TEACH PENDANT

for Controller-B

User's Manual

ESHED ROBOTEC

Table of Contents

Introduction

A new teach pendant (Catalog #1704) has been developed for use with Controller-B.

This teach pendant is a sophisticated portable terminal for operating and controlling the axes connected to Controller-B. This teach pendant is equipped with an EMERGENCY STOP push-button, an AUTO/TEACH selector switch, and a DEADMAN switch. The teach pendant can be either hand-held (thus disabling its ability to run programs) or mounted in a special fixture outside the robot's working envelope (thus enabling access to running programs).

This teach pendant can be used only with a controller which is equipped with **ACL** version 2.28 or later and communicating with the PC by means of **ATS** version 1.85 or later.

This teach pendant also requires that the controller and PC communicate by means of **ATS** version 1.85 or later.

The information in this *User's Manual* supplements or replaces the information given in the user's manuals for **SCORBOT-ER IX**, **SCORA-ER 14** and **PERFORMER-MK2**.
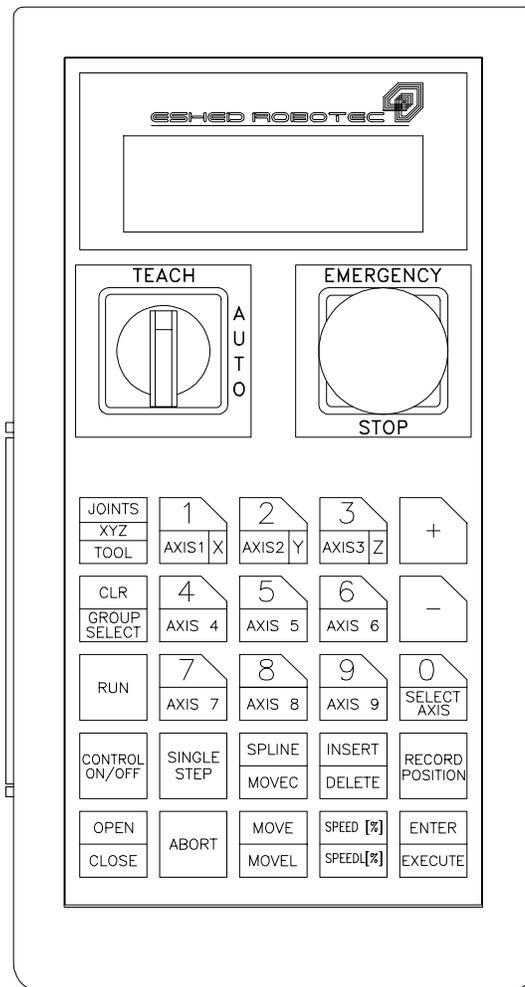
Read This First !   Installing the Teach Pendant

✱   If you purchased and received the teach pendant together with the **Controller-B**, follow
the installation instructions for the teach pendant in the ***Controller-B** User's Manual*.

✱   If the teach pendant was purchased separately, it was supplied with the "EPROM Upgrade
Kit." To install, you must follow the installation/ upgrade instructions in the *appendix at
the end of this manual*.

Operation

✱   *Make sure the teach pendant (or Emergency By-Pass Plug) is properly connected to the
controller before you power on the system.*

The teach pendant can be either hand-held or mounted in a special fixture. The operation
of the teach pendant will vary according to the manner in which it is held.

The Auto/Teach switch on the teach pendant also affects the operation of the teach
pendant, as indicated throughout this chapter.

The Deadman button and the Emergency button ensure the safety of the operator.

Mounted TP

When the teach pendant is mounted in its special fixture, two magnetic switches are
activated by means of magnetic strips on the fixture, thereby allowing programs to be run
from the mounted TP. Mounting the TP ensures that the operator is safely out of the
robot's working envelope when program execution begins.

The Auto/Teach switch must be in the Teach position to enable the mounted TP full
control of the axes.

Hand-Held TP

When the teach pendant is hand-held, the deadman button must remain depressed at all
times for TP operation. Programs cannot be executed from a hand-held TP. These
restrictions are for safety reasons.

The Auto/Teach switch must be in the Teach position to enable the hand-held TP full
control of the axes. In addition, the deadman button must remain depressed; if this button
is released, the system goes into the Emergency state.

Auto/Teach Switch
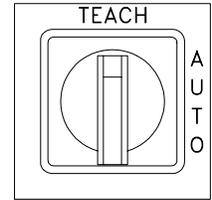
Mounted TP

When the TP is mounted, the Auto/Teach switch affects control
functions and system operation in the following ways:

- When the switch is in the Teach position, the TP has full control of the axes, and programs can be run from the mounted TP.

  Commands which can cause axis movement (such as CON, MOVE, RUN) cannot be entered from the keyboard. All other **ACL** commands (such as COFF, DIR, STAT, and EDIT) remain available when the TP is in the Teach mode.

- When the switch is in the Auto position, the TP is disabled, and the keyboard has full control of the axes.

- When the switch is moved from Auto to Teach, running programs continue execution. Control is transferred to the TP.

- When the switch is moved from Teach to Auto, running programs continue execution. Control is transfered to the keyboard, but only after the **ACL** command AUTO is entered from the keyboard.

Hand-Held TP

When the TP is hand-held, the Auto/Teach switch affects control functions and system operation in the following ways:

- When the switch is in the Teach position, the TP has full control of the axes, provided the deadman button is depressed. However, programs cannot be run from the hand-held TP.

  Commands which can cause axis movement (such as CON, MOVE, RUN) cannot be entered from the keyboard. All other **ACL** commands (such as COFF, DIR, STAT, and EDIT) remain available when the TP is in the Teach mode.

- When the switch is in the Auto position, the TP is disabled, and the keyboard has full control of the axes.

- When the switch is moved from Auto to Teach, all running programs are aborted.

- When the switch is moved from Teach to Auto, control is transfered to the keyboard, but only after the **ACL** command AUTO is entered from the keyboard.

TP Transition

If the TP is put into or removed from the mount while the switch is in the Auto position, system operation is not affected.

If the TP is removed from the mount while the switch is in the Teach position, running programs are aborted. If the deadman button is released, or not properly depressed, during the removal of the TP from the mount, the system will go into the Emergency state.

If the TP is put into the mount while the switch is in the Teach position, system operation is not affected. Once the TP is in the mount, programs can be run from the TP.

Manual Keyboard Control

The <Alt>+M or ~ command for switching to Manual Keyboard control is available only when the TP is in the Auto mode.

If the Auto/Teach switch is moved to the Teach position when Manual Keyboard mode is active, operation from the keyboard is aborted. If the switch is then moved back to the Auto position, and the command AUTO is entered in order to return control to the PC, the keyboard is reset to DIRECT mode, but not Manual mode.

The Manual Keyboard commands C (CON), F (COFF) and S (SPEED), used in previous versions of **ACL**, are not available in **ACL** version 2.28.

Deadman Button

The deadman button is an elongated switch on the left side of the TP, as shown in the diagram here.

When the hand-held TP is in the Teach mode, this button must remain depressed at all times to enable control the axes from the TP.

If the deadman button is released when the hand-held TP is in the Teach mode, the system goes into the Emergency state.

Emergency Button

The emergency button is the red mushroom button on the face of the TP, and functions the same as the emergency button on the controller.

The emergency button can be activated regardless of the TP's location (mounted or hand-held) or status (Teach or Auto mode). Press the button to activate; pull it out to release.

When the button is pressed, the system goes into the Emergency state.

To cancel the Emergency state from the TP, release the emergency botton (if it has been pressed), and press the CONTROL ON/OFF key.
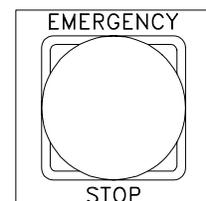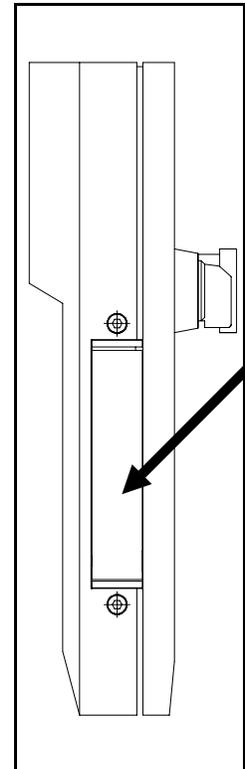
Keypad Functions

The various functions of the teach pendant are described in this section. Many of the command keys on the teach pendant are **ACL** commands; these commands are described fully in the *ACL Reference Guide for **Controller-B***.

The teach pendant's keypad has 25 color-coded keys. Most of the keys are multi-functional; for example, some keys include both an axis drive command and a numeric function. The controller recognizes the keys from the order in which they are pressed. Thus, the numeric function will be active only if a function such as SPEED, RUN, or MOVE has been keyed in first; otherwise, the axis drive command will be active.

TP commands can be executed only when the TP is in the Teach mode and either the deadman button is depressed or the TP is mounted.

The program execution command RUN is available only when the TP is mounted.

Following are descriptions of the teach pendant's keys and instructions for activating them. Bulleted items indicate the different functions of multi-functional keys.

JOINTS XYZ TOOL	1 AXIS1 X	2 AXIS2 Y	3 AXIS3 Z	+
CLR GROUP SELECT	4 AXIS 4	5 AXIS 5	6 AXIS 6	−
RUN	7 AXIS 7	8 AXIS 8	9 AXIS 9	0 SELECT AXIS
CONTROL ON/OFF	SINGLE STEP	SPLINE MOVEC	INSERT DELETE	RECORD POSITION
OPEN CLOSE	ABORT	MOVE MOVEL	SPEED [%] SPEEDL[%]	ENTER EXECUTE

ENTER / EXECUTE

   ・ Accepts and/or executes the command which has been entered.

   ・ Starts execution of a program.

JOINTS / XYZ / TOOL

   ・ Switches the command mode between Joints and Cartesian (XYZ).
     (TOOL is currently not available).

CLR / GROUP SELECT

- Clears a partially entered command.

  Note that this is *not* the same as the **ACL** command CLR.

- Enables TP control of a specific axis group.

  Successively press for group A, group G(gripper), group B, group C, and again for group A, and so on. When group C is displayed, enter the axis number on the numerical keys. Then press Enter.

  Note that the TP treats the gripper as a distinct axis control group, group G.

  When alternating among control groups, group A will remain in the coordinate system (Joint or XYZ) in which it was last active.

+

- In Joint mode, moves the selected axis in positive direction.
- In XYZ mode, moves the tip of the gripper in positive direction.
- If group G is selected, opens the gripper.

  In all of the above, movement will continue as long as the + key is depressed, or until the axis limit is reached.

- This key is also used to confirm the DELETE command.

−

- In Joint mode, moves the selected axis in negative direction.
- In XYZ mode, moves the tip of the gripper in negative direction.
- If group G is selected, closes the gripper.

  In all of the above, movement will continue as long as the − key is depressed, or until the axis limit is reached.

0 / SELECT AXIS

- Numerical key 0.
- Selects axis 1 through 12.

  Press Select Axis. Then press an axis number. Then press Enter.

  When an axis number is selected from the TP, the control group to which the axis belongs (A, B, C, or G[gripper]) is automatically enabled.

1 / AXIS 1 / X

- Numerical key 1.
- Axis 1 in Joint mode.
- Axis X in XYZ mode.

2 / AXIS 2 / Y

- Numerical key 2.
- Axis 2 in Joint mode.
- Axis Y in XYZ mode.

3 / AXIS 3 / Z

- Numerical key 3.
- Axis 3 in Joint mode.
- Axis Z in XYZ mode.

4 / AXIS 4

- Numerical key 4.
- Axis 4 in Joint mode.
- Pitch Axis in XYZ mode (**MK2** and **ER IX** only);
  Roll Axis in XYZ mode (**ER 14** only).

5 / AXIS 5

- Numerical key 5.
- Axis 5 in Joint mode.
  Gripper axis (**ER 14** only)
- Roll Axis in XYZ mode (**MK2** and **ER IX** only).

6 / AXIS 6

- Numerical key 6.
- Axis 6 in Joint mode.
  Gripper axis (**MK2** and **ER IX** only)

7 / AXIS 7

- Numerical key 7.
- Axis 7 in Joint mode.

8 / AXIS 8

- Numerical key 8.
- Axis 8 in Joint mode.

9 / AXIS 9

- Numerical key 9.
- Axis 9 in Joint mode.

CONTROL ON/OFF

Enables and disables control of the selected group, or all groups.

- If pressed once, toggles between CON and COFF for the selected group.
- If pressed twice, changes CON and COFF for all axis control groups.
  If at least one group is in CON mode, COFF is applied to all groups.
  If all groups are in COFF mode, CON is applied to all groups.

  The action to be performed (e.g., COFF GROUP B, CON ALL GROUPS) will be displayed. Press Enter to accept.

Note that selecting an axis from the TP (axis number keys) automatically enables control of the group to which the axis belongs.

If the gripper axis is selected, GRIPPER is displayed and the CON/COFF toggle applies to the gripper only.

RECORD POSITION

This command both defines and records a position.

Only numerical position names, of up to five digits, can be entered from the TP. The position is defined for the currently active group, and receives the current values of the axes in that group. The position coordinates are recorded in the currently active coordinate system.

Press Record Position. Then press up to five digits for the position name. Then press Enter.

If you use a position name which has already been defined, the new coordinates will overwrite the existing ones.

This command is also used to record positions in a vector. The vector must first be attached (ATTACH) to the TP.

INSERT / DELETE

This command is used to add and remove positions in a vector. The vector must first be attached (ATTACH) to the TP.

INSERT records a position in a vector, and shifts all previously recorded positions one place up in the vector. DELETE removes a position from a vector, and shifts all higher positions one place down.

INSERT and DELETE are available only on position vectors which have been defined with the prefix &.

- If pressed once, INSERT is displayed.

  Use the numerical keys to enter the number of the position (the vector index) to be inserted. Press Enter to execute the command.

- If pressed twice, DELETE is displayed.

  Use the numerical keys to enter the number of the position (the vector index) to be deleted. Press Enter.

  The display shows "ARE YOU SURE?" Press + for yes, and then press Enter again.

SPEED(%) / SPEEDL (%)

Sets the speed of manual axis movement, as a percentage of maximum speed.

- If in Joint mode, sets the percentage of maximum joint speed.
  SPEED is displayed.

- If in XYZ mode, sets the percentage of maximum linear speed.
  SPEEDL is displayed.

  Press SPEED(%)/SPEEDL(%). The current speed is displayed.

  Press Enter to accept the displayed default speed. Or use the numerical keys to enter a different speed, and press Enter.

- When group G is active, this command determines the speed of a DC servo gripper.

OPEN / CLOSE

Opens and closes the gripper. This command functions on both electric and pneumatic grippers.

MOVE / MOVEL

Moves the axes to a target position. MOVEL applies only to robot (group A) axes.

- If in Joint mode, movement is by joints (MOVE)

- If in XYZ mode, robot movement is linear (MOVEL)

  Press MOVE/MOVEL. Then use the numerical keys to enter the position number.

  Press and hold the Execute key. Continue holding down the Execute key until the axes reach the target position. If the Execute key is released, the movement is stopped immediately, and the command is aborted.

- The command MOVE 0 moves the axes of the currently active group (A or B only) to their home position.

  The TP display panel will show MOVE 0 for group A, and MOVE 00 for group B.

- When group G is active, pressing this key activates the JAW command for the gripper.

  Use the numerical keys to enter a value for the percentage of the gripper opening, and press Enter.

SPLINE / MOVEC

Moves the axes to a target position. MOVEC applies only to robot (group A) axes. SPLINE applies only to multi-axis devices in group A or group B axes.

- If pressed once, a SPLINE movement will be executed.

- If pressed twice, a MOVEC movement will be executed.

  Use the numerical keys to enter the first position number, and press Enter.

  Use the numerical keys to enter the second position number. Then press and hold Execute.

Continue pressing the Execute key until the axes reach the target position. If the Execute key is released, the movement is stopped immediately, and the command is aborted.

RUN

Executes a program. Available only when the TP is mounted.

Press Run. Then press the program's identity number on the numerical keys. The program name will be displayed in brackets. Then press Enter.

The controller automatically assigns an ID number to each user program. The **ACL** command DIR lists the programs and their assigned (IDENTITY) number.

- ・ The command RUN 0 homes the robot axes (**ACL** command HOME).
- ・ The command RUN 999 executes a system test (**ACL** command TEST).

SINGLE STEP

This command is not currently available.

ABORT

Aborts execution of all running programs. Stops the robot and all peripheral axes.

Display Panel

The teach pendant has a four-line liquid crystal display panel. Each line displays a specific type of message or text.

Messages

When the TP is in either the Teach Mode or Auto mode, line 1 displays system and error messages. The current display is erased when a new message appears.

When the TP is in the Auto mode, lines 2, 3 and 4 will display:

```
TP IN AUTO MODE
 TEACH MODE WILL
ABORT ALL PROGRAMS
```

A list and brief descriptions of all TP messages appears at the end of this chapter.

Commands

When the TP is in the Teach mode, lines 2 and 3 display commands.

Line 2 displays the last command entered. Subsequent commands are scrolled into Line 2.

Line 3 displays the command currently being entered, and serves as a user interface.

- ・ The command SPEED/SPEEDL will display the current value, allowing you to accept or change.

- The commands SPLINE/MOVEC, INSERT/DELETE, RECORD POSITION and MOVE/MOVEL will display the name of the currrently attached position vector, if it exists, and the active control group.

Status Report

When the TP is in the Teach mode, line 4 displays the current status of the axes, in the following format:

group:*g* AX: *xx ccccccc*

When the group (or a specific group C axis) is enabled (CON), the text in the display is normal (black on white).

When the group (or a specific group C axis) is disabled (COFF), the text in the display is inversed (white on black).

g is the currently selected axis control group (if exists):

    A: control group A
    G: gripper
    B: control group B
    C: control group C

xx is the currently active joint or axis in the active group:

    1-12: joint
    X : X axis
    Y : Y axis
    Z : Z axis
    P : Pitch axis
    R : Roll axis

ccccccc is the currently active coordinate system:

    Joint
    XYZ

Examples

GROUP:C AX:11 JOINTS

    Group C, Axis 11 is active, Joint mode, in COFF state.

GROUP:A AX:P XYZ

    Group A, Pitch axis is active, XYZ mode, in CON state.

TP Messages

The following is an alphabetical listing of the system messages which may appear on line 1 of the teach pendant during manual operation and program execution.

The explanation of each message includes the system's ID number for the message and the text of the comparable message which appears on the computer screen.

Refer to the *ACL Reference Guide for Controller-B* for complete descriptions of these messages and full instructions for correcting situations which cause the display of an error message.

ARITHMETIC OVFL
---

(302) Arithmetic overflow (or division by zero)

The result of a mathematical operation is out or range (or invalid).

AXIS DISABLED
---

(304) Axis disabled.

Servo control of the arm has been disabled (COFF).

BAD AXIS
---

(310) Invalid axis.

The axis is not in the group specified by the command, or the axis is not configured.

BAD GROUP
---

(321) MOVES/SPLINE not allowed for a single axis group.

The command (MOVES) cannot be executed on a single axis group.

BAD POINT *n*
---

(312) Invalid position coordinate values.

You attempted to use an invalid position.

BAD XYZ POSITION
---

(317) Invalid Cartesian position *pos*.

The position could not be recorded or reached because its XYZ coordinates are out of the XYZ envelope.

```
CONTROL DISABLED
```

(72) CONTROL DISABLED.

Motors have been disconnected from servo control.

```
CONTROL ENABLED
```

(73) CONTROL ENABLED.

Motors are now under servo control.

```
EMERGENCY
```

(148) To perform *action* - release emergency button.

The emergency switch has been pressed.

```
HOME FAIL
```

(51) *** HOME FAILURE AXIS *n*.

The homing procedure failed for the specified axis.

```
HOME NOT DONE
```

(301) Group/axis has not been homed.

You attempted to move the arm to a recorded positions, or to record a position, before homing was performed on the group or axis.

```
HOMING
```

(31) WAIT !! homing...

```
Homing complete
```

(32) Homing complete

```
IMPACT axis n
```

(53) *** IMPACT PROTECTION axis *n*

The controller has detected a position error which is too large. The system aborted all movements of that axis group, and disabled all axes of that group.

```
INCOMPATIBLE PNT
```

(315) Incompatible positions.

The position or positions you attempted to manipulate are dedicated to different axis control groups.

Index or data error

(36) Invalid index or value.

The command has an incorrect index value.

INDEX RANGE

(309) Index value - out of range.

The value of the index is out of range.

INVALID PROGRAM

(306) Invalid program.

Faulty syntax or logic in the program.

LIMIT AXIS *n*

(33) *** UPPER LIMIT AXIS *n*

(34) *** LOWER LIMIT AXIS *n*

Axis encoder has reached either its maximum or minimum allowed value.

MOTORS OFF

(201) (319) Motor power switch is off.

The motor power supply is switched off.

NO GRIPPER

(316) No gripper configuration.

The command cannot be executed because a gripper has not been configured.

No free space

(159) No free space to insert point

All positions in the vector have been allocated; no memory available.

No hard homing

(40) Cannot hard home axis *n*.

The specified axis has not been configured for hard homing.

NO POSITION

(303) No coordinate values for position *n*.

The position coordinates have not been recorded or set.

NOT ABS POINT

(322) Position must have Absolute Joint coordinates.

The command (MOVES) can only be executed on positions with absolute JOINT values.

NOT XYZ SPACE

(320) Robot is not in XYZ space.

The robot is at a position at which the XYZ coordinate system is not supported.

POINT LOOP

(311) Relative chain loops or exceeds 32 positions.

An error in the linking or recording of the positions in a chain of relative positions.

Point not assigned

(74) No coordinate values for position.

The position coordinates have not been recorded or set.

POINT NOT FOUND

(110) Position not found.

The position you attempted to use cannot be reached.

POINT TYPE *n*

(313) Incompatible position type *pos*.

You have attempted to use a position whose type is incompatible with the command.

Pnt not def or array

(145) Position is not defined or is not a vector.

The position has not been defined, or this is not the name of a position vector.

PROGRAMS ABORTED

(205) All programs aborted.

The TP Abort key has been pressed or the mounted TP has been removed from the fixture when in the Teach mode.

RANGE axis *n*

`(54) *** OUT OF RANGE axis `*`n`*`.`

An attempt was made to record a position (HERE, HEREC, etc.) while the robot arm was out of its working envelope.

THERMIC axis *n*

`(55) *** THERMIC OVERLOAD axis `*`n`*`.`

The system has detected a dangerous condition for that motor. The system aborted all movements of that axis group, and disabled all axes of that group.

TOO DEEP NESTING

`(305) Nesting too deep.`

Too many GOSUB subroutines are nested within one another.

TOO FAST axis *n.*

`(99) *** SPEED TOO FAST axis `*`n`*`.`

The controller has detected a movement which is too fast.

use HERE or HEREC

`(160) INSERT position is empty, use HERE or HEREC`

You attempted to insert a position which does not have any coordinate values.

Appendix A

Installation of Teach Pendant and Controller-B EPROM Upgrading Kit

✱ If you purchased and received the teach pendant together with the **Controller-B**, follow the installation instructions for the teach pendant in the ***Controller-B*** *User's Manual*.

✱ If the teach pendant was purchased separately, it was supplied with the "EPROM Upgrade Kit." This kit contains the following items:

- Set of four **ACL** EPROMs, version 2.28 or later
- **ATS** software diskette, version 1.85 or later
- Documentation

  ATS *for* ***Controller-B*** *Reference Guide*

  Teach Pendant for ***Controller-B*** *User's Manual*

To install, follow the installation/ upgrade instructions in this appendix. *You must perform, in sequence, all of the procedures.*

1 Backup Controller Parameters and Configuration

1. Turn on the computer and the controller.

    Activate **ATS** using your *existing* software. (*Do not yet use ATS 1.85.*)

    Activate the **ATS** Backup Manager menu. Perform two backup operations, making sure you use two different file names.

    - Select the options "Backup ALL" and "BACKUP to disk (F3)." to backup the entire contents of the controller to the **ATS** directory.
      Use the file name ALLBU, for example.
    - Select the options "Backup PROGRAMS" and "BACKUP to disk (F3)." to backup the programs, positions and variables in the controller to the **ATS** directory. Use the file name PROGBU, for example.

2. At the end of the manufacturing process, each robot undergoes an individual calibration procedure. The results of this procedure are assigned to a set of parameters which belong *specifically to each robot*.

    These parameters are included in a file named PARn.CBU in the **ATS** software diskette which was *originally supplied with the robot*.

    n indicates the type of robot; that is:

    - PAR9.CBU contains the parameters for **SCORBOT-ER IX**
    - PAR14.CBU contains the parameters for **SCORA-ER 14**
    - PARMK2.CBU contains the parameters for **PERFORMER-MK2**

    The **ATS** 1.85 diskette includes PARn.CBU files. But they are not competely suitable for use. To ensure the best peformance of your robot, you will need to transfer the calibration parameter values from the old CBU file to the new CBU file.

    From the **ATS** main screen, use the **ACL** command SHOW PAR to display the values of the following parameters. *Write down the values displayed.*

The command format is as follows:

```
SHOW PAR 101
SHOW PAR 102
SHOW PAR 103
SHOW PAR 104
SHOW PAR 105                    not required for SCORA-ER 14

SHOW PAR 121
SHOW PAR 122
SHOW PAR 123
SHOW PAR 124
SHOW PAR 125                    not required for SCORA-ER 14

SHOW PAR 1
SHOW PAR 2
SHOW PAR 3
SHOW PAR 4
SHOW PAR 5                      not required for SCORA-ER 14

SHOW PAR 301
SHOW PAR 302

SHOW PAR 308                    for TOOL command
SHOW PAR 309                    for TOOL command
SHOW PAR 310                    for TOOL command
```

Be sure you have an exact record of the values.

Refer to the *ACL for **Controller-B** Reference Guide* for complete descriptions of these parameters.

3. From the **ATS** main screen, enter the **ACL** command: `CONFIG ?`
    The controller's configuration will be displayed on your computer screen. Make a hard copy of the configuration.

4. Exit to DOS. Turn of the computer. Turn off the controller.
    You may now proceed to the hardware procedures.

2 Hardware Installation

Install the Teach Pendant Mounting Fixture

This special fixture is required for reasons of safety.

✱ *Install this fixture safely outside the working range of the robot and peripheral axes.*

The fixture has two magnetic strips which activate two magnetic switches on the teach pendant. When the teach pendant is mounted in this fixture, programs can be executed from the teach pendant; when the teach pendant is hand-held, program execution cannot be activated from the teach pendant.

The fixture for mounting the teach pendant is supplied with a set of screws for mounting.

Configure the Communication Card Jumper

Jumper JP3 on the controller's communication card, shown in the diagram below, must be open when the controller's **ACL** version is 2.28 or later; otherwise the teach pendant's Emergency button will not function.

✱ *Be sure the controller is switched off.*

1. Unscrew the Phillips screws which hold the cover of the controller. Lift off the cover and set it aside.

2. Locate the communication card (PC17600) behind the power supply.

   Remove the connector at J4 at the top of the communication card (1). This will permit you access to jumper JP3 (2).

3. Remove jumper JP3.

4. Reconnect the connector at J4.
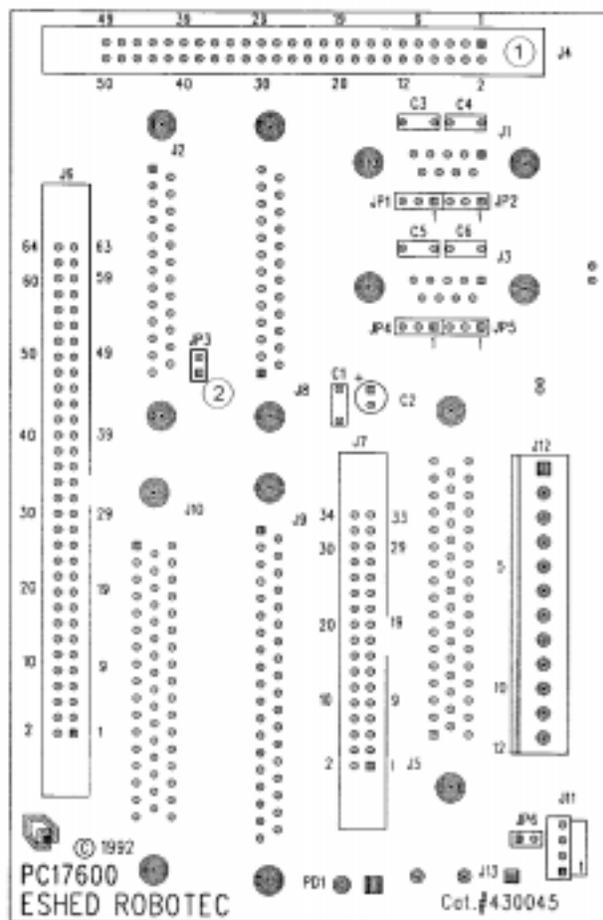
Communication Card PC17600

Replace the EPROMs

ACL is programmed onto a set of four EPROMs which are mounted on the controller's CPU board, indicated by (3) in the diagram below.

CPU Board
PC17050
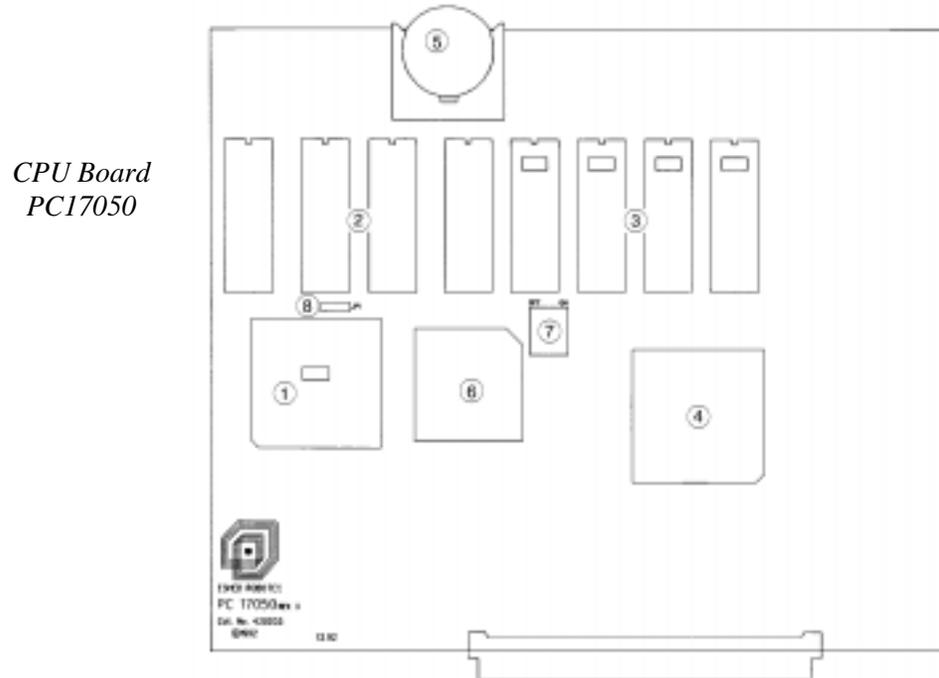
1. The battery must be removed before the EPROMs can be replaced.

    The round backup battery is mounted in a plastic housing at the top of the CPU card, indicated by (5) in the diagram above. Using a small screwdriver, pry the battery loose. Pull out the battery, and set it aside.

    Note that removing the battery from the CPU board erases the controller's battery-backed RAM.

2. Unscrew the screws which hold the CPU board inside the controller. Carefully lift out the CPU board.

3. Locate the four EPROMs mounted in U11, U12, U13 and U14 on the CPU board. Using an IC extracting tool, carefully remove these four EPROMs.

4. Carefully insert the four new EPROMs into the empty sockets of U11, U12, U13 and U14. Insert each EPROM by aligning the notch and the pins on the chip with the notch and the pin receptacles on th e socket. Gently push the chip into the socket until it is firmly seated, as shown in the diagram at right.
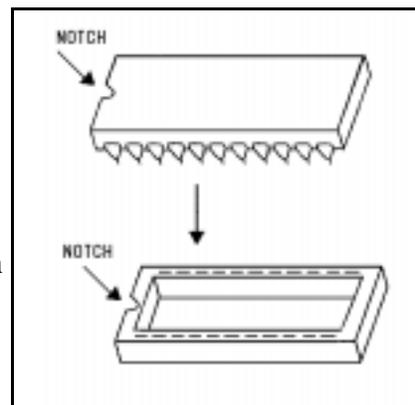
5. *Carefully* replace the CPU board into its slot on the main board. Make sure the connector pins and receptacles are aligned, then firmly but gently press the board into its slot.

6. Refasten the screws holding the CPU board to the main board.

7. Replace the battery. Slide it into the slot until it snaps into place.

8. Replace the controller cover, and refasten the screws.

9. Reconnect the power cables.

Connect the Teach Pendant (and Adapter Plug)

If you do not intend to connect the teach pendant, skip this section, and go to the following section, "Teach Pendant Not Connected."

✴ *Be sure the controller is switched off before you connect the teach pendant.*

The teach pendant is supplied together with a D25 adapter plug. This adapter enables communication between the teach pendant and the controller; it converts teach pendant serial data to parallel, and controller parallel data to serial.

1. Connect this adapter plug to the port marked Teach Pendant on the controller's rear panel, as indicated by the arrow in the diagram below.

2. Tighten the retaining screws.

3. Connect the connector on the teach pendant cable to the adapter plug.

Controller Rear Panel (Partial View)
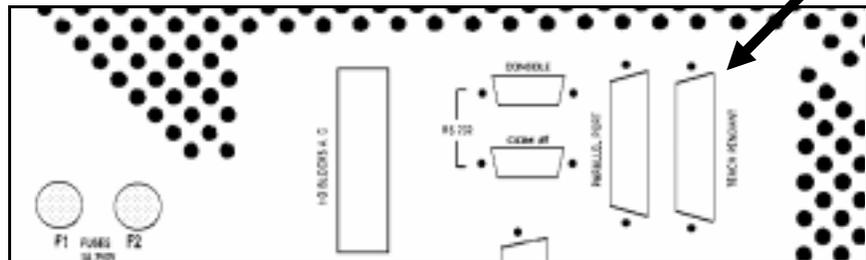
Teach Pendant Not Connected

✴ *When the **Controller-B** teach pendant is not connected to the controller (version 2.28 and later), the Emergency By-Pass Plug must be connected instead.*

This plug prevents the controller from activating EMERGENCY status when the teach pendant is absent.

1. Connect the by-pass plug to the controller's Teach Pendant port.

2. Tighten the retaining screws.

3 Software Installation

Install ATS 1.85 and Load Parameters

✳ *Make sure the teach pendant (or Emergency By-Pass Plug) is properly connected to the controller before you power on the system.*

1. Turn on the computer and the controller.

2. Before proceeding with the upgrade procedure, rename your current **ATS** directory; ATS_OLD, for example.

3. Install the **ATS** 1.85 software in a new **ATS** directory. (Copy all the files from the **ATS** 1.85 diskette to the directory.)

4. Activate **ATS**.

5. Configure the controller. Do *either* one of the following:

   · Press [Ctrl]+F1 for automatic controller configuration.

   · Use the **ACL** command `CONFIG`.
     When prompted, enter the values which were displayed when you entered the command `CONFIG ?` previously.

6. You will now update the parameters for your system with the values which you recorded earlier. *This is a critical step*, which you must perform exactly, as it will affect the performance of your robot.

   Use the **ACL** command `LET PAR`, to reset the parameter values.

   If you encounter a message for PRIVILEGE mode, you will have to enable the password-protected PRIVILEGE mode. (Refer to the *ACL Reference Guide for Controller-B* for instructions).

   The command format is as follows (where *val* is the value displayed by the `SHOW PAR` command which you used previously.

   ```
   LET PAR 101=val
   LET PAR 102=val
   LET PAR 103=val
   LET PAR 104=val
   LET PAR 105=val            not required for ER 14

   LET PAR 121=val
   LET PAR 122=val
   LET PAR 123=val
   LET PAR 124=val
   LET PAR 125=val            not required for ER 14

   LET PAR 1=val
   LET PAR 2=val
   LET PAR 3=val
   ```

```
      LET PAR 4=val
      LET PAR 5=val                      not required for ER 14

      LET PAR 301=val
      LET PAR 302=val

      LET PAR 308=val
      LET PAR 309=val
      LET PAR 310=val
```

7. Use the **ACL** command INIT CONTROL to reinitialize the controller with the new parameter values.

8. You will now record this parameters in the new PARn.CBU.

    Use the **ATS** Backup Manager and the option "Backup PARAMETERS" to save the parameters fromthe controller to the file PARn.CBU. Make sure the Backup directory is the new **ATS** directory.

9. If you want to reload the programs and positions you backed up earlier, use the **ATS** Backup Manager and the option "Restore PROGRAMS" to restore the file PROGBU. Note that this file will be found in the Backup directory ATS_OLD.

10. If you have restored programs, carefully check a restored application to see that it runs properly.

This completes the installation/upgrade procedure.

You may now use the Teach Pendant.