

# Appendix F

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## Operating instructions

### F.1 Introduction

The control system software runs entirely on the processors in the control system sub-rack units, and having loaded and run the software from the development system PC, the PC itself can be disconnected or switched off. There are no ROMs in the system at present, so the control system program must be loaded from the PC each time the control system is powered up. The actions required to power up the system and connect the PC to the control system racks are listed in Table F.1. Table F.2 lists the actions required to load and run the controller software.

### F.2 Single magnet controller data monitoring

While the controller is running, data is monitored and sent to the PC. Type the relevant variable index letter to toggle the variable display on and off. The monitored variables include <R>eference, air<G>ap, <V>elocity, <A>cceleration, <F>orce and <I>-current. Typing <T> toggles between the moving bar display and simple tabular output and <Q> causes a controlled shutdown and return to the menu.

When data is scrolling down the screen, breaking off to go to the development system using <Control A> will not always register due to the higher priority of the screen server. If this occurs, type <P> which causes the controller output to pause briefly, thus allowing the <Control A> to be registered.

**Table F.1** Mains power and fibre optic signal connections

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- 1) Switch on the mains power to the development system PC.
  - 2) Switch on the mains power to the power supply unit (output set to 5 V) feeding the PC's optical fibre interface unit.
  - 3) Switch on the power to the vehicle OR switch on the power to the single magnet controller sub-rack & its associated high power supply.
  - 4) Using a duplex fibre optic cable, connect the reset-out and error-in signals (top and next connectors respectively) on the PC optical interface unit to the reset-in and error-out signals (top and next connectors respectively) on the rack input interface card in the control system sub-rack.
  - 5) Using another duplex fibre optic cable, connect the data-out and data-in signals (bottom and next connectors respectively) on the PC optical interface unit to the data-in and data-out signals (bottom and next connectors respectively) on the rack input interface card in the control system sub-rack.
  - 6) If debugging facilities are required, also connect the analyse signal using a simplex fibre optic cable.
  - 7) If using the vehicle, check that the rack output interface is suitably connected (ie in a similar fashion to the PC to sub-rack connections) to the DAC card in the sub-rack unit with the power controllers.
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### F.3 Single magnet controller data logging

Logging of data to a DOS based disc file is achieved by the following:

- select tabular output;
- select the variables to be monitored;
- break out to the transputer development system;
- load the Network Logger EXE <F5> and run it <F6>.

The network logger waits for a few cycles of reference signal in order to clear any buffer queues and then files the selected data for one cycle of reference signal. If the size of the logged data exceeds 32 Kbyte, the Network Logger program will crash (a limitation of an unavoidable system procedure call). Adjust either the number of selected data signals, the output data rate (in the Data.Monitor() process code) or the reference signal frequency. To re-run the Network Monitor or Network Logger at any

**Table F.2** Loading and running the controller software

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- 1) Set your working directory to D:\Maglev and start the transputer development system <TDS2>.
  - 2) Toggle the number lock to clear it if necessary and enter <Home> the Maglev system fold.
  - 3) Autoload <Shift F5> the compiler utilities and debugger.
  - 4) Move the cursor to the fold containing the Single Magnet Suspension Controller or the Vehicle Suspension Controller and enter <Home> the fold.
  - 5) Move the cursor to the Network Monitor EXE fold and load <F5> the EXE.
  - 6) Next, move the cursor to the PROGRAM fold and load <ALT 4> the program. If the green reset LED on the PC optical interface doesn't flash during a load, check that the interface unit is powered up. If the reset LEDs on the control system sub-rack cards don't flash during a load, the problem probably lies with the reset+error fibre optic connection. If the LEDs flash but the program doesn't load, the data fibre optic connection is probably wrong.
  - 7) Now run <F6> the loaded Network Monitor EXE to gain access to the controller program.
  - 8) Hit <Enter> and the control system menu should now appear on the screen. You can change the controller parameters or reset them to their default values using various submenus. The system does not prevent parameters being entered which make it unstable. All numbers must be entered with a decimal point and following digit. Failure to do so will crash the system - requiring you to return to the development system <Control A> and go back to step 5.
  - 9) Return to the transputer development system by typing <Control A>.
  - 10) Return to the top level fold by closing the current fold <Page Up> and exit the transputer development system by quitting <Control End>.
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stage, sequence through the alternative EXEs <ALT F5> until the right one is found and run it <F6>.

## F.4 Vehicle controller data monitoring

While the controller is running, data can be monitored and sent to the PC. Use the 'Signal Monitor Parameters' menu to set the data monitoring sample time and duration and to initiate a data log. Typing the relevant variable index letter toggles the variable display on and off. The monitored variables include <R>eference, air<G>ap, <V>elocity, <A>cceleration, track <P>osition, <F>orce and <I>-current. Upper case letters give electromagnet signals whilst lower case letters give the vehicle mode signals where appropriate.

When data is scrolling down the screen, breaking off to go to the development system using <Control A> will not always register due to the higher priority of the screen server. If this occurs, type <W> which causes the controller output to pause briefly, thus allowing the <Control A> to be registered.

The following keys have special functions:

- <B> toggles between the moving bar display and simple tabular output.
- <Q> returns to the main menu.
- <L> logs data signals into a buffer.
- <S> toggles screen output between real-time data and logged data.
- <W> waits a few seconds to enable exit to the development system.

## F.5 Vehicle controller data logging

Logging of data to a DOS based disc file is achieved by the following:

- select tabular output;
- select the variables to be monitored;
- break out to the transputer development system;
- load the Network Logger EXE <F5> and run it <F6>.

The network logger waits for the current cycle of reference signal to finish and then files the selected data for one cycle of reference signal. The maximum size of the logged data is limited only by the head processor memory size, and is currently set for 2000 samples. To re-run the Network Monitor or Network Logger at any stage, sequence through the alternative EXEs <ALT F5> until the right one is found and run it <F6>.

## F.6 Guide to using the vehicle controller

Virtually any system parameters can be changed whilst the system is running. However, if you wish to change the reference signal from a track position reference to a vehicle position reference, you *MUST* first de-levitate before making the change. This is because certain filters in the mode position controllers must be re-initialised.

If the system shuts down due to an internal shutdown request, the error message in the top level menu must be cleared before the vehicle can be re-levitated. This is primarily relevant when using the vehicle switch to levitate and de-levitate the system.

There is a problem with the process scheduling which sometimes causes the screen driver to run when the higher priority control code should be running. This causes glitches which disturb the system. When logging data for monitoring purposes, use the 'Signal monitor parameters' menu to initiate a data log to avoid screen output and hence disturbances during the logging period.

The screen output very occasionally halts due to noise pickup on the PC data link. Should this occur, de-levitate the vehicle using the vehicle switch and re-load the controller program.