1 MAIN_MODE
In this mode LASERAID is waiting for you to start a feature.
2 FBs
For details of the current function buttons type '?'.

2 STRaight
STRaight (FB1) - nominally for grid lines and smooth curves.

This is one of four commands (STR, CUR, RAN, ORT) used to start track following. It can, in fact, be set up to use any of the available line types (see the FCF, TYF and PFB commands for details).

2 CURved
CURved (FB2) - nominally for reasonably complex contours.

This is one of four commands (STR, CUR, RAN, ORT) used to start track following. It can, in fact, be set up to use any of the available line types (see the FCF, TYF and PFB commands for details).

2 RANdom
RANdom (FB3) - nominally for highly convoluted lines.

This is one of four commands (STR, CUR, RAN, ORT) used to start track following. It can, in fact, be set up to use any of the available line types (see the FCF, TYF and PFB commands for details).

2 REPaint
REPaint (FB4)
REFresh (FB4)

Repaint the map going backwards through the data file. ABAndon (FB16) may be used to abandon this, returning to MAIN mode.

Note that the command FOR (q.v.) is faster. The WIN command can be used to define a window for paintout.

2 ORThogonal
ORThogonal (FB5) - nominally for buildings.

This is one of four commands (STR, CUR, RAN, ORT) used to start track following. It can, in fact, be set up to use any of the available line types (see the FCF, TYF and PFB commands for details).

2 POInt
POInt (FB6)

Point mode digitising. Two modes exist:

Mode 0: Measure a small right-angled cross or ring, producing a single data point as result.

Mode 1: Measure one or more 'square buildings' (represented by filled squares), producing oriented point features.

The default action on pressing FB6 is determined by the value of PNT (q.v.), but once in POINT mode both options are available. Mode 0 scans are performed using the line type specified for FB6 (see TYF for details on how to set this), but mode 1 scans are performed using TYPe 1. It is recommended that the PITch for type 1 be set to 10 (there is no benefit in setting it any lower).

Further help is available from inside POINT mode.

2 SMF
SMF (FB7) - small feature scan

Features which can be seen by the digitiser in a single scan can be measured by the program in a more efficient manner than line following. The current implementation measures closed features or small solid areas; this is determined by the line type assigned to FB7 (i.e. whether it specifies line or edge mode). See TYF for details on how to set the line type.

The method is invoked in MAIN mode by pressing FB7 rather than one of the 'start line following' buttons. A large scan is performed and an attempt is made to identify a closed feature in the measured data. In line mode, if a feature is found it is displayed in refresh. In edge mode several features may be found by the scan, in which case they are all refreshed with the number found displayed beside them. Note however that only one of these features may be accepted at present; the one required may be selected by command NXE (FB8).

Other useful commands are:

FB7 - Try again. This can be done even if a feature (perhaps the wrong one) has been captured. The scan vector can be changed using the tracker ball and FB14 (in the usual way) before trying again, if the vector does not quite surround the feature.

FB12 - Accept the feature.

FB4 - Abandon the 'small feature' method and revert to track following.

FB16 - Abandon.

2 GNF
GNF (FB8) - Get Next Feature.

If a preguidance file is open (see GUI) this command fetches details of the next feature to be digitised. However, the normal way of using preguidance is to use the VFG option (q.v.).

If no preguidance file is open, this command searches the 'in-core junction list' for the next junction with arms which are yet to be digitised. If none is found then a message to that effect is output.

2 POS
POS (FB9) - Paint Out Suppress.

This is a 'flip-flop' which enables or disables paintout. Having digitised some unpainted features, the system will catch up when the next painted-out feature is accepted.

2 FINd
FINd (FB10)
FUMble (FB10)

Enable/disable the automatic track-finding system.

2 SQR
SQR (FB11) - square feature flag

Set the 'square feature' bit in the feature status (FS) entry of subsequent features. The interpretation of this bit depends on the post-processing software.

2 REVerse
REVerse (FB12)

Set a bit in the feature status (FS) entry of the next feature which instructs a post-processor to order the feature (if closed) in the opposite direction to normal.

Usually the post-processor will force closed features to be anti-clockwise. The exception to this rule is when following in edge mode. In this case the outside of the feature is anti-clockwise and the inside (i.e. any 'hole' in the feature) is clockwise. If the program cannot determine for itself whether the feature is the outside or inside of an area then it will ask.

2 OPEn
OPEn feature (FB13)

This is a 'flip-flop' which disables or enables checking for feature closure.

2 DECrement
DECrement (FB14)

Decrement the feature number or height (see MNF, MHT, NF, HTD, HTI, NFI).

2 INCrement
INCrement (FB14)

Increment the feature number or height (see MNF, MHT, NF, HTD, HTI, NFI).

2 ABAndon
ABAndon (FB16)
ABOrt (FB16)

Reset the program. Repeated ABAndon commands should end up with LASERAID in MAIN mode and with the cursor in the middle of the screen.

2 POcommand
PO - Paintout Only

Instruct a post-processor to delete the next feature (i.e. it has been digitised for paintout purposes only).

2 GUIdance
GUIdance 'filename'

The command GUI is followed by a filename (which defaults to

LSL$GU:IFF.IFF). The existing guidance file is closed, the new file is opened and is used to provide predigitisings to LASERAID. If a guidance file is open the 'in-core junction list' is not available to the operator for feature selection via GNF (FB8).

Also see VFG, GNF, NXG and GFC.

2 VFG
VFG [n [r]] - Very Fast Guidance

Controls the Very Fast Guidance option. The option is enabled if the integer argument n is non-zero, and disabled if is zero or absent. The very fast guidance option has two effects:

(a) When a feature is accepted, the next feature is automatically fetched from the guidance file.

(b) When a feature has been fetched from the guidance file, one of the six 'feature select' buttons will be lit. If 'automatic starting' has been enabled, the command corresponding to this button will be given automatically after a short time. Typing another command, pressing a function button or moving the tracker ball will stop this command being given. The time delay for this command is defined by the second (real) argument for VFG. If this number is positive it enables the 'automatic starting' and sets the time delay (expressed in seconds) if the number is negative, then the option is disabled. If no second argument is given, the time delay is left as it was, regardless of what the first argument is. Thus:

VFG 1.5 - Enable option and set delay to half a second.

VFG 0 - Disable option.

VFG 1 - Re-enable with same delay as before.

2 SKIp
SKIp n

Skip all items in guidance file, up to NF n. The correct layer number will be set. If no such NF entry is found, the guidance file is left positioned where it was and an error message is output.

2 WINdow
Followed by FOR or REP (q.v.), this command allows you to specify a window to be painted out.

2 FORwards
Paintout the data file forwards (see WIN, REP). ABAndon (FB16) may be used to abandon this, returning to MAIN mode.

2 LOCate
Search for the nearest few features to the cursor (within an area of about 3 cm square on the screen) and enter LOCATE mode if anything is found. A maximum of four features can be handled at any one time.

ABAndon (FB16) can be used to abandon the search, returning to MAIN mode.

Further help is available in LOCATE mode.

2 MCF
MCF - Measure Check Fiducial

Measure the check fiducial, perhaps repeating this at a time interval set by CFT (q.v.).

2 CP
CP - measure Control Points

Measure the four control points and specify the check fiducial.

2 CFT
CFT r - Check Fiducial Time interval

Set the time interval between check fiducial measurements to r seconds. This is an alternative to measuring the fiducial after a set number of features have been captured.

2 CHF
CHF [n [m [r]]] - check fiducial parameters

Type or change the check fiducial parameters. Parameter n can be 0 or 1-4, m is the number of features and r is the maximum permitted error.

2 CALibrate
CALibrate [r]

Calibrate the system by measuring a standard grid. CAL takes one real argument, the grid spacing in millimetres.

2 CCP
CCP [r] - Calibrate with Control Points

Perform a combined calibration and control point measurement (assumes the map has a superimposed grid). This is equivalent to CP with FCT set to 1 (see HELP mode).

2 RECover
RECover
UCC - Update Cubic Coefficients

Invoke the recover option to try to correct for a bad CALibration. The corrupt file should be read in using the OLD command qualifier, a CALibration and CP (Control Point) measurement should be made and then the RECover command can be given. Note that the file read in must be the original (non-processed) data, and must have been created using converged LASERAID. Files generated using pre-converged versions are not acceptable. Note also that the same LASERTRAK must be used to perform the recovery as was used to capture the original data.

2 OPerator
OPerator
IDEntifier

The rest of the line after the command is used as text to identify the next section (NS) in the data file. If this command is not given, a default identifier is created consisting of the operator's process/user name, the date/time and the LASERTRAK machine number (see the WHA command).

2 TC

TC text - Transmitted Comment

Create an IFF TC entry in the file.

2 TEXt
TEXt text
CH text

Create an IFF CH (character data) entry in the file.

2 OVerlay
OVerlay n
LAYer n

Specifies the IFF overlay number of subsequently digitised features (see PON, PMF).

2 SS
SS n - Symbol Select

Create an IFF SS entry in the file (obsolete command).

2 PT
PT n - Plotter Type

Create an IFF SL (sic) entry in the file (obsolete command).

2 NF
NF n

Set the feature number for the next feature to n (1-32767). The NF number may be automatically incremented after each feature is digitised (see ANF).

2 ACB
ACB n - Ancillary Code Base

The Ancillary Code Base (ACB) is added to the TYPE of all ACs explicitly created using the SAC or AC commands. It enables convenient access to users' private groups of ACs.

2 SAC
SAC type value [text] - Standing Ancillary Code

The SAC is inserted in all subsequent features until altered by another SAC command or explicitly disabled (by SAC 0). Note that SAC 0 0 is a valid setting and produces "AC 'AC base' 0" in the file.

The AC 'value' is examined for a decimal point, and is stored as a real number if one is found. If the AC 'type' is 3 (INCLUDING the ACB), this is treated as a special case and its value is ALWAYS stored as a real number.

2 PON
PON - Print Overlay Numbers
PLN

Print a list of the created IFF overlays.

2 PMF
PMF - Print Maximum Feature numbers

Print a list of the maximum feature number for each overlay.

2 FCF
FCF n m - Feature Code for Function button

Arrange for features started with FB n to have feature codes of m.

2 TYF
TYF n m - TYpe for Function button

Causes line type m to be used for features started with FB n.

2 PFB
PFB - Print Function Button codes and types

Print out the feature codes and types assigned to the function buttons.

2 GFC
GFC [n [m]] - Guidance Feature Codes

Arrange for feature code n in the guidance file to mean that FB m should be used to start measuring the feature. If m is absent then feature code n is removed from the table. If both n and m are absent then the table of meanings is typed. Feature codes in the range zero to nine are allowed.

2 CHK
CHK
CHEck

Enter CHECK mode which is used to set up the LASERTRAK hardware ready for digitising.

2 MNF
MNF n - Manual New Feature

Set to n the magnitude of the change in NF number produced by the DEC and INC commands (q.v.).

2 ANF
ANF n - Auto New Feature

Set to n the magnitude of the change made automatically to the NF (feature) number after each feature is digitised.

2 HTD
HTD [r] - decimal (real) height mode

Enter 'decimal height mode', optionally initialising the height to r. The height (rather than the feature number) is displayed beside the cursor, and an ancillary code (AC) of type 3 holding the height as a real number is entered into subsequent features. The height may be incremented automatically between features (see AHT), or manually using DEC (FB14) and INC (FB15) if MHT (q.v.) is set. This command may also be given on LASERAIDs command line. See also HTI and NFI.

2 HTI
HTI [n]
HGT [n] - integer height mode

Enter 'integer height mode', optionally initialising the height to

n. The height (rather than the feature number) is displayed beside the cursor, and an ancillary code (AC) of type 2 holding the height as an integer is entered into subsequent features. The height may be incremented automatically between features (see AHT), or manually using DEC (FB14) and INC (FB15) if MHT (q.v.) is set. This command may also be given on LASERAIDs command line. See also HTD and NFI.

2 MHT
MHT r - manual height increment

If LASERAID is in 'height mode' (see HTD/HTI) this command is directly analogous to MNF (q.v.). MHT sets to r the magnitude of the change in height produced by the DEC and INC commands (q.v.).

In 'integer height mode' (HTI) r must be a whole number.

2 AHT
AHT r - automatic height increment

If LASERAID is in 'height mode' (see HTD/HTI) this command is directly analogous to ANF (q.v.). AHT sets to r the magnitude of the change made automatically to the height after each feature is digitised.

In 'integer height mode' (HTI) r must be a whole number.

2 NFI
NFI - display feature number as integer

This command is used to set LASERAID out of 'height mode' (see commands HTD and HTI). The feature number (rather than the height) is displayed beside the cursor, and no height ancillary codes (ACs) are generated in the IFF file. DEC and INC (q.v.) control the feature number. This is the default mode if no HTD/HTI commands have been given.

2 PNT
PNT n - default point feature mode

PNT determines the default action to be taken when POInt (FB6) is pressed to enter POINT mode (q.v.). If PNT is 0 the default action will be to look for a cross ('+' or 'x') or a small ring, whereas if PNT is 1 a scan will be made to search for 'square building' features (represented by filled squares). Note that once in POINT mode both types of scan are available; PNT only determines the action when FB6 is first pressed.

More help is available in POINT mode.

2 TIMe
Print timing information.

2 ZTI
ZTI - zero timings

Forget all timing information for the individual modes. The total elapsed time is still remembered.

2 PMI
PMI - Performance Monitor Initialise

This command is for Laser-Scan engineers only.

2 PME
PME - Performance Monitor End

This command is for Laser-Scan engineers only.

2 PCF
PCF [r] - PhotoChromic Film advance

Photochromic frame advance. The optional real argument specifies the number of frames (the default being 1.0).

2 TYPe
TYPe n

Select line type n.

2 CANcel
Delete the last feature.

After a feature has been painted-out you have the option of CANcelling it. This option is not available forever - the following actions cause the last feature to be irrevocably accepted:

a) Starting a new feature, even if it is subsequently abandoned.
b) Repainting the previously digitised features.
c) Calibrating.
d) Measuring the Control Points.
e) Any command which causes an item to be output, e.g. TC, TEXt.

2 WHAt
Type out the names of the data file, patch file, guidance file (if opened) and identification string (see OPerator).

2 RAS
This command is reserved for possible future use.

2 ZJC
ZJC
ZIJ - Zero In-core Junction list

Zero (forget) all junctions in the in-core list. This list contains details of those junctions which still have arms remaining to be digitised. It is accessed via GNF (FB8).

This command does not delete the junctions from the IFF file, but it does mean that when the unsatisfied arms are measured then a new junction will be created rather than 'snapping' them to the existing junction.

2 WIZ
This command is for Laser-Scan engineers only.

2 ADJust
Enter Adjust mode (actually a privileged HELP mode) which allows you to adjust the track-following parameters.

2 EOS
EOS - End Of Session

Terminates the current digitising session, closes the output IFF file, re-writes the patch file and exits.

2 NXG
NXG - next guidance command

Get the next command from the guidance file and obey it. This is only for testing the system and for examining the effect of each entry in the guidance file.

1 HELP_MODE
In this mode LASERAID is waiting for you to provide some guidance to help in line-following.
2 FBs
For details of the current function buttons type '?'.

2 macros
Many LASERAID commands are, in fact, macros (groups of 'fundamental' commands). Some of these are invoked directly by the user (via function buttons or keyboard commands); the rest are called by other macros or by the program itself. The fundamental commands (or 'macro components') perform individual operations such as predicting the next scan direction, performing the scan, analysing the machine encounters and so on.

The operation of the macros is usually of no concern to the user, hence these commands are only described in detail if they appear on function buttons or are of direct use (e.g. the macro 'B' which draws the 'backlog buffer' of digitised points).

At present 35 macro 'slots' are available in LASERAID; all of these are reserved for Laser-Scan. Macros which are currently unused are given names such as 'AAA', 'BBB' etc. These commands appear in the list obtained by typing '?' in HELP mode but are not shown by the PMA (Print MAcros) command. It should be noted that user-definition of macros is not supported, and no attempt should be made to modify the standard macros provided by Laser-Scan.

2 components
Macro components are 'fundamental' LASERAID commands which perform particular operations as part of the line-following process. These commands are not relevant to the operator and are not described in any detail.

It may be noticed that some of the commands listed in HELP mode as macro components do not, in fact, appear in any of the current macros! Many of these commands are 'hard-wired' into the program for the sake of efficiency; the rest are either experimental or are provided to enable Laser-Scan to construct additional macros in response to particular user requirements.

2 chain_quality
One of the most complicated areas of LASERAID tuning relates to the concept of chain quality. During the line-following process the LASERTRAK encounters are 'grown' into chain elements, and these are then appended together to produce a continuous track. In fact, for unbroken lines this is now a well-defined process for data within a individual scan. The uncertainty arises when appending data from different scans, or when the original line is fragmented (e.g. a pecked line). In such cases, each chain element is assigned a 'quality', and the one with the highest quality is appended.

Consider a chain element which has a length 'len', width 'wid', is a distance 'dis' from the current end of the track and makes an angle 'ang' with the track. The quality of the element is then related to:

```
   LEN*('len'/(SMA*PIT))**2  +  ANG*(cos('ang'))  -
   DST*('dis'/GAP)**2        -  WTH*(('wid'-trackwidth)/trackwidth)
```

The quantities LEN, ANG etc. are LASERAID parameters which are described elsewhere. As may be seen, this is a horribly complex function, but the important thing to remember is that a BALANCE should be maintained. If you want to favour the nearest chain element then DST can be increased, but you should also consider altering one of the other values to prevent the overall quality from being reduced too much (if the quality becomes too small LASERAID will refuse to append anything).

The 'Z' macro (q.v.) performs a scan and lists the chain elements and qualities. This can be a useful tool when tuning LASERAID to follow awkward or poor quality data.

2 MOVe
MOVe (FB14)
M (FB14)

The cursor can either move the tramlines around the screen or alter their orientation. The MOVe command switches it between these two states.

2 ABAndon
ABAndon (FB16)
OK (FB16)
ABOrt (FB16)
Q (FB16)

Abandon the feature and revert to MAIN mode. If ABAndon is pressed twice when in MAIN mode, the LASERTRAK cursor will move to the centre of the screen.

2 SIM
This is a command macro.

2 LOS
This is a command macro.

2 CON
This is a command macro.

2 OKK
OKK - (macro)

Accept the line element 'in hand' and continue digitising.

2 JAN
This is a command macro.

2 ASC
This is a command macro.

2 VER
This is a command macro.

2 GO
GO (FB4) - (macro)

Instruct the program to continue following.

2 SMF

SMF (FB7) - line-mode small feature scan (macro)

Perform a small feature scan in line mode. A large scan is performed and an attempt is made to identify a closed feature in the measured data. If a feature is found it is displayed in refresh and can be accepted using END (FB12).

2 DUN
This is a command macro.

2 HOP
HOP (FB11) - (macro)

Used in the same way as ONE (q.v.) to get the program across a difficult patch of line. Allows a bad section of line to be hopped (e.g. a contour height).

2 ONE
ONE (FB3) - (macro)

Used to guide the track follower through difficult passages. If the track follower is stuck for some reason:

Press ONE
Point the tramlines in the right direction
Press GO
Select the correct track segment with NXT
Press GO to continue track following.

Also see BB (back), HOP, GO and NXT.

2 HEL
This is a command macro.

2 BB
BB (FB15) - (macro)

When the system is track-following, pressing FB15 will stop it and leave the system in HELP mode.

In HELP mode, the first time FB15 is pressed (BB) the cursor is switched into 'rolling' mode which enables you to roll back and forth along the digitised line to undo any erroneous digitising. FB15 is then re-defined to be BACk (q.v.), which deletes the last master point in the list.

2 Imacro
I - (macro)

This is a command macro.

2 END
END (FB12) - (macro)

Accept the digitised line, paint it out and revert to MAIN mode. If the automatic finding option is enabled in MAIN mode (FIN command) then the line is digitised in two parts. At the end of the first part the command END causes the system to return to the start point and follow the second half of the line.

2 Bmacro
B - (macro)

Draw the buffered digitised data on the close-up screen, clearing it first. Large crosses represent 'master' points (those whose final position is essentially determined); smaller crosses represent 'potential' master points awaiting further context.

See also the DRW command.

2 DEC
This is a command macro.

2 INT
This is a command macro.

2 Zmacro
Z - (macro)

Perform a scan as defined by the refresh 'tramlines', analyse the result and display the data on the close-up screen. Used in conjunction with the 'C' macro (q.v.), this command enables an experienced operator to drive the digitiser 'by hand', scan by scan. This can sometimes be useful when tuning a patch file to follow an awkward piece of linework, as it shows some of the decisions being made by the program on the basis of the current parameter settings.

2 Xmacro
X - (macro)

This is a command macro.

2 Jmacro
J - (macro)

Having accepted a junction, macro J enables the tracks corresponding to the junction arms to be displayed on the close-up screen one at a time. This is unlikely to be of much interest to anyone other than Laser-Scan engineers.

2 FPJ
FPJ (FB13) - flip junction state (macro)

This is a 'flip-flop' which enables or disables junction recognition. The current state is indicated by the function button light (lit if enabled). FPJ may be only used when line following has been paused (by means of FB15), not 'on the fly'.

2 MJN
This is a command macro.

2 JIN
JIN (FB9) - junction initialisation (macro)

Look for a junction in the immediate vicinity of the LASERTRAK cursor. If one is found, offer an arm ready to begin line following via GO (FB4).

2 Cmacro
C - (macro)

Having performed a scan using Z (q.v.), append the next chain element (if any) to the current track. The command may be repeated until '-APPENDABLE' appears in the top left-hand corner of the close-up screen (no appendable elements), at which time another Z

command is required. The Z and C commands are sometimes useful when tuning patch files or diagnosing line-following problems.

2 AJN
This is a command macro.

2 ESF
ESF - Edge-mode Small Feature (macro)

Perform an edge-mode small feature scan looking for one or more objects. Several features may be located by the scan, in which case they are all refreshed with the number found displayed beside them. Note however that only one of these features may be accepted at present; the one required may be selected by command NXE (FB8) and accepted using END (FB12).

2 DEFine
DEFine num name text

Define command macro number 'num' to be called 'name' and to consist of 'text'. If 'text' is absent the macro becomes undefined. Undefined macros have names such as 'AAA', 'BBB' etc. by convention. The command PMA may be used to display the currently defined macros.

Note that if 'name' conflicts with an existing command, the macro will have precedence. Frequently accessed macros may be coded into an efficient form by means of the CODe command (q.v.).

It should be noted that user-definition of macros is not supported by Laser-Scan, and no attempt should be made to modify the standard command macros which Laser-Scan supply. All currently undefined macros may be required by Laser-Scan at some point in the future.

To avoid accidental corruption of the command macros, the command ADJust must be given before DEFine.

2 PMA
Print the defined command macros. A macro which has been CODed for efficiency has an asterisk (*) by its name.

2 CODe
CODe n - code command macro

Remember macro number n in an efficient coded form to facilitate fast lookup. Note that macros which contain the DRW command may not be coded.

To avoid accidental corruption of the command macros, the command ADJust must be given before CODe.

2 VARy
VARy par typ val

Assign value 'val' to parameter number 'par' for line type 'typ' in the type table. This enables a single element to be modified without affecting the rest of the line types. The SET command (q.v.) enables a parameter value to be set for all of the available line types.

The type table may be displayed by using the PTY command.

To avoid accidental modification of the type table, the command

ADJust must be given before VARy.

2 PARameter
PARameter num com

Assign parameter number 'num' in the type table to command 'com'. If 'com' is absent then the parameter number is deassigned.

The SET command (q.v.) may be used to assign values to the new parameter for each of the seven available line types.

The type table may be displayed by using the PTY command.

To avoid accidental modification of the type table, the command ADJust must be given before PARameter.

2 SET
SET n r1 r2 r3 r4 r5 r6 r7

Assign values to parameter number n in the type table for each of the seven available line types. Note that if too few arguments are given then the trailing entries are zeroed. The VARy command (q.v.) enables a single element in the type table to be modified.

The type table may be displayed by using the PTY command.

To avoid accidental modification of the type table, the command ADJust must be given before SET.

2 PTY
PTY - Print TYpe table

Display the available line types.

2 TYPe
TYPe n

Select line type n.

2 ADJust
Enable modification of the type table and command macros.

2 STArt
Abandon 'small feature' mode, and try normal line-following.

2 PCO
This command is for Laser-Scan engineers only.

2 PAS
This is a macro component.

2 RFB
This is a macro component.

2 TFB
This is a macro component.

2 QUE
This is a macro component.

2 PAU
This is a macro component.

2 FBX
This is a macro component.

2 FB
This is a macro component.

2 TWO
This is a macro component.

2 MER
This is a macro component.

2 CRU
This is a macro component.

2 USE
This is a macro component.

2 LJN
LJN - locate junction

When line following has been interrupted with FB15, if the user 'rolls' or BACks up to a junction on the current feature then LJN (FB8) can be used to take it 'in hand', allowing an arm to be selected. Arm selection is achieved as usual by means of FB8 which will have been redefined to be NXT.

It should be noted that the 'arms' indicated in refresh when a junction is located in this way are directions only; they will typically not lie exactly along the source linework.

When the required arm is indicated, FB4 will restart line following.

2 MAJ
MAJ n - manual junction

The command MAJ can be used after a manual point has been created using either MP (FB10) or MAN (q.v.) to turn that point into a junction. The mandatory argument n is the number of junction arms.

Manual junctions are treated specially by LASERAID. If one is encountered while line-following or located using LJN (q.v.), the message 'Manual junction' is output and the program will pause with the prediction 'tramlines' displayed. The user may then orient the tramlines to indicate the chosen direction, or accept the feature using FB12. If line-following is to continue, FB4 should be pressed in the usual fashion.

Note that at present manual junctions are never removed from the 'in-core junction list', even when all of their arms have been measured. If all other junctions are complete than ZJC can be used in MAIN mode to delete the entire list.

2 PIX
This is a macro component.

2 EXT
This is a macro component.

2 JMT
This is a macro component.

2 PPX
PPX [k [l [m [n]]]]

This command is for Laser-Scan engineers only.

2 DIG
This is a macro component.

2 CUT
This is a macro component.

2 SCA
This is a macro component.

2 RAS
This command is reserved for possible future use.

2 GRO
This is a macro component.

2 SMT
This is a macro component.

2 COM
This is a macro component.

2 LIS
This is a macro component.

2 APP
This is a macro component.

2 FOR
This is a macro component.

2 TSF
This is a macro component.

2 NXE
NXE - get next edge-mode small feature

If more than one edge-mode small feature has been found in a scan (see ESF), NXE (FB8) enables the user to cycle through them in turn. When the required feature is highlighted in refresh, it can be accepted using END (FB12). All the other found objects are 'dropped' and must be scanned for again.

2 DRO
This is a macro component.

2 FIR
This is a macro component.

2 NXT
NXT (FB8)
NEXt (FB8)

When the program is confused as to which track-segment to choose, NXT will choose the next segment from the list. Also see ONE and HOP.

2 FUM
This is a macro component.

2 RET
This is a macro component.

2 LOOp
LOOp the current feature prior to acceptance. The last point is joined to the first point and the feature becomes closed.

2 SQUare
SQUare the current feature prior to acceptance. This facility is intended for demonstration purposes only as it has two major drawbacks:

a) The algorithm is only capable of forcing lines parallel or perpendicular. Any 45 degree lines (e.g. bay windows) will be forced one way or the other.

b) Squaring is carried out in 'HRD space', which is itself not square. Hence a four-sided object will be forced into a parallelogram rather than a rectangle.

The parameter SQT (q.v.) is used to distinguish between parallel and perpendicular lines.

The SQUare command should not be confused with the 'square feature flag' available in main mode (FB11). The latter command merely sets a bit in the IFF file to say that a feature should (or should not) be squared by some suitable post-processor.

2 EOF
This is a macro component.

2 JUM
This is a macro component.

2 IFC
This is a macro component.

2 ASS
This is a macro component.

2 STE
This is a macro component.

2 AUTomatic
AUTomatic

Proceed automatically based on the digitisers interpretation of the data.

2 SLO
This is a macro component.

2 FAS
This is a macro component.

2 PRE
This is a macro component.

2 POK
This is a macro component.

2 TXZ
This is a macro component.

2 DRW
This command allows a variety of graphic representations of the line-following process to be displayed on the close-up screen for diagnostic purposes. The only command (except those already available via the command macros) which is relevant to users is:

```
DRW B n
```

where n is the number of master points (counting backwards from the end of the buffer) which should be drawn. See also the 'B' macro which draws the whole buffer (note that you CANNOT type 'B n').

2 DRN
This is a macro component.

2 MPcommand
MP (FB10)

When first given this command puts a cursor up on the screen. Subsequent MP commands will add master points to the digitised line.

2 BCC
This is a macro component.

2 BACk
If FB15 is pressed while line-following, HELP mode is entered and FB15 is redefined to be macro BB (q.v.). If FB15 is pressed again, LASERAID allows the user to 'roll' along the digitised data using the tracker ball. FB15 is then defined to be BACk. Subsequent presses of FB15 will cause the last master point in the current feature to be deleted.

It should be noted that master points deleted in this way cannot be recovered (except, of course, by re-digitising that portion of the line).

2 ROL
This is a macro component.

2 NOR
This is a macro component.

2 CURsor
CURsor
CLOse-up

Draw a close-up view of the area around the LASERTRAK cursor on the Tektronix screen, then put up the Tektronix cursor. When a character is typed the LASERTRAK cursor is moved to the equivalent position. This command can be used for fine positioning of the LASERTRAK cursor.

2 MANual
Master points may be created using the close-up screen and cross-hairs. Typing MANual causes a facsimile of the area around the LASERTRAK cursor to be drawn on the close-up screen, also showing the end of the current digitised line if relevant. Additional data points may be created by moving the cross-hairs to the required position and pressing the space bar. Typing 'E' rather than a space exits from this mode and line-following can resume if required.

2 FC
FC n - feature code

Change the feature code of the current feature after it has been started, over-riding the value obtained from the function button. This command should be given with line following paused (using FB15). The feature code is not patched into the IFF file until the feature is accepted.

2 ACB
ACB n - Ancillary Code Base

This is a privileged command in HELP mode which is only used for patch file interaction. It is not available to the user.

2 AC
AC type value [text] - Ancillary Code

Include the specified AC in the current feature.

The AC 'value' is examined for a decimal point, and is stored as a real number if one is found. If the AC 'type' is 3 (INCLUDING the ACB), this is treated as a special case and its value is ALWAYS stored as a real number.

2 SAC
SAC type value [text] - Standing Ancillary Code

This is a privileged command in HELP mode which is only used for patch file interaction. It is not available to the user.

2 FCF
FCF - Feature Code for Function buttons

This is a privileged command in HELP mode which is only used for patch file interaction. It is not available to the user.

2 TYF
TYF - line type for function buttons

This is a privileged command in HELP mode which is only used for patch file interaction. It is not available to the user.

2 PMI
PMI - Performance Monitor Initialise

This command is for Laser-Scan engineers only.

2 PME
PME - Performance Monitor End

This command is for Laser-Scan engineers only.

2 JOI
This is a macro component.

2 CLJ
This is a macro component.

2 WAD
This is a macro component.

2 ANA

This is a macro component.

2 EXI
This is a macro component.

2 MODe
MODe n

Select the scanning mode. MODe 0 scans in edge mode while MODe 1 scans in line mode.

2 DIRection
DIRection n

Select the scan direction. This is usually selected automatically based on the direction of the required scan vector. A value of 0 results in hardware scans which are parallel to the X (horizontal) direction, while a value of 1 results in scans which are parallel to Y.

2 FRQ
FRQ n

Set the scan frequency (range 0:6). If the scan frequency is altered then the PHAse correction must be repeated (FB5 in CHECK mode).

2 WIDth
WIDth n

Set the effective scan width (sensible range 10:63). This value must be multiplied by 64*CRX/Y to obtain the width in HRD counts. It should be noted that the LASERTRAK only has 4 hardware scan widths, corresponding to WIDth 7,15,31 and 63. Intermediate values are obtained by ignoring encounters outside the specified width. This means that the scan on the LASERTRAK screen will double in size when WIDth is increased from 15 to 16, for example.

2 PITch
PITch n

Set the scan pitch (sensible range 5:50 HRD counts).

2 WLO
WLO n

The value of this parameter should be 1. It should not be altered by the user.

2 WHI
WHI n

The value of this parameter should be 255. It should not be altered by the user.

2 TLO
TLO n - set digitiser threshold

The digitiser threshold is usually best set up by using the THReshold command (FB9 in CHECK mode), or by enabling automatic thresholding (TSW 0). If TLO is used, the argument should be in the range 1:255.

2 TSW
TSW n - select automatic/manual thresholding

TSW 0 selects automatic thresholding, while TSW 1 selects manual threshold (set using THReshold - FB9 in CHECK mode). If automatic thresholding is used, command THReshold will yield a horizontal line on the close-up screen.

2 TMS
TMS n - set timeshare factor - not implemented

This command is reserved for possible future use.

2 CRX
CRX r - set counts ratio in X

Except in extraordinary circumstances, this parameter should only be set by means of the OCR command (FB2) in CHECK mode.

2 CRY
CRY r - set counts ratio in Y

Except in extraordinary circumstances, this parameter should only be set by means of the OCR command (FB2) in CHECK mode.

2 OFX
OFX r - set red/blue offset in X

Except in extraordinary circumstances, this parameter should only be set by means of the OCR command (FB2) in CHECK mode.

2 OFY
OFY r - set red/blue offset in Y

Except in extraordinary circumstances, this parameter should only be set by means of the OCR command (FB2) in CHECK mode.

2 PHX
PHX r - set phase correction in X

Except in extraordinary circumstances, this parameter should only be set by means of the PHAse command (FB5) in CHECK mode.

2 PHY
PHY r - set phase correction in Y

Except in extraordinary circumstances, this parameter should only be set by means of the PHAse command (FB5) in CHECK mode.

2 THK
THK r - thickness of line feature

This is the value entered in the IFF TH entry. It is used for paintout unless over-ridden by PTH (q.v.).

Sensible range: 20 to 200 HRD counts. Typical value: 40 HRD counts

2 PTH
PTH r - paintout thickness

Thickness of line for paintout. If PTH is less than or equal to zero, THK (q.v.) is used.

Typical value: 100 HRD counts

2 CLU
CLU r - chaining limit (normal to scan direction)

CLU is used to determine whether a point belongs on the end of a growing chain element. It is the tolerance along the line being followed.

CLU is currently only relevant to edge-mode small feature scans; its use in general line following has been superseded.

See also CLV, CLW, CLX.

Typical value: 2 pitches

2 CLV
CLV r - chaining limit (parallel to scan direction)

CLV is used to determine whether a point belongs on the end of a growing chain element. It is the tolerance across the line being followed.

See also CLU, CLW, CLX.

Typical value: 2 pitches

2 CLW
CLW r - chaining limit (width change)

CLW originally determined whether a point belonged on the end of a growing chain element by comparing the width between adjacent scans (in line mode). It is currently unused.

See also CLU, CLV, CLX.

Typical value: 2 pitches (historical)

2 CLX
CLX r - chaining limit for new chains

CLX is the chaining tolerance used to grow the first few points in a new chain (when the context is poor).

See also CLU, CLV, CLW.

Typical value: 3 pitches

2 ETA
ETA r - preliminary filtering tolerance

The LASERTRAK returns encounters separated along the line by one PITch (assuming the line is continuous). This data density is usually far too high, and a cheap filter is applied based on ETA, which is essentially a lateral tolerance. The more intelligent (and expensive) algorithms such as the H, S and E filter (q.v.) only 'see' the data after this initial filtering.

Hence for essentially straight-line data considerable computational savings can be made by increasing ETA. However, for complex, tortuous data it is important that ETA is not too large or no amount of experimenting with H, S and E will give a pleasing result.

Sensible range: 0.5 to 6 HRD counts

2 GAP
GAP r

GAP is the largest distance which can be 'ignored' by LASERAID (e.g. when following pecked lines). It is also used in determining the chain element quality (see 'chain_quality').

Sensible range: 80 to 400 HRD counts (assuming ID is large enough)

2 SHArpness
SHArpness r

SHArpness is the cosine of the sharpest corner which can be negotiated. Some examples are:

SHA -1.0 - can go backwards (unlimited)
SHA -0.7 - 135 degrees
SHA 0.0 - 90 degrees
SHA 0.7 - 45 degrees ('tunnel vision')

2 DIF
DIF r - 'wide' line criterion

A track is judged to have become 'wide' (for point positioning, etc.) if its width is now greater than (1 + DIF) times the mean track-width.

Typical value: 0.8

2 STIffness
STIffness r

Minimum length of line used to estimate track position and direction. This may be 1 HRD count now.

Typical value: 1 HRD count

2 SMAllness
SMAllness r - smallest appendable chain element

SMAllness is the length of the smallest appendable chain element (in units of the PITch). It only applies between scans.

SMAllness is also used in determining the chain element quality (see 'chain_quality').

Typical value: 2 pitches (must NOT be zero)

2 BETa
BETa r - trackjump test criterion

Trackjumping is hopping between two adjacent lines. This test assumes that we've already passed the NEArness and PRL (q.v.) criteria.

If the line joining the current end of the track to the near end of the next chain element makes too great an angle with either the track or the chain element, we've trackjumped.

A larger value of BETa reduces the chances of trackjumping, but makes LASERAID less able to cope with data imperfections.

Typical value: 0.1 (cosine)

2 NEArness
NEArness r - proximity criterion for trackjump test

If the next chain element is closer to the end of the current track than NEArness, don't perform the trackjump test (i.e. don't check for hopping between two adjacent tracks). NEArness is expressed in units of the PITch.

If NEArness is small LASERAID is less likely to trackjump, but may have difficulty negotiating corners in thick tortuous lines.

See also BETa and PRL.

Sensible range: 3 to 6 pitches (must NOT be zero)

2 PRL
PRL r - parallelism criterion for trackjump test

PRL is the cosine of the angle between the next chain element and the current track direction. If the chains are less parallel (cosine smaller) than PRL, don't perform the trackjump test (i.e. don't check for hopping between two adjacent tracks).

See also BETa and NEArness.

Typical value: 0.0 (i.e. almost never forbid trackjump test)

2 BIAs
BIAs r

BIAs is essentially an obsolete concept now. It is added to the 'quality' of each chain element with the aim of persuading LASERAID to go right, straight-on or left depending on the sign (negative, zero, positive). See also 'chain_quality'.

The latest chain-appending strategy takes care of this automatically.

Typical value: 0

2 MPN
MPN r - tolerance for backtrack checking ('nearness')

This is the distance tolerance to use when performing the backtrack check (see BCH, MPB). If it is too small LASERAID may become prone to backtracking, but if it is too large LASERAID will be unable to follow around tight 'hairpin' bends.

Typical value: 50 HRD counts

2 TIK
TIK r - length of arms of control point ticks

LASERAID creates four three-point tick features in IFF layer 0 corresponding to the measured control points. The length of the arms of these ticks is set by TIK.

Typical value: 500 HRD counts

2 SQT
SQT r - squaring tolerance

SQT is used with LASERAIDs in-built SQUare command (q.v.). This is rather crude and really intended for demonstration purposes only.

Typical value: 30 degrees

2 LEN
LEN r - 'quality' weight for chain length

See 'chain_quality' for a discussion of this parameter.

Typical value: 0.01

2 ANG
ANG r - 'quality' weight for chain angle

See 'chain_quality' for a discussion of this parameter.

Typical value: 3

2 DST
DST r - 'quality' weight for chain distance

See 'chain_quality' for a discussion of this parameter.

Typical value: 2

2 WTH
WTH r - 'quality' weight for chain-width change

See 'chain_quality' for a discussion of this parameter.

Typical value: 0.8

2 CRC
CRC r - 'crushing' cosine

Crushing is a form of filtering and smoothing combined. It is used in junction recognition. CRC, being a cosine value, should always be close to 1.0.

Typical value: 0.985

2 CRD
CRD r - 'crushing' distance

Crushing is a form of filtering and smoothing combined. It is used in junction recognition. CRD should be of the order of (within a factor of two of) the mean line-width.

Typical value: 40 HRD counts

2 SPD
SPD r - Suppress Paintout Distance

In order to 'spot' a previously measured junction when line following, a small amount of each captured arm must be left unpainted. The amount which must be left depends on whether junction 'snapping' is enabled. If a full junction scan must be performed every time (JNC greater than 4) a fairly large region must be left (SPD 300 might be typical). If 'snapping' is enabled (JNC less than 4), LASERAID is able to choose an appropriate paintout gap automatically. This mechanism is invoked by setting SPD negative (usually the existing value is simply negated, e.g.

SPD -300).

The units are HRD counts.

2 STH
STH r - single point paintout thickness

Point features (i.e. those captured in POINT mode) are painted out using a filled square of size STH.

Typical value: 200 HRD counts

2 ID
ID n - scan vector length

Sensible range: 100 to 2000 HRD counts

2 HOLe
HOLe n - maximum gap to chain across in SMF

This is used in line-mode small feature capture (SMF in MAIN mode). It performs a somewhat similar function to CLU (q.v.) in edge-mode small feature capture.

Typical value: 45 HRD counts

2 RIPple
RIPple n - maximum lateral ripple for chaining in SMF

This is used in line-mode small feature capture (SMF in MAIN mode). It performs a somewhat similar function to CLV (q.v.) in normal line following.

Typical value: 80 HRD counts

2 CRS
CRS n - behaviour at 'crossings' (junctions)

Specify the arm to be selected by LASERAID when a junction is captured. Possible values are:

CRS -1 - turn left
CRS 0 - go straight on
CRS 1 - turn right

LASERAID will make its judgement based on the current direction and, of course, which arms are available. Depending on the value of JNC (q.v.) LASERAID can be instructed to select that arm and proceed automatically.

2 MPB
MPB n - number of master points for backtrack checking

This is the number of master points to use when performing the backtrack check (see BCH, MPN).

Typical value: 12

2 CHF
This command is reserved for possible future use.

2 INI
INI n - initialisation command macro number

This is the macro number to use when starting a feature. Allowed values are 15 for a normal line type (enables FINd/FUMble if selected in MAIN mode), or 25 for a line type with junction spotting.

Odd effects are observed if you specify the wrong INI (in particular, FINd stops working).

2 HCH
HCH n - hatching style for area paintout

Set the hatching style for area paintout (in edge-mode line following). This affects the speed of paintout. Allowed values are:

HCH 0 - total infill with lines of thickness PTH (q.v.)
HCH 1 - horizontal lines with separation PTH
HCH 2 - vertical lines with separation PTH
HCH 3 - both directions with separation PTH

Typical value: 3

2 ECHo
ECHo n - command echoing

This is a switch to enable (n = 1) or disable (n = 0) echoing of the command macros as they are obeyed. If enabled when the program is exited, this value is preserved and the patch file parameters are also echoed the next time the patch file is used.

This facility is usually disabled.

2 Vectors
This is a macro component.

2 BCH
BCH n - backtrack check

This is a switch to enable (n = 1) or disable (n = 0) backtrack checking (to ensure LASERAID is not following back down the line it just captured).

It is usual to enable this check (see also MPB, MPN).

2 TCH
TCH n - temporary checks

This is a switch to enable (n = 1) or disable (n = 0) temporary checks and diagnostic graphics.

It is intended for use by Laser-Scan engineers, but can sometimes be useful for demonstrations.

2 EDG
EDG n - use of edge information

This is a switch to enable (n = 1) or disable (n = 0) the use of any edge information found when following in line mode (MODe 1).

Laser-Scan recommends that this is always enabled.

2 SMOothing
SMOothing n - chain smoothing

This is a switch to enable (n = 1) or disable (n = 0) chain smoothing prior to master point extraction.

Laser-Scan recommends that this is always enabled.

2 VEX
VEX n - vertex extraction

This is a switch to enable (n = 1) or disable (n = 0) vertex extraction. After the master points have been generated they are re-examined to ensure that any superfluous ones are removed. This helps to clean up building features, etc. where only vertex points are required.

In fact, Laser-Scan recommends that vertex extraction is turned on for ALL line types, as the improvement in data quality (even on smooth contours) more than offsets the slight additional cpu overhead.

2 JNC
JNC n - junction recognition

This is a switch to enable or disable junction recognition. It is bitwise decoded as follows:

Assuming a starting value of zero,
Add 1 if junction recognition is required at all, then
Add 2 if the program should accept the junction automatically, then
Add 4 if the program should NOT automatically snap to existing junctions, but should perform a complete junction scan each time.

The most usual settings are:
JNC 0 - junctions disabled
JNC 3 - junctions enabled, 'auto-accept-and-go' enabled

Another useful setting is JNC 2. In this state, FPJ (FB13) will turn junction recognition on or off, enabling 'auto-accept-and-go' at the same time. See CRS for information on automatic arm selection.

Remember that line types set up to spot junctions should specify 'INI 25' in the type table (see INI, PTY, VAR).

2 INVerse
INVerse n - inverse polarity

This is a switch to enable (n = 1) or disable (n = 0) 'inverse polarity' mode. This enables the centre lines of double-banked rivers etc. to be captured.

2 BRF
BRF n - brief messages

This is a switch to enable (n = 1) or disable (n = 0) 'brief' messages. This is intended for experienced users or demonstration sessions where messages such as 'feature closed' and 'abandoned' clutter up the close-up screen and are unnecessary. In brief mode the terminal bell is rung to indicate closure, end of feature, etc.

2 ELF
ELF n - Edge-mode Line Following

This is a switch to enable (n = 1) or disable (n = 0) edge-mode

line following. It is set automatically based on the MODe (q.v.) value for the current line TYPe, although that value may be explicitly over-ridden by use of this command (for the benefit of Laser-Scan engineers).

2 Display
This is a macro component.

2 EPS
EPS r - edge-mode chain merging tolerance

Used in edge-mode small feature (ESF) to overlay the results of two scans.

Typical value: 15 HRD counts

2 LIMit
LIMit n r

The LIMits are a set of miscellaneous values required by the line-following algorithms. Optimum values have been ascertained by Laser-Scan and users should not attempt to modify them unless so instructed by a Laser-Scan engineer.

2 Weight
Weight n r

The Weights are a set of miscellaneous values required by the line-following algorithms. Optimum values have been ascertained by Laser-Scan and users should not attempt to modify them unless so instructed by a Laser-Scan engineer.

2 Hfilter
H r - filtering parameter (maximum lateral deviation)

When any 'backlogged' (potential) data point becomes further than H from the least-squares line through those points, a 'master point' is generated.

See also ETA, E and S.

Sensible range: 4 to 20 HRD counts. Typical value: 8

2 Sfilter
S r - filtering parameter (maximum separation)

When line following, no two successive master points may be further apart than S. Setting S to zero disables this mechanism (no points are forced out purely on distance criteria).

See also ETA, H and E.

Sensible range: 500 to 32000 HRD counts (0 to disable)

2 Efilter
E r - filtering parameter (minimum separation)

When line following, no two successive master points may be closer than E. Special rules apply for junctions, however.

See also ETA, H and S.

Sensible range: 20 to 100 HRD counts

2 MPL
MPL n - output master points at this total

When MPL master points have been accumulated, some are flushed to the IFF file, leaving MPF (q.v.) still in the buffer.

Typical value: 80

2 MPF
MPF n - keep this many master points 'in hand'

When MPL (q.v.) master points have been accumulated, some are flushed to the IFF file leaving MPF still in the buffer.

Typical value: 20

2 MPX
MPX n - maximum number of master points in a feature

Typical value: 2900, limit: 32767

2 SEParation
SEParation r - separation of lines for paintout

Typical value: 0.010 mm (on photochromic film)

2 SPOt
SPOt r - size of beam for paintout

Typical value: 0.016 mm (on photochromic film)

2 SCT
SCT n - maximum fiducial scatter

Abandon fiducial (and control point etc.) measurement if more than half the measured positions exceed this scatter.

Typical value: 30 HRD counts

2 REPeat
REPeat n - number of 'dummy' fiducial scans

The number of scans performed to allow the LASERTRAK to 'settle' before fiducial measurements are taken.

Range: 0 to 4. Typical value: 1

2 AVErage
AVErage n - number of scan used to determine fiducial position

Typical value: 5

2 OFF
OFF r - expected scatter of fiducial measurements

Typical value: 8 HRD counts

2 QUAlity
QUAlity r - minimum acceptable fiducial quality

When measuring a control point or check fiducial, LASERAIDs internal 'quality' assessment must be greater than this for the object to be found.

Typical value: 0.3

2 GRId
GRId r - calibration grid-square size

The size of the calibration grid squares. This is only used for normalisation purposes and is not crucial.

Typical value: 40 mm

2 FLE
FLE n - set red laser focus level

Except in extraordinary circumstances, this parameter should only be set by means of the FOCus command (FB13) in CHECK mode.

2 FPR
FPR n - following priority

Process priority when line-following. This will have a detrimental effect on other users if set too high. See also PPR, WPR.

Requires ALTPRI privilege, or sufficient base priority.

Typical value: 4

2 PPR
PPR n - paintout priority

Process priority when painting out. This will have a detrimental effect on other users if set too high. See also FPR, WPR.

Requires ALTPRI privilege, or sufficient base priority.

Typical value: 4

2 WPR
WPR n - waiting priority

Process priority when waiting for input (i.e.   when interacting with the tracker ball etc.). See also FPR, PPR.

Requires ALTPRI privilege, or sufficient base priority.

Typical value: 4

2 FCT
FCT n - Force CP Type

When the CP command is given in MAIN mode, then if CFT is 1 the CCP command (q.v.) is obeyed instead to do a combined CALibration and Control Point measurement (assumes that the map has a superimposed grid).

The normal value is 0.

2 PNT
PNT n - default point feature mode

PNT determines the default action to be taken when POInt (FB6 in MAIN mode) is pressed to enter POINT mode (q.v.). If PNT is 0 the default action will be to look for a cross ('+' or 'x') or a small ring, whereas if PNT is 1 a scan will be made to search for 'square

building' features (represented by filled squares). Note that once in POINT mode both types of scan are available; PNT only determines the action when FB6 in MAIN mode is first pressed.

More help is available in POINT mode.

2 JAT
JAT r - Junction arm Angle Tolerance.

Tolerance for deciding which arm matches the current track.

Typical value: 40 degrees

2 JPT
JPT r - Junction Position Tolerance

If two junctions are closer together than JPT they are merged into one. Also, when locating an existing junction, if the LASERTRAK cursor is within JPT of the junction then it is found.

The value of JPT should be approximately (i.e. within a factor of two of) the mean line-width.

Typical value: 40 HRD counts.

2 JWT
JWT r - Junction arm-Width Tolerance

Do not spot a junction if the line width falls below JWT*(current track-width). Prevents 'flapping' in poor quality data where the linework may contain holes.

Range: 0.0 (disabled) to 0.8. Typical value: 0.3.

2 PPP
PPP - Print Primary (user) Parameters
PUP

Display the parameters which the operator may have to vary in the course of setting up LASERAID to follow a particular type of linework. See also the PAP command which lists additional parameters available to the system manager.

2 PAP
PAP - Print All Parameters

Display all the parameters to which the system manager has access. Note that most of the parameters which do not appear in the basic operator set (see the PPP command) are effectively constants and only require modification in order to follow unusual or poor quality linework.

If you are unable to persuade LASERAID to follow satisfactorily, a sample negative should be sent to Laser-Scan, who will be able to advise you on optimum parameter settings.

2 PSP
PSP - Print Scanner Parameters

Display the parameters which are relevant to the scanning process.

2 PLP
PLP - Print Line-following Parameters

Display the parameters which are relevant to the line-following process.

2 PLW
PLW - print LIMits and Weights

Display the LIMit and Weight parameters. These should be only be altered after consultation with Laser-Scan.

2 POD
POD - print oddments

Display parameters which do not fall into any well-defined category (see also PAP).

1 CONFIRM_MODE
In this mode the system is basically waiting for a YES/NO answer, or permission to commence an action.
2 FBs
For details of the current function buttons type '?'.
Use ?FB1 for information on FB1 (which is context-dependent).

2 FB1
When defining a window for windowed paintout, FB1 resets the origin of the refresh box to the current cursor position.

2 OK
OK (FB4)
YES (FB4)
GO (FB4)

Indicate acceptance.

2 NO
NO (FB16)
ABAndon (FB16)
ABOrt (FB16)
QUIt (FB16)

Indicate rejection.

1 CHECK_MODE
This mode enables the LASERTRAK parameters to be set up ready for digitising.
2 FBs
For details of the current function buttons type '?'.

2 STArt
STArt (FB1)

Set the start point of the required scan vector. If this is selected in error then FB1 can be pressed again to choose the current cursor position. When the start point has been defined, the length and direction of the scan vector is specified by the 'rubber-band' line attached to the cursor.

2 OCR
OCR (FB2) - set red/blue Offset and Counts Ratio

Used in conjunction with WHL (FB3), this command causes a 'goal-post' graph to be drawn on the close-up screen. A good measurement is indicated by a nearly straight diagonal line which overlays the 45 degree line. This set-up should be performed on

horizontal and vertical 'white lines'; each measurement should be performed at least twice and a wide line type should be used (e.g. TYPe 1).

2 WHL
WHL (FB3) - construct a WHite Line for set-up

Although primarily intended for use with OCR (FB2), other checks such as THReshold and PHAse may also be carried out on the 'white line' constructed by this command. A wide line type (e.g. TYPe 1) should be specified before giving this command if an OCR set-up is to be performed.

2 TXZ
TXZ (FB4) - clear the close-up screen

The Tektronix screen is cleared (zeroed).

2 PHAse
PHAse (FB5)

Set the phase correction. A horizontal line is drawn on the close-up screen and a series of scans are performed, one for each time the scan width CHANGES in the type table (e.g. if types 1 to 7 had widths of 63 15 15 20 15 15 20, then 5 scans would be performed). Each scan results in a line which crosses the horizontal line on the close-up screen; that is the correct phase for that scan width. The phase should be measured on both horizontal and vertical lines, and the set-up must be repeated if the scan frequency is altered.

2 CURsor
CURsor (FB8)

Draw a close-up view of the area around the LASERTRAK cursor on the Tektronix screen, then put up the Tektronix cursor. When a character is typed the LASERTRAK cursor is moved to the equivalent position. This command can be used for fine positioning of the LASERTRAK cursor (cf. the CLOse-up command).

2 THReshold
THReshold (FB9)

Set the digitiser threshold. A threshold graph is drawn on the close-up screen and the Tektronix cursor is activated. Usually the threshold which is required is somewhere in the middle of the plateau region of the graph (see the users' guide for more information).

2 CLOse-up
CLOse-up (FB12)

Draw a close-up view of the area around the LASERTRAK cursor on the Tektronix screen (cf. the CURsor command).

2 FOCus
FOCus (FB13)

Set the red laser focus. A 'high' threshold should first be set using the THReshold command (select a value about half-way up the trailing edge of the threshold graph). The FOCus command then causes a focus graph to be drawn and the Tektronix cursor is activated. Perform this check in both axes and choose the highest

point of overlap of the two graphs (if the graphs do not overlap at all then the digitising laser spot is astigmatic and may require adjustment). Remember to reset the threshold afterwards.

2 QUL
QUL (FB14) - check quality of line position measurement

This check should produce an approximately horizontal line on the close-up screen. It is usually performed after OCR (FB2).

2 QUW
QUW (FB15) - check quality of line width measurement

This check should produce an approximately horizontal line on the close-up screen. It is usually performed after OCR (FB2).

2 ABAndon
ABAndon (FB16)

Abandon CHECK mode, returning to MAIN mode.

2 ZERo
This command is for Laser-Scan engineers only.

2 RFK
RFK n - set ReFresh 'Kick' rate

This command is for Laser-Scan engineers only.

2 TBK
TBK n - set Tracker-Ball 'Kick' rate

This command is for Laser-Scan engineers only.

2 ERRor
Repeatedly scan a line (specified using STArt) and check the resulting hardware encounters for consistency. If an error is found the scan will stop and a message will be displayed, otherwise FB16 can be used to abandon scanning.

2 SPH
SPH - Software PHase (not implemented)

This command is reserved for possible future use.

2 PSP
PSP - Print Scanner Parameters

Display the parameters which are relevant to the scanning process.

2 TYPe
TYPe n

Select line type n.

2 PTY
PTY - Print TYpe table

Display the available line types.

2 MODe
MODe n

Select the scanning mode. MODe 0 scans in edge mode while MODe 1 scans in line mode.

2 DIRection
DIRection n

Select the scan direction. This is usually selected automatically based on the direction of the required scan vector. A value of 0 results in hardware scans which are parallel to the X (horizontal) direction, while a value of 1 results in scans which are parallel to Y.

2 FRQ
FRQ n

Set the scan frequency (range 0:6). If the scan frequency is altered then the PHAse (FB5) correction must be repeated.

2 WIDth
WIDth n

Set the effective scan width (sensible range 10:63). This value must be multiplied by 64*CRX/Y to obtain the width in HRD counts. It should be noted that the LASERTRAK only has 4 hardware scan widths, corresponding to WIDth 7,15,31 and 63. Intermediate values are obtained by ignoring encounters outside the specified width. This means that the scan on the LASERTRAK screen will double in size when WIDth is increased from 15 to 16, for example.

2 PITch
PITch n

Set the scan pitch (sensible range 5:50 HRD counts).

2 WLO
WLO n

The value of this parameter should be 1. It should not be altered by the user.

2 WHI
WHI n

The value of this parameter should be 255. It should not be altered by the user.

2 TLO
TLO n - set digitiser threshold

The digitiser threshold is usually best set up by using the THReshold command (FB9), or by enabling automatic thresholding (TSW 0). If TLO is used, the argument should be in the range 1:255.

2 TSW
TSW n - select automatic/manual thresholding

TSW 0 selects automatic thresholding, while TSW 1 selects manual threshold (set using THReshold - FB9). If automatic thresholding is used, command THReshold will yield a horizontal line on the close-up screen.

2 TMS
TMS n - set timeshare factor - not implemented

This command is reserved for possible future use.

2 CRX
CRX r - set counts ratio in X

Except in extraordinary circumstances, this parameter should only be set by means of the OCR command (FB2).

2 CRY
CRY r - set counts ratio in Y

Except in extraordinary circumstances, this parameter should only be set by means of the OCR command (FB2).

2 OFX
OFX r - set red/blue offset in X

Except in extraordinary circumstances, this parameter should only be set by means of the OCR command (FB2).

2 OFY
OFY r - set red/blue offset in Y

Except in extraordinary circumstances, this parameter should only be set by means of the OCR command (FB2).

2 PHX
PHX r - set phase correction in X

Except in extraordinary circumstances, this parameter should only be set by means of the PHAse command (FB5).

2 PHY
PHY r - set phase correction in Y

Except in extraordinary circumstances, this parameter should only be set by means of the PHAse command (FB5).

2 FLE
FLE n - set red laser focus level

Except in extraordinary circumstances, this parameter should only be set by means of the FOCus command (FB13).

1 CALIBRATE_MODE
This mode enables grid intersections to be measured for calibration purposes.
2 FBs
For details of the current function buttons type '?'.

2 AUTo
AUTo (FB 2)

Perform an automatic measurement. The LASERTRAK cursor is left over the intersection position if one is found, otherwise a warning is issued.

2 OK
OK (FB4)
YES (FB4)
GO (FB4)

Accept the measurement.

2 MANual
MANual (FB8)

Perform a manual measurement using the close-up screen and cursor. Position the cross-hairs over the required position on the close-up screen and type any character on the keyboard.

2 SKIp
SKIp (FB12)

Skip this intersection. Pressing SKIp rather than OK (FB4) causes the intersection to be ignored, and LASERAID moves on to the next.

2 CONtinuous
CONtinuous (FB13)

Select continuous, automatic measurement. The default operation is for the program to pause after each intersection measurement for the operator to accept it. Continuous measurement enables LASERAID to proceed automatically, accepting each measurement in turn and proceeding to the next intersection. If a bad intersection is found, automatic measurement will cease and the operator will be invited to enter manual mode. The CONtinuous option may subsequently be re-activated by pressing FB13 again.

2 NO
NO (FB16)
ABAndon (FB16)
ABOrt (FB16)
QUIt (FB16)

Abandon CALIBRATE mode, returning to MAIN mode.

1 LOCATE_MODE
In this mode the feature(s) nearest the LASERTRAK cursor have been LOCated.
2 FBs
For details of the current function buttons type '?'.

2 NXT
NXT (FB1) - get next feature

Get the next feature from the 'found' list (cyclically). The feature is refreshed on the LASERTRAK and is 'in hand'.

A maximum of four features can be held in the list.

2 REPaint
REPaint (FB4)

Repaint the refreshed feature.

2 DELete
DELete (FB13)

Delete the refreshed feature. Note that it cannot subsequently be recovered.

2 ABAndon
ABAndon (FB16)

Abandon LOCATE mode, returning to MAIN mode.

1 MEASURE_MODE
This mode enables the control points and check fiducial to be measured.
2 FBs
For details of the current function buttons type '?'.

2 AUTo
AUTo (FB 2)

Perform an automatic measurement. The LASERTRAK cursor is left over the intersection position if one is found, otherwise a warning is issued.

2 OK
OK (FB4)
YES (FB4)
GO (FB4)

Accept the measurement.

2 MANual
MANual (FB8)

Perform a manual measurement using the close-up screen and cursor. Position the cross-hairs over the required position on the close-up screen and type any character on the keyboard.

2 NO
NO (FB16)
ABAndon (FB16)
ABOrt (FB16)
QUIt (FB16)

Abandon MEASURE mode, returning to MAIN mode.

1 POINT_MODE
This mode enables single-point features to be digitised.
2 FBs
For details of the current function buttons type '?'.

2 DPO
DPO (FB1) - perform and draw a traditional POINT mode scan

Scan for a 'traditional' point feature ('+', 'x', or 'o'), drawing the results on the close-up screen. If a feature is found the LASERTRAK cursor is positioned over the feature and a dot is displayed in refresh. FB4 (OK) can be then be used to accept the feature.

The normal command to use for this type of scan is POI (FB2) which does not draw on the close-up screen.

2 POI
POI (FB2) - perform a traditional POINT mode scan

Scan for a 'traditional' point feature ('+', 'x', or 'o'). If a feature is found the LASERTRAK cursor is positioned over the feature and a dot is displayed in refresh. FB4 (OK) can be then be used to accept the feature.

DPO (FB1) is identical to POI, except that the results of the scan are drawn on the close-up screen.

2 OK
OK (FB4) - accept the point feature(s)
YES (FB4)
GO (FB4)

Accept any refreshed point feature(s). If more than one feature is accepted, the feature number is incremented as usual.

If no features were found by the scan, the cursor position is read and a feature is created there. In 'square building' mode, a warning message will be output to indicate that the orientation of the feature has not been set.

2 DSQ
DSQ (FB5) - perform and draw a 'square building' scan

Scan for one or more 'square building' features (represented by filled squares), drawing the results on the close-up screen. Any recognised objects are highlighted in refresh, with the number found indicated alongside (the scan box is also shown; this may be moved if required and another scan performed).

OK (FB4) will accept all refreshed objects in one go (creating separate oriented point features), or each object may be selected individually using NXT (FB8). DRF (FB7) will draw any refreshed object(s) on the close-up screen.

The normal command to use for this type of scan is SQP (FB6) which does not draw on the close-up screen.

2 SQP
SQP (FB6) - perform a 'square building' scan

Scan for one or more 'square building' features (represented by filled squares). Any recognised objects are highlighted in refresh, with the number found indicated alongside (the scan box is also shown; this may be moved if required and another scan performed).

OK (FB4) will accept all refreshed objects in one go (creating separate oriented point features), or each object may be selected individually using NXT (FB8). DRF (FB7) will draw any refreshed object(s) on the close-up screen.

DSQ (FB5) is identical to SQP, except that the results of the scan are drawn on the close-up screen.

2 DRF
DRF (FB7) - draw selected 'square building' feature(s)

Draw any refreshed 'square building' features on the close-up screen. A cross is drawn inside the 'least-squares' quadrilateral to indicate the position and orientation of the point feature.

2 NXT
NXT (FB8) - select next 'square building' feature

Cycle through the found objects in turn, allowing selected ones to be accepted.

2 CLOse-up
CLOse-up (FB 12)

Draw a close-up view of the area around the LASERTRAK cursor on the Tektronix screen.

2 ABAndon
ABAndon (FB16)
NO (FB16)
ABOrt (FB16)
QUIt (FB16)

Abandon POINT mode, returning to MAIN mode. Any unaccepted point feature(s) will be discarded.

2 AC
AC type value [text] - Ancillary Code

Create an Ancillary Code (AC) in the current point feature. The current Ancillary Code Base (ACB) value (if any) is added to the AC type.

Note that if several point features are being accepted in one go (i.e. in 'square building' mode) then only the FIRST feature will contain ACs created using this command. All of the features will, however, contain the Standing Ancillary Code (SAC) if one has been defined (see MAIN mode).

The AC 'value' is examined for a decimal point, and is stored as a real number if one is found. If the AC 'type' is 3 (INCLUDING the ACB), this is treated as a special case and its value is ALWAYS stored as a real number.