ATS

Advanced Terminal Software

Version 2.0

for Controller-B

Reference Guide

Catalog # 100086 Rev.B

ESHED ROBOTEC

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Table of Contents

CHAPTER 1 **Introduction to ATS 1**

CHAPTER 2 **Activating ATS 2**

Installation 2

Activation 2

CHAPTER 3 **Operating Keys 4**

Short-Cut Commands 4

User-Defined Short-Cut Keys 5

Editor Keys 6

Special Key Combinations 6

CHAPTER 4 **Controller Configuration 7**

ACL Controller Configuration 7

Overriding the Configuration Default Settings 10

CONFIG.ACL File 10

SCORBASE Controller Configuration 12

Peripheral Setup 15

User Interface 16

Axis Definition 17

Group A Axes – Robot Arm 18

Gripper Axis 18

Group B Axes – Peripheral Devices 19

Group C Axes 20

Home Type 20

Auxiliary User Control Box Settings 21

Peripheral Configuration Files 21

PARB.STP File 21

.PRB Files 23

CHAPTER 5 **Print Manager 26**

CHAPTER 6 **Backup Manager 28**

CHAPTER 7 **Command Line Options 32**

Controller Configuration Options 33

Backup / Restore Options 33

Peripheral Option 34

Device Options 34

Off-Line Options 35

CHAPTER 8 **The SEND Utility Program 36**

Options 36

APPENDIX A **Converting .CBU Files to .PRB Files 38**

LSB72-7.CBU File Conversion 39

PAR678.CBU File Conversion 39

PAR78.CBU File Conversion 40

GRP9.CBU File Conversion 40

CHAPTER 1

Introduction to ATS

ATS—Advanced Terminal Software, version 2.0 and later—is supplied on diskette with the **Controller-B**, and provides access to the controller's internal **ACL** programming language from any PC computer operating under DOS.

ATS is a full ASCII terminal emulator operating on RS232 communication channels at 9600 baud, 8 data bits, 1 stop bit, no parity, and XON/XOFF protocol.

ATS provides the following features:

- Controller configuration for **ACL** and **SCORBASE** software.
- Definition of connected peripheral axes and inputs/outputs for automatic loading of parameter settings.
- Predefined and user-definable short-cut keys to simplify programming and controller processes.
- A backup manager for saving and reloading programs, positions, variables and parameters.
- A print manager for printing programs and positions.

CHAPTER 2

Activating ATS

Installation

1. Be sure you have made all the required hardware connections, as described in the ***Controller-B*** User's Manual. Turn on the controller power switch. The green POWER indicator LED lights up.
2. Turn on your computer (boot using your own DOS).
3. If your computer has a hard drive, make a directory for ATS, and copy all the files from the ATS diskette to that directory.

   If your computer does not have a hard drive, make a backup copy of the **ATS** diskette. Keep the original diskette in a safe place, and use the copy for operation.

Activation

ATS may not function properly under the Windows environment, depending on your computer setup. If you experience difficulties, exit Windows and activate **ATS** directly from DOS (5.0 and later).

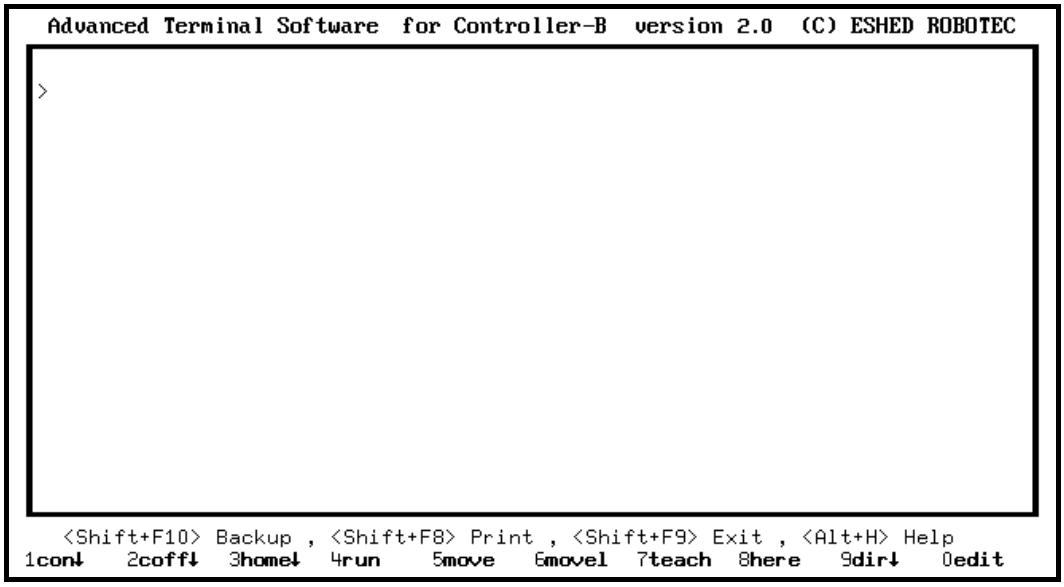
1. Make the **ATS** directory or disk drive the current one.
2. At the DOS prompt, activate **ATS**:

   COM1: If the controller is connected to computer port COM1 (default), type:

   ```
   ats  <Enter>
   ```

   COM2: If the controller is connected to computer port COM2, type:

   ```
   ats /c2 <Enter>
   ```



3. Once the software has been loaded, the **ATS** main screen will appear on your screen:
4. Press <Enter> to receive the > prompt, if it is not already displayed.

   You can now communicate directly with the controller.

CHAPTER 3

Operating Keys

Short-Cut Commands

Note the **ACL** commands listed at the bottom line of the main **ATS** screen.

```
   <Shift+F10> Backup , <Shift+F8> Print , <Shift+F9> Exit , <Alt+H> Help
1con↓   2coff↓  3home↓  4run    5move   6movel  7teach  8here   9dir↓   0edit
```

Pressing the function key which appears next to each command issues the command. For example, F5 writes the command MOVE.

Four sets of ten function keys permit the use of forty short-cut **ACL** commands. Three sets are system-defined sets, and one is user-defined.

A display of the sets of commands can be called from the **ATS** main screen by pressing the hot-key combination:

<Alt> + H

```
            Advanced Terminal Software   version 2.0  (C) ESHED ROBOTEC

  KEY      SET-1         SET-2         SET-3
  F1       con↓          set           list
  F2       coff↓         print         remove
  F3       home↓         run           listp
  F4       run           moved         delp
  F5       move          moveld        listpv
  F6       movel         movecd        init control↓
  F7       teach         label         listvar
  F8       here          goto          delvar
  F9       dir↓          del           show par
  F10      edit          exit          let par

 <Ctrl+F1>      for Controller Configuration
 <Ctrl+F2>      for SCORBASE Controller Configuration
 <Ctrl+F3>      for PERIPHERAL Setup
 <Alt+1/2/3/4> to use SET-1/2/3/4
 <↑ ↓ →>        to recall previously typed commands


>
   <Shift+F10> Backup , <Shift+F8> Print , <Shift+F9> Exit , <Alt+H> Help
1con↓   2coff↓  3home↓  4run    5move   6movel  7teach  8here   9dir↓   0edit
```

The display of command sets will scroll up and off the screen as you continue entering commands at the > prompt.

Only one set of function keys is active at a time. Set 1 is active by default. To activate a different set, simultaneously press the <Alt> key and the number of the set desired. For example, press <Alt>+3 to use the short cut commands in Set 3. (Do not use the numeric keypad for this purpose.)

When Set 3 is active, for example: F1 issues the command LIST and F2 issues the command REMOVE.

The ↓ (down arrow) after a command indicates that <Enter> (a carriage return) automatically follows the command. For most short-cut commands, however, you must also press <Enter> in order to activate the commands.

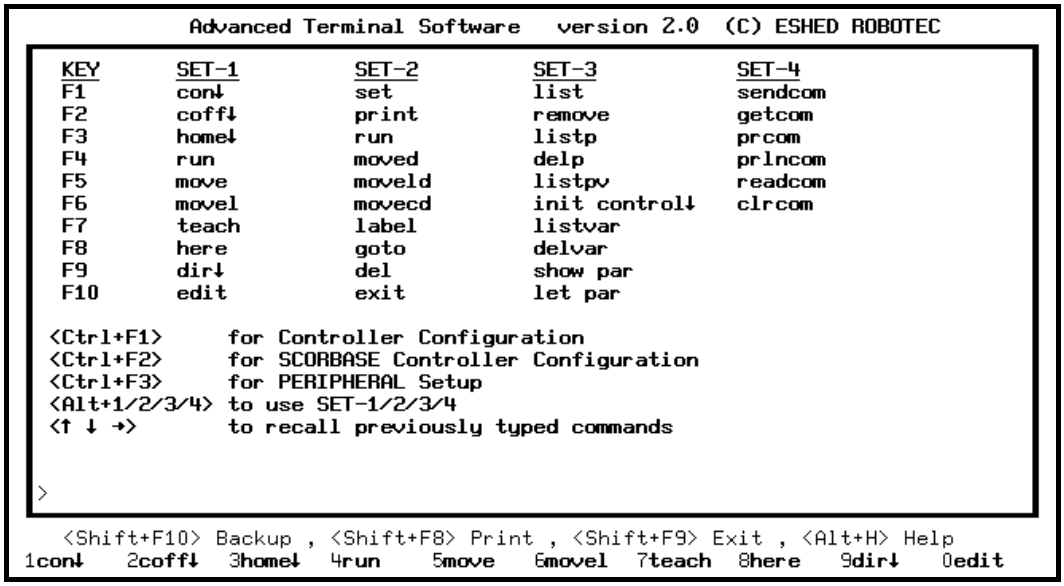
User-Defined Short-Cut Keys

When ATS is loaded, it searches in the current directory for the file TERM.MAC. The first 10 lines of that file define function keys F1 through F10 for Set 4.

Use a text editor to create the TERM.MAC file. Since the function key can activate a string of up to 20 characters, the command lines you define should not exceed 20 characters.

To include an <Enter> at the end of the command line, enter ASCII character 25; in some text editors, pressing <Ctrl>+Y will produce the ↓ character. If your editor is unable to produce the ↓ character, type either ^Y or ^y at the end of the command line. When ATS is loaded ^Y or ^y will be translated to the ↓ character and interpreted as <Enter>.

In the example shown here, the six **ACL** commands for RS232 communication were written to the TERM.MAC file, and thereby assigned to Set 4.



Editor Keys

The following keys are recognized by the **ATS** software.

←	(or backspace) Removes characters.
→	Restores characters.
<Ins>	Inserts characters. Toggles for overwrite.
<Del>	Erases characters.
<Esc>	Erases the currently erased command.
<Ctrl> + →	Restores all remaining characters to end of line.
↓	Repeats the last command(s) entered.

ATS can recall the last ten commands issued. Press ↑ (up arrow) and ↓ (down arrow) to scroll through previously typed commands.

Additional editing functions are activated by **ACL** commands. For more details, refer to the chapter describing the **ACL** commands in the ***ACL** Reference Guide*.

Special Key Combinations

Additional key combinations provide the following special functions:

<Ctrl> + <Shift> + C

Restarts **ATS** and displays a cleared **ATS** main screen.

<Ctrl> + C

Stops the controller from sending data to the screen, such as after a SHOW ENCO command. Also halts printing.

During a controller backup or restore operation, pressing <Ctrl>+C will halt the procedure.

<Alt> + M

Toggles activation of keyboard manual mode. (Sends **ACL** command character ~ to the controller.)

CHAPTER 4

Controller Configuration

ACL Controller Configuration

ATS provides a short form controller configuration which loads default parameter settings.

However, you will need to use the **ACL** command CONFIG when your specific installation or application requires parameter settings other than the defaults loaded by this procedure. Note that the command CONFIG will override all existing settings.

❇ *If you configure the controller after it has been in operation, be sure to backup all data before initiating this configuration procedure.*

The configuration procedure is initiated from the ATS main screen by pressing the hot-key combination:

<Ctrl> + <F1>

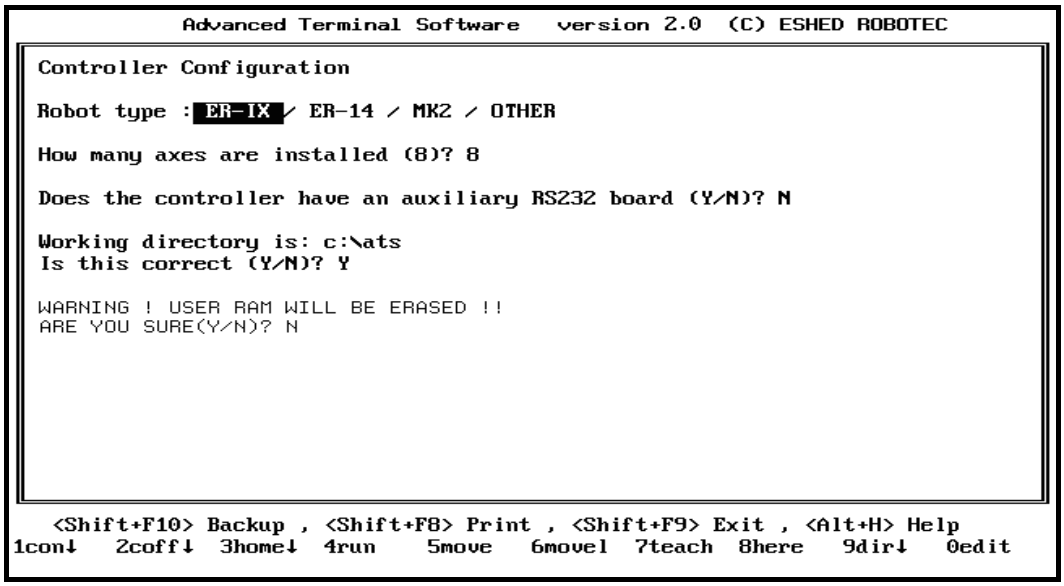
You are now prompted:

```
Controller Configuration
ARE YOU SURE (Y/N)? N
```

Press Y to proceed with the configuration, or
Press N or <Enter> to cancel the configuration.

You are prompted by a short series of Controller Configuration options.

❇ *Make sure you select the proper options for your installation.*
Incorrect selections may result in damage to your equipment.



`Robot type: ER-IX/ ER-14 / MK2 / OTHER`

This defines the robot which is connected to the controller.

Use the left and right arrow keys to highlight the name of the robot which is connected to the controller. Then press <Enter> to accept.

Based on your choice of robot (except OTHER), the controller reserves the next available axis for an electric servo gripper. For example, when configuring for **SCORA-ER 14**, the gripper axis is defined as axis 5; for **SCORBOT-ER IX** it is defined as axis 6.

`How many axes are installed (8)? ..`

This defines the number of axes which can be driven by the controller.

Press <Enter> to accept the default (8), or
Type any other valid number and press <Enter>.

If you have defined the robot type as OTHER, you will also be prompted to define group A:

`How many axes in Group A (6)? ..`

Press <Enter> to accept the default (6), or
Type any other valid number and press <Enter>.

`Does the controller have an auxiliary RS232 board (Y/N)? N`

Press Y if the auxiliary multiport RS232 board is installed.
Press N or <Enter> if the board is not installed.

```
Working directory is:  c:\ats
Is this correct (Y/N)?Y
```

The first time this prompt appears, it shows the DOS directory from which the ATS software was activated.

The Working directory must be the directory which contains the parameter files and the **SCORBASE** program file (.CBU files).

If you change the directory definition, it is written to a file named SETUP.DIR. Thereafter, whenever **ATS** is loaded, the Working directory is set according to the definition in the SETUP.DIR file. Similarly, the SETUP.DIR file determines the definition of the Backup directory shown in the Backup Manager screen. SETUP.DIR is updated when either the Working directory or Backup directory definition is changed.

Press N if you want to change the directory. The cursor moves to the directory line, prompting you to type and <Enter> a different directory.

Press Y if the directory is correct.

Press <Esc> if you are not sure whether the displayed directory is correct. This will cancel the configuration procedure. Press F10 to access the **ATS** Backup Manager menu to verify the proper directory definition. Or exit to DOS to verify the location of the .CBU files.

```
WARNING ! USER RAM WILL BE ERASED !!
ARE YOU SURE(Y/N)? N
```

Press Y to proceed with the configuration.
Press N or <Enter> to cancel the configuration.

After you confirm, **ATS** compares your selections with the controller's current configuration. You are warned of any differences, and again prompted to confirm the configuration.

After you again confirm, **ATS** performs the configuration and loads the proper parameter files in accordance with your selections.

As soon as the configuration is completed, the Peripheral Setup screen appears; this screen is used for defining the devices which are connected to the controller and for loading the parameters for these devices. (The Peripheral Setup is fully described later in this chapter.)

For definitions not included in the short form controller configuration procedure—such as axes in control group C, a robot of another make, and memory allocation—you will need to use the **ACL** command CONFIG. (Refer to the ***ACL** Reference Guide*.)

Overriding the Configuration Default Settings

CONFIG.ACL File

When the **ATS** short form is used to configure **Controller-B**, it searches the current directory for a user file named CONFIG.ACL. If this file does not exist (or, if it exists, but defines a robot type other than the one you have selected to configure), the controller is configured with factory-set defaults according to the selections you made during the configuration procedure.

The CONFIG.ACL file allows you to redefine the default configuration of the controller in order to meet controller memory limitation, to change defaults, or to define a configuration for a customized application.

The CONFIG.ACL file does not exist on the **ATS** distribution diskette. You can create the 16-line file CONFIG.ACL using any ASCII text editor. Each line of the program must contain a number which defines a specific configuration, in the order shown below. Any comments must be preceded by a space, and must not exceed the end of the line.

An optional 17th line may be added, which gives the name of the file which contains parameters for a specific robot, as shown in the following example; par9 refers to parameter file PAR9.CBU for **SCORBOT-ER IX**.

If the 17th line exists in the CONFIG.ACL file, **ATS** will load the specified parameter file during short form configuration. If the line does not exist, **ATS** will simply load the default parameters for the selected robot.

File Lines	Explanation
16	inputs
16	outputs
8	total number of axes (encoders)
0	auxiliary ports
9	robot type (0, 2, 9 or 14)
5	number of servo axes in Group A (must match robot type)
6	servo gripper axis (0 if not exist)
2	number of servo axes in Group B
512	RAM size
400	user programs
7000	user program lines
3500	variables
4400	user positions in Group A
4400	user positions in Group B
0	user positions in Group C
800	user comments
par9	(optional): name of parameter file for specific robot

Refer to the chapter, "User Memory Configuration," in the ***ACL*** *Reference Guide* for an explanation on how to calculate the available number of programs, lines and other data.

SCORBASE Controller Configuration

ATS provides a short-form procedure to configure **Controller-B** for use with the **SCORBASE** software.

❇ *If you configure the controller after it has been in operation, be sure to backup all data before initiating this configuration procedure.*

The configuration procedure is initiated from the **ATS** main screen by pressing the hot-key combination:

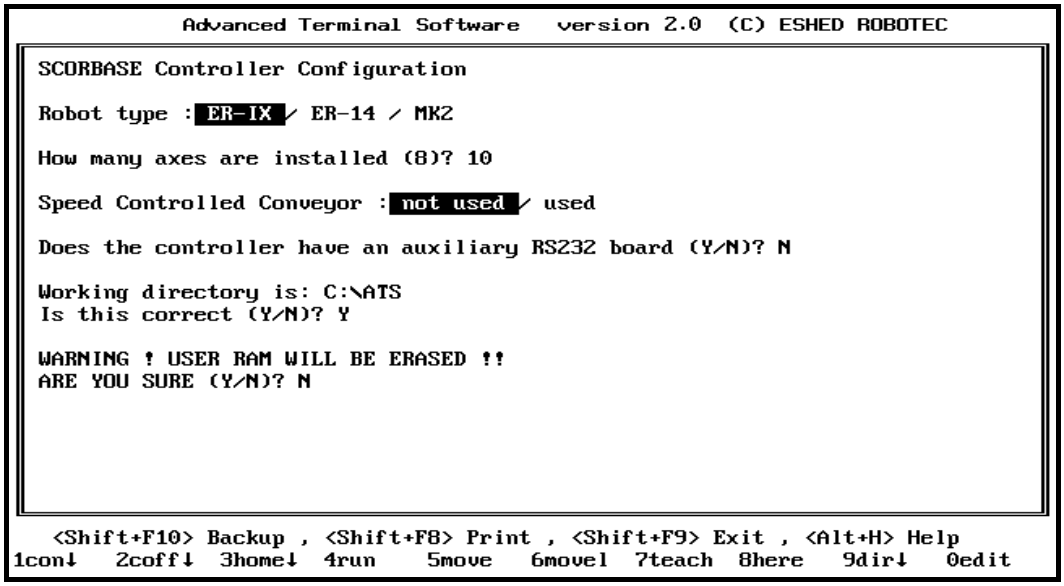
<Ctrl> + <F2>

❇ *When you want to configure the controller for **SCORBASE**, this procedure is used **instead** of the configuration procedure initiated by <Ctrl>+<F1>.*

You are prompted:

```
SCORBASE Controller Configuration
ARE YOU SURE (Y/N)? N
```

Press Y to proceed with the configuration, or
Press N or <Enter> to cancel the configuration.



You are then prompted by a short series of Controller Configuration options.

❇ *Make sure you select the proper options for your installation.*
Incorrect selections may result in damage to your equipment.

```
Robot type: ER  IX / ER 14 / MK2
```

This defines the robot which is connected to the controller.

Use the left and right arrow keys to highlight the name of the robot which is connected to the controller. Then press <Enter> to accept.

```
How many axes are installed (8)? ..
```

This defines the number of axes which can be driven by the controller.

Press <Enter> to accept the default (8), or
Type any other valid number and press <Enter>.

If you have defined more than axe for the **SCORBASE** configuration than those used for the robot and its gripper, you will be also be prompted to define the speed controlled conveyor:

```
Speed Controlled Conveyor : not used / used
```

A standard **SCORBOT** conveyor for **Controller-B** can be installed and controlled like any other peripheral axis, or it can be installed as an independent axis (group C) and used as a speed controlled conveyor.

Use the left and right arrow keys to highlight your response. Then press <Enter> to accept:

- If a conveyor is installed for use as a normal peripheral, enter NOT USED at this prompt.
- If a conveyor is installed for use as speed controlled conveyor, select USED.

```
Does the controller have an auxiliary RS232 board?(Y/N)?N
```

Type Y if the auxiliary multiport RS232 board is installed.
Press N or <Enter> if the board is not installed.

```
Working directory is:  c:\ats
Is this correct (Y/N)? Y
```

The first time this prompt appears, it shows the DOS directory from which the **ATS** software was activated.

The Working directory must be the directory which contains the parameter files and the **SCORBASE** program file (.CBU files).

Once entered, the directory definition is written to a file named SETUP.DIR. Thereafter, whenever **ATS** is loaded, the Working directory is set according to the definition in the SETUP.DIR file. Similarly, the SETUP.DIR file determines the definition of the Backup directory shown in the Backup Manager screen. SETUP.DIR is updated when either the Working directory or Backup directory definition is changed.

Press N if you want to change the directory. The cursor moves to the directory line, prompting you to type and <Enter> a different directory.

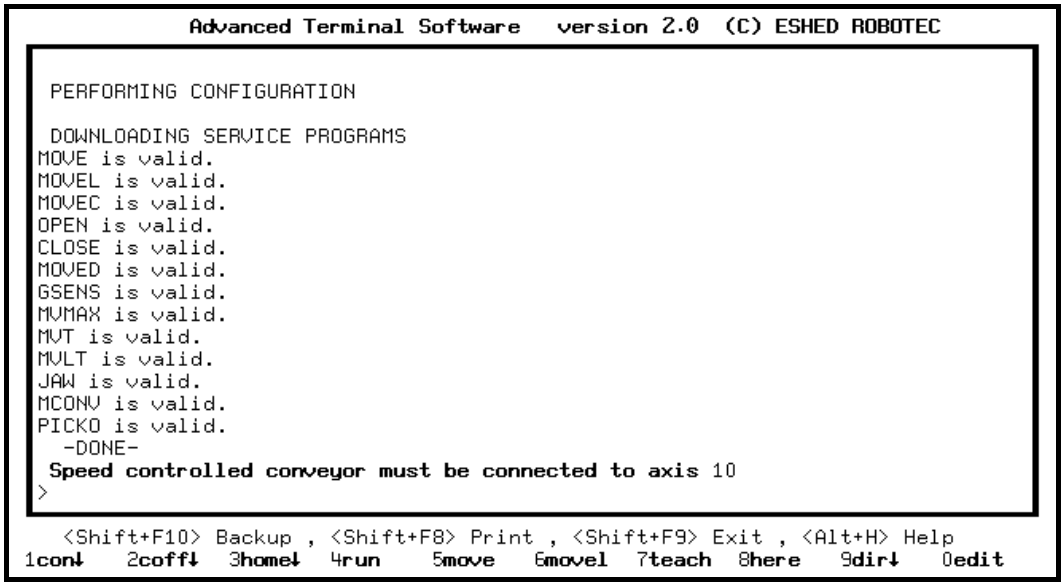
Press Y if the directory is correct.

Press <Esc> if you are not sure whether the displayed directory is correct. This will cancel the configuration procedure. Press F10 to access the **ATS** Backup Manager menu to verify the proper directory definition. Or exit to DOS to verify the location of the .CBU files.

```
WARNING ! USER RAM WILL BE ERASED !!
ARE YOU SURE(Y/N)? N
```

Press Y to proceed with the configuration.
Press N or <Enter> to cancel the configuration.

ATS will now perform the configuration and load the parameter file and the **ACL** programs required for **SCORBASE**. You will see the following displayed on your screen.

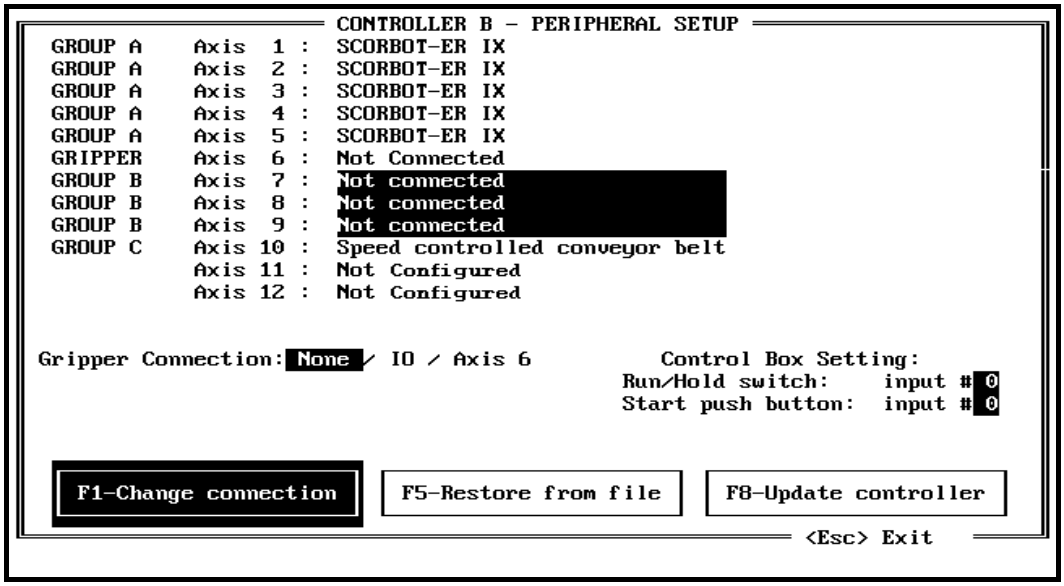


The programs MCONV and PICKO are included in the configuration only when a speed controlled conveyor is installed.

Note that the speed controlled conveyor is automatically configured for use as the last existing axis. Therefore, be sure the conveyor is properly connected to the controller.

Peripheral Setup

After the system has downloaded the configuration files and completed the controller configuration procedure, the Peripheral Setup screen will appear.



The Peripheral Setup screen is used to define and load the parameters for the following items:

- The devices connected to the axes of Group B and Group C.
- The type of gripper used in the robotic system, including I/O settings for a pneumatic gripper.
- The I/O settings for the auxiliary user control box.

The Peripheral Setup screen can be accessed in one of three ways:

- From the **ATS** main screen, at any time, by pressing the hot-key combination: **<Ctrl> + <F3>.**
- From the Home Menu in **SCORBASE**, by selecting the **P**eripheral equipment setup option.
- The Peripheral Setup screen can be accessed even when a controller is not connected (off-line mode). No data from the controller's configuration will appear (i.e., robot/gripper/groups); the screen will show all axes as "Not Configured." Function F5 (restore setting) can be activated, thereby displaying the last setup which was downloaded to the controller. Function F1 (change connection) can then be activated. Function F8 (update) cannot be activated until communication with the controller is established.

When you activate the Peripheral Setup screen by means of the **ATS** hot-key combination <Ctrl>+<F3> or the **SCORBASE** Home Menu, you will be prompted to verify, and change if necessary, the directory which contains the controller parameter (.PRB) files.

```
Parameter directory is:  c:\ats
Is this correct (Y/N)?Y
```

Press N if you want to change the directory. The cursor moves to the directory line, prompting you to type and <Enter> a different directory.

Press Y if the directory is correct. The Peripheral Setup screen will appear.

Press <Esc> if you are not sure whether the displayed directory is correct. The Peripheral Setup screen will not be activated. You may now press F10 to access the **ATS** Backup Manager menu to verify the proper directory definition. Or exit to DOS to verify the location of the .PRB files.

The screens on the following page are examples of how the Peripheral Setup screen will appear after you have completed all the settings.

❇ *An Auto/Manual switch option will appear in the Control Box Setting when using a controller equipped with **ACL** EPROM version 2.26.*

❇ *You must be sure the settings in the Peripheral Setup screen match the actual robotic installation.*

User Interface

Use the arrow keys to reach the available option lines and items in the Peripheral Setup menu. When the option you want is highlighted, press <Enter> to accept the selection.

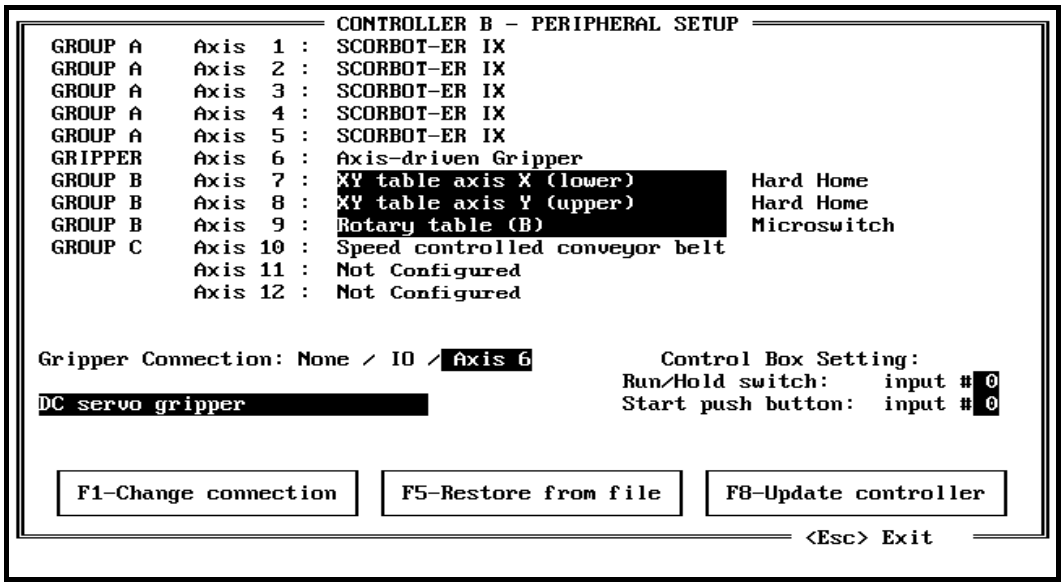
Press **F1** to display the list of options for the setting you want to change.

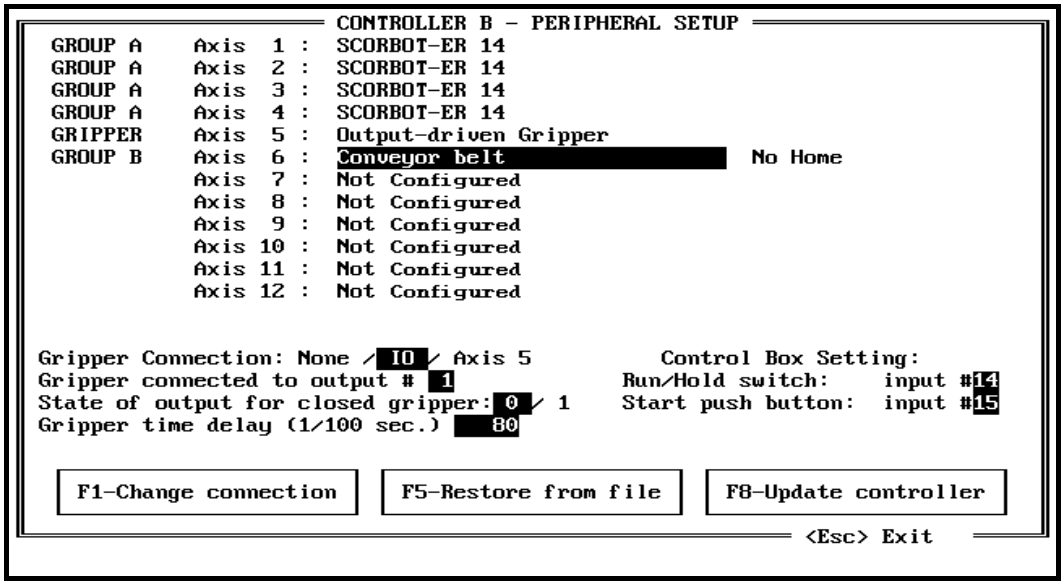
Press **F5** to cancel the settings currently displayed on the screen, and display the settings last saved in the PARB.STP file.

Press **F8** to accept the definitions which appear on the screen. A warning note will appear. The controller parameters are then updated according to the definitions displayed on the screen, and written to the file PARB.STP.

Never interrupt the parameter update once it has begun; particularly, do not press <Ctrl>+C during the process.

Press <**Esc**> to return to the **ATS** main screen or the **SCORBASE** Home Menu.





Axis Definition

The Peripheral Setup menu presents a list of the twelve axes which can be connected to **Controller-B**. To the left of each configured axis is the name of the control group to which it belongs, or the word "gripper," according to the controller configuration. To the right of each axis is the definition of the connection.

Note the meaning of the terms which may appear on an axis definition line.

- **Not Configured**: An axis driver does not exist in the controller, or the axis was not configured by the **ATS** controller configuration. (Formerly "Not Installed" in **ATS** version 1.84)

- **Not Connected**: The axis was configured by the **ATS** controller configuration, but no device is connected to the axis driver.
  You may also choose to maintain the designation of an installed gripper as "Not Connected," so that controller will not perform homing or other control operations, such as impact and thermic protection, on the specific axis.
- **Undefined**: The axis was configured by the **ATS** controller configuration, and a device is connected to the axis driver; however, **ATS** is unable to determine the identity of the device. (Formerly "Not Defined" in **ATS** version 1.84)

Group A Axes – Robot Arm

If the configured axis belongs to a robot arm, the name of the robot will appear to the right of the axis. This information comes from the controller configuration and cannot be altered by the user in this screen.

If 0 ("Other") was selected as the robot type during the controller configuration, the robot axes lines will be accessible to the user.

Gripper Axis

The Peripheral Setup screen allows you to define the type of gripper used in the robotic system. "Not Connected" initially appears on the gripper axis line, and a gripper connection option line is also displayed on the screen. The option line permits you to define whether the gripper is axis-driven or output-driven, as follows:

No Gripper

```
Gripper Connection: None/ IO / Axis 6
```

None indicates a gripper is "Not Connected." If the controller has been configured for a gripper, the specific axis reserved for the gripper is indicated on this line. If the controller has not been configured for a gripper, no axis option will appear on this line:

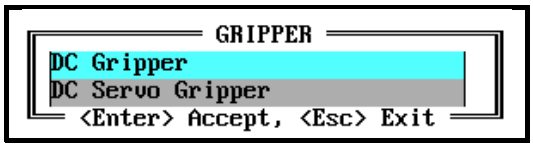
The axis line will display either "Output-driven Gripper" (after the output number is set) or "Axis-driven Gripper" (after the gripper type has been selected).

Axis-Driven Gripper

```
Gripper Connection:  None / IO / Axis 6
```

To complete the definition of an axis-driven gripper, use the arrow key to highlight the **Axis #** option, and press <Enter>.

A Gripper Type window opens, showing the available types of axis-driven grippers. Use the arrow key to highlight your selection, and press <Enter> to accept.



The window will close, and the selected gripper is displayed below the Gripper Connection option line.

To change the type of gripper, bring the cursor to the line displaying the gripper connection options, and press **F1**. The Gripper Type window will again open, allowing you to change the gripper definition.

Output-Driven Gripper

```
Gripper Connection:  None / IO/ Axis 6
```

When you define an output-driven gripper (a pneumatic gripper, for example), the gripper will respond to the **ACL** commands OPEN and CLOSE and to the teach pendant commands Open Gripper and Close Gripper, as well as to output commands.

To complete the gripper definition for an output-driven gripper, use the arrow key to highlight the **IO** option, and press <Enter>.

The following option lines will appear, in sequence:

```
Gripper Connected to Output #  0
```

Type in the number of the output to which the gripper is connected, and press <Enter>. The gripper must be activated by a relay. You can use outputs 1–4 on **Controller-B**, which are relay outputs; or you can activate an external relay through one of the open collector outputs (5–16).

```
State of output for closed gripper 0/ 1
```

Select 0 for an output OFF signal to close gripper.
Select 1 for an output ON signal to close gripper.

```
Gripper time delay (1/100 sec.)    80
```

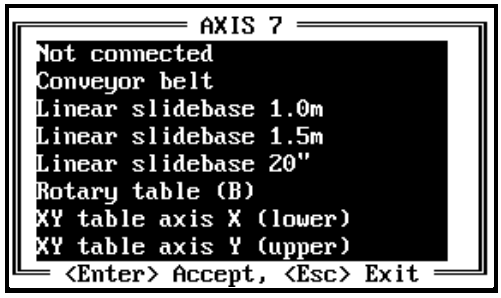
This option determines the time required to execute a CLOSE or OPEN gripper commmand. Press <Enter> to accept the default, or enter a new value for this option.

Group B Axes – Peripheral Devices

If you have performed the short form controller configuration, the axes are configured according to default settings for the selected robot. Group B axes begin with the first available axis after the axes reserved for group A and the gripper. With **SCORBOT-ER IX**, group B begins with axis 7; with **SCORA-ER 14**, group B begins with axis 6.

The configured peripheral axes are highlighted in the Peripheral Setup screen. After a controller configuration has been performed, "Not Connected" will appear on each axis line until you define the connected devices.

To define the type of peripheral device, bring the cursor to the specific peripheral axis line, and press **F1**. A window will open, displaying the list of devices which can be connected to the axis. Highlight your selection, and press <Enter> to accept.



The window can display up to 20 devices. If more than 20 devices are available, you are prompted to use <PgUp> and <PgDn> to see the continuation of the device list.

Once you have defined the peripheral axis, the type of device and the method for homing each axis remain displayed on the screen.

For each peripheral device the **ATS** software includes a (.PRB) definition file. When the Peripheral Setup screen is activated, **ATS** searches for a file which contains the definition which matches the controller parameters for each axis. The appropriate file contains the name of the peripheral device which is displayed on the axis line.

"Undefined" will appear on this axis line if **ATS** is unable to find a file which contains the definition which matches the current parameters for the axis. This can be the result of changing axis parameters by means other than the Peripheral Setup screen; if so, *axis behavior is unpredictable.*

Group C Axes

Group C axes will be displayed in the Peripheral Setup screen if independently controlled axes have been configured by means of the **ACL** command **CONFIG**.

If a speed controlled conveyor has been defined (performed only in the **SCORBASE** controller configuration), the last installed axis will automatically appear as a Group C axis, with the definition "Speed Controlled Conveyor." This line cannot be accessed by the user.

Home Type

The Peripheral Setup screen displays the method used to home each specific axis.

Each peripheral device is homed by means of one of the following methods: hard home, microswitch, encoder C-pulse; or, no homing is performed. The homing methods are defined by means of controller parameters. Users should not attempt to change them.

The **ACL** command HOME executes a home search on all robot axes; the command HOME n, searches for home on axis n (where n=axis number).
The **ACL** command HHOME n executes a search for a hard stop on the specified axis.

SCORBASE executes the home search (from the Home Menu) according to the controller parameters.

Auxiliary User Control Box Settings

The Peripheral Setup screen allows you to define the inputs to which the control box switches are connected, provided an auxiliary control box is present.

❇ *An Auto/Manual switch option will appear in the Control Box Setting when using a controller equipped with **ACL** EPROM version 2.26.*

An input defined as 0 indicates that the switch or button is not connected to an input.

To define the input connections for the controller box, type and <Enter> the input numbers to which the switches and button are connected; for example:

Press F8 to accept the definitions. The corresponding controller parameters will then be updated.

Peripheral Configuration Files

Controller-B uses two kinds of files for the definition and parameter setting of peripheral accessories and grippers: the PARB.STP file and *.PRB files.

❇ *Although these files are user-accessible, do not attempt to edit them.*

PARB.STP File

When data is successfully downloaded to the controller, by means of the **F8** function in the Peripheral Setup screen, the settings displayed on the screen are saved to the file PARB.STP.

Whenever the Peripheral Setup screen is activated, the system searches for the PARB.STP file in the directory defined by the DOS variable **ROBOT**. If the variable ROBOT does not exist, the search is performed in the current DOS directory.

Example

The following is an example of a PARB.STP file:

```
$dir C:\ATS
$axis 7 XYT 0
$axis 8 XYT 1
$axis 9 RT 0
$gripper GRIP
$scc SCCORNG
$io 14 15 16 2 0 0 25
```

Explanation

`$dir C:\ATS`

Indicates the directory (C:\ATS) in which the active executable file (either **ATS** or **SCORBASE**) was located the last time the controller parameters were updated by means of the **F8** function in the Peripheral Setup screen.

`$axis 7 XYT 0`
`$axis 8 XYT 1`

The file XYT.PRB contains the definition for a dual-axis device (XY-Table). 0 indicates axis 7 is connected to the first axis of the device; 1 indicates axis 8 is connected to the second axis.

`$axis 9 RT 0`

The file RT.PRB contains the definition for a single axis device (Rotary Table) which is connected to axis 9.

`$gripper GRIP`

The file GRIP.PRB contains the definition for the gripper currently in use.

`$scc SCCORNG`

The file SCCORNG.PRB contains the definition of the speed-controlled conveyor.

The $scc line will appear only if a speed controller conveyor was configured during the **SCORBASE** controller configuration (<Ctrl>+<F2>).

`$io 14 15 16 2 0 0 25`

This line defines the input/output connections, in the following order:

`14` The Run/Hold switch is connected to input 14.

`15` The Start push button is connected to input 15.

`16` The Auto/Manual switch is connected to input 16.

(This definition is ignored when using a controller equipped with **ACL** EPROM ver 2.28 and later.)

`2` The gripper is axis-driven.
Type of gripper connection: 0=none; 1=IO; 2=axis.

`0` If IO gripper connection: output number.

`0` If IO gripper connection: state of output for closed gripper.

`25` If IO gripper connection: time delay for opening and closing.

.PRB Files

The .PRB files contain the descriptions of the peripheral devices, the parameters which are downloaded to the controller after the **F8** function is activated, the types of robots compatible with the device, the **ACL** EPROM versions compatible with the device, and the programmer-defined date of the file.

Each .PRB file is associated with one device (accessory or gripper).

The files NOCONECT.PRB and NOCONECG.PRB are used to reset the necessary parameters for indicating that a configured axis is not connected to any device. When these files are downloaded, the controller recognizes that nothing is connected to the axis and, accordingly, will not perform any control operations on the axis—homing, impact protection, and so on.

Whenever the Peripheral Setup screen is activated, the system searches for .PRB files in the directory defined by the DOS variable **PARBFILES** (SET PARBFILES=*path*). If the system cannot find the directory defined by the PARBFILES variable, the Device List in the Peripheral Setup screen will be empty, and all configured peripheral axes will appear as "Undefined."

If the variable PARBFILES does not exist, the system searches for .PRB files in the directory defined by **$dir** in the PARB.STP file. If the system cannot find the directory defined by **$dir**, the Device List in the Peripheral Setup screen will be empty, and all configured peripheral axes will appear as "Undefined."

If PARB.STP (or $dir) does not exist, the system searches for .PRB files in the directory in which the current executable **ATS** or **SCORBASE** file is located.

The system may fail to find the directory with the .PRB files for a number of reasons; for example: the directory does not exist; the wrong diskette is in the disk drive; the path is incorrectly defined in the PARB.STP file; and so on.

Example

The following are two examples of .PRB files—on the left is a file for the 72" linear slidebase and on the right is a file for the XY-Table. Each line of the file defines a specific configuration or parameter setting.

```
$name Linear Slidebase 72"
$short LSB-72"
$axes 1
$date 16/05/94
$robot 0 14 2 9
$ver F2.25.01 19/01/94
$ver F2.26.01 21/02/94
$par 2x  2000
$par 4x  2000
$par 40x    0
$par 48x    0
$par 60x 2000
$par 62x    2
 .
 .
 .
```

```
$name1 XY-Table (axis X)
$name2 XY-Table (axis Y)
$short1 XY Table X
$short2 XY Table Y
$axes 2
$date 16/05/94
$robot 0 9 14 2
$ver F2.26.01 21/02/94
$par  2x   11   12
$par  4x  111  112
$par  6x  211  212
$par 40x    0    0
$par 48x 2000 2000
$par 60x    0    0
$par 62x   11   12
 .
 .
 .
```

Explanation

`$name Linear Slidebase 72"` **`$name1 XY-Table (axis X)`**
`$name2 XY-Table (axis Y)`

This name is the definition of the device (accessory/gripper) which will appear on the Peripheral Setup screen to the right of the axis. Maximum length is 30 characters. If the device has more than one axis, such as the XY-Table, both axes are defined in the file.

`$short LSB-72"` **`$short1 XY Table X`**
`$short2 XY Table Y`

The short name is provided for use in software screens which have limited space for the display of device names. Maximum length is 10 characters.

`$axes 1` **`$axes 2`**

Defines the number of axes in the device.

`$date 16/05/94`

The date of creation or last update of the file.

`$robot 0 14 2 9`

The types of robots compatible for use with the device.

The peripheral setup procedure will use only the files which contain the robot types compatible with the currently configured robot.

```
$ver F2.25.01 19/01/94
$ver F2.26.01 21/02/94
```

The version and date of the EPROM with which the device is compatible. This line is repeated for each compatible version. The peripheral setup procedure will use only the files which contain the exact version and date of the **ACL** EPROM currently installed in the controller.

```
$par 2x  2000
$par 4x  2000
$par 40x    0
$par 48x    0
$par 60x 2000
$par 62x    2
```

```
$par  2x   10   10
$par  4x  111  510
$par  6x  210  210
$par 40x    0    0
$par 48x 2000 2000
$par 60x    0    0
$par 62x   10   20
```

The list of parameters required by the device, and their values.

x indicates the number of a specific axis. During the downloading of the parameters, *the value of x* is added to the parameter number; for example, *par 48x* may become 487, 488, . . . 490, 491, 492.

Parameter numbers which do not include an x indicate the parameter is applied globally (and not to a specific axis).

The file contains a column of parameter values for each axis in the device. If, in the example for the XY-Table, axis 7 is the X-axis, and axis 8 is the Y-axis:

Parameter 27 will receive the value 10
Parameter 28 will receive the value 11

Parameter 47 will receive the value 111
Parameter 48 will receive the value 510

Parameter 407 will receive the value 0
Parameter 408 will receive the value 0

Parameter 487 will receive the value 2000
Parameter 488 will receive the value 2000

Axes in dual-axis devices do not need to be installed consecutively; the XY-Table can use axes 7 and 9, for example.

The software does not check whether the axes of a multi-axis device are installed, or whether they are installed (as required) in the same group.

`$gripper`

This line indicates the file defines an axis-driven gripper.

`$scc`

This line indicates the file defines the speed controlled conveyor.

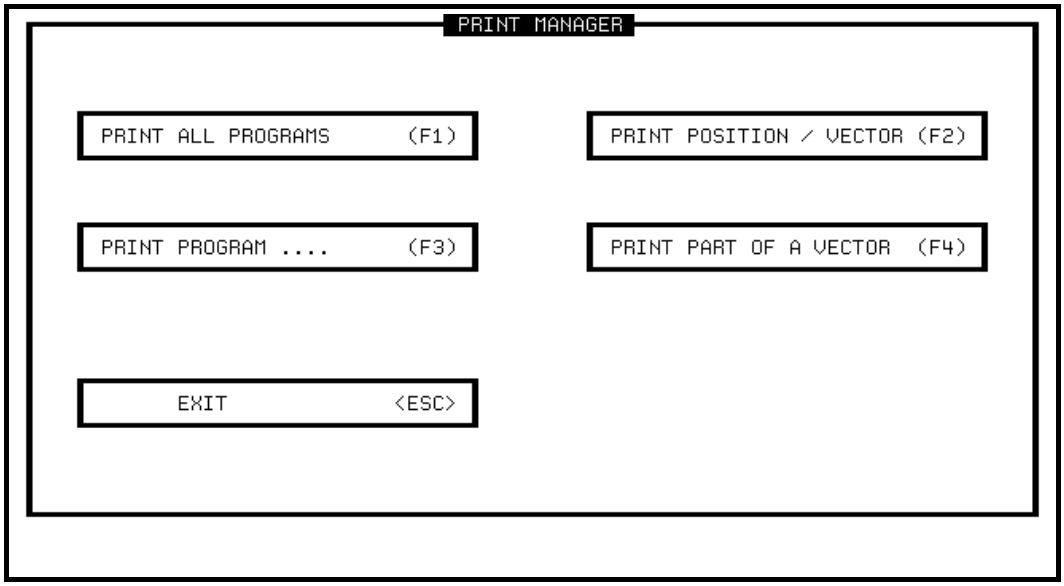
CHAPTER 5

Print Manager

The Print Manager allows you to print copies of the user programs and/or positions currently in the controller's RAM.

The print menu is activated from the **ATS** main screen by pressing the hot-key combination:

<Shift> + <F8>



Make sure a printer is properly connected and ready for operation. If your printer is not fully IBM compatible, you may see the message:

```
POSSIBLE PRINTER ERROR, PRINT ANYWAY?(Y/N)? N
```

The print menu contains the following elements. To activate an option, press the corresponding function key.

PRINT ALL PROGRAMS (F1)

Prints all user programs.

ATS prompts you to confirm before printing will begin:

```
ARE YOU SURE (Y/N)?
```

PRINT POSITION/VECTOR (F2)

Prints the coordinates of a specified position or of all the positions in a specified vector.

- For absolute robot positions, coordinates are printed in both joint (encoder) and Cartesian values.
- For relative robot positions, offset values are printed in either joint (encoder) or Cartesian values, according to how the position was recorded.
- For peripheral device positions, all coordinates are in join (encoder) values.

ATS prompts you for the name of a position or vector. Type the name and press <Enter>.

PRINT PROGRAM (F3)

Prints the program specified.

ATS prompts you for a program name. Type the program name and press <Enter>.

PRINT PART OF VECTOR (F4)

Prints part of a position vector.

ATS prompts you for a vector name. Type the name and press <Enter>. You are then prompted to specify the indices:

```
FROM_______ TO________
```

Type the indices and press <Enter> after each entry.

EXIT <Esc>

Returns to the main **ATS** screen.

<Ctrl>+C

Use the hot-key combination <Ctrl>+C to halt printing.

CHAPTER 6

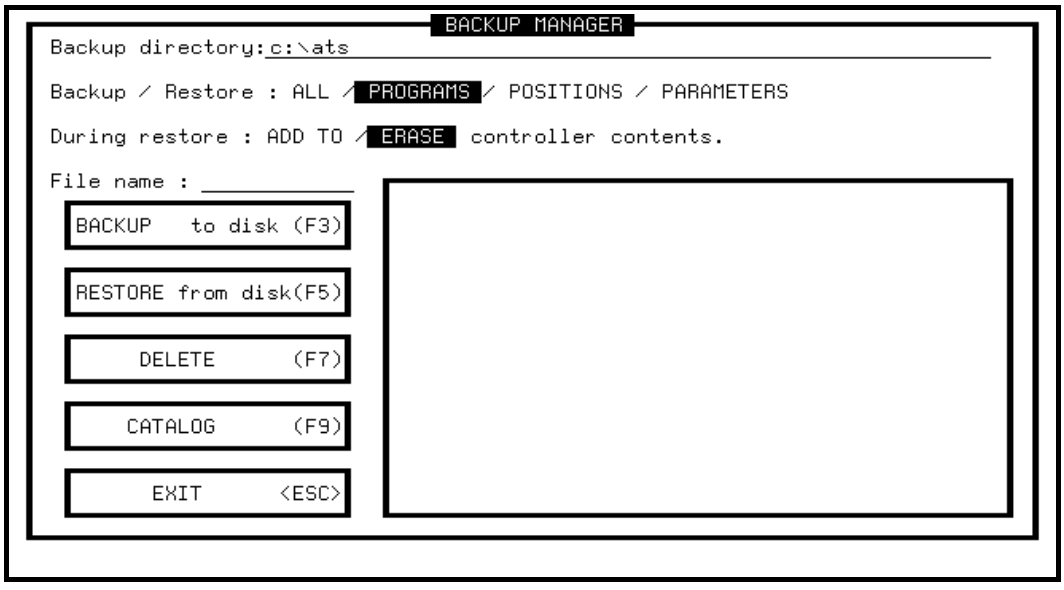
Backup Manager

The Backup Manager allows you to perform a complete or partial backup of the controller RAM. Similarly, it can restore to the controller the contents of a previously created controller backup (.CBU) file.

Note that in **ATS** version 2.0 (and later) for **Controller-B**, parameter files for peripheral devices are loaded through the Peripheral Setup screen, and not the Backup Manager.

The backup utility is activated from the **ATS** main screen by pressing the hot-key combination:

<Shift> + <F10>



The backup menu contains the following elements. Use the arrow and <Enter> keys to move the cursor and enter your selections. To activate an option, press the corresponding function key.

Backup Directory

The first time this prompt appears, it shows the DOS directory from which the **ATS** software was activated.

For Restore operations, the Backup directory must be the directory which contains the parameter (.CBU) files.

If you change the directory definition, it is written to a file named SETUP.DIR. Thereafter, whenever **ATS** is loaded, the Backup directory is set according to the definition in the SETUP.DIR file. Similarly, the SETUP.DIR file determines the definition of the Working directory displayed during the controller configuration procedure. SETUP.DIR is updated when either the Backup directory or Working directory definition is changed.

You may change the directory definition by typing any valid DOS directory; for example:

```
B:
A:\PROGBU
C:\ROBOT
```

Backup/Restore: ALL / POSITIONS / PARAMETERS / PROGRAMS

Select the items you want to backup or restore. The options are:

`ALL:` Includes all data elements: programs, positions, variables, parameters.

`PROGRAMS:` Includes all data except parameters.

`POSITIONS:` Includes only the positions.

`PARAMETERS:` lncludes only the parameters.

During restore: ADD TO/ERASE CONTROLLER CONTENT

Select the manner in which data will be restored. The options are:

`ADD TO:` Adds the restored data to the existing data in the controller RAM.

Only new data is restored. If an element already exists in the controller, it will not be changed. The only exception is in restoring positions. If a position is defined but has not been assigned coordinate values, it will receive the coordinates from the backup file.

`ERASE:` Replaces all existing data in the controller with the new data.

The ERASE option erases all data elements except parameters, regardless of the elements being restored.

File Name : _____

Type the name of the file containing the backup data. Do not use an extension. **ATS** adds the extension **.CBU** to all backup files.

BACKUP to disk (F3)

The backup procedure reads the selected data from the controller and writes it to the specified backup file. If the specified file already exists, you are warned and prompted to confirm the overwrite. If you choose to overwrite the existing file, the original CBU file is copied and saved with the extension BAK.

When you perform a controller backup, a two-line header is written at the top of the (.CBU) file which is created during the backup; for example:

```
# Configured robot, version number and version data
$ver 9 F2.26.02 21/02/94
```

The second line indicates the type of robot configured (**SCORBOT-ER IX**, in this example), the **ACL** software version, and the date of the **ACL** version.

At the end of the backup procedure, after the controller has sent all data to the host computer, the controller also sends the line $CHK nnnn (where nnnn is the controller calculated CHECKSUM value).

Meanwhile, as the host computer receives the data, it also calculates CHECKSUM, and compares it to the CHECKSUM received from the controller. If the two values are not equal, an error message is displayed.

```
CHECKSUM ERROR
Continue Backup (Y/N)?N
```

Press Y to save the backup file, which may contain errors.

Press N or <Enter> to abandon the backup. You may then reattempt the backup.

RESTORE from disk (F5)

Reads the selected data from the backup file and loads it into the controller RAM.

When you begin to restore the backup file to the controller, **ATS** compares the information in the header of the CBU file (see above) with the controller's current configuration and version. You are warned of any differences, and prompted to confirm the restore procedure.

DELETE (F7)

Deletes the specified file from the backup directory.

CATALOG (F9)

Displays the list of backup files in the backup directory.

EXIT <Esc>

Returns to the main **ATS** screen.

CHAPTER 7

Command Line Options

Three controller functions can be performed from the DOS command line without activating **ATS**: controller configuration, controller backup, and restore to controller.

In addition, switches for a number of options can be included in the command line when **ATS** is activated from either the batch file or the executable file TERM_ACL.

To see a list of the options and format, type **ATS /?** from the **ATS** directory. The following is displayed:

```
Advanced Terminal Software   version 1.9  (C) ESHED ROBOTEC
Syntax : TERM_ACL [/options] [filename]
/?               displays options
/Cn              n=COM #
/On              n=printer port #
/T[A/B]          controller type for off-line
/B or /R         Backup or Restore
  /ADD             Adds to existing data during Restore
  /ERASE           Erases existing data during Restore
  /ALL             Programs, positions, variables and parameters
  /PROGRAM         Programs, positions and variables
  /POS             Positions only
  /PAR             Parameters only
  [filename]     File to be backed up or restored
/CONFIG          Controller configuration
  /Xn              n=number of axes installed
  /RS232           Auxiliary multiport RS232 board installed
  /SCOR            SCORBASE controller configuration
    /CONV            Speed controller conveyor installed
  /ROBOT_TYPE=xx   xx=type of robot: 5, 5+, 7, 9, 14, 2, 0
/PRF             Loads peripheral parameters

C:\ATS>
```

Controller Configuration Options

To perform a controller configuration, use the following format:

`ATS /config`

You must specify the type of robot, or assume the default **SCORBOT-ER IX** (shown in parentheses).

`/robot_type=2`	Loads parameters for **PERFORMER-MK2.**
`/(robot_type=9)`	(Loads parameters for **SCORBOT-ER IX.)**
`/robot_type=14`	Loads parameters for **SCORA-ER 14.**
`/robot_type=0`	Separate axes; kinematics unknown.

You may add the following options:

`/x`*n*	If specified, *n*=number of axes. Default is 8.
`/scor`	Configures controller for **SCORBASE**.
`/conv`	(**SCORBASE** configuration) Speed controlled conveyor is installed.
`/rs232`	Auxilliary multiport RS232 board is installed.
`/center`	Configures Central CIM Controller.

Example **`ATS /CONFIG /ROBOT_TYPE=14 /X10 /CONV /GRAY`**

Loads **ATS**, configures the controller for ten axes of control, including a gray speed controlled conveyor, and loads the parameters for **SCORA-ER 14.**

Backup / Restore Options

These options are the same as those in the Backup Manager screen. For a complete explanation, refer to the section which describes the backup and restore procedures.

To backup the controller or restore data without activating **ATS**, use the following format:

`ATS` ***`filename`*** **`/b`**	Backup operation.
`ATS` ***`filename`*** **`/r`**	Restore operation.

You must include a file name:

filename	Name of file to be saved or restored.

You may specify the following options, or assume the defaults (shown in parentheses).

(/add)	Adds data to existing data during restore.
/erase	Erases existing data during restore.
/all	Programs, positions, variables, and parameters.
(/program)	(Programs, positions, variables.)
/pos	Positions only.
/par	Parameters only.

Example **ATS poslist /b /pos**

Backs up the positions currently in the controller to a file named POSLIST.

Peripheral Option

/prf When **ATS** is loaded, the parameters for the peripheral equipment are automatically loaded according to the peripheral definition last performed.

Device Options

/C Defines the computer's RS232 port to be used for communication with the controller.

(/C1)	(COM1 port.)
/C2	COM2 port.

/O Defines the computer's parallel port to be used for printing.

(/O1)	(PRN1.)
/O2)	PRN2.
/O3	PRN3.

Example **ATS /C2**

Loads **ATS** with communication on COM2.

Off-Line Options

When loaded, the **ATS** software automatically recognizes the type of controller with which it is operating. Accordingly, **ATS** knows which robots are compatible with the controller, and displays the proper screens and menus.

If you are working off-line (not communicating with controller), and want **ATS** to display the proper screens, load the software with the following options:

`ATS (/TA)`	Simulates communication with **Controller-A**.
`ATS /TB`	Simulates communication with **Controller-B**.

When running off-line, **ATS** continually attempts to establish communication with the controller. As soon as the controller responds to **ATS**, the actual controller type is recognized, and the switch is cancelled; the switch will subseqently be ignored, even if communication fails.

CHAPTER 8

The SEND Utility Program

The SEND.EXE utility program contained on the **ATS** diskette can be used to send **ACL** commands to the controller from the DOS command line. This is useful if you do not want to activate **ATS**.

In addition to this utility, **ACL** commands can be sent to the controller from programs written in high-level languages, such as C or Pascal, by directing them to the serial port by means of a communication driver.

The controller's responses to the commands are automatically displayed on your computer screen.

To send an **ACL** command to the controller by means of the SEND utility, use the following command line format:

```
SEND message [/Ccom] [/N] [/R] [/Ttime] [/F filename]
```

The switches are optional, as indicated by the square brackets.

Options

message	The **ACL** command you want to transmit to the controller.
/C	Defines the RS232 port used for communication with the controller. Default is COM1(/C1).
/N	Controller responses will not be displayed on the computer screen.
/R	Controller responses will be displayed on the computer screen until a key is pressed.
/T	The maximum pause between controller responses. Value is in tenths of a second. If the pause exceeds the defined value, it is assumed that the controller has completed its response. Default value is 1 second (/T10).
/F *filename*	The controller response is sent to a file (and not displayed on monitor).

`/F PRN` The controller response is sent to the printer (and not displayed on monitor).

`/?` Displays the Help lines.

Examples

`SEND SET OUT[1]=1`	Turns on output #1.
`SEND OPEN`	Opens the gripper.
`SEND RUN PAINT`	Activates execution of a program named PAINT.
`SEND LISTVAR`	Displays a list of all variables currently in the controller's memory.
`SEND LISTP /F POSITS`	Creates a file named POSITS, which contains a list of all the defined positions in the controller's memory. This list will not be displayed on the computer screen.

APPENDIX **A**

.CBU to .PRB File Conversion

❊ *This appendix relates only to a peripheral device which was supplied together with a customized parameter file (*.CBU) to enable use of the device with* ***Controller-B****.*

Refer to the complete description of ***Controller-B*** *parameters in the* ***ACL*** *Reference Guide.*

Two type of parameters appear in the .CBU file—parameters applicable to specific axes, and parameters applicable to a device regardless of the axis to which it is connected (for example, parameter 176—the DAC value appplied at the start of gripper movement).

Many parameters in the controller's table of parameters are allotted a range of numbers, at intervals of 20, indicating that a parameter value is defined specifically for each axis. For example, parameters 203, 463 and 563 are homing parameters for axis 3; parameters 69, 70 and 71 define the integral feedback constants for axes 9, 10, and 11, respectively.

The following is an example of a line in a .CBU file.

```
$par 226 20 20 5
```

When the .CBU file is loaded by means of the "Restore Parameters" option in the **ATS** Backup Manager, the specified parameter (par 226) receives the first value defined (20). The next sequential parameter (par 227) receives the second value defined (20); the next parameter (par 228) receives the third value defined (5); and so on, for as many values as appear in the line.

To convert the .CBU file to the .PRB format utilized by the Peripheral Setup screen, follow the instructions and explanations provided in the following examples. "Before" and "After" examples of these files appear on the following pages.

LSB72-7.CBU File Conversion

This file contains parameters for a 72" linear slidebase connected to axis 7. It is an example of a file with parameters for a single-axis device. The parameter values in the first column apply to axis 7. The values in the second column apply to axis 8.

1. Copy the original .CBU file to the **ATS** directory, and give it a name with the extension .PRB. Make sure you do not use the name of an existing .PRB file.
2. Replace the last digit of the parameter number (in this file it is always the digit 7), with the lowercase character **x**.
3. Delete the second (or any additional) column of values.
4. Delete all lines which do not begin with **$par**.
5. Add the following lines to the top of the file (their location is not critical, however), and complete their definitions. Refer to the explanation of these items in the section of this manual which describes and details the .PRB files.

```
$name
$short
$axes
$robot
$ver
```

Make sure the version information exactly matches the information displayed when you enter the **ACL** command VER.

You may also include a **`$date`** line, if desired.

PAR678.CBU File Conversion

This file contains parameters for an XY-Table which is connected to axes 7 and 8, and used in conjunction with the **SCORA-ER 14** robot. It is an example of a file with parameters for a dual-axis device.

In this file parameters are defined for axes 6, 7, and 8; axis 6 is not in use, but defined as part of group B. The parameter values in the first column apply to axis 6; the values in the second column apply to axis 7; and the values in the third column apply to axis 8.

To convert the .CBU file to the .PRB format, follow the five steps described above, with the following changes:

- Delete the first column of values in each row, and keep columns 2 and 3.
- Change the last digit of the parameter number, 6, to x.

PAR78.CBU File Conversion

If your device was supplied with the file **PAR78.CBU** (parameters for the XY-Table when used with a robot other than the SCORA-ER 14), the conversion procedure is the same as described for PAR678.CBU, with the following differences: the last digit of the parameter number is 7 (replace it with **x**), and only two columns of values appear (leave them unchanged).

GRP9.CBU File Conversion

This file contains parameters for a DC servo gripper which is being used on a **SCORBOT-ER IX** robot.

❇ *Do not make any changes to the lines which contain values for parameters which are not axis-specific (shown in bolded typeface in the example here).*

If you are uncertain whether a parameter is axis-specific or not, refer to the list of parameters for **Controller-B** in the ***ACL** Reference Guide*.

BEFORE : LSB72-7.CBU File

```
$par 27 -50000
$par 47 -50000
$par 67 0
$par 87 0
$par 107 6000
$par 127 -130000
$par 147 16000
$par 167 4500
$par 187 70     100
$par 207 400    0
$par 227 20     10
$par 247 1000
$par 267 1000
$par 287 3000
$par 327 1       1
$par 347 1       1
$par 367 2800    0
$par 387 5000    0
$par 407 0       0
$par 427 0       0
$par 447 80      512
$par 467 0       0
$par 507 10      10
$par 527 20      20
$par 547 300000  500000
$par 567 1       1
$par 587 20      20
$par 607 1000    0
$par 647 15      15
$par 667 3000    3000
$par 687 1000    1000
$par 707 1000
$par 727 1500
$par 747 100
$par 767 100000
$par 787 1000
(END)
```

AFTER : LSB72-7.PRB File

```
$name Linear Slidebase 72"
$short LSB-72"
$axes 1
$robot 0 14 2 9
$ver F2.26.01 21/02/94
$par 2x -50000
$par 4x -50000
$par 6x 0
$par 8x 0
$par 10x 6000
$par 12x -130000
$par 14x 16000
$par 16x 4500
$par 18x x0
$par 20x 400
$par 22x 20
$par 24x 1000
$par 26x 1000
$par 28x 3000
$par 32x 1
$par 34x 1
$par 36x 2800
$par 38x 5000
$par 40x 0
$par 42x 0
$par 44x 80
$par 46x 0
$par 50x 10
$par 52x 2020
$par 54x 300000
$par 56x 1
$par 58x 20
$par 60x 1000
$par 64x 15
$par 66x 3000
$par 68x 1000
$par 70x 1000
$par 72x 1500
$par 74x 100
$par 76x 100000
$par 78x 1000
```

BEFORE : PAR678.CBU File

```
$par 26 0 -8000 -8000
$par 46 0 -8000 -8000
$par 66 0 -20000 -20000
$par 86 0 0 0
$par 106 100000 600 550
$par 126 -100000 -11500 -11000
$par 146 16000 16000 16000
$par 166 4500 4500 4500
$par 186 80 20 80
$par 206 5000 2S0 3500
$par 226 20 20 5
$par 246 1000 1000 1000
$par 266 32000 10 10
$par 286 5000 2400 2400
$par 306 0 0 0
$par 326 0 10 0
$par 346 0 1 0
$par 366 0 5000 5000
$par 386 0 10500 10500
$par 401 5 5 5
$par 426 0 0 0
$par 446 0 0 0
$par 466 0 0 0
$par 486 100 108 126
$par 506 20 20 5
$par 526 100 30 30
$par 546 500000 500000 500000
$par 566 0 1 0
$par 586 20 20 300
$par 606 0 200 2000
$par 626 1 3 3
$par 646 0 15 15
$par 666 0 2500 3500
$par 686 10000 1000 1000
$par 706 5000 5000 5000
$par 726 1000 1500 2000
$par 746 100 100 100
$par 766 100000 50000 50000
$par 786 1500 1500 4000
(END)
```

AFTER : XYTBL14.PRB File

```
$name XY Table for ER14 Axis X
$name XY Table for ER14 Axis Y
$short XY TBL 14 X
$short XY TBL 14 Y
$axes 2
$robot 0 14 2 9
$ver F2.26.01 21/02/94
$par 2x -8000 -8000
$par 4x -8000 -8000
$par 6x -20000 -20000
$par 8x 0 0
$par 10x 600 550
$par 12x -11500 -11000
$par 14x 16000 16000
$par 16x 4500 4500
$par 18x 20 80
$par 20x 2000 3500
$par 22x 20 5
$par 24x 1000 1000
$par 26x 10 10
$par 28x 2400 2400
$par 30x 0 0
$par 32x 10 0
$par 34x 1 0
$par 36x 5000 5000
$par 38x 10500 10500
$par 401 5 5
$par 42x 0 0
$par 44x 0 0
$par 46x 0 0
$par 48x 108 126
$par 50x 20 5
$par 52x 30 30
$par 54x 500000 500000
$par 56x 1 0
$par 58x 20 300
$par 60x 200 2000
$par 62x 3 3
$par 64x 15 15
$par 66x 2500 3500
$par 68x 1000 1000
$par 70x 5000 5000
$par 72x 1500 2000
$par 74x 100 100
$par 76x 50000 50000
$par 78x 1500 4000
```

BEFORE : GRP9.CBU File

```
$par 26 -1000
$par 46 -1000
$par 66  0
$par 106 0
$par 126 -32768
$par 146 3000
$par 166 4900
$par 186 3000
$par 206 -2000
$par 686 20000
$par 326 0
$par 346 0
$par 386 0
$par 266 100
$par 546 500000
$par 246 1000000
$par 286 4900
$par 606 0
$par 466 0
$par 586 100
$par 666 3000
$par 274 0
$par 275 0
$par 276 -5000
$par 277 5
$par 73 9350
$par 74 0
$par 75 -2000
$par 76 80
$par 308 152000
(END)
```

AFTER : GRP9.PRB File

```
$name Servo Gripper for ERIX
$short GRIPSER ERIX
$axes 1
$robot 0 14 2 9
$ver F2.26.01 21/02/94
$gripper
$par 2x -1000
$par 4x -1000
$par 6x  0
$par 10x 0
$par 12x -32768
$par 14x 3000
$par 16x 4900
$par 18x 3000
$par 20x -2000
$par 68x 20000
$par 32x 0
$par 34x 0
$par 38x 0
$par 26x 100
$par 54x 500000
$par 24x 1000000
$par 28x 4900
$par 60x 0
$par 46x 0
$par 58x 100
$par 66x 3000
$par 274 0
$par 275 0
$par 276 -5000
$par 277 5
$par 73 9350
$par 74 0
$par 75 -2000
$par 76 80
$par 308 152000
```