# Motion Control System

# PANTERM
# User Manual

**Revision 1.3**

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## Table of Contents



# 1 DOCUMENT MANAGEMENT

## 1.1 Release

| Issue | Date | Comments | Software |
|---|---|---|---|
| 1.1 | August, 1998 | First release | V1.91 |
| 1.2 | April, 2001 | | V1.92 |
| 1.3 | September, 2001 | 50 line display | V1.93 & V2.1 |

# 2 INTRODUCTION

This document describes the PANTERM programme for use (on a personal computer) with the Pan Controls motion control system.

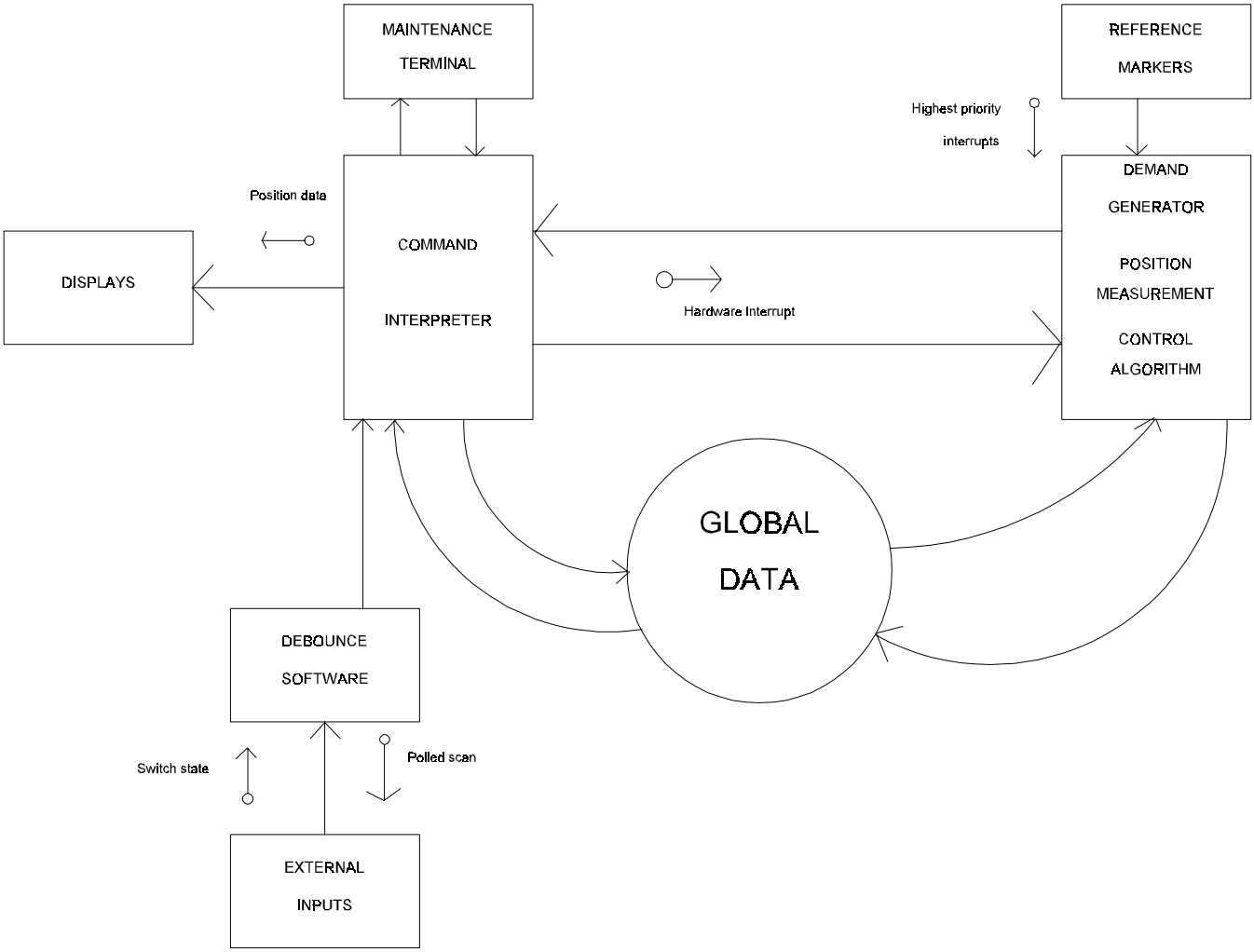
PANTERM requires a 80x86 based personal computer which is capable of running MS-DOS or a MS-DOS emulation (e.g. under Windows 95/98). It needs a standard RS-232 serial port, preferably with a FIFO buffer (the software will automatically recognise this if it sees a serial port with FIFO). It is recommended that the programme is put in a directory in the executable path (e.g. C:\WINDOWS\COMMAND). The programme can then be executed in any directory where the user might want to keep code. It will automatically create a local configuration file in the directory from which it is being used.

Version 1.93 of Panterm is named PANTERMV, and is specifically designed for use with the value controller. It can however be configured to operate with the multi-axis control system.

Version 2.3 is designed for the multi-axis control system, and allows features, such as 50-line display, continuous display of axis positions, etc..

# 3 GENERAL DESCRIPTION - SOFTWARE FUNCTIONALITY




**Data flow diagram**

The control software is highly deterministic, being interrupt driven by a hardware timer. The control algorithm is implemented every time this hardware timer generates an interrupt (every 1÷256 second). In addition, polling of the external inputs is carried out during the same servo loop closure process. Serial character receipt and transmission is also handled by the interrupt mechanism, and a special high priority interrupt is used for reference marker detection. This gives a response time of better than 15µs.

The command interpreter is executed in background mode, together with display routines.

The modular approach to the software means that system can be easily adapted to particular situations.

# 4 MODIFICATIONS TO THE USER PROGRAMME

The user programme consists of sequences of instructions which are stored in non-volatile memory on the Pan controller.

To make the management of the construction of the user programme simple, a system has been developed to allow the user to develop and modify a master copy of the user programme on a personal computer.

The sequence of programme development can be summarised as follows:

1. Develop programme on personal computer using any editor which will generate an ASCII file (i.e. no embedded control codes).
2. Download programme from personal computer to Pan controller (to the controller's RAM - volatile memory).
3. Save the programme from the controller's RAM to EEPROM (non-volatile memory).

This procedure means that a master copy of the programme is always maintained on a personal computer, and can be copied and maintained for archiving purposes.

A utility programme (called "PANTERM") is supplied to run on an MS-DOS based personal computer. This enables the personal computer to emulate a terminal, and to allow file transfer. The personal computer must have a serial port ("COM1", "COM2", "COM3", or "COM4").

It is suggested that a batch file be set up to enable the user to enter the programme by entering a single name (e.g. control). This will start the "PANTERM" programme, and prompt the user to press a key to start terminal emulation.

If the Pan controller is connected to the personal computer and switched on, then any keys which are pressed on the personal computer will be echoed back to the screen. If characters are not echoed, then there is something wrong with communications. The leads should be checked. Also, the "PANTERM" configuration can be modified by pressing <ALT> C. A sample screen might appear as follows:

| Configuration | |
|---|---|
| Communications Port (1 - 4): | 1 |
| Baud Rate: | 9600 |
| Serial mode; RS232, 422 or 485: | 232 |
| File loading delay (milliseconds): | 0 |
| File loading mode: Transparent or Check for acknowledge | C |
| Software or Hardware handshaking: | S |
| Colour or Mono display: | C |
| Parity: None or Even: | E |
| Number of lines (25 or 50): | 25 |
| Editor name: | edit |

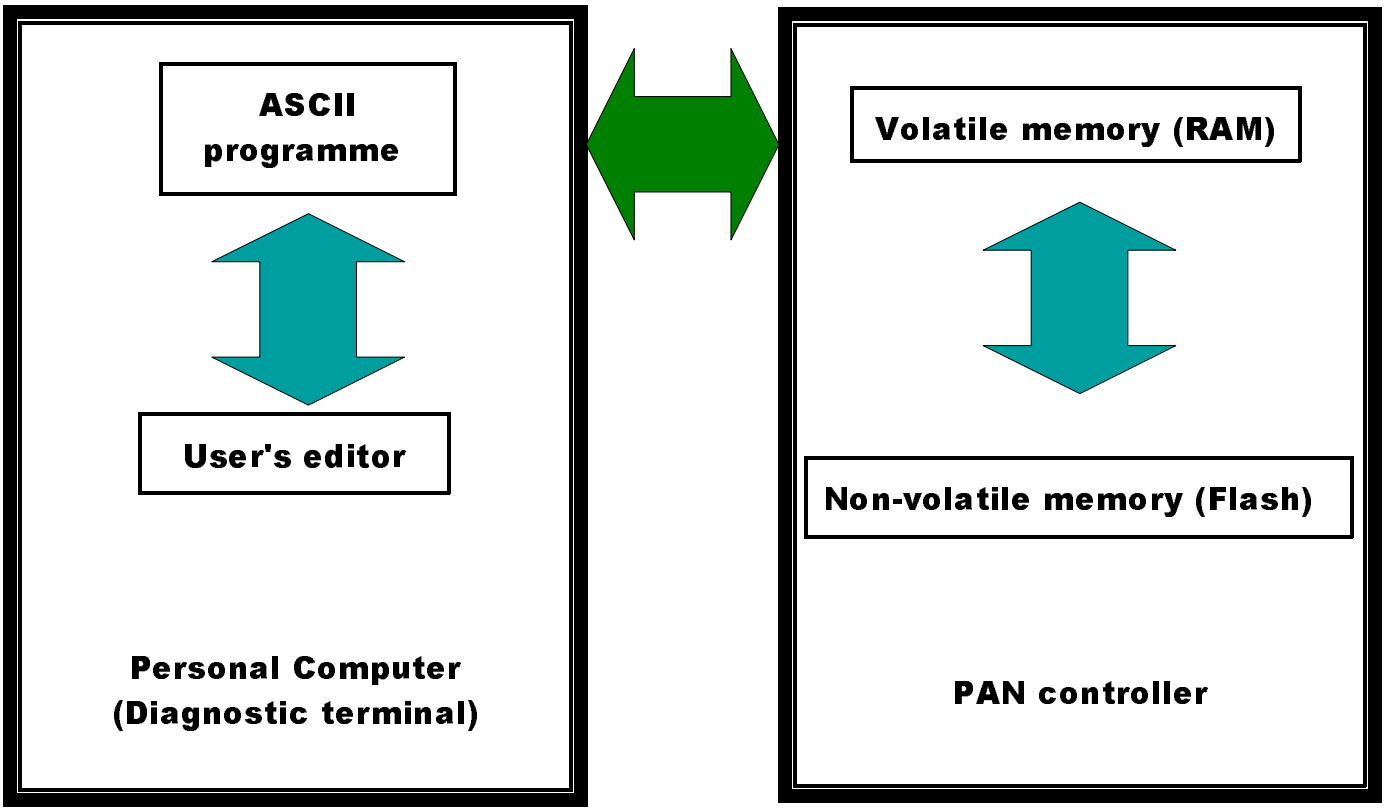
In order to modify a source programme, it is necessary to access the editor by pressing <ALT> E. The user is then prompted to enter a file name (e.g. "ICI6.1"). The editor then enables the user to move around the programme, using the cursor keys and the <Page Down> & <Page Up> keys.

Modifications can be made until the user is satisfied. The user can then leave the editor by pressing <esc> followed by E (to Exit and save), followed again by <esc>.

In order to download a source programme from the personal computer to the Pan controller, it is first necessary to ensure that the controller is in the "privileged mode" (see command "PM"). It is suggested that the user resets

the controller to its default state by using the "RS" command, particularly when doing a final installation. This will enable a definite checksum to be established on a particular machine. This means that any subsequent changes (accidental or intentional) can be identified. If the file loading mode is set to C (checksum), The programme is downloaded by pressing <ALT> U. The user is then prompted to enter a file name (e.g. "ICI6.1"), and the programme will then be transferred. If the programme uses stored profiles, these will need to be downloaded in the same way (e.g. ICI6.PRF).




PANTERM programme maintenance environment

# 5 PANTERM communications programme for personal computer

## 5.1 Introduction

The program can be run on an IBM Personal Computer or compatible MS-DOS computer (PC) to make that PC act as a terminal to a PAN digital control system. Please note that this programme operates best outside of a Windows shell. This is because the interrupt response time of a Personal Computer is degraded by the time-slicing requirements of a multi-tasking operating system. If the Personal Computer being used is running Windows 95, it is recommended to use the option *Restart the computer in MS-DOS mode.* Once installed and running, most commands entered on the PC are transmitted directly to the control system and any responses from the control system are displayed on the PC. In addition, some special commands are provided which are not transmitted to the control system but are handled locally by the PC. These commands allow text files to be edited locally on the PC and then transmitted to the control system. This allows complex command strings for the control system to be created and amended using the PC and then transmitted to the control system together.

## 5.2 Setting up the serial link

Some PAN control systems have more than one serial port. The port marked Terminal should be used. Most PCs have up to four serial ports referred to as COM1, COM2, COM3 & COM4. PANterm assumes that COM1 will be used but this can be changed. RS-232 levels should be used and it is assumed that the PC has a 9 way or 25 way D connector plug. If the PC has a different connector type then the PC and control system should be linked with a four wire lead having the following connections. The connections between a PC and the Control Board are as follows:

Connections for cable for IBM compatible Personal Computer:

| | 9-pin plug(Controller) | | 25-pin socket(PC) | 9-pin socket (PC) | |
|---|---|---|---|---|---|
| | 2 | -> | 3 | 2 | RX |
| | 3 | <- | 2 | 3 | TX |
| | 5 | <-> | 7 | 5 | GND |
| Hardware ) | 7 | <- | 4 | 7 | RTS |
| Handshake ) | 8 | -> | 5 | 8 | CTS |
| Connect these 4 | ) | -> | 8 | 1 | DCD |
| lines together | ) | -> | 6 | 6 | DSR |
| when using hardware | ) | -> | 22 | 9 | RI |
| handshaking | ) | <- | 20 | 4 | DTR |

RS-232 serial connections

PAN control system's terminal ports are configured to run at 9600 baud and to use hardware handshaking by default. This can be changed by means of the "BD" baud rate command. PANterm defaults to the same settings but can be changed by means of the configuration menu.

## 5.3 Using PANTERM as a simple terminal

PANterm is started from the MS-DOS command prompt (A> or C>) by typing:

PANTERM

There are no command line options. The PC will then display its copyright message for a few seconds, before going into terminal mode. When you receive your copy of PANterm it should already be configured to work with your control system. Typing RETURN at this point should produce a control system prompt on the screen:-

1:

If this does not happen, you will need to configure PANterm to work with your control system which is explained in the Configuration section below.

At this stage, control system commands such as CH1, PC, MR1000 etc can be typed and will be transmitted directly to the control system. The responses from the control system such as 1:, 1> and 2M will be displayed on the PC. Your PC is now working as a terminal on the control system.

To leave the PANterm terminal program and return to MS-DOS type Alt-X (Exit).

## 5.4 Preparing system command files

PANterm has been designed not just to send single commands to a control system, but also for the preparation and issuing of files of command to the systems. PANterm can also be used to receive a set of commands which actually exists on a control system, and place these commands in a file. You are then able to edit this file as required, and issue the new commands to the control system in a similar way.

You may edit a file of commands with any text editor. PANterm also allows you to set up a specific editor for use with the program, and this is explained in the configuration section. Note that your editor must be able to prepare a file which contains pure ASCII test, without hidden control codes. Most editors will do this in "non document" or "ASCII" mode. The resulting file should contain a list of control system commands in exactly the same format as you would type them in direct terminal mode. The file could look like this:

```
# move forward and back
CH1
PC
SA500
SV1000
MR5000
SV200
MR-5000
# move complete
```

Note that comment lines can be put in the file by starting the line with a "#" (pound or hash) symbol. In due course we will see what happens to these comment lines.

When the above example is sent to a control system it would cause the system to execute the move forward and back immediately. This assumes that the control system is ready to move and the velocity and accelerations are sensible. If an error occurs, perhaps because the motor cannot achieve this acceleration, then the system will respond in the normal way with an error message. If the move fails early on then all the subsequent move commands will generate errors and a whole batch of error messages may be received by the PC. Error messages can be recorded to a file disk (using the Alt-R PANTERM command). In addition the last error on the control system can be interrogated using the LE last error command.

If you do not want the sequence of commands to be executed immediately but to be stored on the control system for future use we could edit the file to look like:-

```
# enter sequence to move forward and back
ES1
CH1
PC
SA500
SV1000
MR5000
SV200
MR-5000

# end of sequence
# now define input line 1
DI1-/XS1
```

When this is sent to the control system, the sequence will be stored and input line 1 will be set up so that when it is activated (perhaps by an operator pushing a button) then the sequence will be executed. Note that the file contains a blank line at the end of the sequence. This tells the control system that the end of the sequence has been reached. This blank line must also be included when entering profiles and maps. Note that this command file could be written on fewer lines by putting several commands on one line with a delimiter between them:-

```
# enter sequence to move forward and back
ES1
CH1/PC/SA500/SV1000/MR5000
SV20/MR-50000

# end of sequence
# now define input line 1
DI1-/XS1
```

Putting several commands on one line has no effect on the way the control system will respond. The only exception to this rule is the repeat (RP) command. This is used as the last command on a line and causes all the previous commands on that one line to be repeated, in order, the specified number of times.

Spreadsheet programs can also be used instead of editors to prepare control system command files. Any spreadsheet which allows the user to output columns to a disk file in an ASCII format can be used. The following example shows how a spreadsheet might be set up to create a move profile:-

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | JOLT FREE PROFILE CALCULATION | | | | EP1 |
| 2 | | | | 1 | 0 |
| 3 | Parameters:- | | | 2 | 1 |
| 4 | | | | 3 | 3 |
| 5 | Move distance | 500 | Counts | 4 | 8 |
| 6 | Move time | 30 | Ticks | 5 | 14 |
| 7 | | | | 6 | 24 |
| 8 | w = 2*3.14159/B6 = | .2094393 | | 7 | 38 |
| 9 | | | | 8 | 54 |
| 10 | Formula used in cells E2 to E31:- | | | 9 | 74 |
| 11 | | | | 10 | 98 |
| 12 | Profile = B5/B6*(Dn-SIN(B8*Dn)/B8) | | | 11 | 124 |
| 13 | | | | 12 | 153 |
| 14 | (where n is the row number) | | | 13 | 184 |
| 15 | | | | 14 | 217 |
| 16 | | | | 15 | 250 |
| | ~~~ | ~~~ | | ~~~ | |
| 28 | | | | 27 | 497 |
| 29 | | | | 28 | 499 |
| 30 | | | | 29 | 500 |
| 31 | | | | 30 | 500 |
| 32 | | | | | |

If the spreadsheet is used to print column E to a disk file then that disk file would be a suitable control system command file. Note that the printout should include row 32 containing a blank entry. Note also that column E should be formatted so that the numbers in it are integers.

It will be obvious to any computer programmer that programming languages such as "Basic", "C" and "Fortran" can also be used to produce control system command files. By using such a language or a spreadsheet it is possible to produce complicated profiles and maps and load them into a control system far more easily than can be done by hand. Also, this approach is far quicker when it comes to making amendments. For instance, in the above example a second profile move, numbered 2, of 600 counts could be created by amending just two cells - E1 and B5.

## 5.5 Loading command files

Once you have prepared a control system command file and set up PANterm in its terminal mode, you are ready to transmit command files to the control system. This is called loading. To do this type UP (to put the controller in Upload mode) followed by Alt-L (Load). You will then be asked the name of the file that you wish to load. Type its name and press return. PANterm will now start sending the file to the control system. The characters that you will see on your screen are all echoed back from the control system, so that you know they have been received correctly. The exception to this rule is the comment; comments are not sent, but printed directly to the screen, in reverse colours.

When your command file has been loaded, the programme will revert to the terminal mode. Also, pressing any key while loading will cause the load to be paused; a second keypress will continue the load.

PANterm incorporates a delay mechanism so that you can check the response of the control system to your command file. You can type Alt-S (Slow) or Alt-F (Fast) to slow down or speed up the loading. A very slow speed combined with pausing can be useful for spotting errors.

While in terminal mode, you may want to record what some of the commands and definitions currently on the control system are. You can start this recording by typing Alt-R. You will be prompted to enter a name for the recording file. Both the commands that you type, and the control system's response will be recorded. You can stop the record at any time by pressing Alt-R again.

While loading a command file, you may wish to abort the load and return to the terminal mode. Press Alt-T (terminal) if you wish to do this. Pressing Control-C, which stops many programs, will not affect PANterm - this gets sent straight to the control system.

You might have aborted because you spotted an error in your command file. If so you will want to edit your file. PANterm allows you to type Alt-E which will start up your editor without leaving PANterm, provided that PANterm has been told which editor to use in the configuration section. You may use your editor as normal. On exiting your editor you will return immediately to PANterm in its terminal mode. By leaving PANterm in your PC's memory in this way, restarting PANterm is considerably speeded up.

## 5.6 Loading system programme files

The controller system programme can be changed by using the UP command from the boot programme. A system programme in Motorola S-record format must have bee prepared in advance, and this can be uploaded using the Alt-U option. Otherwise this option is similar in operation to the Alt-L load file option.

## 5.7 Configuring PANTERM

PANterm will generally be configured when you receive it. This facility allows you to set up differences required for your system once, and then to use that version in future without further difficulty.

To reconfigure PANterm, type Alt-C when you are in terminal mode. A new window will appear, with the header 'Configuration'. Each entry, together with its default value, is explained below.

Communications Port

Normally, PCs have up to 4 serial ports, one of which will be used to talk to the control system. PANterm is set up to use Port 1 by default. Some PCs have more than four ports; because this is not standard, and methods of implementation between different computers vary, it has not been possible to write PANterm to use other ports.

Baud Rate

This item indicated the speed at which PANterm will attempt to talk to the control system. This is normally set at 9600 baud, because this is the default speed at which the control system will communicate. You may want to change this value if you are talking to a different device (other than a control system).

Serial mode; RS232, 422 or 485

PANterm is designed to operate in conjunction with the standard 16450 or 16550 UART device. This option allows the use of an RS-422 or RS-485 converter (as manufactured by KK systems) to be connected to the standard RS-232 serial port of a personal computer. The hardware handshake mode (see below) can only be selected if the RS-232 option is selected, since the RS-422 and RS-485 adaptors do not have hardware handshake facilities. The RS-485 option uses the RTS line to control the direction of data flow.

File Loading delay

The rate of loading a file to the control system will be controlled by this value, which is in milliseconds. You may also speed up file loading by pressing Alt-F, which has the effect of halving the delay time on each press, or pressing Alt-S, which has the reverse effect. When you start to download a new file, the initial delay time will revert to this value. The default value is 0 milliseconds.

File loading mode; Transparent or Check for acknowledge

This determines how PANterm communicates with the control system. Under transparent mode, PANterm will load files (using Alt-L) exactly as they are entered on the keyboard. Under check for acknowledge mode, PANterm always waits for acknowledge after each <CR> character, and before starting to transmit the next line. It also performs a checksum check on the complete file at the end of transmission. If this fails, the personal computer displays the failure, and waits until the operator presses a key before continuing.

Software or Hardware Handshaking

If set to software handshaking, PANTERM will use the *XON* and *XOFF* characters for flow control. If set to hardware handshaking, PANTERM will use to dedicated hardware lines, *CTS* and *RTS* for flow control. Hardware handshaking is only allowed when the RS-232 serial mode has been selected. For the Value controller, use software handshaking; otherwise it is recommended to use hardware handshaking.

Colour or Mono display

You should set this to colour if you have a colour screen, for better presentation. The default is mono.

Even parity or none

This should normally be set to Even. This performs parity checking on incoming data and generates a parity bit for outgoing data.

25 or 50 lines

If you want more information on the screen, set this to 50 line display. Host controller software V157.1 and later is designed to operate in either 25 or 50 line mode. A regular update window for monitoring axis positions and I/O is displayed at to bottom of the 50 line display. The XW auXiliary output word selects which information is sent to the controller. Bit 1 of the display word can be cleared to send the correct number of lines for long listings (e.g. LI).

Editor name

This item is used to set the editor that you wish to use to edit the control system command files. By default, it is set to 'ed'.

## 5.8 Automatic baud rate configuration

PANterm has the facility to set its baud rate automatically to that of the controller to which it is connected. Having established the baud rate of the controller, PANterm sets the baud rate of the PC to match, and updates the PANterm configuration file accordingly. This feature is invoked by typing Alt-B.

## 5.9 PANTERM command summary

Alt-B (Baud rate set) Sets PANTERM to the baud rate of the controller automatically.

Alt-C (Configure) Allows configuration PANTERM.

Alt-D (Dos) Starts an MS-DOS shell.

Alt-E (Editor) Temporarily leaves terminal mode and loads your editor for editing control system command files.

Alt-H (Help) Display a list of possible commands and other help information on screen.

Alt-L (Load) Starts loading of a control system command file. When your file has been loaded, the program will revert to the terminal mode.

Alt-R (Record) Allows recording of control system commands to a file. You will continue to record all commands until you repeat the Alt-R command.

Alt-T (Terminate) Terminates loading of a control system command file and returns to terminal mode.

Alt-U (Upload) Starts loading of a control system S-record file. This is used for changing the system low level programme, and can only be used from the boot controller programme using the UP command. When the file has been loaded, the program will revert to the terminal mode.

Alt-X (eXit) Exits the PANterm terminal program and returns to MS-DOS.

# 6 APPENDIX

## 6.1 Standard set-up for Value controller (Panterm Ver 1.93)

| | |
|---|---|
| Communications Port (1 - 4): | 1 |
| Baud Rate: | 9600 |
| Serial mode; RS232, 422 or 485: | 232 |
| File loading delay (milliseconds): | 0 |
| File loading mode: Transparent or Check for acknowledge | C |
| Software or Hardware handshaking: | S |
| Colour or Mono display: | C |
| Parity: None or Even: | E |
| Editor name: | edit |

## 6.2 Standard set-up for Multi-axis controller (Panterm Ver 2.1)

| | |
|---|---|
| Communications Port (1 - 4): | 1 |
| Baud Rate: | 9600 |
| Serial mode; RS232, 422 or 485: | 232 |
| File loading delay (milliseconds): | 0 |
| File loading mode: Transparent or Check for acknowledge | C |
| Software or Hardware handshaking: | H |
| Colour or Mono display: | C |
| Parity: None or Even: | E |
| Number of lines (25 or 50): | 25 |
| Editor name: | edit |

## 6.3 Sample programme listing

```
#
#  PANMC/V154.3  Rev 6th July 1999
#  Pan Controls PC3/100 board, Issue F - No of wait states = 0
#  AMD 1048576 bytes flash memory
#  Operator Interface V106.5 OI 19980530 PC3/120 Issue C
#
#
#          Hardware; PC3/100 Host control board
#
#
#
# The machine is a 3 axis flexographic printer with axes defined,
#
#     Desc.          CH3           CH2           CH1
# Master/Slave     Master        Slave 1       Slave 2

# Axis             Web          Colour 1(7)   Colour 2(8)
# Encoder [ppr]    1000
# Counts/rev       4000      6.75*4*       6.75*4*
# Distance/rev  444.5mm (17.5") 1 repeat      1 repeat
# Counts/mm
#
# The type roll is driven via a 140t 1/4" pitch gear mounted on the
# impression roll whose circumference is 889mm (35").
# Set slave motor to 280ppr gives 1120 cts/rev so 35" is approx 7560cts
# Master is 4000 cts for 17 1/2" so gives 8000 cts per 35" an approximate
# ratio of 1:1. This is a fixed nominal ratio.
# Store web/slave counts/inch *1000 (cts/0.001") multiply by repeat (in 0.01")
# then divide by 100000
# G = 15483, H = 15483  Ratio starting values for FM FD = 14
# G = 30966, H = 30966  Ratio starting values for FM FD = 15
#
# Modification History;
#
# Mod [28/07/99]
#           [Link ratio resolution increased to achive finer correction
#             using FD15 (32768) and FM 30966]
# Mod [06/08/99]
#           [Added F4 to allow operation with no registration]
# Mod [10/08/99]
#           [Made fine adv/ret 3 was 10]
#
# Mod [11/08/99]
#           [Added a jog mode on F5 for type roll clean up operation
#             making use of the advance/retard buttons with the colour
#              select switch
#                conditions; ..Machine must be in machine mode
#                            ..Press must not be inched during this mode
#                 When ESC is used to quit jog rolls will realign to last
#                  position before jog was used]
#           [also modified S122 to pass the reg. error to both colours
#             simultaneously using pointer system >, < ]
#
# Variable used list,
#  A.."Repeat Length    mm "
#  B..Ch2 DS colour 1 error
#  C..
```

```
#  D..Scaled colour 1 Ch2 FM
#  E..
#  F..Slave bounds used to calculate adv/ret shift
#  G..Nominal FM for Col 1
#  H..
#  I..CH2 running average total
#  J..
#  K..Desired offset, ch 2
#  L..
#  M..Error (signed), ch 2
#  N..
#  O..
#  P..Cumulative CH3 DF 5 samples
#  Q..Correction for one shot PGC
#  R..Repeat for display use
#  S..Speed for display use
#  T..Registration error for display use
#  U..Colour 1 error multiplier for FM
#  V..Colour 1 error divisor for FM
#  W..Web bounds used to monitor actual repeat
#  X..Display actual repeat integer
#  Y..Display actual repeat decimal
#  Z..Number of samples for reg correction
#
#  a..Constant -1
#  b..Constant  0
#  c..Constant  1
#  d..Constant  2
#  e..Constant  3
#  f..Constant  4
#  g..Constant  5
#  h..Constant  60
#  i..Constant  216000  (Counts per 1000")
#  j..Constant  100
#  k..Number of samples before correction
#  l..Constant 100000
#  m..Web modified bounds
#  n..Slave modified bounds
#  o..Correction limit value [S122, S123]
#  p..Counts per foot for speed conversion S200
#  q..calculated reg error to load into Q
#  r..Reset initialisation average total
#  s..Set RE sequence trigger to initialisation sequence
#  t..Testing variable
#  u..
#  v..
#  w..Initialisation offset value for registration
#  x..Reset initialisation value for x
#  y..run mode flag
#  z..Division remainder
#
#
# INPUTS to Panax from machine devices,
#    1..Web registration detector
#    2..Colour 1 registration detector
#    3..Colour 2 registration detector
#    4..
#    5..Coarse advance/retard inc HS
#    6..Fine advance/retard inc HS
```

```
#    7..Phase advance HS
#    8..Phase retard HS
#    9..Select colour 2 for advance/retard HS
#   10..E.Stop has been reset
#   11...
#   12..
#   13..
#   14..
#   15..
#   16..
#   18..
#   19..
#   20..
#   21..
#   22..
#   23..
#   24..
#   25..
#   26..
#   27..
#   28..
#   29..Stepper drives colour 2 ready SA2R X1.15 [144]
#   30..Stepper drives colour 1 ready SA1R X1.15 [145]
#   31..Drive 2 ready TDA2 X2.4 [146]
#   32..Drive 1 ready TDA1 X2.4 [147]
#
# OUTPUTS from Panax to machine interface
#    1..
#    2..
#    3..
#    4..
#    5..
#    6..Control OK monitor relay R1 [123]
#    7..
#    8..
#    9..
#   10..
#   11..
#   12..
#   13..
#   14..
#   15..
#   16..
#   17..
#   18..
#   19..
#   20..
#   21..
#   22..
#   23..
#   24..
#   25..
#   26..
#   27..
#   28..
#   29..
#   30..
#   31..
#   32..
```

```
#
# SEQUENCE LIST
#     1..
#     20...Escape key sequence
#     30...Start screen menu
#     36...Display screen with registration
#     38...Display screen with registration disabled
#     40...Edit sequence
#     41...Reset all working values sequence
#     50...Starting up screen  Ms
#     51...Colour 1 drive ready  Ms
#     52...Colour 2 drive ready  Ms
#     53...Colour 1 steppers ready  Ms
#     54...Colour 2 steppers ready  Ms
#     55...Startup complete Ms
#     56...Reset E.Stop prompt
#     59...Power up header
#     60...Diagnostic/service screen
#     70...Phase advance print setup
#     71...Phase advance print
#     72...Phase retard print setup
#     73...Phase retard print
#     76...Jog positive off Advance button
#     77...Jog negative off Retard button
#     120..Initialisation of registration seq called via RE
#     122..Fine reg correction col 1
#     123..Fine reg correction col 2
#     124..Adjust the repeat length
#     140..One shot correction sequence
#     145..One shot correction sequence complete colour 1
#     146..One shot correction sequence complete colour 2
#     200..Tick driven sequence
#     201..Machine settings update
#     202..Set new ratio
#     203..Change direction mode
#     204..E.stop relink
#     250..Motor off sequence
#     252..E.stop Auto restart sequence
#     253..Default system parameters called from S255
#     254..Default variable values called from S255
#     255..Autostart system setup
#
#
#
EV"BEMIS54.PAN"
DW100010

#*************************************************************************
#*                           MAIN MENU                                   *
#*************************************************************************

ES20                    # Escape key sequence
CE0
ABK/XS30

ES30                          # Start screen
IVy5                          #Load y with run value
ABK                           #Abort keypad activity
EK/WT128                      #Enable keys + wait to clear pending tick
```

```
MD                              #Clear display & address each line
MD1"*** SYNPRO M. I. ***"
MD2" Use function keys  "
MD3" to select required "
MD4" option             "
SKA40                           #F1 key executes seq 40 [Edit]
SKB36                           #F2      ditto       36 [Run]
SKC60                           #F3      ditto       60 [Diag]
SKD38                           #F4      ditto       38 [Plain run]
SKE32                           #F5      ditto       32 [Jog mode]
SKK20                           #ESC     ditto       20
EK/MKE                          #Enable 'F' keys mask jog mode
SK0

#*************************************************************************
#*                            RUN SCREEN                                 *
#*************************************************************************

ES32                    # Display screen with jog facility F5
IF$43:b/XT              #If press is running go back to last menu
IVy-1/CE0               #Load y with jog value turn off update tick
MK/EKK/MI3/SKK34        #Mask F keys & register input
CH2/DPOu/ST             #Record colour 1 position
CH1/DPOv/ST             #Record colour 2 position
MD/CO7                  #Clear display & set output 7
MD1"      JOG MODE      "
MD2" Use Colour, +, -,  "
MD3" to jog type rolls  "
MD4"  Esc to Quit jog   "

ES34                    #Quit jog mode sequence
IVy0                    #Clear jog mode flag
MD                      #Clear display
MD1"      JOG MODE      "
MD2"Resetting type rolls"
MD3"   Please wait....  "
MD4"                    "
CH2/ST/MAVu/LM3         #Reset colour 1 type roll
CH1/ST/MAVv/LM3         #Reset colour 2 type roll
EI/SO7/SKK20/XS20       #Clear output 7 & go to menu header screen


ES36                    # Display screen with registration F2
IF$43:b/XS20/XT         #If press is running go back to menu
MK/EKK/EKE/EI           #Mask F Keys enable ESC & F5 [jog]
IVy2                    #Load y with run value
MD                      #Clear display
CE200/PL256             #Tick sequence per second
MD1"    PRINT MODE      "
MD2"Print Repeat  "A:"."o
MD3"Press speed   "n
MD4"Actual Repeat "X:"."Y

ES38                    # Display screen with registration disabled F4
IF$43:b/XS20/XT         #If press is running go back to menu
IVy3                    #Load y with run value
MK/EKK/MI1/MI2/MI3      #Mask F keys & register inputs
CH2/ST/FD15/FMVG/LM3    #Set up starting link
CH1/ST/FD15/FMVG/LM3    #Setup starting link
```

```
MD                      #Clear display
MD1"    PLAIN MODE      "
MD2"  Please note that  "
MD3"   Registration is  "
MD4"     DISABLED !!!   "

#*************************************************************************
#*                            EDIT MENU                                  *
#*************************************************************************

ES40                            #Edit sequence F1
IF$43:b/XS20/XT                 #1If press is running go back to menu
EK/MKA/MKB/MKC/MKD/MKE/MKK      #2 Mask F keys
IVy1                            #3 Load y with run value
MD                              #4
MD1"     EDIT MODE      "       #5
MD2"Enter Repeat length "       #6
MD3"1700 - 4700 inch*100"       #7
GL14                            #8 Go to line 13
MD1"     EDIT MODE      "       #9
MD2"Length out of range "       #10 Wrong length input message
MD3"1700 - 4700 inch*100"       #11
GL14                            #12 Go to line 13
MD3"xx00 xx25 xx50 xx75 "       #13 Wrong resolution entered [1/4 "]
VK4:%1                          #14
WK                              #15
IVt1700/IGt%1/GL9               #16 If length out of range go to line 8
IVt4700/IG%1:t/GL9              #17 If length out of range go to line 8
IVt25/VD%1:ttz/IFzb/GL13        #18 If resolution is not .25" go to line 12
VM%1:iF                         #Repeat *228343 (cts/1000")
VDFlFz                          #Divide by 1000 to get cts/repeat
VDFj%9:z                        #Bounds/100 = cts/0.01inch
VD%1:jAo                        #Scale repeat to integer & decimal
IVt228571/VM%1:tW               #Web repeat *228571 (cts/1000")
VDWlWz                          #Web divide by 1000 to get cts/repeat
CH1/SBVF                        #Set slave bounds to current repeat
CH2/SBVF                        #Set slave bounds to current repeat
CH3/SBVW                        #Set web bounds to current repeat
MD2
MD3
MD4
MD3"Saving settings...  "
SPV                             #Save values
XS30

ES41                    #Reset working values
IV%1:1700
IV%2:1
IV%3:2
IV%4:0

#*************************************************************************
#*                    STARTING UP MESSAGE SCREENS                        *
#*************************************************************************

ES50                     #Starting up screen
MD1"   JODE SYSTEMS     "
MD2"  Machine starting  "
MD3"   waiting for...   "
```

```
ES51                    #Colour 1 drive ready
MD
MD1"   JODE SYSTEMS     "
MD2"  Machine starting  "
MD3"   waiting for...   "
MD4"Colour 1 drive ready"

ES52                    #Colour 2 drive ready
MD
MD1"   JODE SYSTEMS     "
MD2"  Machine starting  "
MD3"   waiting for...   "
MD4"Colour 2 drive ready"

ES53                    #Colour 1 steppers ready
MD
MD1"   JODE SYSTEMS     "
MD2"  Machine starting  "
MD3"   waiting for...   "
MD4" Col 1 stepper ready"

ES54                    #Colour 2 steppers ready
MD
MD1"   JODE SYSTEMS     "
MD2"  Machine starting  "
MD3"   waiting for...   "
MD4" Col 2 stepper ready"

ES55                    #Startup complete
MD
MD1"   JODE SYSTEMS     "
MD2"  Machine starting  "
MD3"   waiting for...   "
MD4" Startup Completion "

ES56                    #Reset E.Stop prompt
MD1"   JODE SYSTEMS     "
MD2"  Machine starting  "
MD3"   waiting for...   "
MD4"E.Stop to be reset "

ES59                            #Power up header
MD                              #Clear display & address each line
MD1" Control by         "
MD2"     JODE SYSTEMS   "
MD3"  for               "
MD4"    SYN             "
WT200
MD4"    SYNPRO          "
WT200
MD4"    SYNPRO M.       "
WT200
MD4"    SYNPRO M.I.     "
WT500

#*************************************************************************
#*                          DIAGNOSTIC SCREEN                            *
#*************************************************************************
```

```
ES60                    #Diagnostic/service screen F3
MK/EKK                          #Mask F2 & F3
IVy4                            #Load y with run value
MD                              #Clear display
MD2"   PANMC/V154.6     "
MD3" Rev 15th Sep 1999  "
MD4"    BEMIS54.PAN     "

#*************************************************************************
#*         START OF PUSH BUTTON ADVANCE & RETARD CONTROL                 *
#*************************************************************************

ES70                    #Advance setup sequence
MI7/MI8/EK/MKA/MKB/MKC/MKD/MKE/CE0/RE0  #Mask F keys
IEay/XS76/GA/EI/EK/XT           #If in jog mode do Seq76
II5-/II6+/IVQ230                #Set coarse adv/ret increment
II5+/II6+/IVQ100                #Set medium adv/ret increment
II5+/II6-/IVQ3                  #Set fine adv/ret increment
XS140                           #Set advance/retard tables if req.
XS71

ES71                            #Phase advance print
CH3/CE0/RE0                    #Mask advance & retard push buttons
IE%5:%17/CH2/PGP               #Positive shift on colour 1
IE%5:%18/CH1/PGP               #Positive shift on colour 2
IEyd/IGQj/MD1"  ADVANCING..coarse "
IEyd/IEQj/MD1"  ADVANCING..medium "
IEyd/IGjQ/MD1"  ADVANCING..fine   "

ES72                    #Retard setup sequence
MI7/MI8/EK/MKA/MKB/MKC/MKD/MKE/CE0/RE0  #Mask F keys
IEay/XS77/GA/EI/EK/XT           #If in jog mode do Seq77
II5-/II6+/IVQ230                #Set coarse adv/ret increment
II5+/II6+/IVQ100                #Set medium adv/ret increment
II5+/II6-/IVQ3                  #Set coarse adv/ret increment
XS140                           #Set advance/retard tables if req.
XS73

ES73                            #Phase retard print
CH3/CE0/RE0                    #Mask advance & retard push buttons
IE%5:%17/CH2/PGN               #Negative shift on colour 1
IE%5:%18/CH1/PGN               #Negative shift on colour 2
IEyd/IGQj/MD1"  RETARDING..coarse "
IEyd/IEQj/MD1"  RETARDING..medium "
IEyd/IGjQ/MD1"  RETARDING..fine   "

ES76                            #Jog positive off Advance button
IE%5:%17/CH2/SV1750/VC+         #Set jog speed & direction col 1
IE%5:%17/WT64/II7-/RP           #Test advance button still pressed
IE%5:%17/CH2/ST/XT              #Stop colour 1 on button release
IE%5:%18/CH1/SV1750/VC+         #Set jog speed & direction col 2
IE%5:%18/WT64/II7-/RP           #Test advance button still pressed
IE%5:%18/CH1/ST/XT              #Stop colour 2 on button release
CH2/ST/CH1/ST/GA/EI             #Stop trap if colour changed during jog

ES77                            #Jog negative off Retard button
IE%5:%17/CH2/SV1750/VC-         #Set jog speed & direction col 1
IE%5:%17/WT64/II8-/RP           #Test retard button still pressed
IE%5:%17/CH2/ST/XT              #Stop colour 1 on button release
```

```
IE%5:%18/CH1/SV1750/VC-         #Set jog speed & direction col 2
IE%5:%18/WT64/II8-/RP           #Test retard button still pressed
IE%5:%18/CH1/ST/XT              #Stop colour 2 on button release
CH2/ST/CH1/ST/GA/EI             #Stop trap if colour changed during jog

#************************************************************************
#*         START OF INITIALISATION OF REGISTER POSITION                 *
#************************************************************************

ES120                    #Initialisation of registration seq called via RE
IE$43:b/CH3/RE120/EI/XT #If press is stopped reset reg. and eXiT
MI3/VA%12:c%12:          #Mask reg input & inc counter (%12 )
CH2/DSOB/VSKBM/VAMII     #Get current reference error into variable B
IG%12:Z/XS122            #If average total complete do correction col 2
CH3/DFOR/VAPRP           #Collect DF samples
VAkck/IGk%10:/XS124      #Increment k to average error
CH3/RE120/EI             #Rearm reg seq trigger

ES122                    #Fine reg correction col 1
VDI%12:Mz                #Divide total error by number of samples
IGM%16:/IVM1500          #Limit correction to + value approx 6" coarse
IG%15:M/IVM-1500         #Limit correction to - value approx 6" coarse
IGM%15:/IG%16:M/VMMUM/VDMVMz  #Fine correction scaling
VAMGD/AP>2:VD/AP>1:VD    #Scale FM load AP for col 1 & col 2
FM</IVI0/IV%12:0         #Action FM on both channels using AP value

ES124                   #Adjust the repeat length
VDPkPz/VSWPm/VMm%1:%11:/VD%11:W%11:z  #Calc. act. rpt. on web in %11
IVk0/IVP0/VD%11:jXY   #Reset accumulator totals & calc. display
IG%10:Y/MD4:15:"      "  #Refresh only if Y < 10
IEyd/MD4"Actual Repeat "X:"."Y

#************************************************************************
#*                 START OF ADV/RET POSITION CONTROL                    *
#************************************************************************

ES140                   #One shot correction sequence
CH1
CUC3000/CLC600/PGCVQ  #Load correction with variable Q
CH2
CUC3000/CLC600/PGCVQ  #Load correction with variable Q

ES145                    #One shot correction sequence complete colour 1
EI/EKE                   #Enable all inputs
CH3/RE120
IEyd/MD1"    PRINT MODE      "   #Clear advance/retard message

ES146                    #One shot correction sequence complete colour 2
EI/EKE                   #Enable all inputs
CH3/RE120
IEyd/MD1"    PRINT MODE      "   #Clear advance/retard message

#************************************************************************
#*                      START OF TICK DRIVEN ACTIVITY                   *
#************************************************************************

ES200                    #Tick driven sequence
VM$43:hn/VDnpnz          #System var.$43 to cts/min then per foot
IG%99:n/MD3:15:"      "  #Refresh only if n < 99
```

```
IEyd/MD3"Press speed   "n    #Update display if in run page
IG%10:Y/MD4:15:"     "  #Refresh only if Y < 10
IEyd/MD4"Actual Repeat "X:"."Y
IEnb/XS201              #When press speed is 0 update settings

ES201                   #Machine settings update
IF%1:%14:/XS202         #If repeat length has changed set new ratio
IE%250:c/XS204          #Relink after E.stop
CE0                     #Disable tick

ES202                   #Set new ratio
EI1/EI2/EI3
VA%1:b%14:/IVk0         #Copy repeat length into %14 reset offset correction
CH2/ST/FD15/FMVG/LM3    #Set up starting link
CH1/ST/FD15/FMVG/LM3    #Setup starting link
VAGbD/VAGbE             #Copy starting ratio to working reg.
CE0/RE120               #Turn off tick arm reg

ES204                   #E.stop relink
IV%250:0
CH2/ST/PC/LM3           #Relink colour 1
CH1/ST/PC/LM3           #Relink colour 2

#*************************************************************************
#*                      ERROR REACTION ACTIVITY                          *
#*************************************************************************

ES250                   #Motor off sequence
CE0/MI3
CH2/MO
CH1/MO
IV%250:1                #Set an E.stop marker
IVk0                    #Reset average counter
XS252                   #E.stop Auto restart sequence

#*************************************************************************
#*               START OF POWER UP AUTOSTART ACTIVITY                    *
#*************************************************************************

AS255

ES252                   #E.stop Auto restart sequence
MI1
MD                      #Clear display
XS50                    #Start screen
XS56                    #Reset E.Stop prompt
II10+/RP                #Wait for reset
XS51                    #Drive ready prompt
MI                      #Mask inputs
WI32-                   #Drive 1 ready TDA1 X2.4 [147]
XS52
WI31-                   #Drive 2 ready TDA2 X2.4 [146]
XS53
WI30-                   #Stepper drives colour 1 ready SA1R X1.15 [145]
XS54
WI29-                   #Stepper drives colour 2 ready SA2R X1.15 [144]
WT512                   #Delay the enable signal
CH3/RE120               #Set reference trigger sequence to initialise
XS30                    #Start screen
```

```
EI                      #Enable inputs

ES253                   #Default system parameters for testing
CH2/GE145/FD15          #Set reference complete trigger sequence colour 1
LW111110/RA0            #+/- tables, 16 bit num., DF/DS average,use demand
SA60000/SZ80000         #Acc/Dec
KP100/KF970             #Gain terms
SE8000/SW100            #Error
CW1011011               #Setup control word
PC/WT64/ID              #Enable drive and initialise demand RF [X4.2]
DB25/GW110              #Debounce inputs
SBVF                    #Set slave bounds to current repeat
CH1/GE146/FD15          #Set reference complete trigger sequence colour 2
LW111110/RA0            #+/- tables, 16 bit num., DF/DS average,use demand
SA60000/SZ80000         #Acc/Dec
KP100/KF970             #Gain terms
SE8000/SW100            #Error
CW1011011               #Setup control word
PC/WT64/ID              #Enable drive and initialise demand RF [X4.2]
SBVF                    #Set slave bounds to current repeat
CH3/SBVW                #Set web bounds to current repeat
AP>3:1                  #Set a default value for CH3 FM
VT5                     #Average the web velocity to smooth out

ES254                   #Default variable values
IE%1:b/IV%1:2100        #If the saved repeat is 0 then default to 21"
VA%1:bA                 #Copy %1 to A (add 0 to %1)
VD%1:jAo                #Scale repeat to integer & decimal
IV%10:10                #Lower one shot value also counter 'k' target
IV%500:500              #Upper one shot value
IV%99:99                #Upper limit to refresh display
VM%9:%4:Q               #Shift value
IV%11:0                 #Starting actual repeat value
IV%12:0                 #Reset reg average counter 1
IV%13:0                 #Reset reg average counter 2
IV%14:0                 #Reset first time stored length comparison
IV%15:-1500             #Lower coarse band
IV%16:1500              #Upper coarse band
IV%17:1                 #Constant
IV%18:2                 #Constant
IVG30966                #Ratio starting value
IVI0                    #Starting error average values
IVK2000              #Offset, ch 2
IVP0                    #Starting DF accumulator
IVU10/IVV15             #Fine error gain values
IVX0/IVY0               #Starting actual display
IVZ3                    #Number of samples for reg correction
IVa-1                   #Constant
IVb0                    #Constant
IVc1                    #Constant
IVd2                    #Constant
IVe3                    #Constant
IVf4                    #Constant
IVg5                    #Constant
IVh60                   #Constant seconds to min.
IVi216000               #Constant slave counts per 1000"
IVj100                  #Constant
IVk0                    #Number of samples before correction counter reset
IVl100000               #Constant for slave repeat correction
```

```
IVp2473                 #Constant for counts per foot on the web
IVr0                    #Reset initialisation average total
IVs120                  #Set RE sequence trigger to initialisation sequence
IVx0                    #Reset initialisation value for x
IVw0                    #Reset increment total value
VM%1:iF                 #Repeat *228343 (cts/1000")
VDFlFz                  #Divide by 1000 to get cts/repeat
VD%1:jAo                #Scale repeat to integer & decimal
IVt228571/VM%1:tW       #Web repeat *228571 (cts/1000")
VDWlWz                  #Web divide by 1000 to get cts/repeat

ES255                   #Autostart sequence
MI1
XS59                    #Startup Synpro banner
MD                      #Clear display
XS50                    #Start screen
XS56                    #Reset E.Stop prompt
CO8                     #Set control OK
II10+/WT64/RP           #Wait for reset
WT350                   #Delay to clear stepper startup
XS51                    #Drive ready prompt
MI                      #Mask inputs
WI32-                   #Drive 1 ready TDA1 X2.4 [147]
XS52
WI31-                   #Drive 2 ready TDA2 X2.4 [146]
XS53
WI30-                   #Stepper drives colour 1 ready SA1R X1.15 [145]
XS54
WI29-                   #Stepper drives colour 2 ready SA2R X1.15 [144]
XS55                    #Waiting startup complete message
XS254                   #Default variable values
WT512                   #Delay the enable signal
II9+/IV%5:1             #Set start up shift colour 1 selection
II9-/IV%5:2             #Set start up shift colour 2 selection
XS253                   #Default system settings
XS140                   #Set default shift
XS30                    #Start screen
EI                      #Enable inputs
CH3/RE120/RW1           #Set reference trigger sequence to initialise

#DEFINED INPUTS
CH3/DR3-                #Reference input on master axis
CH2/PS2-                #Slave axis position snapshot [linked to input 1]
DI7-/XS70               #Advance Pb.
DI8-/XS72               #Retard Pb.
DI9-/IV%5:2             #Set colour 2 for shift
DI9!/IV%5:1             #Set colour 1 for shift
DI10+/XS250             #E.stop monitor to MO motors
#CH1/PS1-                #Slave axis position snapshot [linked to input 1]

#POSITION TRIGGERED OUTPUT
#CH1/POn-/m/p

# System diagnostic sequences if required

#ES101                          #Channel 1 system test
#OV$1                           #Channel 1 status
#OV$9                           #Channel 1 mode
#OV$17                          #Channel 1 error
```

```
#OV$25                          #Channel 1 bound count
#OV$33                          #Channel 1 position
#OV$41                          #Channel 1 velocity
#OV$49                          #Channel 1 position error

#ES102                          #Channel 2 system test
#OV$2                           #Channel 2 status
#OV$10                          #Channel 2 mode
#OV$18                          #Channel 2 error
#OV$26                          #Channel 2 bound count
#OV$34                          #Channel 2 position
#OV$42                          #Channel 2 velocity
#OV$50                          #Channel 2 position error

#
#END
```

# 7 INDEX

