULHOUSE (HABSHEIM) LFGB
MUNKFORS ESKO
MURCIA (ALCANTARILLA) LERI
MURCIA (SAN JAVIER) LELC
MURET (L'HERM) LFBR
MURSKA SOBOTA LJMS
MUS LTCK
NABERN/TECK EDTN
NAESTVED

Route:

DCT: << not defined >> DIST MC

N ☒ S ☐ E ☐ W ☐

48 21 283 011 47 250

118.70 TWR North, 120.50 TWR South, 121.97 GND North, 121.82 GND South, 121.92 Apron, 119.05 München RADAR | ELEV 1486ft / 08R-26L 4000m Concrete, ILS08R 110.9, ILS26L 108.3, 08L-26R 4000m Concrete,

APT VOR NDB INT USR Cancel

Now you may choose between:

- APT** Airports with supplementary information
- VOR** VORs with frequencies
- NDB** NDBs with frequencies
- INT** IFR-Intersections und
- USR** user-defined waypoints (shown on the chart as yellow diamond symbols).

Once you have selected a database, the commands on the menu bar return to their former status. In the heading you will now find the waypoint type. The rectangular field on the left of the display will contain an alphabetical list of waypoints with the corresponding codes. If you would rather work with the identifiers, shift the selection bar to the column with the codes (by pressing the NEXT button one or more times). The codes will be automatically alphabetized.

The Nav page makes a variety of data and possibilities available to you. You may use these in either the flight or the map mode. At this point we offer a description of the functions applicable to and necessary for the flight mode. For further information please refer to Chapter 3.1.3.

You may leave the Nav page and return to the chart display by pressing the MAP button at any time.

Please note: The GTO function is de-activated in flight mode. Since the chart is controlled by the GPS, you will not be able to influence the procedure. By pressing this button you are simply closing the Nav page and your current position will be shown.

2.6.2. Plotting a route

In flight you may put together a route made up of waypoints from different databases.

- **Select the database type** by pressing WPT and choosing one of the five alternatives. Moving Terrain will always prompt you to use the database last used and displays the point you last selected. If you switch to another database, a point at the same position in the alphabet will be suggested (Example: If you have used Brussels APT and change to the VOR database, you will automatically land at Brussels VORs).
- **Finding a waypoint:** Use the frame-type keyboard to enter the desired name. Usually the first letters are sufficient to find the name and you will be at the desired position in the alphabet. If you didn't score a direct "hit", press the DOWN button until you reach the waypoint you are seeking.
- **There is a further way** to select the desired waypoint: Press the DOWN button repeatedly until you reach the waypoint you are seeking. To skip a number of points, keep the button depressed. The keyboard has a repeat function and if you keep the button depressed even longer, it will skip whole pages. Releasing the button will return it to the point-to-point scrolling function. If you have inadvertently overshoot your goal, you can move back upward using the UP button (also skips whole pages).
- **Looking for waypoints with the aid of the identifier:** Please note that you can also display the database sorted according to identifiers. Position the selection bar in the list of codes by repeatedly pressing the NEXT or PREV buttons. It will alphabetize the list. Here again, you can accelerate the procedure by entering the name on the keyboard.
- **Activating a waypoint:** If a waypoint is activated (highlighted) the coordinates and waypoint information refer to this waypoint.
- **Inserting a waypoint in the route (INS):** Once you have selected a waypoint, press INS to add it to your route. Repeat this procedure for all waypoints which are to make up your route. You may, of course, combine points from all five databases.
- **Correcting your route plotting:** Have you inadvertently omitted a waypoint and wish to insert it at an earlier point? Position the selection bar in the route list by pressing NEXT. Use the UP and DOWN buttons to highlight the point before which you wish to insert the additional point. If you wish to add a waypoint at the end of the list, position the selection bar on the last vacant line. Press PREV to move back into the waypoint list, highlight the desired point and insert it with the INS button.
- **Deleting a waypoint from the route** Do you wish to eliminate a point from the route list? Position the selection bar on the point and press DEL. There is no risk of permanently deleting the waypoint from the supplied databases (APT, VOR, NDB and INT) since no access is permitted to the data.

Warning: *You can delete your own USR waypoints! Please note carefully in which box the selection bar is located. If it is in the route box (right-hand side), DEL*

relates to this list and you will only delete the point from the route. However, if the selection bar is in the list of waypoints (left-hand side), with DEL you will delete the point from your database. When a route is saved all waypoints together with their names and coordinates will be saved as well. If a route also includes Uer waypoints, the subsequent modification or deletion of the latter from the appropriate Nav database will in no way affect the saved route.

- Please note: to avoid confusion, e.g. between VORs with APTs of the same name, the route points have been provided with identifiers. The distance (DIST) of the selected route is shown in nautical miles (nm). At the same time you will receive the magnetic course (MC).

Waypoints: APT

Waypoint	APT
BERLIN (TEGEL)	EDDT
HANNOVER	EDDV
BREMEN	EDDW
BAD LANGENSALZA	EDEB
HERRENTEICH	EDEH
BAMBERG (BAMBERG AAF)	EDEJ
LANGENLONSHEIM	EDEL
MOSENBERG	EDDM
NIEDERSTETTEN (NIEDERSTETTEN)	EDEN
MUEHLHAUSEN	EDEQ
WALLDUERN	EDEW
ANSPACH / TAUNUS	EDFA
REICHELSCHEIM	EDFB
ASCHAFFENBURG	EDFC
BAD NEUSTADT / SAALE	EDFD

Route:

DCT: << not defined >>

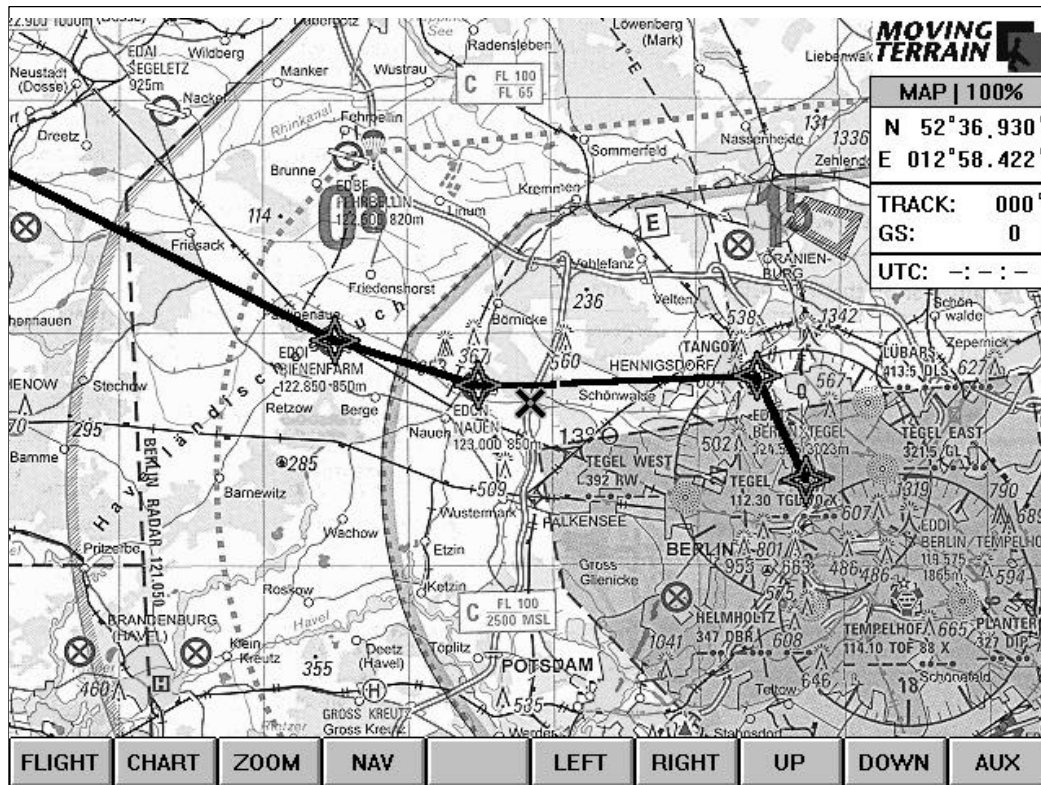
Route	DIST	MC
EDDT	72	334
TANGO	67	267
EDCN	55	286
EDOI	49	297
BKD	0	---

N 52° 33' 666
S 013° 17' 366
E 013° 17' 366
W 013° 17' 366

124.52 TWR, 121.92 GND, ATIS 125.90, BERLIN RADAR 121.05 | ELEV 121ft
/ 08L-26R 3023m Asphalt ILS08L 109.10, ILS26R 110.10, 08R-26L 2424m
Asphalt ILS08R 108.50, ILS26L 109.30

WPT GTO DCT INS DEL PREV NEXT UP DOWN MAP

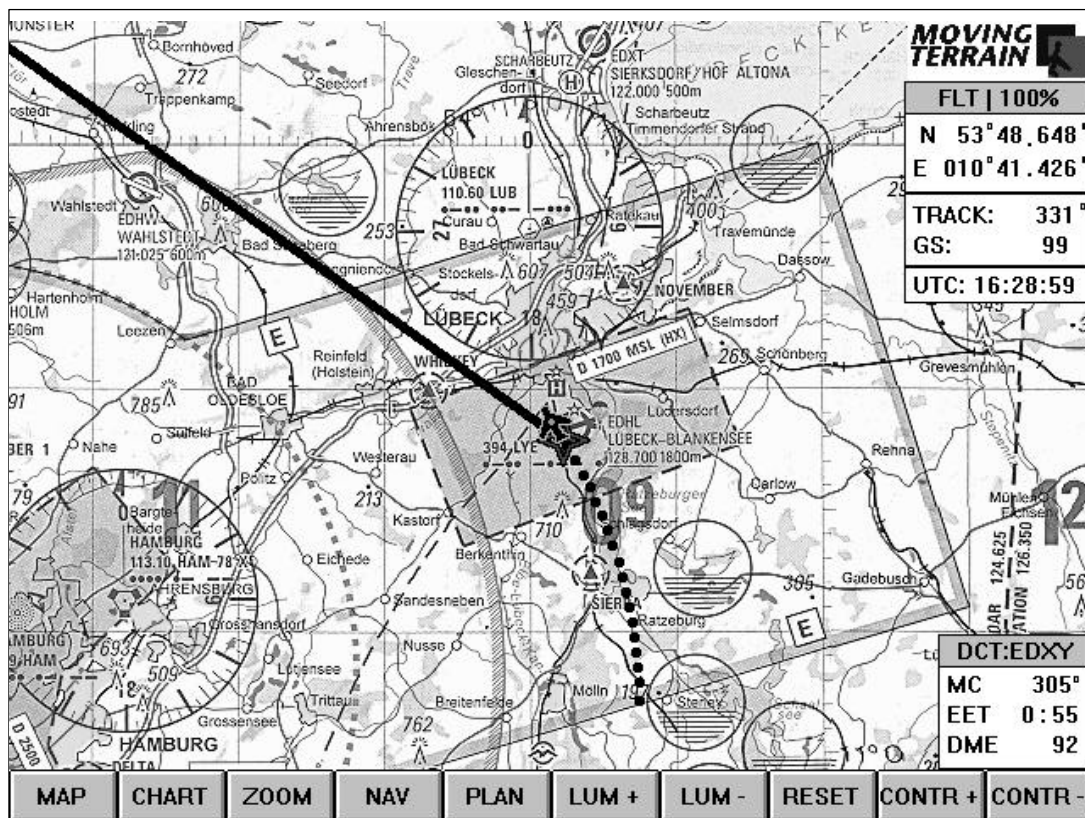
- Press MAP to return to the chart. The waypoints on the route will now appear connected by broken lines. The points are interconnected by the calculation of lateral deviation. Waypoints appear as green diamond-shaped symbols.



2.6.3. Plotting a direct vector(DCT)

If you wish to determine the distance, the course and anticipated flying time from your current position to your destination, proceed as follows:

- Select the proposed destination from one of the five database lists. The name must be highlighted. Press DCT.
- The display switches back automatically to the chart and from your current position a line is pointing to the selected destination. Beginning and endpoint of the direct vector will be designated by red diamond-shaped symbols.



- A window will appear at the bottom right edge of the display. Its title bar will enable you to verify that you have selected the correct endpoint. In addition, the constantly updated values are shown for magnetic course (**MC**), estimated enroute time (**EET**) and distance measuring equipment (**EDM**). On the basis of current ground speed (in knots), the **EET** calculates the time required to reach the destination by the most direct route.
- **Deleting the direct vector.** Press NAV. Press NEXT repeatedly until the selection bar is positioned in the single-line rectangular box at the right-hand side of the display in which the direct destination appears. Press DEL.
- **Deleting the direct vector.** Press NAV. Press NEXT repeatedly until the selection bar is positioned in the single-line DCT field on the right-hand side of the display in which the direct destination appears. Press the DEL button.
- **Only one DCT vector may**, of course, be calculated **at one time**. If you want to select another destination for your "hot vector", the former destination must be abandoned, new calculations carried out for the new destination and the line plotted.

If the red diamond symbol appears in the display, but not the line, it is likely that you have chosen your own position as a destination. Please verify the entry in the field adjacent to DCT by re-opening the NAV page. Re-select your destination (it must appear in the left-hand rectangular box) and press DCT.

2.6.4. Plotting waypoints during flight(pilot tops)

If you wish to save the point you are currently flying over, press the NAV button. This saves the position so that it is available to you for input at any time. When you press MAP to return to the chart, the position data will be updated by the GPS.

To access the database of user-defined waypoints press WPT and USR in succession.

Waypoints: USR

USR00001

AVRANCHES

RIGA

TANGO

TRACY

Route:

DCT: << not defined >>

DIST MC

N 53 37 086 (current position)

E 009 59 364

WPT GTO DCT INS DEL PREV NEXT UP DOWN MAP

Press PREV in order to position the selection bar in the upper single-line box. Now use the keyboard to allocate a unique name to the waypoint and save it in the USR waypoint list by pressing INS. Now the point is available to you for route planning or plotting a direct vector.

Warning: INS has a double function in this special context: Pressing the button when you have entered a name will cause the latter to be adopted in the database created and managed by you. However, pressing it when a plotted point in the list is currently highlighted will cause it to be inserted in the route. Please review the comments previously made on the DEL button.

2.6.5. Calling up information on database items

If during a flight you wish to review the coordinates of a waypoint, the frequency of radio beacons and critical information on airports, press the NAV button.

- Moving Terrain offers you the database list you last worked with: use the keyboard or the UP / DOWN buttons to select the desired point. The information will appear in the waypoint data box at the lower edge of the display.
- If you wish to change to another waypoint type, press WPT and then select either APT, VOR, NDB, INT or USR. Continue in the usual manner.

2.7. Loading and saving a route(PPLAN)

During the flight you can load a previously prepared route. You can also save the route you have just plotted and "file" it for future use.

- **To load:** Press PPLAN. You now have the choice between "Load" and "Save As". "Load" will be already highlighted. Press ENTER. A window will appear, enabling you to select one of the route already filed (files with the suffix *.rte). The desired route must appear in the single-line field under "File name". Now press ENTER. If you wish to abort the procedure, press CANCEL.
- **You can also save a route during flight:** Press PPLAN. Position the selection bar on "Save As" by pressing the DOWN button. Press ENTER to open the window. Moving Terrain now prompts you with a name for the route calculated by internal computation. Press ENTER to save your route under this name. You may also save the route under a different name by entering it on the keyboard. Save it by pressing ENTER.

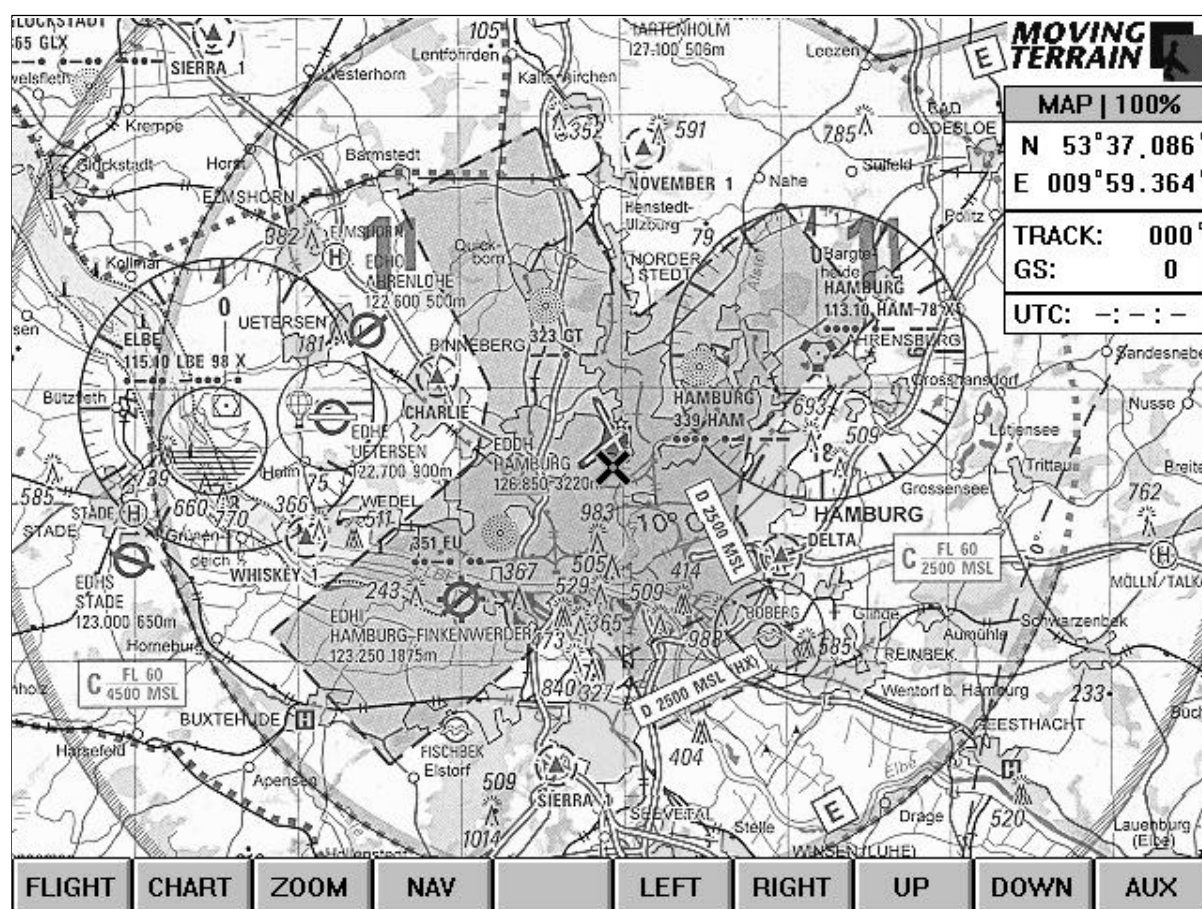
2.8. Changing over to the Map Mode(MAP)

Pressing the MAP button will terminate the positioning of the charts by the GPS receiver and thus the navigation mode. A confirmation (indication) that you are now in the map mode will appear in the Navdata window at the right edge of the display. Press the FLIGHT command button in the menu bar to switch over to flight mode.

3. Chart work with MT-ULTRA Professional JTSO (MAP)

3.1. The Main mode (MAIN)

Die wichtigsten Funktionen zur Kartenarbeit finden Sie jetzt auf der Beschriftungsleiste der Bedienungstasten. Nachfolgend werden die Tastenfunktionen von rechts nach links erklärt, was zwar ungewöhnlich klingt, durchaus aber der Verdeutlichung dient.



3.1.1. Changing over to further functions in Map Mode(AUX)

Pressing the AUX button will reveal further chart plotting options. Pressing this button once again (now marked MAIN) will return you to the main chart plotting mode.

3.1.2. Moving the chart(LEFT / RIGHT / UP / DOWN)

The charts can be moved by pressing the LEFT, RIGHT, UP and DOWN buttons. The longer you hold the respective button depressed, the faster the cross-hair cursor - the symbol for your current position - will move on the chart in the desired direction. There will be intermittent pauses in the movement of the charts. This is due to the reloading of the charts. If you wish to cover a substantial distance by this method, you should keep the button depressed during the time when apparently nothing is happening (the computer is working). This will maintain the internal acceleration of the chart movement.

3.1.3. The Nav page (NAV)

You will already be familiar with the Nav page (Chapter 2.6).

It supplies you with a wide range of data and alternatives for use in both the flight and map modes. At this point particular emphasis is placed on the functions which can be performed in the map mode only or which are effective only here. You will also find explanations of functions which may be performed in both modes.

3.1.3.1. Go To (GTO)

Pressing the GTO button will take you instantaneously to any desired point. The point may be selected from one of the five databases. It must be entered at the top left. Press GTO and you will be automatically positioned on the selected waypoint. If you wish to select a point on a route, position yourself with NEXT in the right-hand field and go to the desired point by pressing the DOWN button. GTO also functions here.

GTO is a very fast and precise method of moving around the chart. You can position yourself at any point around the globe, although only charts you have loaded (and for which you have obtained a license!) will be displayed.

3.1.3.2. Plotting a USR waypoint

Move the chart to the point at which you wish to plot a waypoint by pressing the LEFT / RIGHT / UP / DOWN buttons. Now press the NAV, WPT and USR buttons in succession. You will be prompted to accept a point in the first rectangular box at the top left.

Give the waypoint a unique name: press PREV in order to highlight the name field. Enter a name using the keyboard, provided you are positioned on the chart at the point at which you wish to plot a waypoint.

Important: Please verify that you are positioned at the point you wish to plot or rename. If your current position is not identical to that of the waypoint you wish to plot, the input will be incorrect.

Save: Save your work by adding the point to the list with INS .

Remarks: If you wish to record remarks (right-hand bottom), you must do this before pressing INS. Afterwards this is no longer possible. Once you have assigned a name, press PREV once again: the "current position" is highlighted in the remarks box. Enter your text and save the point with INS.

To delete: Highlight the point in your list of USR waypoints which you wish to delete and press DEL.

3.1.3.3. Plotting a USR waypoint by means of coordinates

Press NAV, WPT and USR in succession. Position the selection bar in the upper field and enter a name. Now position the selection bar in the coordinates fields by pressing PREV repeatedly (not NEXT, since this will assume the coordinates of a previously saved point!). Verify that north/south and east/west have been selected correctly and modify if necessary (DOWN). Enter the desired data in the coordinate fields using the keyboard (jump to next field by pressing NEXT). If you wish, you can enter remarks on your waypoint and save it by pressing INS .

3.1.3.4. Positioning the chart by coordinate input

If you wish to position the chart by entering coordinates, proceed as follows:

Call up the user waypoint database (NAV / WPT / USR). Position the selection bar in the first coordinate field by repeatedly pressing PREV (not NEXT, as this will assume the coordinates of a previously saved point!). Verify that north/south and east/west have been selected correctly. Use the keyboard to enter the desired data in the coordinate fields (jump to next field by pressing NEXT). Press GTO and the chart will be positioned. Now this can also be saved in the list: press NAV, then press NEXT until you are in the single-line name field at the top left. Enter a name for the point and save it in the list of waypoints by pressing INS.

3.1.3.5. Plotting and "flying" a route

For the correct procedure please refer to Chapter 2.6.2. Note that in the map mode you can quickly and easily obtain an overview of a terrain, since you may position yourself with GTO on the respective route waypoints. In the course of flight preparations this enables you to familiarize yourself with the terrain and the shortest connections between route points .

3.1.3.6. Plotting a search pattern

You can plot a route without having to go through the tedious procedure of allocating a name to each individual route point:

Go to the starting point on the chart. Press the NAV button. Now one of the standard databases must have been selected (not USR!). Position the cursor on the coordinate field. The coordinates you previously established with chart positioning (current position) will be entered automatically. Press INS. You will notice that the coordinates have been entered in the route field. Press MAP and move the chart to the next route point (UP / DOWN / LEFT / RIGHT). You will see the route has been plotted on the chart and the points marked by green diamonds .

How to plot a search pattern

- ☒ NAV
- ☒ Position the cursor in the coordinate field
- ☒ INS
- ☒ MAP
- ☒ Move chart
- ☒ NAV, cursor is already correctly positioned
- ☒ INS
- ☒ MAP
- ☒ Repeat until the route is complete

3.1.3.7. Creating a direct vector(DCT)

As in flight mode, a "hot vector" can be displayed to any desired destination in the map mode.

3.1.4. The zoom function (ZOOM)

This function is also familiar to you from the flight mode:

ZOOM: 50%, NORMAL and 200%.

In the normal mode you will see the charts in their usual size, 50% reduces them by half and pressing the 200% button will enlarge them by a factor of two. The Navdata window tells you the current display mode. The zoom functions may be used in the same way for custom charts. Pressing NORMAL returns you to the standard display mode and the menu bar will be that of the main mode.

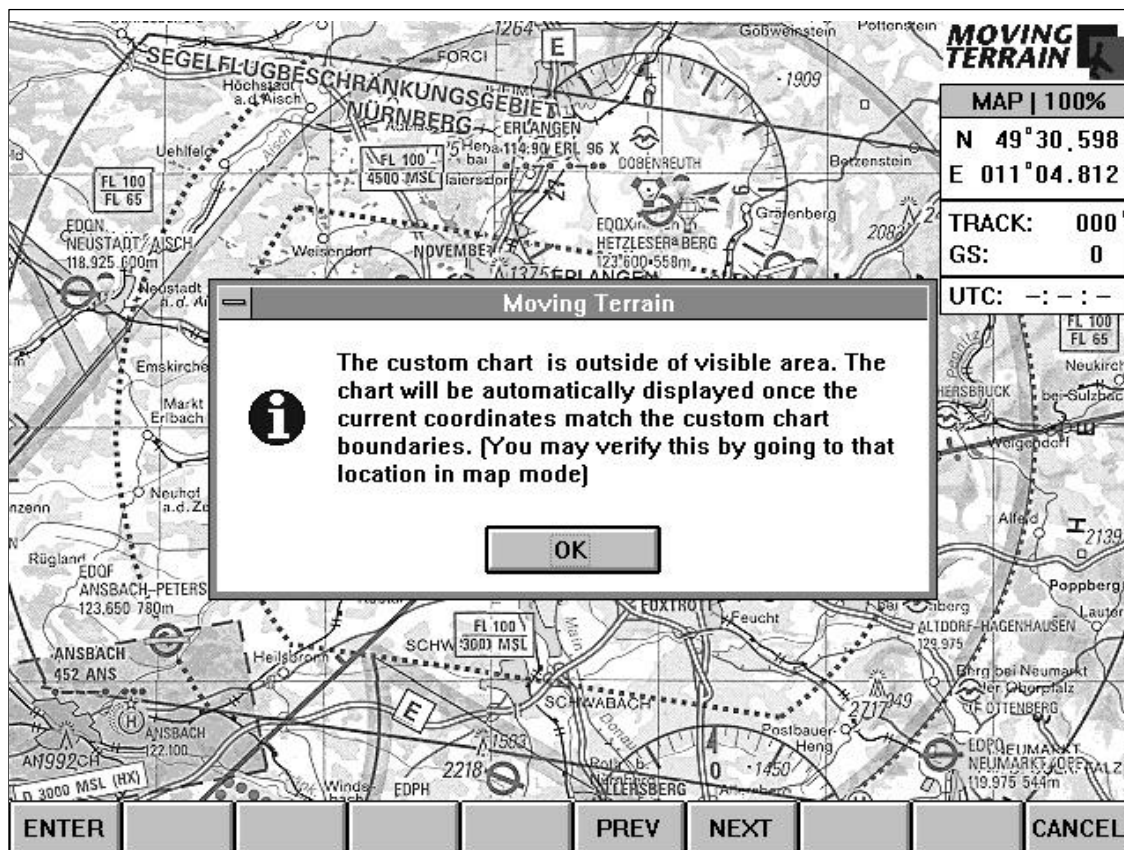
3.1.5. Changing over to another chart basis in the running system (CHART) and loading a custom chart (CUSTOM)

You may switch to another chart basis during flight. These charts will then be available to you in the running system for correct determination of your position. Press CHART, select BASE and then highlight the desired chart basis by pressing UP and DOWN. Confirm your choice with ENTER. In a few seconds the desired chart will appear on the display.

Custom Charts

Select a user-defined chart as described in Chapter 2.3.2.

Press the ENTER button to activate the selected custom chart and the display will switch back to show the chart. Above the menu bar at the left-hand edge of the display you will see the name of the custom chart. If you are already in the terrain for which this chart is referenced, you will now see the latter. You will otherwise see a message that although the chart is available, it is currently outside the visible area.



Confirm this message by pressing ENTER.

You now have various alternatives for viewing the chart:

- Press NAV, select the waypoint which is located in the chart area. Position yourself on the chart with GTO.
- Use the LEFT / RIGHT / UP and DOWN buttons to move the base chart into the region for which the custom chart is referenced. It will be loaded automatically.

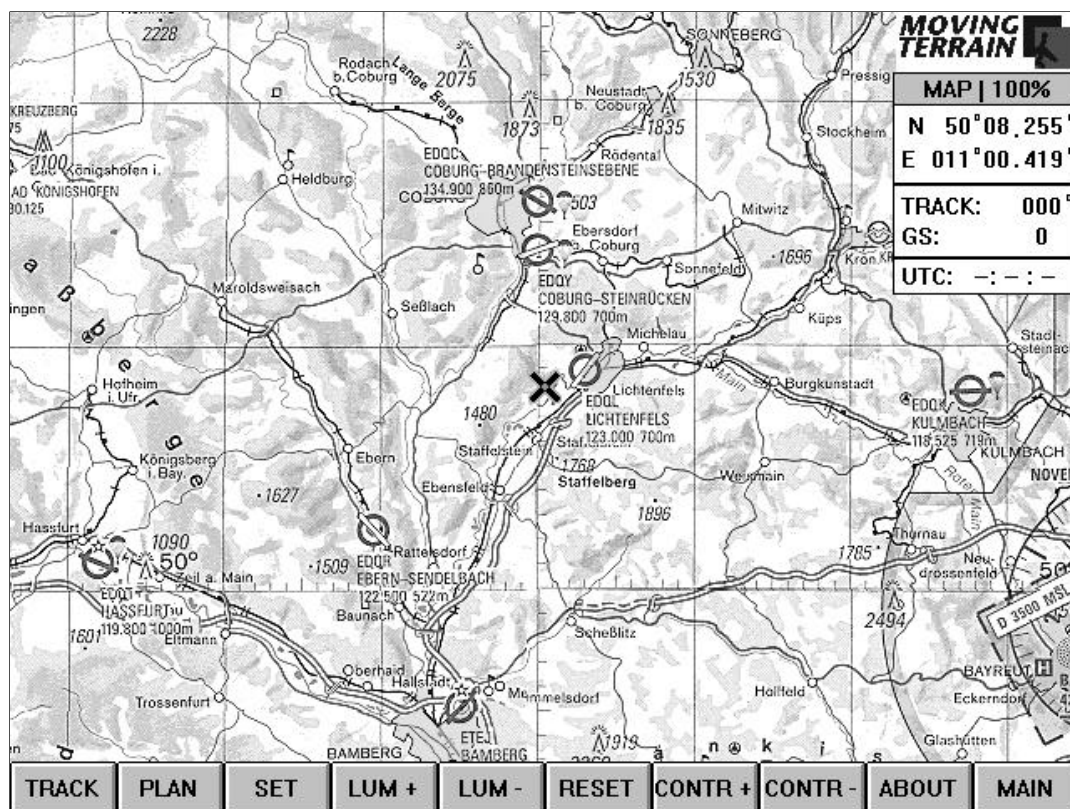
If you wish to see the standard base chart, press CHART / CUSTOM once again. This will deactivate the custom chart and you will be back in a familiar environment. If you press CHART / CUSTOM yet again, Moving Terrain will prompt you to accept the chart last activated. Without needing to go back to the beginning, you can now load the chart instantaneously by pressing the ENTER button. This enables you to easily switch back and forth between the base chart and your custom chart.

3.1.6. Changing over to Flight Mode(FLIGHT)

Durch Drücken der Taste FLIGHT wird der Flug-Modus aktiviert. Die vom GPS gesendeten Daten werden verarbeitet und die Karten positioniert.

3.2. The Auxiliary Mode (AUX)

Press the AUX button. Additional chart plotting functions will now be displayed on the menu bar at the bottom. Again in this chapter the commands will be explained from right to left.



3.2.1. Returning to the main chart functions(MAIN)

Pressing the MAIN button will return you to the main mode for chart work. More detailed instructions are to be found in Chapter 3.1. Pressing the same button once more (now marked AUX) will take you back to the additional chart plotting functions.

3.2.2. ABOUT

Please read the information on Moving Terrain Version 3.6. Re-close the window by pressing ENTER.

3.2.3. Adjusting display brightness and contrastLUM+ / LUM- / RESET / CONTR+ / CONTR-

In the chart mode you can also quickly adjust brightness and contrast of the display to according to current requirements. Brightness is adjusted with the buttons marked LUM+ and LUM-. Contrast is adjusted with the buttons marked CONTR+ and CONTR-. The RESET option returns the display to the original status.

3.2.4 Changing the screen display (SET)

Press SET. Selecting the keyboard mode will take you to an interface controlled by a standard keyboard.

Important: This option should only be selected on the MT-ULTRA Professional JTSO if you are familiar with computer operation and an external keyboard is available!

To operate in the keyboard mode you must connect an external keyboard. If you wish to return to the touch mode (i.e. the normal MT-ULTRA Professional JTSO operating interface) perform the following steps:

Press the ALT and S keys simultaneously. "Touch mode" will now be highlighted on the display. Confirm with ENTER. Now you will see the familiar interface and you can operate the MT-ULTRA Professional JTSO with the frame-type keyboard.

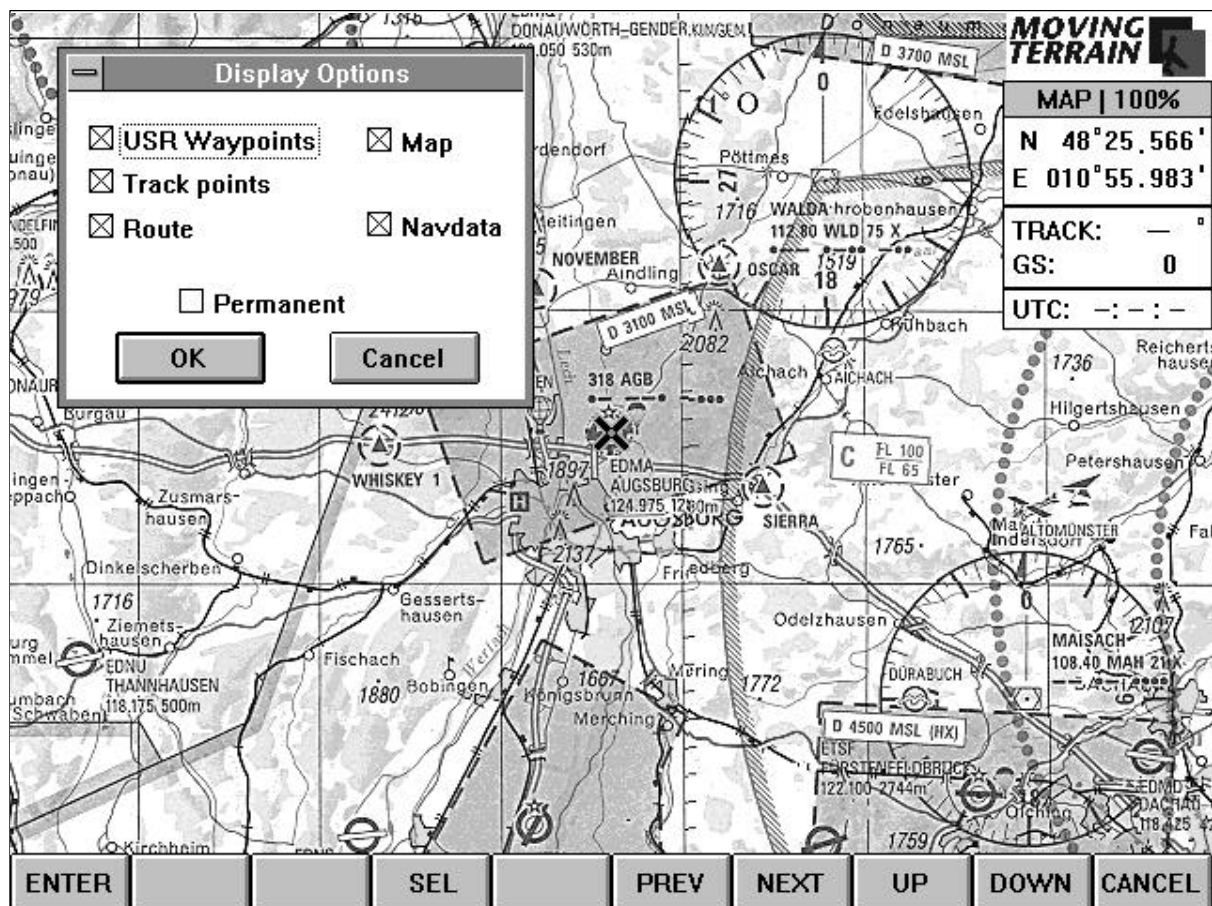
The external keyboard is required for the following function:

- **Custom chart reference** for preparing and referencing your own charts.

SET provides a further option:

Press AUX and SET to return to the settings menu and select DISPLAY.

On the "Display Options" window you can now select which information is to be displayed on screen. Currently all possible options are checked, i.e. all are displayed:



Should you wish to select the option once more, re-open the window with the display options and select the item by pressing SEL. Further options (Track points, Route, Map, Navdata) may be selected by pressing PREV / NEXT or UP / DOWN and deciding whether you wish the cross-hair cursor to appear by switching it on or off (SEL).

Should you wish to select the option once more, re-open the window with the display options and select the item by pressing SEL. Further options (Track points, Route, Map, Navdata) may be selected by pressing PREV / NEXT or UP / DOWN and deciding whether you wish the cross-hair cursor to appear by switching it on or off (SEL).

Program Setup: Installation of a GPS and installation of charts (base and custom charts), updating of the Nav databases and program updates. M-ULTRA has already been installed in the factory, so that as a rule you will not have to deal with setup problems. For the installation of new, updated or other chart material, Navdata or a GPS you are, of course, free to use our installation service or contact your repair base. In the new version this program option is,

however, already available via the frame-type keyboard. Please refer to Chapter 4.

3.2.5. Loading and saving a route(PLAN)

Please refer to Chapter 2.4.4.

3.2.6. Working with a flight path already covered(TRACK)

Moving Terrain makes a record of your flight. This enables you to review your path in the map mode. Several options are available to you:

- Replay** Review your track in quick motion. You can go over your flight once again together with the recorded data and times (displayed in the window with the current flight path information). The track loaded will be played back or - if you had the equipment in continuous use - the last track flown.
- Caution:** If you wish to view it at a later date, you must save your track before switching off the equipment.
- Clear** Delete the track from the screen. If you wish to use the flight path for a later debriefing, you must first of all save it with the "Save As" option.
- Load** Loading a previously-saved flight path (for procedure see loading a custom chart in Chapter 2.4.1). If you wish to view a previously-saved track in Replay, select "Load" and the track will start up in fast motion.
- Save as** Save the track under a unique name.

4. Program Setup

To install new charts and custom charts, change the configuration or perform an update of Navdata or of the Moving Terrain program, use the AUX / SET buttons in the map mode and highlight "Program Setup" using the DOWN button.

Five modes will now be available to you in the dialog box:

Chart Installation/Update	replaces, supplements or deletes individual chart files.
Custom Chart Installation	prepares individual, previously (e.g. by MT) scanned and referenced special charts for use .
GPS Configuration	adapts the program to almost every available GPS type.
Nav-Database Update	Aktualisierung der Nav-Datenbank.
Nav Database Update	Updates the Nav database
Program Update	Updates the MT program.



Select an option by pressing the DOWN / UP buttons and confirming your selection with ENTER.

To terminate program setup without any changing any settings, press ABORT.

4.1. Installing the Charts

You can easily select the chart sections you require and copy them to your hard drive.

Insert the CD-ROM with the charts into the dataloader (CD-ROM drive). Connect the dataloader to MT-ULTRA Professional JTSS's parallel port.

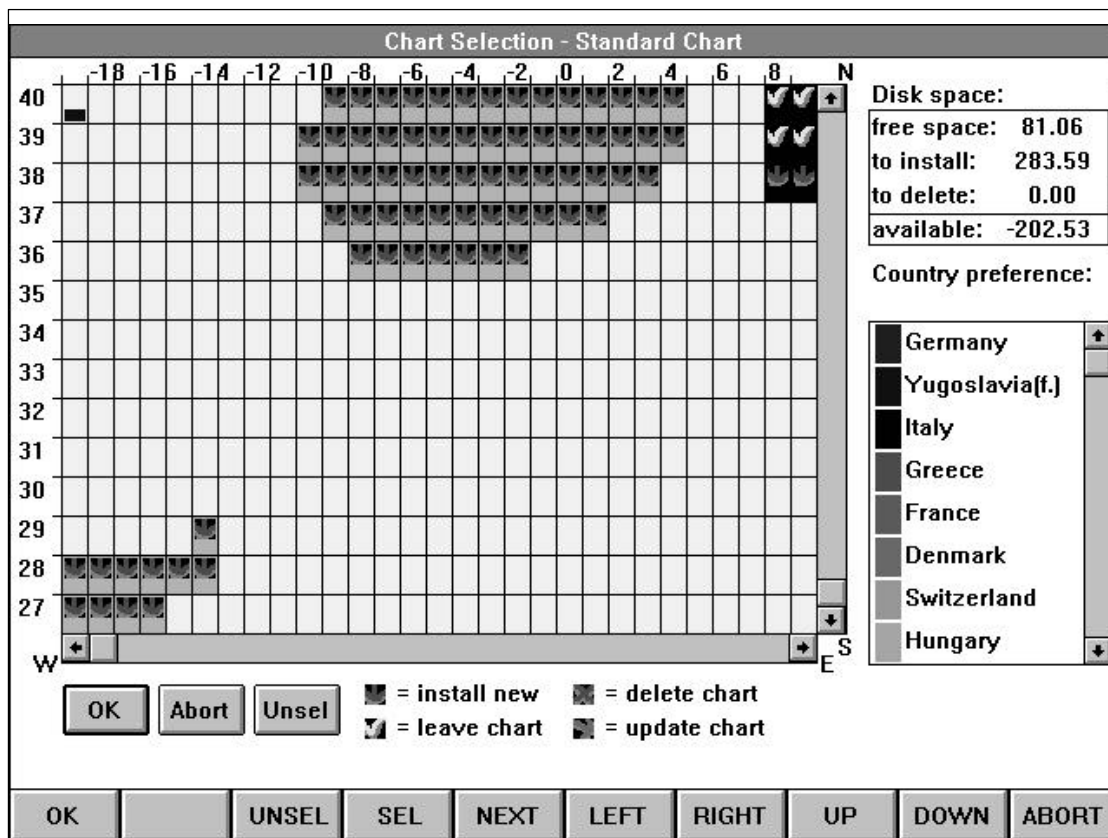
Before installing the charts, the setup program will determine whether the CD-ROM drive is connected and the Moving Terrain chart CD has been inserted.

A window will set out the alternatives open to you. The charts available on the CD and those already installed on your hard drive will be displayed on a grid with latitude and longitude and marked with various symbols.

If you simply wish to see which charts are installed on your computer, press ABORT. This displays a list of all base charts hitherto installed (ICAO, helicopter, etc.). Marking the desired chart basis will display all the charts which have hitherto been installed.

To install new charts, the setup program will require the respective descriptive file **MAPINFO.INF**. Normally, this file is to be found in the standard directory of the chart CD. In the event that your CD-ROM drive has a letter other than D:, you must select the correct drive in the field at the bottom right. Please note that the **MAPINFO.INF** file must be highlighted, otherwise it will not be found. A little patience is required for the chart index to appear after pressing "OK".

If you wish to install new or other charts on your hard drive, select the **Chart Update Mode**.



Now you can select chart areas. Once you have completed and confirmed your selection, the charts will be installed on your hard drive without making changes to the program, the GPS driver or the starting position.

In this chart index, countries are displayed in various colors (see key at the right). Areas for which no charts are available are shown in gray. The chart installation program will initially display the most south-westerly point available on the CD-ROM (and for which your device is licensed!) in the bottom left corner. In the above figure with the EUR-CD it is the Canary Islands.

The symbols for the individual chart sectors determine the action for the same:

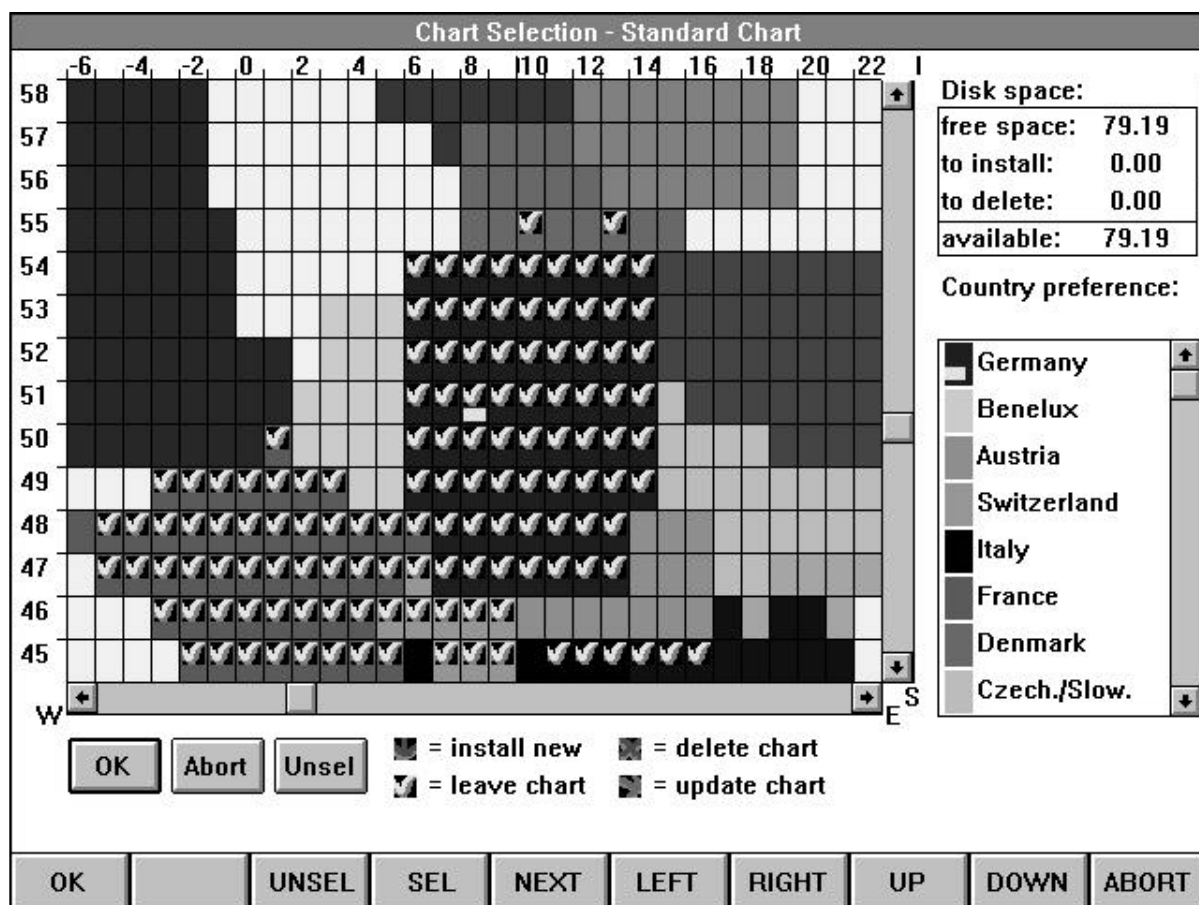
- | | |
|--------------|--|
| Arrow down: | Chart will be installed new. |
| Arrow right: | Chart is already installed and will be replaced by an updated version. |
| Red X: | A previously installed chart will be deleted. |
| Yellow V: | Chart will remain unchanged |

In the upper right half of the window you will see a field marked "Disk space". This box shows you if you have enough space on your hard drive to perform the desired chart operation.

Important: A negative value in the "available" field indicates that there is insufficient capacity on the hard drive.

In the above figure you will observe that 200 MB of space are lacking for the installation of the currently selected chart material.

Since it is assumed you will wish to install all chart material for the first time, in the standard setting all chart sectors available on the CD are selected. Should you wish to install only certain charts, use the UNSEL button.



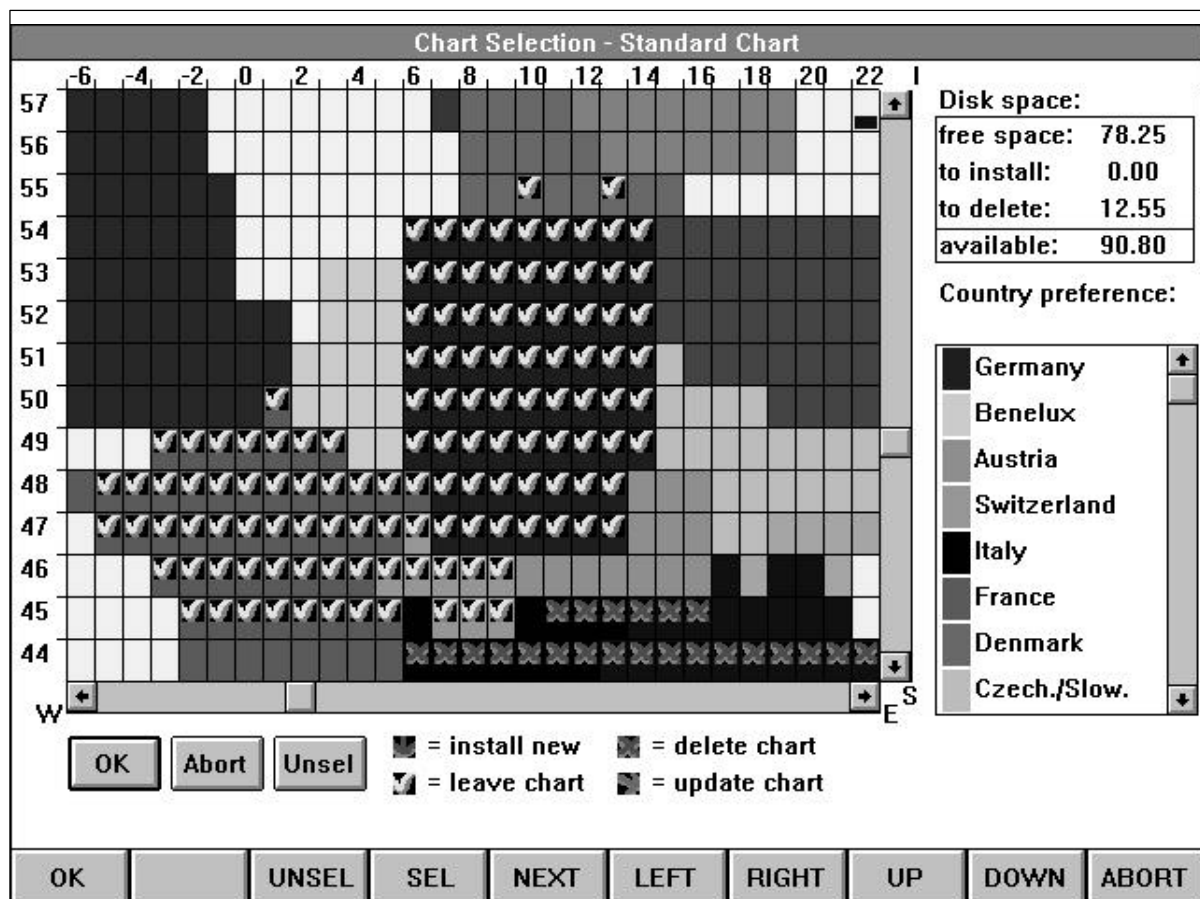
Here again you will see each country displayed in a different color. No pre-selection has yet taken place (green arrow pointing down). Only the countries already installed on your MT-ULTRA Professional JTSO are displayed with a yellow check.

4.1.1. Selecting charts(LEFT / RIGHT / UP / DOWN / SEL)

At the top left of the chart index you will find a small rectangular bar for selecting the charts. This marker can be moved with the LEFT / RIGHT / UP / DOWN buttons and positioned on the desired chart rectangle. Not all charts available on the CD-ROM can be displayed at once, but if you move the marker to the right, the page will scroll to reveal the charts in the eastern portion of the graphic display.

The degrees of longitude are shown above the graphic display. Degrees of latitude are shown to the left.

Now press the SEL button. If no chart has yet been installed, you can only use this function to "install new" (green arrow pointing down). If the chart is already installed, the other options will also be available. Press the SEL button until the desired procedure is displayed.



In the above figure the charts of northern Italy, already installed on the device, have been marked for deletion.

4.1.2. Country preference

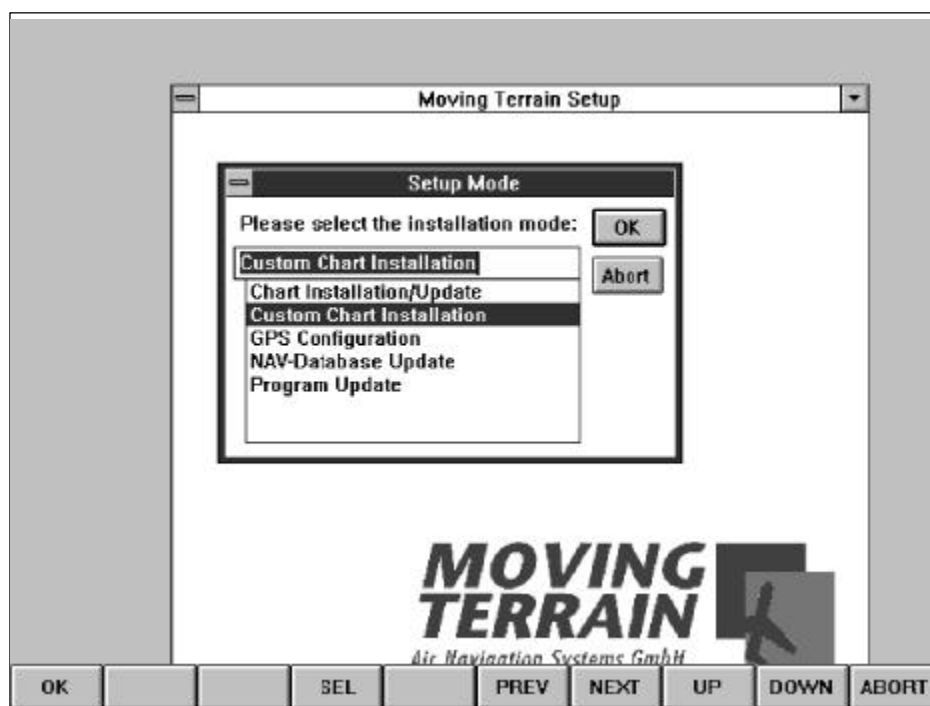
A further component in the window is the "Country preference" box, which lists the available countries. To help you distinguish them from one another, they have been allocated colors. In peripheral areas the charts abut each other and have been assigned to the country whose territory predominates on the chart. Germany, Austria and Switzerland are exceptions: all charts are available for these countries. For instance, if you wish to install the whole of Switzerland, select the "Country preference" box by pressing NEXT. Highlight Switzerland and press SEL.

A few moments patience will be necessary. Subsequently you will observe that the country name has move up one position in the list. Repeat the procedure as required until Switzerland is in first position. Now you can be sure that by selecting Switzerland you have installed all charts in the chart index. The same applies to Austria and Germany.

Once you have completed your selection, press the OK button. The window now appearing will confirm the action you have selected. If you wish to continue installation, press the OK button once again.

Upon successful installation the Moving Terrain Program will be re-loaded.

4.2. Custom Chart Installation

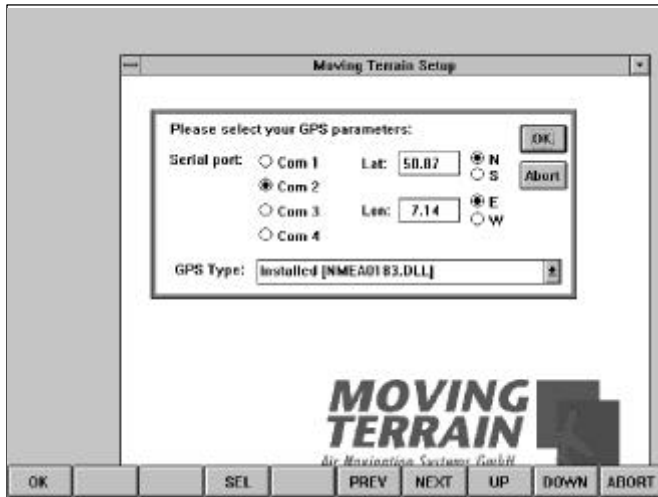


Ideally the custom charts (*.MTC) should be located in the **D:\CUSTOM** file, e.g. if you have had the charts digitized by MT and copied to CD-ROM (and if your CD-ROM drive is identified with D:). You can accept the default settings and install all the custom charts. A selection of one or more charts is not possible! Should you modify the path, an *.MTC file must be highlighted (Note: all files will be copied).

4.3. GPS Configuration

To change the configuration of your GPS, use the AUX / SET buttons in the map mode and highlight "Program Setup" with the DOWN button.

Now select GPS configuration.



You can now select the Com port by highlighting the appropriate position and confirming with OK.

Important:

- COM 2 must be set for the supplied MT-Integral.
- If you have connected your GPS to the serial port at the back of the device, you must select COM 1.

Pressing NEXT will take you to the field for selecting GPS type. Use UP and DOWN to scroll through the list of GPS drivers. For the integral GPS this line must read:

MT-Integral GPS (NMEA 0183).

Pressing the NEXT button will take you to the coordinate fields. The coordinates as shown determine the starting point of Moving Terrain, i.e. the chart position which will be displayed when the program is launched. Since the frame-type keyboard does not include a decimal point, you can only determine latitude and longitude. Note the North/South and East/West settings and change these if necessary (UP / DOWN).

Confirm your selection with OK or terminate the operation by pressing ABORT.

Once the GPS configuration has been successfully completed, Moving Terrain will be launched automatically.

4.4. Nav-Database Update

Selecting Nav Database Update will update your Navdata. Launch the Nav database update from the Moving Terrain program Setup. As a standard procedure, the program will look for database files in the D:\NAVDATA directory. If the directory cannot be found there, the following message will appear: "No files have been found on the CD-drive..". If your Navdata carrier is in a drive identified by a different letter, abort the procedure and select the valid path manually. At least one database file must be highlighted before you start installation with "OK". Independent of highlighting, all Navdata (airports, VORs, NDBs, intersections) will be updated - a selection is not possible. As a standard procedure, the Setup program assumes that the Moving Terrain system to be updated is located in the C:\MOVTER directory. If the main program <MT.EXE> is found at this location, the update will be performed without further prompting. Otherwise you must select the correct path for Moving Terrain installation and start the update with "OK".

4.5 Program update

When selecting Program update you must stipulate in which directory the program to be updated <MT.EXE> is located. The default is the **C:\MOVTER** directory. Should your <MT.EXE> be located in a different directory, use the NEXT button or the mouse to position the cursor in the corresponding box and select the correct drive/directory (UP, DOWN and SEL buttons). Please note that the <MT.EXE> program must be highlighted in one of the left-hand fields (use PREV to return to the previous field, select it with SEL and confirm it with OK). Now the Setup program will be updated.

Upon successfully completing the update you can call up the new MT functions (in touch mode: AUX, SET, Program Setup ..., in the keyboard mode Settings, Program Setup...).

Please note: It will take a few minutes to regenerate the indices of the databases!

5. Installation via an external keyboard

Brief summary with key assignment

The following brief summary of key assignments on the external keyboard as described in Chapter 4 is intended to facilitate operation:

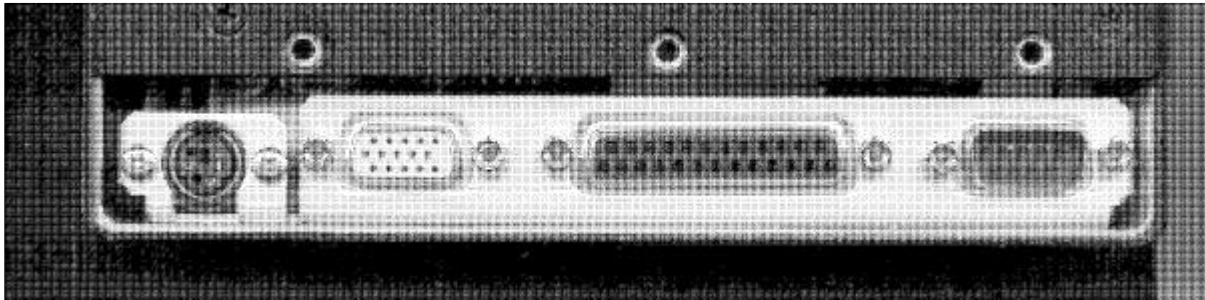
Key markings in touch mode	External keyboard	Function
LEFT/RIGHT/UP/DOWN	Arrow keys (cursor) left/right/up/down	Positioning of the selection bar on the chart rectangle or desired country
SEL	Spacebar	Selection of chart operation Assignment of country preference
NEXT	Tabulator	Alternate between chart and country window
UNSEL	Backspace*	Unselect all charts
ABORT	ESC*	Abort
OK	Return key*	Confirm

* Only functions if the selection bar is located in the chart window and not the country window!

6. Connections for MT-ULTRA Professional JTSO

6.1. Interfaces:

The interface cover at the rear of the device (secured with three blank screws) may be removed. Opening the device will render the warranty void! The remaining screws have been coated with tamper-proof lacquer.



Keyboard
PS/2

VGA
Monitor output
(for remote display)

Parallel port
LPT1

Serial port
COM 1

6.2. Connecting to GPS and mains supply

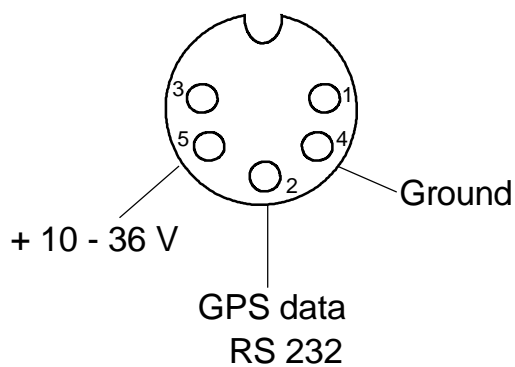
Your GPS must be equipped with a data output and a cable for transmitting data to your computer. If this is not the case, please consult your GPS dealer and purchase the necessary data cable.

If it does not already have one, a 5-pole semi-circular connector must be soldered to the cable.

The connector pin assignment (viewed from the solder side) is as follows :

Connector for GPS 5-pole pins

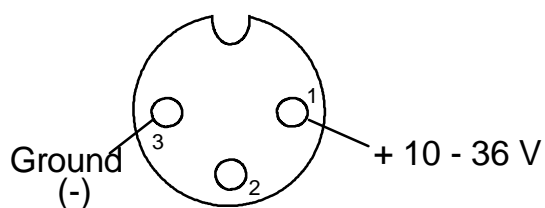
Solder side



- 1 not assigned
- 2 NMEA data line
- 3 not assigned
- 4 ground (-)
- 5 + 10-36 V

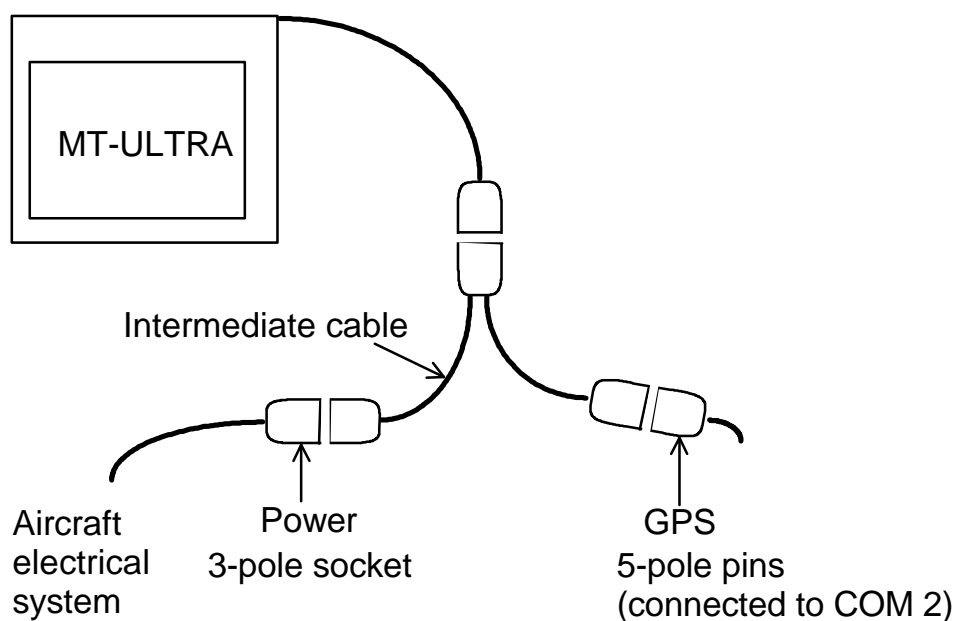
Connector for 3-pole pins

Solder side

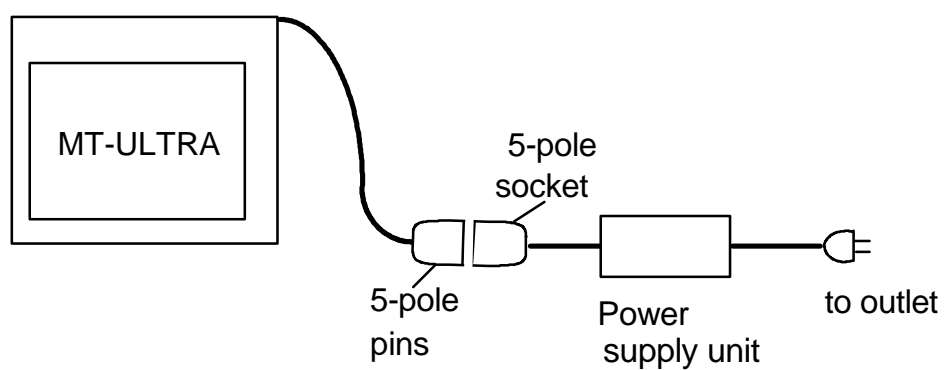


6.3. Cabling

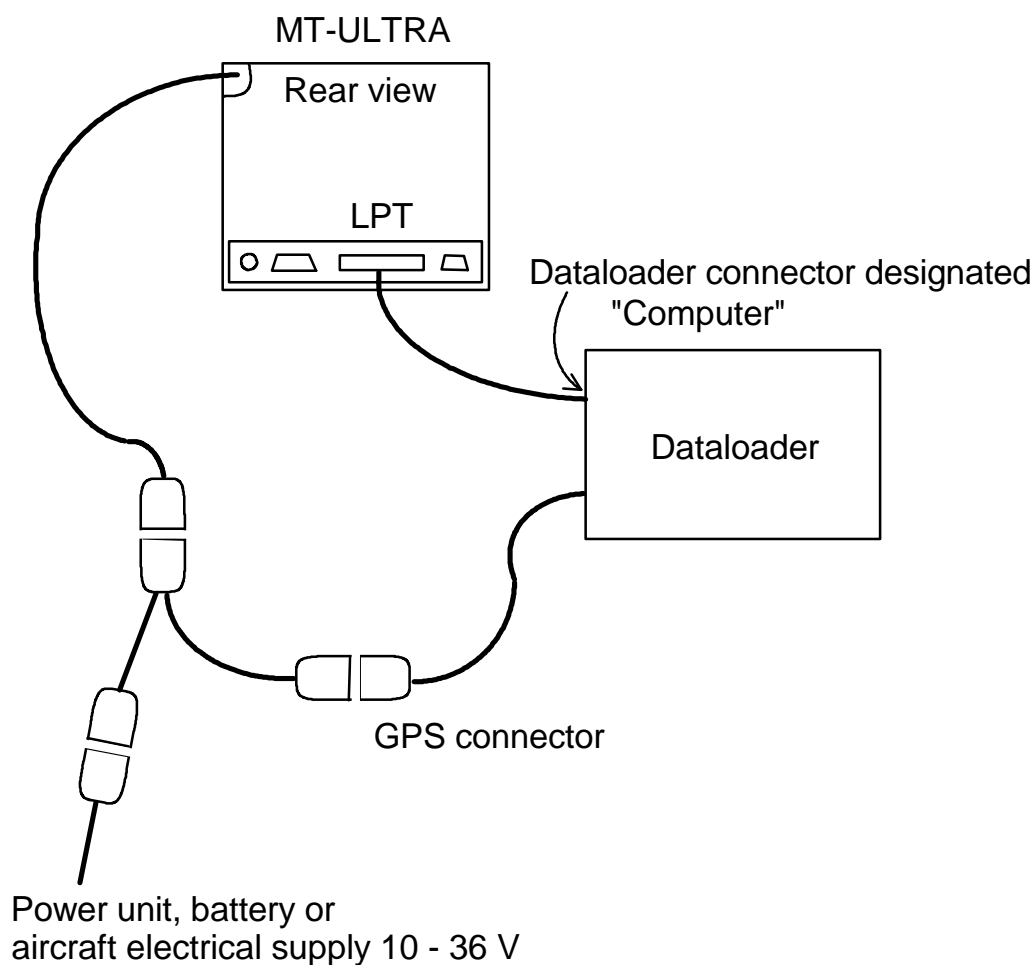
6.3.1. Standard connections



6.3.2. Connecting to mains outlet via a power supply unit



6.3.3. Connecting the dataloader



6.4. Setting data signal type on the GPS

Most GPS manufacturers have made the correct default setting for you (e.g. often NMEA 0183 as data output). You can verify the correct data type in the following table:

<u>Manufacturer</u>	<u>GPS Type</u>	<u>GPS settings</u>
Ashtech	AV 12	NMEA 0183
Furuno	GN-72	NMEA 0183
Garmin	GPS 55	NMEA 0183
Garmin	GPS 90	NMEA 0183

Garmin	GPS 95	NMEA 0183
Garmin	GPS 100	NMEA 0183
Garmin	GPS 150	NMEA 0183
Garmin	GPS 10-00	NMEA 0183
II Morrow	Apollo 820	NMEA 0183 V2.00; Baud=4800
II Morrow	Apollo 920	NMEA 0183 V2.00; Baud=4800
King	KLN 90	9600 baud, 8 N 1
Magellan	5000 A	NMEA 0183
Moving Terrain	MT add-on GPS	NMEA 0183
Moving Terrain	MT integral GPS	NMEA 0183
Moving Terrain	MT Mobile II	NMEA 0183
Rockwell/Gessa	Gessa GPS Pac	automatic
Rockwell	Sonstige Nav Core V	no setting necessary
Trimble	TNL 1000	Mode=R1; data update rate=1/sec; 9600 baud
Trimble	TNL 2000	Mode=R1; data update rate=1/sec; 9600 baud
Trimble	TNL 3000	Mode=R1; data update rate=1/sec; 9600 baud
Trimble	Flightmate Pro	NMEA 0183
Trimble	SVeeSix	TSIP
Trimble	Mobile GPS II	see description for Winmobile or Readme file

If your GPS is not listed here, please inquire. A suitable existing driver can usually be found, otherwise we will be pleased to provide an appropriate driver on request.

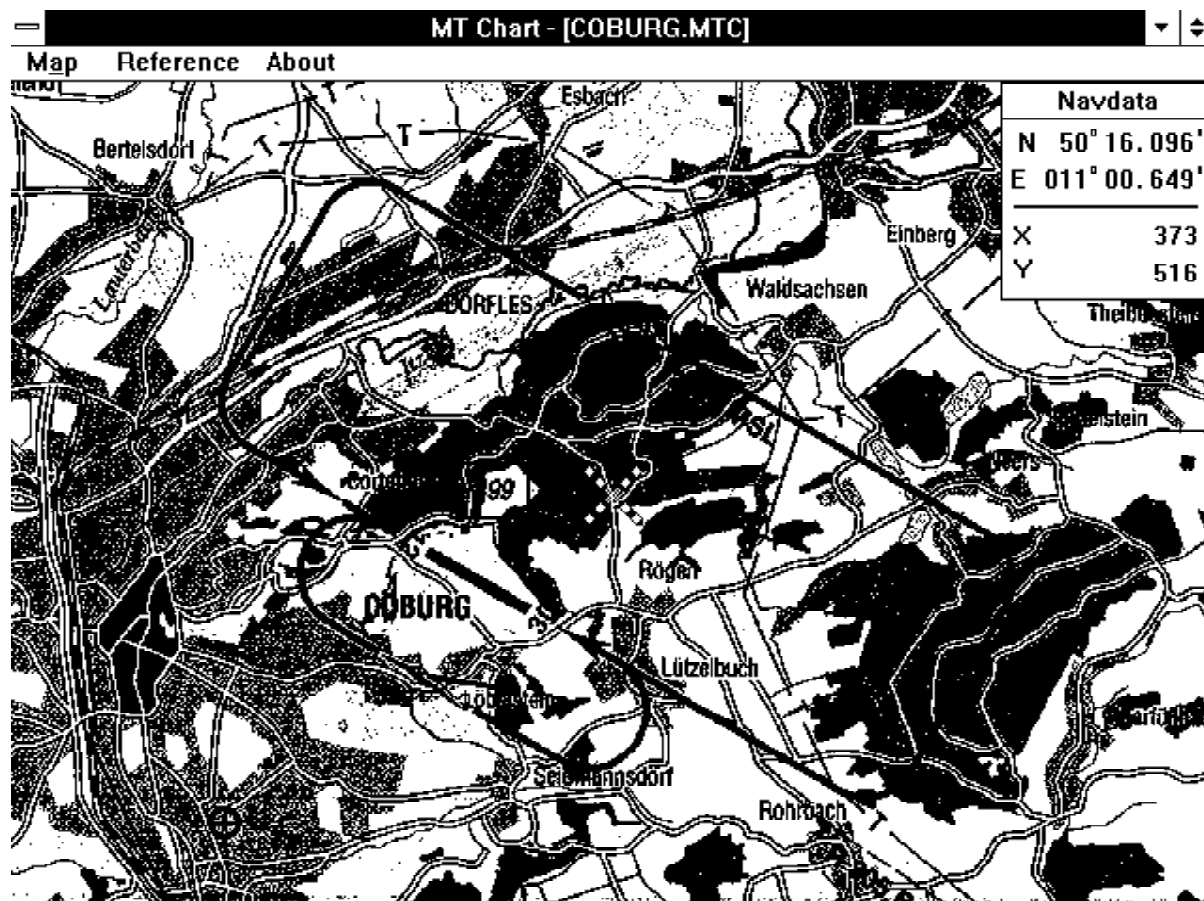
6.5. Special GPS drivers

Test drivers (No GPS)

This driver does not support any GPS. It only simulates positional data in a circular path for test and demonstration purposes. As in actual flight, a track appears, which may be saved or reviewed via the "Replay" function.

7. The MT Chart program

With MT Chart you can reference your own charts (scans). These can be control from the MT main program by means of the assigned coordinates.



7.1. Scanning

Before you launch the MT Chart program you must have scanned the desired chart. For it to be recognized by Moving Terrain, your chart must be in the form of a bitmap file in the so-called Windows-PMP format (files with suffix *.BMP). In addition, the color depth must be 24-bit, i.e. 16 million colors = true color.

Charts may be converted to the above file format by means of a hand-held scanner, in a scanning lab in your neighborhood or by us. Any standard scanner may be used for the purpose. Your file must, however, be saved as a 24-bit BMP file.

Good results, particularly in color, without distortion are to be obtained with a color flatbed scanner. When buying the scanner, make sure that image processing software is included.

Ensure that the charts used are as true to scale as possible. Street maps such as those produced by Falk are prepared with an extremely distorted projection in order to achieve greater clarity in dense urban areas. Although these maps can be referenced, the results do not reflect the real situation! It is best to use topographical maps or those approved for navigational purposes.

The program also tolerates non-oriented scans. They should preferably be northed, but the software will compensate for errors resulting from inadvertent rotation.

7.2. Referencing

To work with the MT Chart program you will need to connect an external keyboard to the MT-ULTRA Professional JTSO (cf. Chapter 1.4, Working with an external keyboard, P. 8).

In the map mode, select the keyboard mode by pressing AUX and SET (keys F11 and F4 on the external keyboard). Now connect the external keyboard and call up the Settings menu by simultaneously pressing ALT+S. Use the cursor keys to select the Custom Chart Reference program. Confirm your selection with the return key.

Once the MT Chart is loaded, in the center of the display you will see a special referencing symbol (diagonal crosshair) a still empty Navdata box and three menu items. Select the Open function in the map menu (Alt + A) or press the F2 key. A "Load Custom Chart" dialog box will appear. Select the drive, directory and file (.bmp format) you wish to reference. You can move within the rectangular boxes with the cursor (arrow) keys, to the next box with the tabulator key or to the previous box by simultaneously pressing shift + tab. We recommend saving your custom chart in the C:\MOVTER\CUSTOM directory. This is where you will find charts you have ordered from us.

Once you have selected the chart to be referenced (its name must appear in the single-line rectangular field beneath "File name"), confirm your selection with ENTER. The file will now be converted automatically to the .mtc Moving Terrain format. You may choose to save the .bmp file or only the .mtc file (which will take up less space on your hard drive). Since you will need only the .mtc file in future, we recommend deleting the .bmp file. If your scanning was done externally, it may be wise to make a back-up copy on another floppy before starting work.

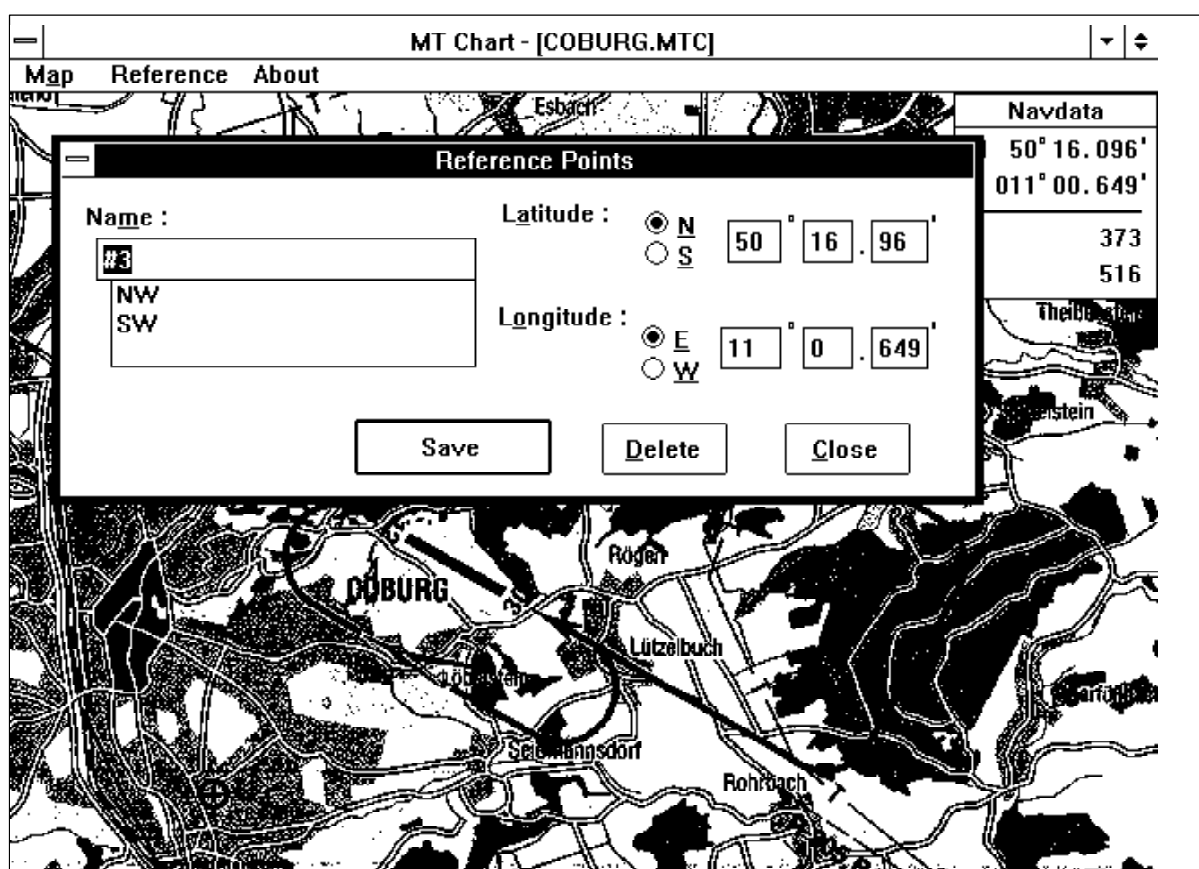
Now comes the most critical stage of preparing your chart for use in Moving Terrain: referencing. The more carefully this stage is performed, the better the results you will subsequently achieve with the GPS. For referencing you must assign exact coordinates to three points on the chart (latitude and longitude). Move the chart with the cursor keys to position the referencing symbol over a point whose coordinates are known to you, or can be read off the chart. In the case of visual approach charts the grid at the edge of the chart should be used. If no coordinates are given on the

chart (e.g. street map) you can also drive/fly/walk to a number of points on the chart and plot the coordinates with the GPS.

You must reference three points. Important: your reference points should be well distributed over the chart, not clustered together or in alignment with each other.

The MT program will also work with only two points. However, you will be relinquishing a critical element of safety and accuracy.

To plot a reference point, move the desired chart point beneath the referencing symbol and select the Referencing menu (Alt+R) or press the F8 key. In the dialog box which now appears you can give the reference point a name and enter its coordinates (up to 1/1000 angular minute). Now move from one field to the next by pressing the tab key (or to the previous field by pressing Shift+ Tab). Save the point by pressing ENTER. In this way, save a total of three points.



The program will now assess the accuracy of the input and calculate the deviation of the chart from the rectangular reference. The following evaluations will be made:

Remarks	very good	good	medium	poor but useable	unuseable
del psi *	0-1	1-2	2-6	6-10	>10

(* is the internal weighting factor, calculated from the relative angle of rotation of the chart between the ground coordinate system and the pixel system as determined by the straight connecting lines between the input points. The program thus evaluates projection and reference errors at the same time.)

Confirm this message by pressing ENTER. Referencing quality can subsequently be verified under MAP/INFO.

Now save the correctly referenced chart in the Map menu (Alt + A) or by pressing the F3 key. This will save the chart in Moving Terrain format and also your referencing details so that they are available for use in the Moving Terrain program.

7.3. Further functions in MT Chart

7.3.1. Map Menu

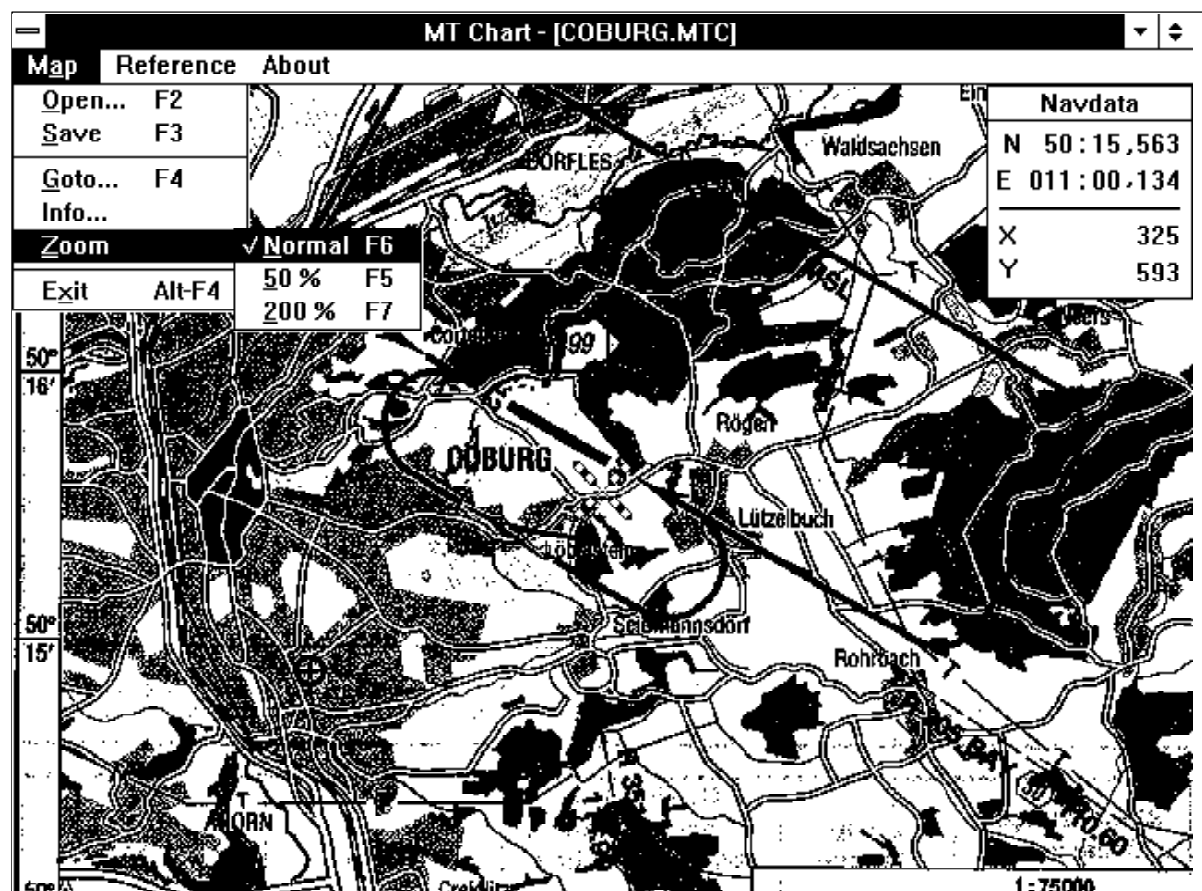
In addition to Open (for opening .bmp or .mtc files), Save (for saving .MTC files with referencing) and Info (for displaying the quality of your referencing) as explained in Chapter 3.1, the Map menu (Alt+A) also contains the following functions:

7.3.2. Goto...

You will need this function for checking the chart by entering coordinates which should be on it. The referencing symbol should then appear exactly at the position stipulated by you. However, if the coordinates are off your chart, you will receive an error message.

7.3.3. Zoom...

As in the main Moving terrain program, besides the standard size you can also enlarge your own charts by 200% or reduce them by 50%.



8. Errors in Practical Use of Moving Terrain

The greatest danger in the use of this system is that in time you will inevitably feel that you yourself no longer need to do any navigating, because the system takes care of everything. In the improbable event of a system crash you would be under extreme pressure.

Do as we do: get accustomed to Moving Terrain, preferably prior to permanent installation, by "playing" with it as often as possible in your car or boat. When flying with it for the first time, make sure you are accompanied: the copilot should operate the device and the pilot should initially just cast a glance at it when convenient.

Remember the days when you were familiarizing yourself with a VOR, HSI or Flight Director. Even if Moving Terrain is intuitive in use and constitutes the most natural form of navigation, you will need to adjust certain knobs under pressure of time and get used to time constants. Learn to master the intricacies of the device in a non-stress situation and don't wait until the first time you have to confirm your position in critical circumstances!

The following explains a few hidden problems discovered by our pilots, to enable you to increase your level of attentiveness and cautiousness.

- It is possible that you will forget that your GPS was in simulation mode when it was last switched off (your GPS, not the Moving Terrain program). The GPS will not display this, but will transmit the false position to the Moving Terrain computer, whereby the simulation, regardless of the information previously input, will always run from your current position. You will get yourself into considerable difficulty if there is a discrepancy between version on your display and what is passing by below you, although the program seems to be working properly. Moving Terrain cannot recognize the error for you because the GPS data signal does not contain a code whether it is in normal or simulation mode.
- Assume you have connected the device to the aircraft electrical system. During the flight the connection becomes loose, the computer continues to run on the battery, but after a while it cuts out completely! This would be signaled by a light on your computer, but it is possible to oversee that.

According to Murphy's Law, these and other problems will always occur at the most inopportune moment, i.e. when you need an additional orientation for an approach, when you are located between control zones and urgently need MT to help you find your way, or when you have just maneuvered around a thunderstorm and have flown into a valley you're not sure there's a way out of. Do as the professionals do: hold a redundancy in reserve, navigate terrestrially as well.

9. GPS Error Messages

Although your GPS has been connected, there is a problem with the cable, connectors or moisture.

Solution: Wait for a moment. The problem may resolve itself.

Check the connections, test once again in a dry room.

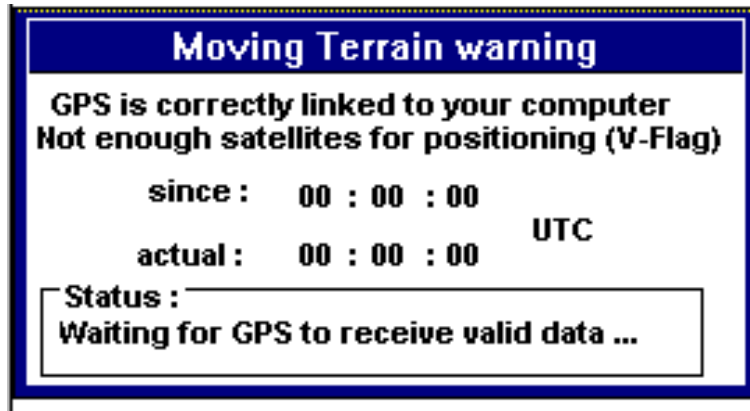
You may have soldered the cable incorrectly to a COM connector.

Verify that you have loaded the correct GPS driver in Setup (e.g. NMEA 0183 or as appropriate).



Your GPS is not connected, defective or you have set the wrong COM port.

Solution: Check to ensure that your GPS operates independently. Check the COM port setting and cable connections.



Your GPS is correctly connected to the computer, but it is not receiving enough satellites for 3D positioning. Keep an eye on the GPS display.

User Registration

In order to take advantage of our product support and update service it is essential for you to register as an approved user. Please remit this completed registration card **immediately** after the purchase of our product to the following address:

Airplus Maintenance GmbH
Flughafen 28
D-88046 Friedrichshafen
Phone ++49 7541 / 34209
Fax ++49 7541 / 34218

Company:

Name:

Street address:

City / Zip code:

Phone:

Fax:

Serial No. of your equipment:

Serial No. of your program disk:

Chart material:

Name and address of your dealer:

Your wishes and suggestions regarding the Moving Terrain system :

!!! Without registration we are unable to afford any type of support !!!