

## BEFORE READING THIS MANUAL...

This User's Manual is not enough to operate the CAC-V3000.

This manual mainly describes CAC-V3000's control commands. Handling and installing instructions are described in the Operating Instructions which is included with the CAC-V3000. It also defines the situations in which to do what when a malfunction occurs. Keep it with the **Compact Disc Auto Changer**.

If you have not been trained to operate the CAC-V3000, do not use it in service mode, which operates the mechanism. Otherwise, the disc or discs may be damaged. And even if you've been well trained, always keep the Operating Instructions by your side to operate the CAC-V3000 correctly.

## CAC-V3000

### User's Manual

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### Version 2.0

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#### ATTENTION:

1. Read the OPERATING INSTRUCTIONS first before you'll start to read this manual.
2. When you will transport the auto changer you MUST OBEY the instruction described in "1.2 Safety Informations".

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This user's manual is not enough to operate the CAC-V3000.

This manual mainly describes CAC-V3000's control commands. Handling and Installing precautions are described in the Operating Instruction which is included with the CAC-V3000. It also describes how to install discs and what to do when a malfunction occurs. Keep it with this manual and always be ready to reference them.

If you've never been trained to use service modes, do not use the service modes which operate the mechanism. Otherwise the mechanism or discs may be damaged. And even if you've been well trained, always keep the service manual by your side to operate CAC-V3000 correctly.

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## 1. Introduction

This manual is applicable to microcomputer versions and model names beginning from those given below.

- System microcomputer version : Ver6.58\_1
- CD player microcomputer model name : P151206

For details on checking the version number of the system microcomputer, see Section 1.3.2, "Service Mode". For details on checking the model number of the player microcomputer, see the command heading "CDP MODEL NAME REQUEST" in Section 5.2, "Request Commands".

This manual describes commands, operational modes, setting the DIP switches, control protocol and how to use the interface connector. Limitations on control and technical notes for designing application can be found at the end of this manual.

Handling and Installing precautions are described in the Operating Instruction which is included with the CAC-V3000. It also describes how to install discs and what to do when a malfunction occurs. Keep it with this manual and always be ready to reference them.

### 1.1. CAC-V3000 Overview

- Space saving design

Capable of storing up to 300 12cm compact discs in a very compact space, even controlling multiple CAC-V3000's takes up little space.

- Built-in RS-232C and RS-422A serial interfaces

The CAC-V3000 can be controlled by an external computer or controller. A data transmission speed of 4800 bps or 9600 bps for transferring control commands may be selected.

- Two built-in CD players each with independent D/A converters and output terminals

The CAC-V3000 is equipped with two independent CD players. By assigning different addresses to each CD player, each player may be controlled completely separately for simultaneous performances or alternating performances depending on application requirements. Since both CD players are equipped with their own D/A converters, they provide the following audio output options.

- Two independent analog outputs, one from each player.
- Mixed output combining the analog output of both players.
- Two independent digital outputs, one from each player.

- Digital attenuator built into each CD player

Since each built-in CD player is equipped with its own digital attenuator, the following effects can be realized independently for each CD player. Knowledgeable use of the attenuator even allows smoothing of recorded levels and cross fade effects.

- Volume adjustments using the digital attenuator
- Fade in and fade out

Note that the digital attenuator works for the D/A converter. Therefore the above effects are only possible on analog outputs.

- Convenient Auto Cue function is available

Auto Cue search is a convenient cueing function to realize a rapid start skipping the blank portion after the beginning of a track. And Auto Cue Stop function detects the blank portion before the end of a track and stop playback.

Auto Cue Search function is only available through analog outputs because the digital attenuator is used to mute playback during detection.

The CAC-V3000 comes with many commands to take full advantage of these many features. However, the extent to which these features are realized is fully dependent upon the application, so use commands intelligently for optimal control. For examples of simple applications using these commands, see Section 7. "Technical Notes".

## 1.2. Safety Informations

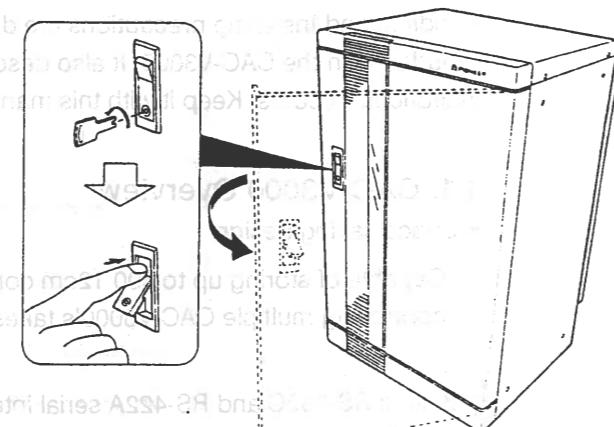
### 1.2.1. Before Turning On the Power

The inside mechanism of this set is secured by 5 transport screws to avoid trouble during shipping.

You must loosen and remove all screws before you turn it on. Otherwise the mechanism may be damaged.

To unlock the door, insert the key into the keyhole and turn it 45 degrees counterclockwise. (see Fig. 1)

For safety reasons, the inside mechanism of this set dose not work when the door is open. FIG-1



### 1.2.2. How to Remove Transport Screws

#### Screws

Please loose the 5 screws and remove them by hand and a big-sized cross blade screwdriver. (see Fig. 2)

Removed transport screws must be kept for the future. Please store them in the special compartment located inside the set, identified by an asterisk in Fig. 2.

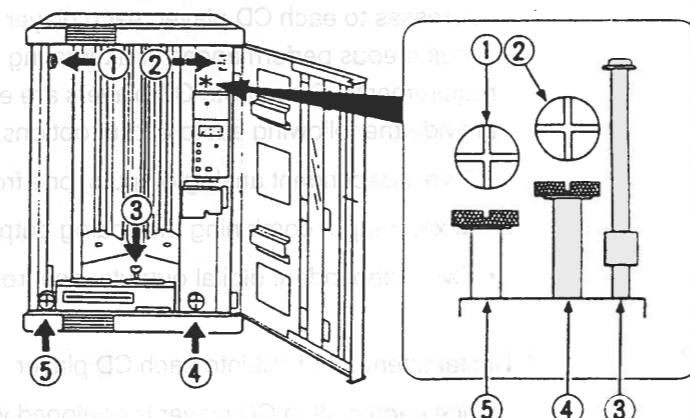


FIG-2

### 1.2.3. Before Transporting

When transporting this set, first remove all discs, and then firmly secure each part with the transport screws.

- Open the door.
- If the inside mechanism is not at the bottom (shipping position), please move it to the bottom by the means described below.

\* Enter the disc exchange mode.

Set the DIP switches as in fig. 3.

Close the door.

Turn on this set.

\* After the initialization is completed, the indicator flickers rapidly.

Open the door.

\* Press S1, S2, S3 and S4 one by one.

DISC ADDRESS [000] must be displayed and the indicator flickers rapidly.

\* Close the door.

The mechanism goes down to the bottom.

The indicator flickers slowly.

\* After the movement is completed, the indicator flickers rapidly again.

\* Please open the door.

\* Power may be switched off.

\* Set all DIP switches off as in Fig. 4.

3) Remove all discs by hand and insert them into the disc case.

4) Secure the 5 screws which you've removed and kept. (see Fig. 2)

5) Close the door and lock it correctly.

6) Remove power supply cord and connecting cables.

7) Move the set slowly and carefully. When you transport it, re-packing the set is necessary.

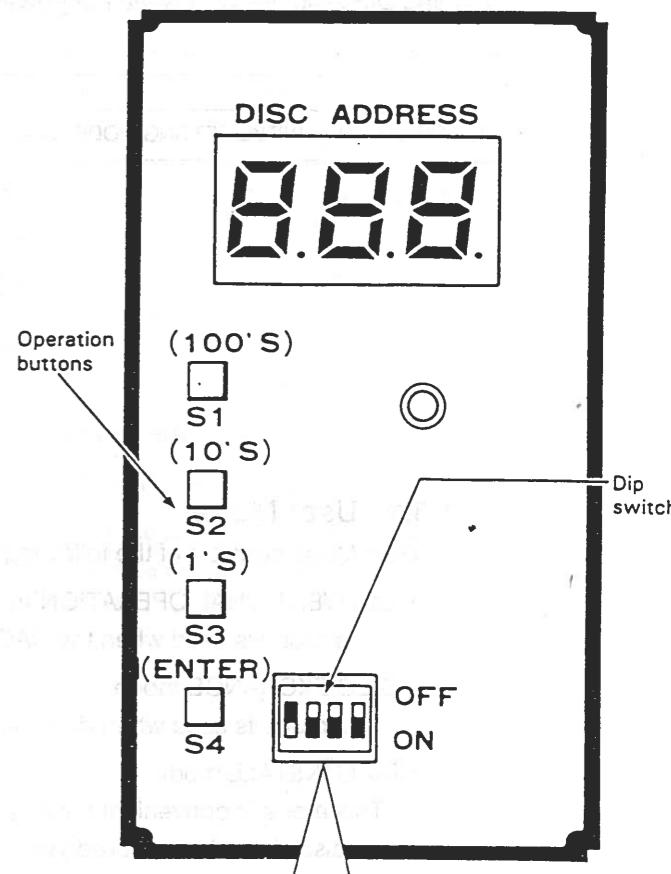


FIG-3

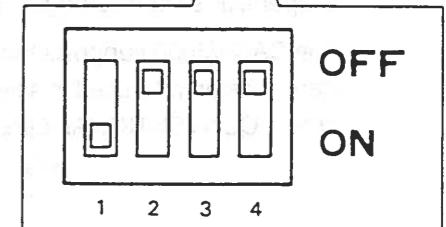
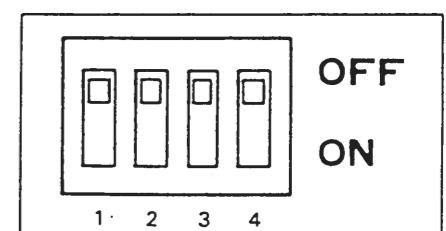
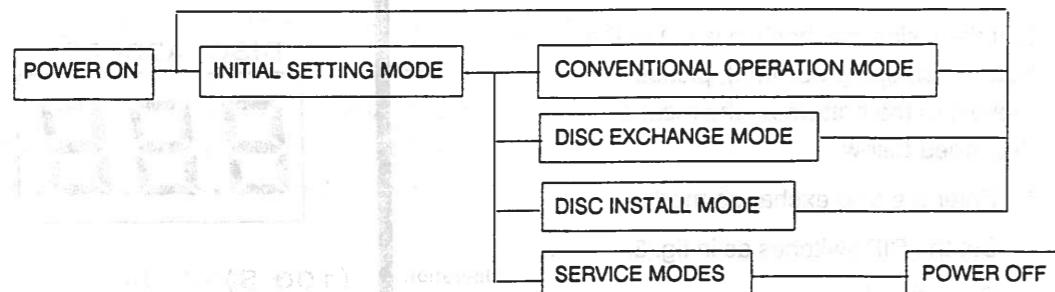


FIG-4



### 1.3. Operational Modes

Operational modes are divided into 2-groups: User Mode and Service Mode. These operational modes can be selected based on the settings of the operational buttons (S1 - S4) and DIP switches (S5) when the power is turned on.



#### 1.3.1. User Mode

User Mode consists of the following three modes.

- CONVENTIONAL OPERATION mode

This mode is used when the CAC-V3000 is being controlled by a host computer.

- DISC EXCHANGE mode

This mode is used when discs stored in the CAC-V3000 are being replaced by new discs.

- DISC INSTALL mode

This mode is convenient for when the CAC-V3000 is being installed for the first time and no discs have been stored yet.

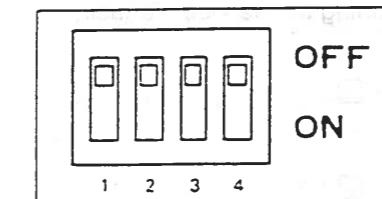
User modes are selected by DIP switch settings. To select, open the door and make the proper DIP switch settings. These settings will be activated when the door is closed.

The CAC-V3000 supports two data transmission rates: 4800 bps and 9600 bps. The data transmission rate used is selected based on the DIP switch settings at the time the unit enters CONVENTIONAL OPERATION mode.

Entering CONVENTIONAL OPERATION mode with either data transmission rate selected is shown below.

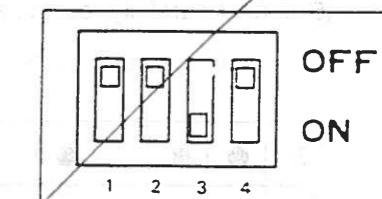
#### Selecting 4800-bps Data Transmission Rate

Open the door, set all DIP switches to OFF, and close the door to restart the system from INITIAL SETTING mode.



#### Selecting 9600-bps Data Transmission Rate

Open the door, set only DIP switch 3 to ON, and close the door to restart the system from INITIAL SETTING mode.

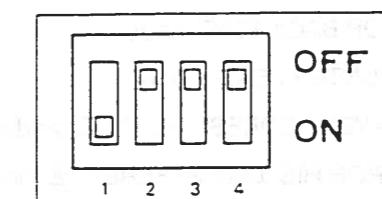


*geld nicht in alle Fächer!*

Entering DISC EXCHANGE and DISC INSTALL modes is shown below.

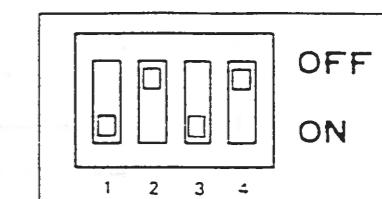
#### DISC EXCHANGE modes

Open the door, set only DIP switch 1 to ON, and close the door to restart the system from INITIAL SETTING mode.



#### DISC INSTALL mode

Open the door, set DIP switches 1 and 3 to ON, and close the door to restart the system from INITIAL SETTING mode.



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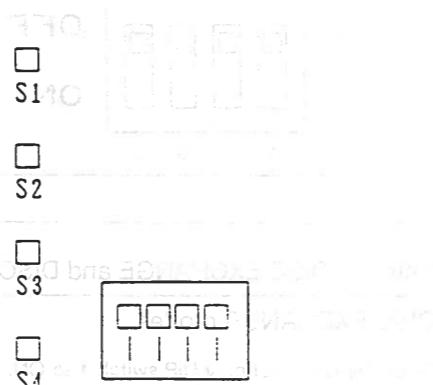
#### 1.3.2. Service Modes

Service Mode consists of the following eight modes:

- 1) SOFTWARE VERSION REFERENCE mode
- 2) LOOP BACK TEST mode
- 3) COUNTER READ mode
- 4) PLAYER ADDRESS SETTING mode
- 5) ERROR HISTORY REFERENCE mode
- 6) MANUAL mode
- 7) SUPER MANUAL mode
- 8) SCREENING mode

Except for SCREENING mode, all Service Modes can be entered by turning on power while pressing the proper operational buttons. The combination of buttons pressed determines which mode is entered. To change between modes, it is necessary to turn the power off and then on again while pressing the proper combination of buttons. For details on each of these Service Modes, please refer to the Service Manual. Note that modes causing the operation of mechanisms (MANUAL, SUPER MANUAL and SCREENING modes) can result in damage to the system if used improperly. Only enter these modes (5-8) after carefully reading and fully understanding the Service Manual.

|    |   |   |   |   |   |   |   |   |
|----|---|---|---|---|---|---|---|---|
| S1 | ● | ● |   |   | ● |   |   | ● |
| S2 | ● | ● |   |   | ● | ● |   |   |
| S3 | ● |   | ● | ● |   |   | ● |   |
| S4 | ● | ● | ● | ● | ● |   |   | ● |



- 1) SOFTWARE VERSION REFERENCE mode
- 2) LOOP BACK TEST mode
- 3) COUNTER READ mode
- 4) PLAYER ADDRESS SETTING mode
- 5) ERROR HISTORY REFERENCE mode
- \*6) MANUAL mode
- \*7) SUPER MANUAL mode
- \*8) SCREENING mode

\*Note: Use these modes only after carefully reading the service manual.

If you've never been trained to use service modes, do not use the service modes which operate the mechanism. Otherwise the mechanism or discs may be damaged. And even if you've been well trained, always keep the service manual by your side to operate CAC-V3000 correctly.

### 1.3.3. The Indicator

The indicator has important meanings. Always pay careful attention to indicator readings, as they represent the same meaning in almost every mode.

- Rapid blink pattern

If the door is open, this blink pattern indicates the door should be closed. For example, when entering MANUAL mode mechanisms must be fully initialized. If initialization is not complete, this blink pattern requests that the door be closed. In this case, the system will enter CONVENTIONAL OPERATION mode once initialization is complete, so it will be necessary to start over from power off. Also, since mechanism operations needed for disc replacement in DISC EXCHANGE mode can only be performed with the door closed, this blink pattern will request that the door be closed.

If the door is closed, this blink pattern indicates the door should be open. When one stage of operations in DISC EXCHANGE mode is completed and the next stage becomes necessary, this blink pattern will request that the door be opened. Also, if an error occurs, this blink pattern requests that the door be opened for visual inspection of the error message. In the case of an error, this rapid blink pattern will occur even if the door is already open.

- Slow blink pattern

This blink pattern indicates that mechanisms are currently active. This warns against accidentally opening the door while mechanisms are in motion. This blink pattern also occurs during INITIAL SETTING mode.

- OFF

This indicates that the door is closed (in User Mode).

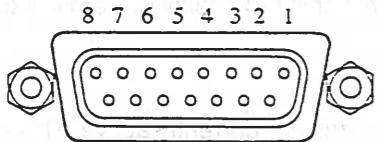
- ON

This indicates that the door is open (in User Mode). If service mode is entered at this point, the indicator will stay ON even if the door is closed later, making it easy to determine that the door was accidentally closed while still in Service Mode.

## 2. Connections

### 2.1. RS-232C Serial Interface

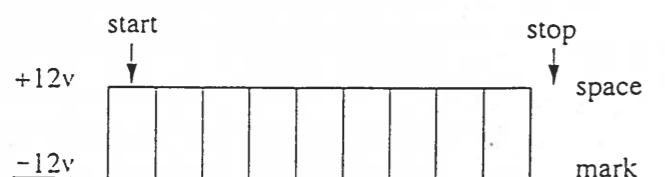
A female 15-pin Dsub connector is used for the interface.



Notes: 15 14 13 12 11 10 9

1. DTR can be used in cases where the connected host computer will not operate unless CTS input is processed by hardware. DTR is a +12V signal pulled up by 1 kΩ.

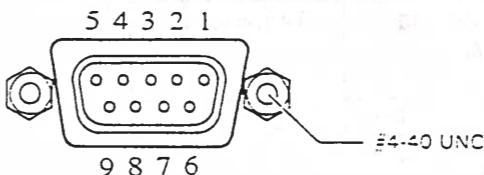
2. The signal levels of TX and RX are as shown in the figure below.



| Pin No. | Pin Name | I/O    |
|---------|----------|--------|
| 1       | GND(FG)  |        |
| 2       | TX       | Output |
| 3       | RX       | Input  |
| 4       | DTR      | Output |
| 5       |          |        |
| 6       |          |        |
| 7       |          |        |
| 8       |          |        |
| 9       |          |        |
| 10      |          |        |
| 11      | GND(FG)  |        |
| 12      |          |        |
| 13      |          |        |
| 14      |          |        |
| 15      | GND(FG)  |        |

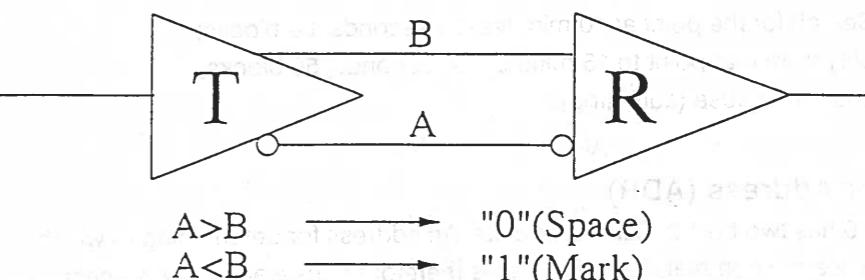
### 2.2. RS-422A Serial Interface

A female 9-pin Dsub connector is used for the interface.



| Pin No. | Pin Name | I/O    |
|---------|----------|--------|
| 1       | GND(FG)  |        |
| 2       | TXD(A)   | Output |
| 3       | RXD(A)   | Input  |
| 4       | GND(SG)  |        |
| 5       |          |        |
| 6       |          |        |
| 7       | TXD(B)   | Output |
| 8       | RXD(B)   | Input  |
| 9       | GND(FG)  |        |

Note: Signal lines A and B are defined as shown in the figure below.



$$\begin{aligned} A > B &\rightarrow "0" \text{ (Space)} \\ A < B &\rightarrow "1" \text{ (Mark)} \end{aligned}$$

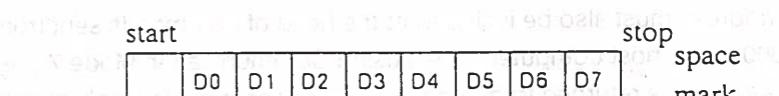
## 3. Communication Protocol

### 3.1. Communication Signals

| Synchronization   | Asynchronous  |
|-------------------|---|
| Transmission Rate | 4800 bps or 9600 bps  |
| Transmission Code | 1 start bit;<br>8-bit ASCII data;<br>1 stop bit;<br>no parity |

The transmission rate setting is made using dip switches on the auto changer. For a description of how to make this setting, see "1.3.1 User Mode" or Instruction Manual.

Logical 0



Logical 1

1 start bit + 8 data bits + 1 stop bit

### 3.2. Command Format

BASIC COMMAND FORMAT:

| Player Address (ADR) | Argument (ARG) | Command (CMD) | Terminator |
|----------------------|----------------|---------------|------------|
| 1PS                  | 12             | SE            | <c/r>      |

(Search for track 12 of the disc in Player 1.)

COMPOUND FORMAT (COMMAND LINE):

[ADR] + (ARG)CMD + (ARG)CMD + .... + (ARG)CMD + <c/r>

Command Line (up to 20 characters)

EXAMPLE: 1 P S B K 1 0 0 0 0 0 S E 1 5 3 0 5 0 S M P L < c / r >

Command Line (up to 20 characters)

Search for the point at 10 minutes, 00 seconds, 00 blocks;  
play from that point to 15 minutes, 30 seconds, 50 blocks;  
and then pause (auto stop).

#### 3.2.1. Player Address (ADR)

The CAC-V3000 has two built-in CD player units. An address for determining to which player communication command are directed is therefore necessary. It is also necessary to specify specific players in systems including more than one CAC-V3000.

Addresses can therefore be assigned to each player unit. The host computer can then access any given player unit by specifying the proper address. Other optional equipment can also be controlled by the host computer by assigning unique addresses for each. Addresses must have a value in the range 1 thru 99.

The player addresses of CAC-V3000's shipped from the factory are '1' and '2'. The player to the left of the door is Player 1, while that to the right is Player 2. When specifying one of these players use the form [1PS] or [2PS].

Follow the guidelines given below to ensure proper operation.

- The player address must not be omitted. The first three bytes, or four bytes, of a command line (described later) must contain a player address.
- Player addresses may not be placed in the middle of a command line. A single command line must be made up of commands sent to a single player.
- When using commands directed at the changer mechanism, such as [?E], a player address must be used as a dummy because the changer mechanism has no address.
- A player address must also be included at the head of commands sent from the CAC-V3000 to the host computer. When using Communication Mode 7 (described later), a response is returned from the player just accessed. The only exception is that the left player address will be used by default if a communication error occurs and it is unknown to which player the command resulting in an error was directed.

#### 3.2.2. Arguments (ARG)

The argument is used to include numeric values needed for a particular command. Such values are expressed in decimal using ASCII digit codes. Note that the argument comes before the command. An error (E06) results if no argument has been given for a command that requires one. There are also commands that allow the argument field to be used for specifying options. For commands such as these, the presence or absence of an option merely changes the way the command executes. For details, see "5. Description of Commands" later in this manual.

The following type of information can be specified in the argument field.

**ADDRESS:** Represents a block number, time code, track number or index number. An address set flag is used to indicate which of these is being specified. Note that values larger than the maximum possible cannot be evaluated properly.

**DISC:** Represents a disc number.

**PARAMETER:** Represents some other control parameter.

|              |  |
|--------------|--|
| Block Number | N1 N2 N3 N4 N5 N6<br>(N1N2 min. N3N4 sec. N5N6 blocks)<br>MIN: 000100; MAX: 995974 |
| Time Code    | N1 N2 N3 N4<br>(N1N2 min. N3N4 sec.)<br>MIN: 0001; MAX: 9959                       |
| Track Number | N1 N2<br>MIN: 01; MAX: 99  |
| Index Number | N1 N2 N3 N4<br>(N1 N2 Track N3 N4 Index)<br>MIN: 0100; MAX: 9999                   |
| Disc Number  | N1 M2 N3<br>MIN: 001; MAX: 300   |
| Parameter    | Number of digits allowed depends on the associated command                         |

#### 3.2.3. Command List

Commands are represented in the command field by two ASCII codes. No case distinctions are made, but upper case is normally used by convention.

|          |    |                              |
|----------|----|------------------------------|
| Examples | PL | : PLAY                       |
|          | SE | : SEARCH                     |
|          | ?P | : PLAYER ACTIVE MODE REQUEST |

Commands can be divided into two types: execution commands and request commands.

◆ Execution Commands:

Commands used to control a player. Such commands either cause operations or change register values.

◆ Request Commands:

Commands used to request player status.

### 3.2.4. Terminator <c/r>

Each command, including associated ADR and ARG field, is terminated by a <c/r> (carriage return) code (0Dh). The CAC-V3000 unconditionally accepts all ASCII codes into a command buffer until a <c/r> is encountered. Command execution begins once the <c/r> is received.

A group of two or more successive commands is called a "command line". Command line is terminated by a single <c/r> occurring after the last command. No intermediate terminators are necessary. Limitations on the commands that may be used together in command lines are given in "7.3. Command Line Limitations".

The following tables list the execution and request commands available.

|    | Execution Commands | Arg. |    |
|----|--------------------|------|----|
| 1  | PLAYER SELECT      | addr | PS |
| 2  | DISC SELECT        | addr | ZS |
| 3  | DISC RETURN        |      | ZR |
| 4  | START              |      | SA |
| 5  | SEARCH             | addr | SE |
| 6  | STOP MARKER        | addr | SM |
| 7  | PLAY               | addr | PL |
| 8  | REJECT             |      | RJ |
| 9  | PAUSE              | addr | PA |
| 10 | SCAN FORWARD       |      | NF |
| 11 | SCAN REVERSE       |      | NR |
| 12 | BLOCK              |      | BK |
| 13 | TIME               |      | TM |
| 14 | TRACK              |      | TR |
| 15 | INDEX              |      | IX |
| 16 | CLEAR              |      | CL |
| 17 | LEADOUT SYMBOL     |      | LO |
| 18 | COMMUNICATION MODE | para | CM |
| 19 | SPEED              | para | SP |
| 20 | AUTO CUE SEARCH    | addr | QS |
| 21 | AUTO CUE STOP      | para | QT |
| 22 | CUE LEVEL SET      | para | QL |
| 23 | LIMIT TIME SET     | para | LT |
| 24 | VOLUME             | para | VL |
| 25 | DURATION           | para | DU |
| 26 | FADE IN/OUT        | para | FD |
| 27 | CHANGER RESET      |      | !! |

|    | Request Commands           |    |
|----|----------------------------|----|
| 1  | JOB STATUS REQUEST         | ?J |
| 2  | PLAYER ACTIVE MODE REQUEST | ?P |
| 3  | DISC NUMBER REQUEST        | ?Z |
| 4  | MECHANISM ERROR REQUEST    | ?E |
| 5  | BLOCK NUMBER REQUEST       | ?B |
| 6  | TIME CODE REQUEST          | ?T |
| 7  | TRACK NUMBER REQUEST       | ?R |
| 8  | INDEX NUMBER REQUEST       | ?I |
| 9  | TOC INFORMATION REQUEST    | ?Q |
| 10 | CATALOG NUMBER REQUEST     | ?G |
| 11 | CDP MODEL NAME REQUEST     | ?X |
| 12 | COMMUNICATION MODE REQUEST | ?M |
| 13 | PLAY TIME REQUEST          | ?A |
| 14 | DISC STATUS REQUEST        | ?K |

addr: A player address, disc address, track address, etc.

para: A parameter.

### 3.3. Status Report and Communication Modes

When a command is sent from the host computer to the CAC-V3000, the CAC-V3000 returns a status report. Although there are several communication modes described in the Pioneer Standard Protocol, each of which defines a different timing for returning status reports, the CAC-V3000 only supports Communication Mode 7.

The main feature of Communication Mode 7 is that polling may be made simpler for applications that must control more than one player simultaneously. Communication Mode 7 protocol will be described below.

#### 3.3.1. Communication Mode 7

Under Communication Mode 7 protocol, a confirmational request command is sent after each execution command. Since the host computer is always the master under Communication Mode 7, this mode is suitable for the simultaneous control of more than one player.

First, the host computer sends an execution command and the player returns a status indicating the command was received. Next, the computer sends a request command and the player returns the requested status. The host computer then keeps sending the same request command until the desired status is returned.

Communication Mode 7 does not automatically return execution completion status or error messages. Only two types of returns are made automatically: "R", to indicate that a command was received, and "E00", to indicate that a communication error occurred. Information such as whether a command has completed execution and which specific errors may have been encountered must be checked for using the request command "?J".

An example illustrating Communication Mode 7 protocol is given below.

| Host Computer   |                | Player  |
|---|----------------|---|
| "Search for track 3"  | → → →<br>← ← ← | "Command received"<br>(search operation begins) |
| "Is search complete?"<br>(Repeated until status goes to pause.) | → → →<br>← ← ← | Status returned                                 |
| "Play until track 4"  | → → →<br>← ← ← | "Command received"<br>(play operation begins)   |
| "Is play complete?"<br>(Repeated until status goes to pause.)   | → → →<br>← ← ← | Status returned                                 |

Status can be classified as follows.

#### Status Reporting

- Receive completion Message
- Error Messages
- Requested Status

### Receive Completion Message

The receive completion message is indicated by an "R". This message is returned as soon as the terminator for the execution command is encountered while entering it into the receive buffer.

FORMAT: R<c/r>

A status, but no receive completion message, is returned in response to request commands.

### Error Messages

Error messages are indicated by an "E" followed by a two digits error number.

FORMAT: EN1N2<c/r>

DESCRIPTION: Error messages can be confirmed using the request command "?J". Information concerning the last error that occurred is kept in a buffer and returned in response to the "?J" command. Error code [E00] is returned in response to execution commands only when a communication error occurs. For a table of error messages, see "6. Error Messages".

### Requested Status

A status is returned in response to each request command as a character strings terminated by a <c/r> code.

EXAMPLE: [ADR] +?B<c/r> [ADR] +0003 [ADR] +000200<c/r>

Request commands are always accepted regardless of timing, with the appropriate status returned immediately.

There are several commands available that request status. Those which listed below are the principal ones.

- ?P Requests active mode of the player.
- ?B Requests the current block number.
- ?T Requests the current time code (relative time).
- ?A Requests the current time code (absolute time).
- ?R Requests the current track number.
- ?I Requests the current index number.
- ?Z Requests the current disc number.
- ?E Requests the mechanical error code of the auto changer.
- ?J Requests completion status of the job

### 3.3.2. Command Line

A group of two or more successive commands (including the ARG fields) is called a "command line".

EXAMPLE: 1PS 3SE 4PL<c/r>: For Player 1, search for Track 3 and play to Track 4.

Command lines are handled as follows.

- 1) A command line is at most 20 characters long. The player address is not counted in the length of a command line.
- 2) A command line must be terminated by a <c/r> code (0Dh).
- 3) After the terminator is reached, the command line is evaluated and executed one command at a time beginning from the first command.
- 4) (LINE FEED) code (0Ah) and SPACE code (20h) encountered within a command line are ignored, and <c/r> codes are not counted in the length of a command line.
- 5) If an error occurs, no further commands are executed.
- 6) If a new command or command line is received before execution is complete, the contents of remaining commands are cleared and not executed. This feature may be utilized to clear as yet unexecuted commands by merely sending a <c/r> code.

Note: Always use request commands singly. For details, see "7.3 Command Line Limitations".

## 4. Active Mode of the Player

Player operation can be found based on the transitions of its active mode. Sending and executing a command results in a change in the internal active mode of the player.

Recognizing player operations by mode makes it easier to understand the effects of commands that have been sent.

There are seven main active modes: DISC UNSET, LOAD, UNLOAD, PARK, SET UP, REJECT and RANDOM ACCESS. The set also enters DOOR OPEN mode when its door is opened, but this is not an active mode.

DISC UNSET mode is a status before loading a disc in the player.

Use DISC SET command to pick up a target disc among maximum 300 discs and to carry and load it. Passing LOAD mode, it reaches to PARK mode.

Use START command to start rotating a disc. SETUP mode begins at that time.

When the player is ready to play, it is called RANDOM ACCESS mode.

RANDOM ACCESS mode consists of PLAY, SCAN, PAUSE and SEARCH mode.

Use REJECT command to stop a playback and a rotation of a disc.

REJECT mode begins at that time.

Use DISC RETURN command to return a disc to its original storage location.

Passing UNLOAD mode, it reaches to DISC UNSET mode.

For typical performances, operational mode transitions of the player are as follows. The host can poll the active mode of the player using the [?P] command.

| STATUS             | ACTIVE MODE   | DESCRIPTION   |
|--------------------|---------------|---|
| Before Performance | DISC UNSET    | No disc is carrying to the player                       |
|                    | LOAD          | Target disc is loaded in the player                     |
|                    | PARK          | Disk is loaded, but is still on the player              |
|                    | SET UP        | Disc has started rotating and TOC data is being read    |
|                    | RANDOM ACCESS | PLAY, SCAN, PAUSE and SEARCH operations enabled         |
| After Performance  | REJECT        | Audio playback is suspended and disc rotation stopped   |
|                    | PARK          | Disk is still in the player                             |
|                    | UNLOAD        | Disc is being returned to its original storage location |
|                    | DISC UNSET    | No disc is loaded in the player                         |

## 5. Description of Commands

### 5.1. Execution Commands

This section describes commands supported by the CAC-V3000.

#### PLAYER SELECT

**FUNCTION:** Specifies the player of the auto changer to which commands are directed.

**FORMAT:** [ARG] + PS

**DESCRIPTION:** This command specifies the address of a player within the CAC-V3000. This command causes the internal receive buffer to be switched so that subsequent commands are taken as directed at the player specified. This same address is also used in responses from the auto changer to indicate the player which a return concerns.

[ARG] may be one or two digits, representing any value from 1 thru 99.

**NOTE:** The PLAYER SELECT command can only be used as the first command on the command line. An error (E04) results if it is used at any other location in the command line.

Although no error results, the lone use of a PLAYER SELECT command is meaningless.

\* [ADR], that are described in the FORMAT field of other commands, means the Player Select command.

**DISC SELECT**

**FUNCTION:** Sets the disc matching the specified disc number to the specified player.

**FORMAT:** [ADR] + [DISC] + ZS

**DESCRIPTION:** This command is executable in all modes other than DOOR OPEN mode. For example, if the player is in RANDOM ACCESS mode, playback will immediately stop when this command is received, the disc will stop rotating, the player will enter PARK mode and the current disc will be unloaded and returned to the rack. (I.e., the RJ and ZR commands will be executed automatically.) The target disc, specified by [DISC], will then be loaded into the player specified by [ADR] and that player will enter PARK mode. Job status will change from [B] to [R] at this point. If, however, the disc currently playing and the player in which it is playing are specified, the disc will be stopped but not returned to the rack. [R] will be returned as the job status in this case.

**EXECUTION:** RANDOM ACCESS mode

|            |         |             |
|------------|---------|-------------|
| 1PS 288 ZS | 1PS R   | : receive   |
| 1PS ?J     | 1PS B   | : busy      |
| 1PS ?P     | 1PS P03 | : REJECT    |
| 1PS ?P     | 1PS P01 | : PARK      |
| 1PS ?P     | 1PS P22 | : UNLOADING |
| :          | :       |             |
| 1PS ?P     | 1PS P20 | : UNSET     |
| 1PS ?P     | 1PS P21 | : LOADING   |
| :          | :       |             |
| 1PS ?P     | 1PS P01 | : PARK mode |
| 1PS ?J     | 1PS R   | : complete  |

**PARK mode**

**ERROR:** If the specified disc does not exist, the set will return to UNSET mode from LOADING mode. In this case, the error message "E92" will be returned in response to the ?J command.

**DISC RETURN**

**FUNCTION:** Returns the disc in the specified player to the rack.

**FORMAT:** [ADR] + ZR

**DESCRIPTION:** This command is executable in all modes other than DOOR OPEN mode. For example, if the player is in RANDOM ACCESS mode, playback will immediately stop when this command is received, the disc will stop rotating, the player will enter PARK mode and the disc will be unloaded and returned to its storage location. Job status will change from [B] to [R] at this point.

**EXECUTION:**

RANDOM ACCESS mode

|        |         |             |
|--------|---------|-------------|
| 1PS ZR | 1PS R   | : receive   |
| 1PS ?J | 1PS B   | : busy      |
| 1PS ?P | 1PS P03 | : REJECT    |
| 1PS ?P | 1PS P01 | : PARK      |
| 1PS ?P | 1PS P22 | : UNLOADING |
| :      | :       |             |
| 1PS ?P | 1PS P20 | : UNSET     |
| 1PS ?P | 1PS P21 | : LOADING   |
| :      | :       |             |
| 1PS ?P | 1PS P01 | : PARK mode |
| 1PS ?J | 1PS R   | : complete  |

**DISC UNSET mode**

**NOTE:** The disc in the specified player will be returned to the rack unconditionally when the ZR command is used. If the next track desired is on the same disc, that track can be more efficiently selected using the ZS command alone without using the ZR command.

**START**

**FUNCTION:** Starts the rotation of the disc in the specified player.

**FORMAT:** [ADR] + SA

**DESCRIPTION:** When this command is received in PARK or REJECT mode, the player will enter SET UP mode and the disc will be made to start rotating. Once the TOC has been read and the player is ready for playback, the player will pause at the beginning of the first track.

**EXECUTION:**

PARK mode

|        |         |            |
|--------|---------|------------|
| 1PS SA | 1PS R   |            |
| 1PS ?J | 1PS B   |            |
| 1PS ?P | 1PS P02 | : SET UP   |
| :      | :       |            |
| 1PS ?P | 1PS P06 | : PAUSE    |
| 1PS ?J | 1PS R   | : complete |

**PAUSE mode**

**SEARCH**

**FUNCTION:** Searches for the specified address of the disc in the specified player.

**FORMAT:** [ADR] + [address] + SE

**DESCRIPTION:** The specified address is written into the search address register in accordance with the address specification flag (this flag specifies the type of addressing being used). When the search begins, the search address is compared with the advancing current address and the optical pickup is moved so that the current address is that immediately before the search address. When the search is complete, the player enters PAUSE mode. Job status is [R] at this point.

**EXECUTION:** PLAY mode Address Specification Flag = Block

|              |                             |
|--------------|-----------------------------|
| 1PS 002345SE | 1PS R                       |
| 1PS ?J       | 1PS R : complete            |
| 1PS ?B       | 1PS 002345 : block = 002345 |
| 1PS ?P       | 1PS P06 : PAUSE             |

PAUSE mode

|            |                     |
|------------|---------------------|
| 1PS TR05SE | 1PS R AU D00        |
| 1PS ?J     | 1PS R : complete    |
| 1PS ?R     | 1PS 05 : track = 05 |
| 1PS ?P     | 1PS P06 : PAUSE     |

PAUSE mode Address Specification Flag = Track

**STOP MARKER**

**FUNCTION:**

**FORMAT:**

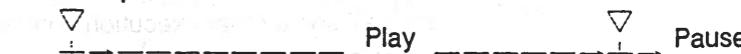
**DESCRIPTION:**

Sets a stop marker at the specified address of the disc in the specified player.

[ADR] + [address] + SM

The specified address is written into the mark address register in accordance with the address specification flag (this flag specifies the type of addressing being used). Job status is [R]. If "PL" is then used to play the disc, the player will enter PAUSE mode when it reaches this mark address. Block, track or index number requests, or even player active mode requests, can be used to find whether or not this mark address has been reached. If the "CL" or "RJ" command is received before reaching this address, the register will be forcibly cleared. Although this command is functionally the same as the auto stop operation of the PLAY command, it differs in the timing that execution status is set. With auto stop, execution status [R] is not set until the specified mark address is reached, whereas with this command execution status [R] is set once the mark address is written into the stop marker address register. The STOP MARKER command must be used in cases where it is necessary to use another execution command before reaching the mark address. If the auto stop feature of the PLAY command is used in such cases, the mark address specified will be irrecoverably lost.

Auto stop set here.  Mark Address

 Play  Pause

Execution Status = [B]

Execution Status = [R]

Stop marker set here.  Mark Address

 Play  Pause

Execution Status = [R]

**EXECUTION:**

PAUSE mode

|                  |                  |
|------------------|------------------|
| 1PS 0VL          | 1PS R            |
| 1PS BK012345SMPL | 1PS R            |
| 1PS 255FD        | 1PS R FADE IN:   |
| 1PS ?J           | 1PS R            |
| 1PS ?P           | 1PS P04 : PLAY   |
| 1PS ?P           | 1PS P04 : PLAY   |
| 1PS 0FD          | 1PS R : FADE OUT |
| 1PS ?P           | 1PS P04 : PLAY   |
| 1PS ?P           | 1PS P06 : PAUSE  |
| 1PS ?B           | 1PS 012345       |

PAUSE mode Reached block 012345.

**PLAY**

**FUNCTION:** Plays the disc in the specified player.  
**FORMAT:** [ADR] + (address) + PL  
**DESCRIPTION:**

- 1) When this command is received in RANDOM ACCESS mode with no address specified, the player will enter PLAY mode at the current address.
- 2) When this command is received in RANDOM ACCESS mode and includes an address, an auto stop is made at that address, and then PLAY mode is entered. The specified address is then written into the mark address register and compared with the current address during play. During comparison, execution status is [B]. When the two addresses match, the player automatically enters pause mode, resulting in execution status is [R]. An auto stop will be made at the lead-out if it is encountered before reaching the specified address. This may be caused because the address specified was too large or because current address is already beyond the specified address.
- 3) Although the auto stop operation of this command is functionally the same as the STOP MARKER command, it differs in the timing that execution status is set. With PLAY, auto stop is cleared and the player enters NORMAL PLAY mode if some other command is received before reaching the specified address.
- 4) Although the auto stop operation of this command is functionally the same as STOP MARKER command, it differs in the timing that job status changes.
- 5) Auto stop is cleared and the player enters NORMAL PLAY mode if some other execution command is received before reaching the specified address.

**EXECUTION:**

- 1) PAUSE mode
 

|        |                |
|--------|----------------|
| 1PS PL | 1PS R          |
| 1PS ?J | 1PS R          |
| 1PS ?P | 1PS P04 : PLAY |
- 2) PAUSE mode (Paused at Track 2)
 

|            |                          |
|------------|--------------------------|
| 1PS TR04PL | 1PS R                    |
| 1PS ?J     | 1PS B                    |
| 1PS ?P     | 1PS P04 : PLAY           |
| 1PS ?R     | 1PS 02 : playing Track 2 |
| 1PS ?R     | 1PS 03 : playing Track 3 |
| 1PS ?R     | 1PS 04 : playing Track 4 |
| 1PS ?J     | 1PS R                    |
| 1PS ?P     | 1PS P06 : PAUSE          |
- 3) PAUSE mode (Paused at Track 4)
 

|        |                  |
|--------|------------------|
| 1PS PL | 1PS R            |
| 1PS ?J | 1PS B            |
| 1PS ?R | 1PS P02 : SET UP |
| 1PS ?R | 1PS P07 : SEARCH |
| 1PS ?J | 1PS R            |
| 1PS ?P | 1PS P04 : PLAY   |

PLAY mode

**REJECT**

**FUNCTION:** Stops the rotation of the disc in the specified player.  
**FORMAT:** [ADR] + RJ  
**DESCRIPTION:** When this command is received in RANDOM ACCESS or SET UP mode, the player will enter REJECT mode and the disc will be made to stop rotating. When the disc has completely stopped rotating, the player will enter PARK mode.

**EXECUTION:**

|        |                  |
|--------|------------------|
| 1PS RJ | 1PS R            |
| 1PS ?J | 1PS B            |
| 1PS ?P | 1PS P03 : REJECT |
| 1PS ?P | 1PS P01 : PARK   |
| 1PS ?J | 1PS R : complete |

PARK mode

**PAUSE**

**FUNCTION:** Pauses playback of the disc in the specified player.  
**FORMAT:** [ADR] + PA  
**DESCRIPTION:** When this command is received in RANDOM ACCESS mode, the player pauses the disc at its current location.

**EXECUTION:**

|        |                 |
|--------|-----------------|
| 1PS PA | 1PS R           |
| 1PS ?J | 1PS R           |
| 1PS ?P | 1PS P06 : PAUSE |

PAUSE mode

**SCAN**

**FUNCTION:** Scans the disc in the specified player in either forward or reverse.

**FORMAT:** [ADR] + NF : SCAN FORWARD

[ADR] + NR : SCAN REVERSE

**DESCRIPTION:** When this command is received in RANDOM ACCESS mode, the player will scan in the specified direction for about 2.5 seconds. The set enters SCAN mode during this time and returns to its original mode when scanning is finished. Note that the value of 2.5 seconds is only an approximation.

**EXECUTION:** PLAY mode

|        |                  |
|--------|------------------|
| 1PS NF | 1PS R            |
| 1PS ?J | 1PS B            |
| 1PS ?P | 1PS P08 : SCAN   |
| :      | :                |
| 1PS ?P | 1PS P08 : PLAY   |
| 1PS ?J | 1PS R : complete |

PLAY mode

**NOTE:** The scan operation can be cleared using the CLEAR command, causing the set to immediately return to its original mode. This is possible even when multiple SCAN commands (up to 10) have been sent in succession.

PLAY mode

|                     |                     |
|---------------------|---------------------|
| 1PS NFNFNFNFNFNFNFN | 1PS R               |
| 1PS ?J              | 1PS B               |
| :                   | :                   |
| 1PS CL              | 1PS R : SCAN cancel |
| 1PS ?P              | 1PS P04 : PLAY      |

PLAY mode

**BLOCK**

**FUNCTION:** Sets the address specification flag of the specified player to indicate blocks.

**FORMAT:** [ADR] + BK

**DESCRIPTION:** When this command is received, all subsequent addresses specified will be evaluated as representing block numbers. Note that block numbers are interpreted based on absolute time.

**EXECUTION:** Here, a search is made for the block representing the absolute time 12 minutes, 34 seconds, 56 blocks.

1PS BK123456SE 1PS R

Next, a search is made for the block at 0 minutes, 34 seconds, 56 blocks.

1PS 003456SE 1PS R

1PS ?J 1PS R

1PS ?B 1PS 003456

**TIME**

**FUNCTION:** Sets the address specification flag of the specified player to indicate time codes.

**FORMAT:** [ADR] + TM

**DESCRIPTION:** When this command is received, all subsequent addresses specified will be evaluated as representing time codes. Note that such addresses are handled as absolute times as with block numbers.

**EXECUTION:**

Here, a search is made for the absolute time 12 minutes, 34 seconds.

1PS TM1234SE 1PS R

1PS ?J 1PS R

1PS ?T 1PS 1234

**TRACK**

**FUNCTION:** Sets the address specification flag of the specified player to indicate tracks.

**FORMAT:** [ADR] + TR

**DESCRIPTION:** When this command is received, all subsequent addresses specified will be evaluated as representing tracks.

**EXECUTION:**

Here, a search is made for track 12.

1PS TR12SE 1PS R

1PS ?J 1PS R

1PS ?R 1PS 12



**AUTO CUE SEARCH**

**FUNCTION:** Searches for the specified address and advances the optical pickup to the point where the specified output level is exceeded.

**FORMAT:** [ADR] + [address] + QS

**DESCRIPTION:** Searches for the specified address and then begins mute playback until an output level greater than that specified by QL is reached. The player pauses at that point. During AUTO CUE SEARCH (even during mute playback), "P07" is returned in response to "?P" and "B" is returned in response to "?J".

**EXECUTION:**

|            |                                    |
|------------|------------------------------------|
| PLAY mode  | Address Specification Flag = Track |
| 1PS 05SE   | 1PS R                              |
| 1PS ?P     | 1PS P07 : searching                |
| 1PS ?J     | 1PS B                              |
| 1PS ?J     | 1PS R : complete                   |
| 1PS ?P     | 1PS P06 : PAUSE                    |
| 1PS ?A     | 1PS 0501000000                     |
| PAUSE mode |                                    |
| 1PS 05QS   | 1PS R                              |
| 1PS ?P     | 1PS P07 : searching                |
| 1PS ?J     | 1PS B                              |
| 1PS ?J     | 1PS R : complete                   |
| 1PS ?P     | 1PS P06 : PAUSE                    |
| 1PS ?A     | 1PS 0501000043                     |
| PAUSE mode | Address Specification Flag = Track |

**AUTO CUE STOP**

**FUNCTION:** Specifies the target output level and sets the blank detection flag.

**FORMAT:** [ADR] + [ARG] + QT

**DESCRIPTION:** [ARG] is specified as an integer from 0 to 255. 0 corresponds to the minimum output level, while 255 corresponds to the maximum. The correspondence between this value and decay is about the same as that with VL and FD. When the playback is executing with the blank detection flag set, the player will enter PAUSE mode as soon as a playback level continuously less than that specified level for a set length of time. This limit time can be set with the LT command.

**EXECUTION:**

|                  |                |
|------------------|----------------|
| PAUSE mode       |                |
| 1PS 0VL          | 1PS R          |
| 1PS 16QT TR6SMPL | 1PS R          |
| 1PS 255FD        | 1PS R :FADE IN |
| 1PS ?J           | 1PS R          |
| 1PS ?P           | 1PS P04 :PLAY  |
| :                | :              |
| 1PS ?P           | 1PS P06 :PAUSE |
| 1PS ?R           | 1PS 05         |
| 1PS ?A           | 1PS 0501044963 |

PAUSE mode MUTE DETECT PAUSE occurred before reaching Track 6.

**CUE LEVEL SET**

**FUNCTION:** Specifies the target output level for AUTO CUE SEARCH.

**FORMAT:** [ADR] + [ARG] + QL

**DESCRIPTION:** [ARG] is specified as an integer from 0 to 255. 0 corresponds to the minimum output level, while 255 corresponds to the maximum. The correspondence between this value and decay is about the same as that with VL and FD. The default value used is 16 (about -60 dB). Once a value is specified with this command, it remains unchanged until this command is executed again.

**NOTES:**

The correspondence between values specified for arguments of VL, FD, QL and QT versus the decay of the digital attenuator is given in the table below. Each decrease of 6 dB represents a 1/2 drop in sound pressure.

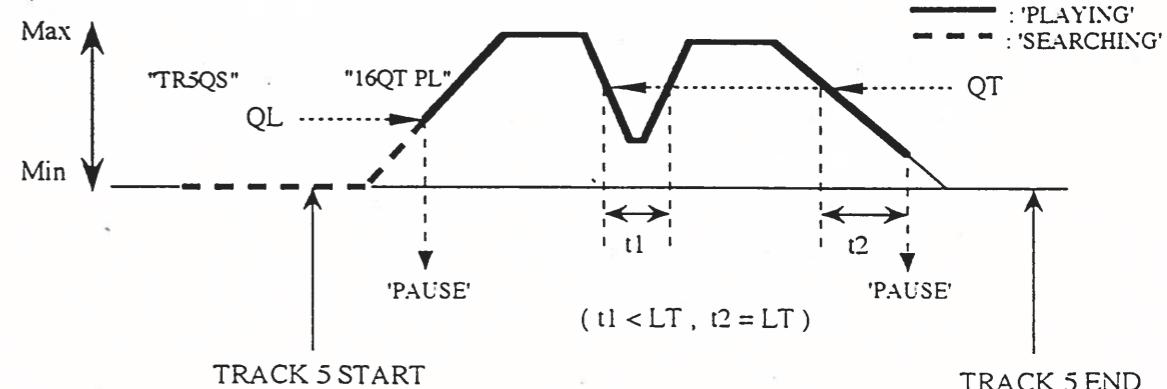
| Decay (dB) | Argument Value |
|------------|----------------|
| 0          | 255            |
| -1         | 247            |
| -3         | 239            |
| -6         | 230            |
| -10        | 213            |
| -20        | 174            |
| -30        | 138            |
| -40        | 97             |
| -50        | 60             |
| -60        | 16             |
| -70        | 5              |
| -80        | 1              |
| $\infty$   | 0              |

**LIMIT TIME SET**

**FUNCTION:** Specifies the length of time how long the playback with the blank detection flag should continue after the target output level is once detected.

**FORMAT:** [ADR] + [ARG] + LT

**DESCRIPTION:** [ARG] is specified as an integer from 01 to 99. Each step of 1 corresponds to 100 ms, for a specifiable range of 0.1 to 9.9 seconds. The default value used is 20 (about 2 seconds). Once a value is specified with this command, it remains unchanged until this command is executed again.

**RECORDED LEVEL**

**VOLUME**

**FUNCTION:** Sets the playback volume level.

**FORMAT:** [ADR] + [ARG] + VL

**DESCRIPTION:** This command specifies the playback volume level of the player as an integer from 0 thru 255. Here, 0 represents the minimum volume level, while 255 represents the maximum. Execution of the ZR, RJ or SE commands will cause this setting to be cleared and the volume to be reset to the default level of 255.

**DURATION**

**FUNCTION:** Specifies how long a volume level transition takes.

**FORMAT:** [ADR] + [ARG] + DU

**DESCRIPTION:** [ARG] may be specified as a 2-digit value, representing seconds, from 01 thru 99. Although a default duration of 05 seconds is used, but may be set to another value using this command. Once set, values remain in effect until DU is executed again.

**FADE IN/OUT**

**FUNCTION:** Continuously varies the playback volume level.

**FORMAT:** [ADR] + [ARG] + FD

**DESCRIPTION:** [ARG] specifies an ending volume level, and may be specified as an integer from 0 thru 255. The starting volume level used is the playback level in effect when this command is executed. Execution of the ZR, RJ or SE commands will cause this setting to be cleared and the volume to be reset to the default level of 255.

**EXECUTION:** Fade in during first 7 seconds of Track 4.

1PS TR4SE      1PS R

1PS 000VL      1PS R

1PS 7DU      1PS R

1PS 5SMPL      1PS R

1PS 255FD      1PS R

Fade out over 5 seconds.

1PS 5DU000FD      1PS

**CHANGER RESET**

**FUNCTION:** Resets the changer.

**FORMAT:** [ADR] + !!

**DESCRIPTION:** This command allows the changer to be restarted without turning off the power. This command can be used in situations such as when the changer has stopped due to an insignificant error, or when the host needs the restart control after stopping operations.

**NOTES:**

This command not only resets changer mechanisms but resets the built-in players as well. However, be aware that the address flags and argument values set with the CM, DU, QL and LT commands continue to be maintained even after execution of this command.

**5.2. Request Commands****JOB STATUS REQUEST**

**FUNCTION:** Returns the job status of the command currently being executed for the specified player. (CM7)

**FORMAT:** [ADR] + ?J

**DESCRIPTION:** This command may only be used in Communication Mode 7. An error [E04] will result if it is executed in CM3. This command is used in CM7 to check if a command has completed execution or resulted in an error. When this command is received, one of the following status is immediately returned.

| Status   | Corresponding Code |
|----------|--------------------|
| BUSY     | B                  |
| COMPLETE | R                  |
| ERROR    | Exx                |

The conditions required for "B" (BUSY) to be returned are either that the operation associated with the command is not complete or that there is further command line execution remaining. The condition required for "R" (execution complete) to be returned is that the last command of a command line has completed execution. Information concerning the last error that occurred is kept in a buffer and returned in response to the "?J" command. For a table of error messages, see "6. Error Messages".

**EXECUTION:**

PAUSE mode

|            |         |                      |
|------------|---------|----------------------|
| 1PS TR05SE | 1PS R   | : receive complete   |
| 1PS ?J     | 1PS B   | : busy (searching)   |
| 1PS ?P     | 1PS P07 | : searching          |
| 1PS ?J     | 1PS R   | : execution complete |
| 1PS ?R     | 1PS 05  | : track = 05         |
| 1PS ?P     | 1PS P06 | : pause              |

**PAUSE mode**

|          |         |                    |
|----------|---------|--------------------|
| 1PS SMPL | 1PS R   | : receive complete |
| 1PS ?J   | 1PS E06 | : missing argument |

**PLAYER ACTIVE MODE REQUEST**

**FUNCTION:** Returns the current active mode of the specified player as a 3-digit alphanumeric code.

**FORMAT:** [ADR] + ?P

**DESCRIPTION:** The active mode is returned as one of the following codes.

|     |            |   |
|-----|------------|---|
| P01 | PARK       | The disc is not rotating                                |
| P02 | SET UP     | The disc starts rotating to be ready for random access. |
| P03 | REJECT     | The disc is being stopped rotation.                     |
| P04 | PLAY       | The disc is being played at normal speed                |
| P06 | PAUSE      | Audio output and tracking have ceased                   |
| P07 | SEARCH     | The target address is being searched for                |
| P08 | SCAN       | The disc is being scanned                               |
| P20 | DISC UNSET | No disc is loaded in the player                         |
| P21 | LOAD       | A disc is being loaded in the player from the rack      |
| P22 | UN LOAD    | A disc is being returned to the rack from the player    |

**EXECUTION:** PLAY mode

|        |         |           |
|--------|---------|-----------|
| 1PS ?P | 1PS P04 | : playing |
| 1PS PA | 1PS R   |           |
| 1PS ?J | 1PS R   |           |
| 1PS ?P | 1PS P06 | : pause   |

**PAUSE mode**

|        |         |         |
|--------|---------|---------|
| 1PS ?P | 1PS P04 | : pause |
|--------|---------|---------|

**DISC NUMBER REQUEST**

**FUNCTION:** Returns the number of the disc currently clamped in the specified player as a 3-digit code.

**FORMAT:** [ADR] + ?Z

**DESCRIPTION:** This command is used when you wish to know which disc is clamped in a player. XXX is returned if no disc is clamped in the player.

**EXECUTION:** PARK mode

|        |         |
|--------|---------|
| 1PS ?Z | 1PS 003 |
| 1PS ZR | 1PS R   |
| 1PS ?P | 1PS P22 |
| 1PS ?Z | 1PS XXX |

**MECHANISM ERROR REQUEST**

**FUNCTION:** Returns error messages related to the changer mechanism.

**FORMAT:** [ADR] + ?E

**DESCRIPTION:** [E20] is returned in response to the ?J command whenever an error has occurred in the changer mechanism. ?E can be used to find out exactly which error occurred. This command returns the most recent error data stored in error history memory. For a table of error messages, see "6. Error Messages". Note that even though use of a player address is meaningless with this command one must be used anyway.

**EXECUTION:** DISK UNSET Mode

|           |         |                   |
|-----------|---------|-------------------|
| 1PS ?P    | 1PS P20 | : unset           |
| 1PS 235ZS | 1PS R   |                   |
| 1PS ?P    | 1PS P21 | : loading         |
| 1PS ?J    | 1PS B   |                   |
| 1PS ?J    | 1PS E20 | : fatal error     |
| 1PS ?E    | 1PS E94 | : locked          |
| 2PS ?E    | 2PS E94 | : (same as above) |
| 2PS ?P    | 2PS P04 | : playing         |

**BLOCK NUMBER REQUEST**

**FUNCTION:** Returns the block number of the location currently being played back by the specified player as a 6-digit numeric code.

**FORMAT:** [ADR] + ?B

**DESCRIPTION:** This command returns the current address during play and the target address during pause. In either case the return represents an absolute time. Note that the block number may change during the time required to transfer the return when executed during play. Note that XXXXXX is returned in other than RANDOM ACCESS modes, and 000000 is returned at the lead-in. If the disc's code cannot be properly read, the last value stored is used.

**EXECUTION:** PLAY mode

|                |                         |
|----------------|-------------------------|
| 1PS ?B         | 1PS 010000              |
| 1PS BK123456SE | 1PS R                   |
| 1PS ?J         | 1PS R : search complete |
| 1PS ?B         | 1PS 123456              |

PAUSE mode

|        |       |
|--------|-------|
| 1PS ZR | 1PS R |
| 1PS ?J | 1PS R |

PARK mode

|        |            |
|--------|------------|
| 1PS ?B | 1PS XXXXXX |
|--------|------------|

**TIME CODE REQUEST**

**FUNCTION:** Returns the time code of the location currently being played back by the specified player as a 4-digit numeric code.

**FORMAT:** [ADR] + ?T

**DESCRIPTION:** This command returns the current address during play and the target address during pause. In either case the return represents an absolute time. Note that the time code may change during the time required to transfer this command when executed during play. Note that XXXX is returned in other than RANDOM ACCESS modes, and 0000 is returned at the lead-in. If the disc's code cannot be properly read, the last value stored is used.

**EXECUTION:** PLAY mode

|              |                         |
|--------------|-------------------------|
| 1PS ?T       | 1PS 1234                |
| 1PS TM4321SE | 1PS R                   |
| 1PS ?J       | 1PS R : search complete |
| 1PS ?B       | 1PS 4321                |

PAUSE mode

|        |       |
|--------|-------|
| 1PS RJ | 1PS R |
| 1PS ?J | 1PS R |

PARK mode

|        |                      |
|--------|----------------------|
| 1PS SA | 1PS R                |
| 1PS ?P | 1PS P06 : PAUSE AT   |
| 1PS ?T | 1PS 0002 : 1ST track |

**TRACK NUMBER REQUEST**

**FUNCTION:** Returns the track number of the track currently being played back by the specified player as a 2-digit numeric code.

**FORMAT:** [ADR] + ?R

**DESCRIPTION:** This command returns the current address during play and the target address during pause. Note that the track number may change during the time required to transfer this command when executed during play. Note that XX is returned in other than RANDOM ACCESS modes, 00 is returned at the lead-in, and AA is returned at the lead-out. If the disc's code cannot be properly read, the last value stored is used.

**EXECUTION:** PLAY mode

|           |        |
|-----------|--------|
| 1PS ?R    | 1PS 12 |
| 1PS TR8SE | 1PS R  |
| 1PS ?J    | 1PS R  |
| 1PS ?R    | 1PS 08 |

**INDEX NUMBER REQUEST**

**FUNCTION:** Returns the track number and index number of the location currently being played back by the specified player as a 4-digit numeric code.

**FORMAT:** [ADR] + ?I

**DESCRIPTION:** This command returns the current address during play and the target address during pause. Note that the track number and index number may change during the time required to transfer this command when executed during play. Note that XXXX is returned in other than RANDOM ACCESS modes, 0000 is returned at the lead-in, and AA01 is returned at the lead-out. If the disc's code cannot be properly read, the last value stored is used.

**EXECUTION:** PLAY mode

|             |          |
|-------------|----------|
| 1PS ?I      | 1PS 1201 |
| 1PS IX801SE | 1PS R    |
| 1PS ?J      | 1PS R    |
| 1PS ?I      | 1PS 0801 |

**TOC INFORMATION REQUEST**

**FUNCTION:** Returns TOC information of the specified player.

**FORMAT:** [ADR] + [ARG] + ?Q

**DESCRIPTION:**

- When no numeric value is specified for [ARG], a total of 10 digits, representing the track number of the first track, track number of the last track and absolute time of the beginning of the lead-out, are returned. XXXXXXXXXXXX is returned if the disc is not clamped or has not been started up at least once after clamping.
- The code format is:  
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10  
where
  - C1 C2 : Track number of the first track
  - C3 C4 : Track number of the last track
  - C5 C6 C7 C8 C9 C10 : Absolute time at the beginning of the lead-out
- When a numeric value, representing a track, is specified for [ARG], a total of 8 digits, representing the absolute time of the beginning of that track and a code representing whether it is an audio or data track, are returned. The last two digits are 00 if it is an audio track, or 04 if it is a data track. XXXXXXXX is returned if the disc is not clamped or has not been started up at least once after clamping.
- The code format is:  
C1 C2 C3 C4 C5 C6 C7 C8  
where
  - C1 C2 C3 C4 C5 C6 : Absolute time at the beginning of the specified track
  - C7 C8 : Code indicating the track is either audio or data

**EXECUTION:** PLAY mode

|   |            |
|---|------------|
| 1PS ?Q  | 0109665544 |
| • In this example, the first track is 01, the last track is 09, and the lead-out begins at 66 minutes, 55 seconds, 44 blocks. |            |
| 1PS 5?Q   | 10020000   |
| • In this example, track 5 begins at 10 minutes, 20 seconds, 0 blocks and is shown to be an audio track.                      |            |

**CATALOG NUMBER REQUEST**

**FUNCTION:** Returns the catalog number of the disc currently being played back by the specified player as a 13-digit code.

**FORMAT:** [ADR] + ?G

**DESCRIPTION:** Note that not all discs contain a catalog number. If this command is executed and a catalog number is found on the disc currently being played back, it will be returned as a 13-digit code. XXXXXXXXXXXXXXX is returned if the disc is not clamped, has not been started up at least once after clamping, or if no catalog number can be found.

**EXECUTION:** PLAY mode

|        |                     |             |
|--------|---------------------|-------------|
| 1PS ?G | 1PS XXXXXXXXXXXXXXX | : not found |
| 2PS ?G | 2PS 0000000000000   | : found     |

**CDP MODEL NAME REQUEST**

**FUNCTION:** Returns the model name of the CDP.

**FORMAT:** [ADR] + ?X

**DESCRIPTION:** The format used for the model name is P\*\*\*\*\*. The first four characters represent a model-specific number, while the last two represent the version number of the player's controlling microcomputer. During design and development the version number 00 is used, followed by 01 when production begins. The version number is thereafter incremented with each version upgrade.

**EXECUTION:** For the CAC-V3000, the model name is returned as follows.

|        |             |
|--------|-------------|
| 1PS ?X | 1PS P151206 |
|--------|-------------|

**COMMUNICATION MODE REQUEST**

**FUNCTION:** Returns the current communication mode.

**FORMAT:** [ADR] + ?M

**DESCRIPTION:** This command always returns 7 as the CAC-V3000 only supports communication mode 7.

**EXECUTION:** 1PS ?M

|         |
|---------|
| 1PS CM7 |
|---------|

**PLAY TIME REQUEST**

**FUNCTION:** Returns the track number, index number and play time of the current playback point of the specified player as a 10-digit code.

**FORMAT:** [ADR] + ?A

**DESCRIPTION:** This command returns the current address during play, and the target address during pause. Play time represents the playback time as counted from the beginning of the current track. Note that in play mode the track number, index number and playtime may change during the time required to transfer return data. Note that XXXXXXXXXX is returned in other than RANDOM ACCESS modes, 0000000000 is returned at the lead-in, and AA01000000 is returned at the lead-out. If the disc's code cannot be properly read, the last value stored is used.

**EXECUTION:** PLAY mode

|                |                         |
|----------------|-------------------------|
| 1PS 5?Q        | 1PS 12345600            |
| 1PS BK124966SE | 1PS R                   |
| 1PS ?J         | 1PS R : search complete |
| 1PS ?B         | 1PS 124966              |
| 1PS ?A         | 1PS 0501001510          |

**DISC STATUS REQUEST**

**FUNCTION:** Returns the attributes of the disc being played by the specified player as an 8-digit code.

**FORMAT:** [ADR] + ?K

**DESCRIPTION:** The format of the return made in response to this command is as follows.

C1 C2 C3 C4 C5 C6 C7 C8

where

|    |                  |                                       |
|----|------------------|---------------------------------------|
| C1 | : Disc set/unset | 0 = unset; 1 = set; X = unknown       |
| C2 | : Audio track    | 0 = not audio; 1 = audio; X = unknown |
| C3 | : Data track     | 0 = not data; 1 = data; X = unknown   |
| C4 | : CDV?           | 0 = NO; 1 = YES; X = unknown          |
| C5 | : CDI?           | 0 = NO; 1 = YES; X = unknown          |
| C6 | : (reserved)     | X                                     |
| C7 | : (reserved)     | X                                     |
| C8 | : (reserved)     | X                                     |

**EXECUTION:** PLAY mode

|           |               |
|-----------|---------------|
| 1PS ?K    | 1PS 11000XXX  |
| 1PS ZR    | 1PS R         |
| 1PS ?K    | 1PS 0XXXXXXXX |
| 1PS 123ZS | 1PS R         |
| 1PS ?P    | 1PS P01       |
| 1PS ?K    | 1PS XXXXXXXX  |
| 1PS SA    | 1PS R         |
| 1PS ?K    | 1PS 11000XXX  |

**6. Error Messages****6.1. Error Detection and Processing**

Error messages are sent:

- 1) When a received command is undefined
- 2) When the ?J command is received
- 3) When the ?E command is received
- 4) When there is an error in receiving a command

**1) When a received command is undefined**

The proper format for a request command is '?' followed by an alphabetic. If an undefined character is encountered after the '?', the request command will be judged as undefined and the player will return the error code [E04].

EXAMPLE: 1PS ?Y 1PS E04

Although all legal execution commands consist of two alphabets, the player will try to interpret any command that does not begin with a '?' as an execution command. In the case of execution commands [R] is returned to signal that the command has been received, but error status must be explicitly requested with the '?J' command.

EXAMPLE: 1PS YY 1PS R  
1PS ?J 1PS E04

**2) When the ?J command is received**

In Communication Mode 7, an error message for the last command to result in an error can be gotten using [?J].

EXAMPLE:  

|          |         |                              |
|----------|---------|------------------------------|
| 1PS ?P   | 1PS P06 | :pause                       |
| 1PS ?R   | 1PS 08  | :at Track 8                  |
| 1PS 15SE | 1PS R   | :receive complete            |
| 1PS ?P   | 1PS P06 | :still in pause              |
| :        | :       | :                            |
| 1PS ?P   | 1PS P06 | :still in pause              |
| 1PS ?R   | 1PS 08  | :still at Track 8            |
| 1PS ?J   | 1PS E04 | :error: track does not exist |

**3) When the ?E command is received**

The ?E command returns the latest error message from the changer stored in memory.

EXAMPLE:  

|        |         |                     |
|--------|---------|---------------------|
| 1PS ?E | 1PS E91 | :mechanical timeout |
|--------|---------|---------------------|

#### 4) When there is an error in receiving a command

The CAC-V3000 will return an error to the computer sending a command when transmitted serial data is not received properly and a retry is required. Although faulty reception may be due to either a framing error or an overrun error, both types are defined as communication errors and handled together using the error code [E00].

All commands in a command line up to the <c/r> terminator will be lost when an error occurs. The host computer must therefore transmit again the entire command line beginning from the player address.

Furthermore, error code [E00] is returned to the host even when a communications error occurs between the system microcomputer of the CAC-V3000 and the player microcomputer. Attempt a resend if this happens.

This error may be caused by any of the following.

- There is no response from the player microcomputer for more than 250 ms.
- The receive buffer overflowed.
- A framing error or overrun error occurred during transmission.

**EXAMPLE:** 2PS 12SE13SMPL<c/r> 2PS E00<c/r> : error  
2PS 12SE13SMPL<c/r> 2PS R<c/r> : receive complete

## 6.2 Player Error Messages

|     |                       |  |
|-----|-----------------------|--|
| E00 | Communication error   | Communication line error.<br>Framing error. Buffer Overflow.   |
| E04 | Feature not available | Attempt to execute feature that is not available. Improper command mnemonic. Cannot use feature in current mode. |
| E06 | Missing argument      | Necessary parameter not specified.   |
| E11 | Disc not exist        | Player could not recognize a disc.   |
| E12 | Address error         | Could not find specified search address.   |
| E13 | Defocussing error     | Optical pickup out of focus.   |
| E14 | Spindle unlock        | Spindle has become unlocked.   |
| E20 | Changer Panic         | Irrecoverable error occurred in changer.   |
| E21 | Changer door open     | Changer front door is open.  |
| E22 | Changer initializing  | Changer mechanism currently initializing.  |
| E92 | Disc select error     | Specified disc not in rack.  |
| E96 | Start up error        | Start up operations not possible.  |
| E99 | Player Panic          | Irrecoverable error occurred in player. Could not continue play, entered stop. Player not connected properly.    |

### 6.3 Changer Error Messages

|     |                     |   |
|-----|---------------------|---|
| E81 | No player available | Players being initialized. Neither player operative.                      |
| E82 | Buffer Overflow     | Data from CDP could not be processed                                      |
| E83 | Player Error        | Disk cannot be played normally.   |
| E84 | Protocol Error      | Error in data from host computer.   |
| E85 | Buffer Overflow     | Data from host could not be processed                                     |
| E86 | Not safe to SWING   | Determined that executing SWING operation would be dangerous.             |
| E87 | Not safe to SLIDE   | Determined that executing SLIDE operation would be dangerous.             |
| E88 | Version unmatch     | CDP microcomputer version number does not match.                          |
| E89 | No response         | CDP did not return response within 250 msec.                              |
| E90 | Backup data broken  | Contents of backup memory destroyed.                                      |
| E91 | Mechanical timeover | Cannot complete mechanical operation without exceeding set timeout value. |
| E92 | Disc can't chuck    | Cannot grab disc believed to exist.                                       |
| E93 | Return address lost | Do not know where to return disc.   |
| E94 | Vertical moving NG  | Vertical motor has been locked for more than 10 seconds.                  |
| E95 | Software trouble    | Determined that program may run wild.                                     |

When an error occurs in screening mode, the changer will not reset to initial setting mode even if the power is turned on again or the changer reset command (!!) is issued. This is called "ERROR LOCK STATUS" and an error number flashes rapidly on the LED display. After removing or repairing the cause of the error, release the ERROR LOCK as follows.

- 1) While pressing switches S3 and S4 simultaneously, turn the power switch ON. The error number will flash slowly on the LED display.
- 2) Press S4. The LED display will show [E-]. This means the error number that has been displayed is cleared and ERROR LOCK is released.
- 3) Turn the power switch OFF and ON again. The changer will start mechanism initialization.

**Caution:** If S4 is pressed more than four seconds, the entire error history will be cleared and the speed the LED flashes will increase.

Detailed information about trouble shootings is described in the OPERATING INSTRUCTIONS. Read them carefully and take care not to operate incorrectly. Otherwise the mechanism or discs may be damaged.

### 7. Technical Notes

#### 7.1. Initial Settings

Internal registers and switches are initialized as given below when the set's power is turned on. Carefully note initial settings during application program development.

| ITEM                                       | Initial Setting | Reset By       |
|--|-----------------|----------------|
| Address Flag                               | Track           |                |
| Communication Mode                         | Mode 7          |                |
| Auto Cue Level                             | -60 dB (16)     |                |
| Limit Time                                 | 2 seconds (20)  |                |
| Transition Time for Changes in Audio Level | 5 seconds       |                |
| Audio Level                                | MAX (255)       | ZS, ZR, RJ, SE |
| Speed                                      | Normal (100)    | ZS, ZR         |

**Note:** Execution of commands shown in the last column cause automatic reset to the initial setting given.

#### 7.2. Initial Settings of the Changer Mechanism

The changer mechanism is initialized when the set's power is turned on. Error code [E22] will be sent in response to all commands received during changer initialization.

The changer mechanism is disabled while the front door of the changer is open. Error code [E21] will be sent in response to all commands received while the door is open. The changer will be re-initialized when the door is closed, resulting in error code [E22] being sent in response to all commands received during changer initialization.

Initialization can be assumed to be complete once response code [R] is sent in response to command [?J]. The player specified is inoperative if error code [E99] is sent instead.

### 7.3 Command Line Limitations

Although the use of command lines for sending multiple commands at once eases the processing burden of the host computer during normal operation, error processing for some commands can become much more complex. We therefore strongly recommend that you use the commands [ZS], [ZR], and all request commands one per command line. Take careful note of the following points when you use command lines.

- Consider the difference in response timing for execution commands and request commands
- Be sure that all separate elements on the command line are valid execution commands

Communication Mode 7 uses polling to determine execution status. Command execution begins after an execution command is received and the corresponding receive completion message is sent back. Even after execution completes, execution status will not be returned unless in response to the request command [?J]. This holds equally for command lines; execution status will not be affected until execution of the last command on the command line completes even if a request command is received while execution status is [B].

#### EXAMPLE:

```
1PS ?P          1PS P01      : parking
1PS SATR12SE13PL 1PS R      : receive complete
1PS ?P          1PS P02      : set up
1PS ?P          1PS P07      : searching
1PS ?P          1PS P04      : playing
1PS ?J          1PS B      : busy
1PS ?J          1PS R      : play complete
1PS ?P          1PS P06      : pausing
```

In an error occurs during command line execution, an error message will immediately be entered into the Execution Status Register and all subsequent commands will be ignored. The contents of the Execution Status Register can only be read out using the request command [?J]. The safest and most reliable method of control in Communication Mode 7 is to monitor execution status using command [?J].

#### EXAMPLE:

```
1PS ?P          1PS P01      : parking
1PS SATR12SE13PL 1PS R      : receive complete
1PS ?J          1PS B      : busy
1PS ?J          1PS E06      : missing argument
1PS ?R          1PS 12      :
1PS ?P          1PS P06      : pausing
```

Command [?J] must be used to check for the occurrence of errors in Communication Mode 7 since only completion message [R] will be returned even if a command line includes an undefined command.

#### EXAMPLE:

```
1PS SATR10SQ11SMPL 1PS R      : receive complete
1PS ?J          1PS B      : busy
1PS ?J          1PS E04      : command mnemonic error
1PS ?P          1PS P06      : pause
```

## 7.4. Before Designing an Application

Take note of the following points before attempting to design an application.

- Too quick status management is a burden on the application

Status management is an important aspect of programming for the CAC-V3000 which cannot be overlooked. However, it is not the case that quick status management will result in operational time savings. In fact, the burden on the application can grow too large if this is attempted.

- Sometimes software recovery is possible even for hard errors of the changer

Usually performances go without any problems, but after a long period of use accidents can occur when least expected. Even if an error causes the changer to stop, there are situations where software recovery is possible. For details, see Section 7.8, "Error Recovery".

### 7.4.1. Burden Sharing

The CAC-V3000 is controlled by a system microcomputer and two player microcomputers. The functions carried out by the system microcomputer can be classified into the following general categories.

- Data transmissions with the host computer
- Data transmissions with the built-in players
- Control of the changer mechanism
- Processing of manual operation keys
- Display the operating information like status error

Output of the digital audio signal output from a player, mute, fade and other such control is not handled by the system microcomputer. The functions carried out by the player microcomputers can be classified into the following general categories.

- Data transmissions with the system microcomputer
- Control of the player mechanism
- Control of the digital attenuator

The CAC-V3000 operates in accordance with the application program of the host computer. To achieve minimal restrictions on applications and allow for a simple command structure, error processing is fully at the discretion of the application.

### 7.4.2. Transparent and Non-transparent Commands

This manual covers all the information necessary for developing application programs on a host computer, and explains CAC-V3000 operations as seen from the outside. For this reason, no distinction is made between processing performed by the system microcomputer and the player microcomputers. However, some of the internal processing involved is outlined here.

Commands defined in the reference table inside the system microcomputer are called "non-transparent commands". These commands are those for which processing is handled by the system microcomputer and are mainly those associated with mechanism control or error processing. All other commands are called "transparent commands" and are sent to one of the players. The response sent as a result of a transparent command is transferred to the host, unchecked by the system microcomputer.

There are seven commands defined for the CAC-V3000 as non-transparent. These are: [ZS], [ZR], [?Z], [?E], [?J], [?P] and [!!].

#### [?Z] : DISC NUMBER REQUEST

When this command is received, the disc number loaded in the target player is read and returned as a 3-digit code. Since the player itself only plays the disc that is loaded and does not know where it came from, the system microcomputer must make this return.

#### [?E] : MECHANISM ERROR CODE REQUEST

When this command is received, the value in the mechanism error code register is read and returned in the form [Exx]. The system microcomputer makes this return because it performs mechanism control.

#### [ZS] : DISC SELECT

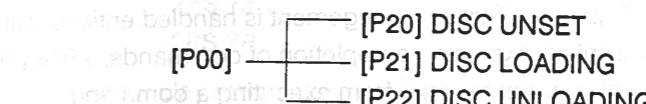
This command causes the system microcomputer to transport a disc to the specified player. The system microcomputer therefore returns the completion status code [R] to the host, and enters DUMMY BUSY mode. Once the disc reaches the player, the system microcomputer sends [ZS] to the player and leaves DUMMY BUSY mode.

#### [ZR] : DISC RETURN

Although this command is immediately transferred to the specified player, the system microcomputer transfers [R] to the host without interpretation, and enters DUMMY BUSY mode to execute disc return operations.

#### [?P] : PLAYER ACTIVE MODE REQUEST

This command is also immediately transferred to the specified player, but the status returned from the player is not sent to the host without processing. This is due to the fact that the return code [P00] returned from the player must be detailed based on the operational sequence of the mechanism.



#### [?J] : JOB STATUS REQUEST

This command is immediately transferred to the specified player, but the status returned from the player is not sent to the host without processing if the system microcomputer is in DUMMY BUSY mode. If an error message is returned from the player, it is sent to the host unchanged, otherwise the system microcomputer returns [B].

#### [!!] : CHANGER RESET

The system microcomputer returns [R] to the host without sending this command to a player.

The processing of transparent commands is exactly the same, being done via the system microcomputer, but can be viewed as a direct interface between the host and the players. The system microcomputer is therefore not concerned when execution errors occur at a player, and even if an unknown command is received from the host, the target player itself must determine what to do with it.

#### 7.4.3. Time Lag

The confirmation of command execution completion is very important in terms of control timing, but the amount of time required for a command to complete execution can vary greatly depending on the command in question. For commands such as DISC SELECT and DISC RETURN which involve control of the changer mechanism, command completion can sometimes take over 30 seconds. Commands which involve the control of player mechanisms, particularly the spindle motor as in the case of START and REJECT, can also take time. Other commands such as fade in/out, speed changes, etc. need some time to complete execution. On the other hand, request commands and commands which merely set a value can be thought of as having completed execution as soon as they have been received.

In general, the host computer needs to confirm the execution completion of a command before it sends the next command to be executed, but given such variation in execution completion times, this is a drawback from the standpoint of processing performance. To address this problem, the CAC-V3000 supports Communication Mode 7. This is one of the Pioneer Standard Protocol. Under Communication Mode 7, a response is returned just after receiving a command. Since execution completion is handled as a status change, the host can check execution completion at any time. For details, see Section 3.3, "Communication Mode 7".

### 7.5. Examples of Simple Applications

#### 7.5.1. Command Examples for Independent Performances

This is an example of how commands are used by an application which only requires the two built-in CD players to perform independently from one another. This is the same as operating two independent CD players. Status management is handled entirely using only [?J] and [?P]. [?J] is used to confirm execution completion of commands, while [?P] is used to confirm that the expected status resulted from executing a command.

##### SAMPLE APPLICATION:

|        |         |                 |
|--------|---------|-----------------|
| 1PS ?J | 1PS E22 | : initializing  |
| :      | :       |                 |
| 1PS ?J | 1PS R   | : 1st CDP ready |
| 1PS ?P | 1PS P20 | : unset         |
| 2PS ?J | 2PS R   | : 2nd CDP ready |
| 2PS ?P | 2PS P20 | : unset         |

#### Initialization complete

|           |         |
|-----------|---------|
| 1PS 213ZS | 1PS R   |
| 1PS ?J    | 1PS B   |
| 2PS 035ZS | 2PS R   |
| 2PS ?J    | 2PS B   |
| 1PS ?J    | 1PS B   |
| 2PS ?J    | 2PS B   |
| 1PS ?J    | 1PS R   |
| 1PS ?P    | 1PS P01 |

#### Player 1 disc set complete

|                |         |
|----------------|---------|
| 2PS ?J         | 2PS B   |
| 1PS SA3SE4SMPL | 1PS R   |
| 1PS ?J         | 1PS B   |
| 2PS ?J         | 2PS B   |
| 1PS ?J         | 1PS R   |
| 1PS ?P         | 1PS P04 |

#### Player 1 play start

|        |         |
|--------|---------|
| 2PS ?J | 2PS B   |
| 1PS ?J | 1PS R   |
| 1PS ?P | 1PS P04 |
| 2PS ?J | 2PS R   |
| 2PS ?P | 2PS P01 |

#### Player 2 disc set complete

|                |         |
|----------------|---------|
| 1PS ?J         | 1PS R   |
| 1PS ?P         | 1PS P04 |
| 2PS SA8SE9SMPL | 2PS R   |
| 2PS ?J         | 2PS B   |
| 2PS ?J         | 2PS R   |
| 2PS ?P         | 2PS P04 |

#### Player 2 play start

|        |         |
|--------|---------|
| 1PS ?J | 1PS R   |
| 1PS ?P | 1PS P04 |
| 2PS ?J | 2PS R   |
| 2PS ?P | 2PS P04 |
| 1PS ?P | 1PS P06 |

**Player 1 performance complete**

|        |         |           |
|--------|---------|-----------|
| 1PS RJ | 1PS R   |           |
| 1PS ?J | 1PS B   |           |
| 2PS ?J | 2PS R   |           |
| 2PS ?P | 2PS P04 | : playing |
| :      | :       |           |
| 1PS ?J | 1PS R   |           |
| 1PS ?P | 1PS P01 | : parking |

**Player 1 stop**

|        |         |           |
|--------|---------|-----------|
| 1PS ZR | 1PS R   |           |
| 1PS ?J | 1PS B   |           |
| 2PS ?J | 2PS R   |           |
| 2PS ?P | 2PS P04 | : playing |
| :      | :       |           |
| 1PS ?J | 1PS R   |           |
| 1PS ?P | 1PS P20 | : unset   |

**7.5.2. Command Examples for Alternating Performances**

This is an example of how commands are used by an application which needs to alternate track playback between CD players such as in a jukebox or karaoke application.

In the case of alternating performances, there is a clear division between the CD player currently performing and the one on standby. This makes control simpler than in the case of two independently performing CD players. Since the application does not need to worry immediately about changes in the status of a player that has begun performing, it can concentrate on putting the next track to be played on standby.

Once the application has finished preparing the next track, it can return to performing status management for the CD player currently performing. There is no need to request status from the standby player until it is okay to begin playback.

|                                |         |                     |
|--------------------------------|---------|---------------------|
| 1PS ?J                         | 1PS E22 | : initializing      |
| 1PS ?J                         | 1PS R   | : 1st CDP ready     |
| 2PS ?J                         | 2PS R   | : 2nd CDP ready     |
| <b>Initialization complete</b> |         |                     |
| 1PS 213ZS                      | 1PS R   | : 1st tune selected |
| 1PS ?P                         | 1PS P21 | : loading           |
| 1PS ?J                         | 1PS B   |                     |
| :                              | :       |                     |
| 1PS ?J                         | 1PS R   |                     |
| 1PS ?P                         | 1PS P01 | : parking           |
| 1PS SA3SE4SMPL                 | 1PS R   |                     |
| 1PS ?P                         | 1PS P02 | : set up            |
| 1PS ?J                         | 1PS B   |                     |
| :                              | :       |                     |
| 1PS ?J                         | 1PS R   |                     |
| 1PS ?P                         | 1PS P04 | : playing           |

**Now that this tune is playing, we can get the next one ready**

|           |           |                      |
|-----------|-----------|----------------------|
| airT      | 2PS 035ZS |                      |
| bns       | 2PS ?P    | : next tune selected |
| 2PS ?J    | 2PS P21   | : loading            |
| 2PS B     |           |                      |
| 2PS ?J    | 2PS R     |                      |
| 2PS ?P    | 2PS P01   | : parked             |
| 2PS SA8SE | 2PS R     |                      |
| 2PS ?P    | 2PS P02   | : set up             |
| 2PS ?J    | 2PS B     |                      |
| 2PS ?J    | 2PS R     |                      |
| 2PS ?P    | 2PS P06   | : pause after search |

Now that the next track is ready, we'll wait until the tune now playing is finished

|        |         |                      |
|--------|---------|----------------------|
| 1PS ?P | 1PS P04 |                      |
| :      | :       |                      |
| 1PS ?P | 1PS P06 | : pause by auto-stop |

We can play the tune on standby now

|           |         |              |
|-----------|---------|--------------|
| 2PS 9SMPL | 2PS R   | : play start |
| 2PS ?P    | 2PS P04 | : playing    |

Now that this tune is playing, we can get the next one ready

|           |         |             |
|-----------|---------|-------------|
| 1PS RJ    | 1PS R   |             |
| 1PS ?P    | 1PS P03 | : reject    |
| 1PS ?J    | 1PS B   |             |
| 1PS ?J    | 1PS R   |             |
| 1PS ?P    | 1PS P01 |             |
| 1PS ZR    | 1PS R   |             |
| 1PS ?P    | 1PS P22 | : unloading |
| 1PS ?J    | 1PS B   |             |
| 1PS ?J    | 1PS R   |             |
| 1PS ?P    | 1PS P20 | : unset     |
| 1PS 158ZS | 1PS R   |             |
| 1PS ?P    | 1PS P21 | : loading   |
| 1PS ?J    | 1PS B   |             |
| 1PS ?J    | 1PS R   |             |
| 1PS ?P    | 1PS P01 | : parking   |

## 7.6. Using the Attenuation Function

Each of the two built-in CD players are equipped with an attenuation function. This function can be used to compensate for variations in recorded levels among songs and for cross fades.

### 1) Compensating for variations in recorded levels among songs

If the system has been set up to manage variations in recorded levels among songs using a database, it is possible to maintain playback at a constant level for all songs.

|              |         |                      |
|--------------|---------|----------------------|
| 1PS ?P       | 1PS P01 | : parking            |
| 1PS SATR12SE | 1PS R   |                      |
| 1PS ?P       | 1PS P02 | : set up             |
| 1PS ?J       | 1PS B   | : busy               |
| :            | :       |                      |
| 1PS ?J       | 1PS R   |                      |
| 1PS ?P       | 1PS P06 | : pause after search |
| 1PS ?R       | 1PS 12  |                      |
| 1PS 252VL    | 1PS R   | : modify play level  |
| 1PS 13PL     | 1PS R   | : play start         |
| 1PS ?P       | 1PS P04 | : playing            |
| 1PS ?J       | 1PS B   | : busy               |
| :            | :       |                      |
| 1PS ?J       | 1PS R   | : play complete      |
| 1PS ?P       | 1PS P06 | : pause by auto-stop |

### 2) Cross fades

Cross fades are possible when alternating performances between the two CD players, by fading out the song currently being played on one player while fading in the next song on the other player.

|              |         |                      |
|--------------|---------|----------------------|
| 1PS ?P       | 1PS P01 | : parking            |
| 2PS ?P       | 2PS P04 | : playing            |
| 1PS SATR12SE | 1PS R   |                      |
| 1PS ?P       | 1PS P02 | : set up             |
| 1PS ?J       | 1PS B   | : busy               |
| :            | :       |                      |
| 1PS ?J       | 1PS R   |                      |
| 1PS ?P       | 1PS P06 | : pause after search |
| 1PS ?R       | 1PS 12  |                      |
| 1PS OVL      | 1PS R   | : minimize volume    |
| 2PS OFD      | 2PS R   | : fade out start     |
| 1PS PL       | 1PS R   | : play start         |
| 1PS ?J       | 1PS B   | : busy               |
| :            | :       |                      |
| 1PS ?J       | 1PS R   |                      |
| 1PS 255FD    | 1PS R   | : fade in start      |
| 2PS ?J       | 2PS B   | : busy               |
| :            | :       |                      |
| 2PS ?J       | 2PS R   |                      |
| 2PS PA       | 2PS R   | : play stop          |
| 2PS ?P       | 2PS P06 | : pause              |
| 2PS ?J       | 2PS R   |                      |

## 7.7. Auto Cue

The Auto Cue function is divided into two functions: AUTO CUE SEARCH and AUTO CUE STOP. Descriptions of each function and technical notes are stated here.

### 7.7.1. Auto Cue Search

The basic function of AUTO CUE SEARCH is to skip over blank portions between tracks. Although it is common for about one second of blank space to exist at the beginning of a track, this command automatically skips this part and pauses immediately before the audio part begins.

It is possible with this command to greatly reduce the blank time between songs when using players for alternating performances. It is also useful for fair overlapping during cross fades. Furthermore, since it is possible to finely set the target output level used during AUTO CUE SEARCH over a range of 255 values, it is even possible to skip over song intros given the right setting for this value.

Return status is identical to that used with the SEARCH command.

**Notes:** If the target output level is set too high, the system may AUTO CUE SEARCH beyond the target track and into the next track. It is therefore recommended that the ?R command be used in combination with the ?J command to determine the current track number when using AUTO CUE SEARCH. If the current track is higher than the target track, use the CL command to clear the search.

AUTO CUE SEARCH may only be used with analog output. Never use AUTO CUE SEARCH when using digital audio output.

### 7.7.2. Auto Cue Stop

AUTO CUE STOP detects blank spaces and stops. Usually there are several seconds of blank space between the end of a song and the beginning of the next one. Since with STOP MARKER PLAY the performance will not end until the next track is entered, several seconds of extra blank space will be played at the end of track.

AUTO CUE STOP PLAY function is controlled by [QT] which specifies the target output level and [LT] which specifies the length of time how long the playback below the target level. If the playback level gets back within the specified length of time, it continues the playback. Therefore, it allows unnecessary parts of a song to be cut without unexpected stopping at the short break during playing a song.

Return status is essentially the same as that used with STOP MARKER PLAY. It is therefore not possible to clear AUTO CUE STOP PLAY by executing speed and fade control-related commands. Be sure to use the CL command to clear AUTO CUE STOP PLAY.

**Notes:** If the target output level is set too low (with the length of time set too long), the performance may continue into the next track. In order to avoid this, be sure to set the target level higher than 16 (about -60 dB). It is also recommended that this command be used in conjunction with a STOP MARKER just in case of problems. (Once the performance is over, the STOP MARKER/AUTO CUE STOP will be cleared.)

The following example illustrates the basic usage of the AUTO CUE function in playing a fictional Track 5, running 4 minutes, 51 seconds, 37 blocks.

```

1PS 001ZS      1PS R      : receive complete
1PS ?P          1PS P21    : loading
1PS ?J          1PS B      : busy
:
1PS ?J          1PS R      :
1PS ?P          1PS P01    : parking
1PS SA          1PS R      : receive complete
1PS ?P          1PS P02    : set up
1PS ?J          1PS B      : busy
:
1PS ?J          1PS R      :
1PS ?P          1PS P06    : pause
1PS 16QLTR5QS  1PS R      : receive complete
1PS ?P          1PS P07    : searching
1PS ?J          1PS B      : busy
1PS ?R          1PS 01     :
:
1PS ?J          1PS R      :
1PS ?R          1PS 05     :
1PS ?P          1PS P06    : pause after cue-search
1PS ?A          1PS 0501000043

```

Player 1 pauses 43 frames from the beginning of Track 5.

```

1PS 2LT16QT6SMPL 1PS R      : receive complete
1PS ?J          1PS R      :
1PS ?P          1PS P04    : playing
:
1PS ?P          1PS P06    : pause by cue-stop
1PS ?A          1PS 0501044963

```

The performance stops a little more than 1 second before the end address of Track 5.

**Note:** Recorded level data is obtained from the decoder IC. Depending on the specifications of the IC, it is uncertain which recorded level data corresponds to the left and right channels. An average is calculated internally to make up for this. Also note that the AUTO CUE function does not always pause at the exact same address, but rather slight variations may occur.

## 7.8. Error Recovery

### 1) When a changer mechanism error occurs

When a mechanism error occurs in the changer, error code [E20] is returned in response to the [?J] command. Even when a mechanism error occurs, it is possible to continue controlling players during a performance. In this case, execute control carefully to avoid halting the performance prematurely.

Even in the case of a mechanism error it is sometimes possible depending on the symptoms to restore the changer from software. One method of restoring the changer is for the application to send the [!!] command to reset the changer. Once the current performance is finished, it is worth trying the [!!] to see what happens. Since there is no way to automatically determine the status of the changer, it is not possible to know whether or not an attempt to reset the changer will work without trying.

Rather than completely abandoning control when an error occurs, applications should try recovering whenever possible.

### 2) When the status expected is not returned

In cases such as when the selected disc is not in the rack or when the set disc does not start, an error code will be returned in response to the [?J] command. All of these situations are completely controllable since none of them are fatal errors in terms of the changer. Applications should handle error recovery in these cases.

### 3) When there is no response from the changer over a set length of time

In Communication Mode 7, responses must be made to all commands sent from the host. If there is no response from the changer, the host must determine that an error has occurred. The length of time needed to determine that an error has occurred is about 200 ms—the amount of time required for data to be transferred from the host to the changer. In this case, first try resending the command line for which no response was received.

