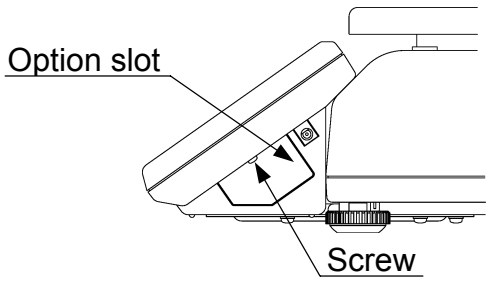
13. OP-03 RS-232C SERIAL INTERFACE

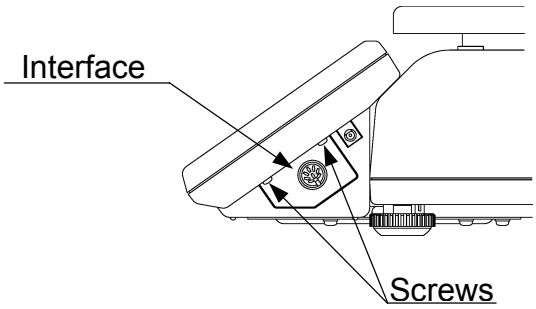
This interface allows the HC-*i* series to be connected with a multifunction printer or a personal computer.

- ❑ The OP-03 unit includes an interface board, a connector plug (DIN type) and two screws. (M3x6 tapping type).

13-1. Installation

1. Disconnect the AC adapter from the scale. If the battery is used, switch off the scale.
2. Loosen the screw and remove the panel covering the option slot.
3. Connect the connector cable on the OP-03 to the connector inside the option slot.
4. Fix the OP-03 unit using the two screws included in the OP-03.

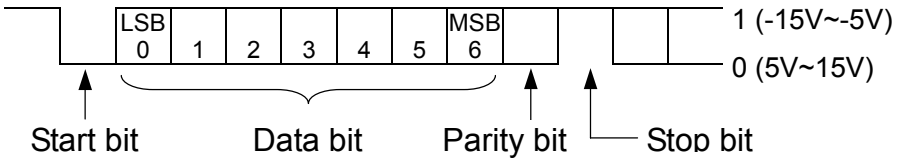




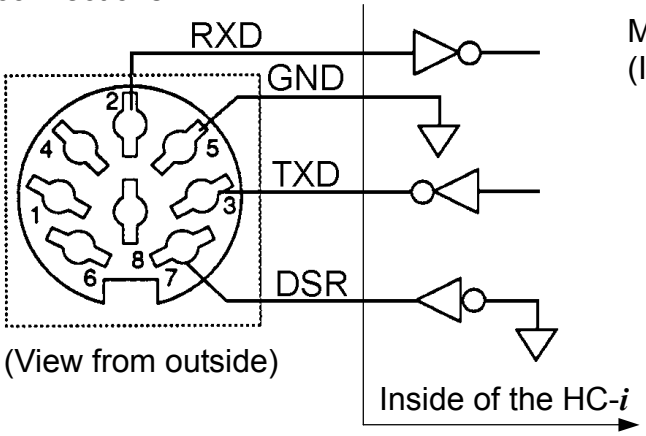
13-2. RS-232C Specifications

Transmission form: Asynchronous, bi-directional, half-duplex

Data format:
- Baud rate: 2400, 4800, 9600 bps
- Data: 7 bits + parity 1bit (even / odd) or 8 bits (non-parity)
- Start bit: 1 bit
- Stop bit: 1 bit
- Code: ASCII
- Terminator: Data Send / C_RL_F Data Receive / C_R or C_RL_F



Pin connections



Mating connector: JA+TCP0586
(Included in the OP-03)

2	Receive data
3	Transmit data
5	Signal ground
7	Data set ready
1, 4, 6 and 8	N.C.

❑ The HC-*i* is designated as DCE (Data Communication Equipment).

13-3. Data Output Mode

❑ The Data Output Modes and Parameters are set by F-Functions in F-06-X as described in the “9-2. F-Functions”

❑ To control the scale using commands form an external device, see “13-6. Command Mode”.

❑ Refer to “13-6. Command Mode” about the output data format.

Data Output Mode (F-06-01)

❑ Key Mode (F-06-01="0")
When the weight display is stable, data is sent by pressing the [PRINT] key. The count display will blink when the data has been sent.

❑ Stream Mode (F-06-01="1")
Data is sent continuously. The data-update rate is approximately 10 times per second for F-06-03="2". For F-06-3="0" or "1", the interval between continuous data is approximately 2 seconds.

❑ Auto-print Mode A (F-06-01="2")
Data is sent if the weight display is stable at +5d (weighing display division) and above. The next transmission can not occur until after the weight display falls below +5d.

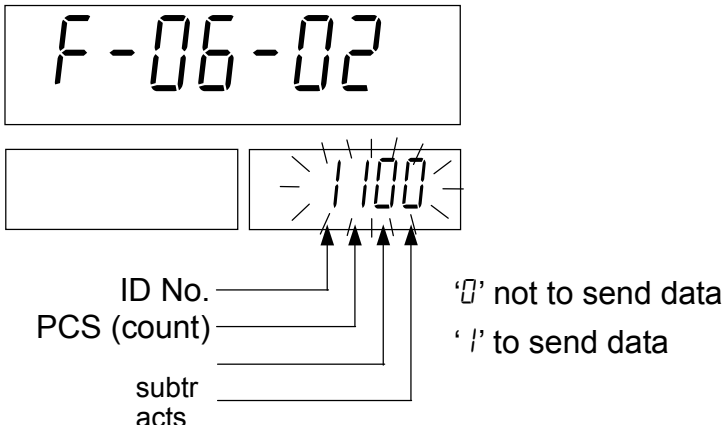
❑ Auto-print Mode B (F-06-01="3")
Data is sent if the weight display is stable at ±5d (weighing display division) and above/below. The next transmission can not occur until after the weight display falls between –5d and +5d.

⚠ To use with the UFC format, refer to "13-7. Using UFC (Universal Flex Coms) Function"

Data to be Sent (F-06-02)

Select which data to be sent by keying in a [0] or [1] for the data: ID No., PCS (count), weight or unit weight.

Example: Key in [1] [1] [0] [0] to display 1100, this setting would send only the ID number and the count.



Data Format (F-06-03)

❑ Format for AD-8121 MODE 1 or 2. (F-06-03="0")

❑ Format for AD-8121 MODE 3. (F-06-03="1")

❑ Format for general apparatuses, computers, etc. (F-06-03="2")

Baud Rate (F-06-04)

Select the baud rate according to the device to be connected.

- ❑ 2400 bps (F-06-04="0") Select 2400 bps to connect with an AD-8121.
- ❑ 4800 bps (F-06-04="1")
- ❑ 9600 bps (F-06-04="2")

13-4. Connecting the AD-8121 Printer / MODE 1 or MODE 2

- ❑ When using the AD-8121 printer (MODE 1 or MODE 2), you will be able to get data: Number of data items, total, maximum, minimum, mean value, range of data (max. - min. data) and standard deviation.
- ❑ When using the AD-8121 with MODE 2, set F-06-02 to print pcs (count) data only or weight data only.
- ❑ To print date and time, use the AD-8121's calendar / clock function and set F-06-02 to print pcs (count) data only or weight data only.

Print Operations Settings

Print By:	F-Function F-06-01	Printer MODE
HC [PRINT] key	0	MODE 1
Auto Print	2 or 3	MODE 1
Printer [DATA] key	1	MODE 2

Example of F-06-02 settings

- ❑ To print pcs (count) data only: set F-06-02 at "0 100"
- ❑ To print weight data only: set F-06-02 at "00 10"
- ❑ To print pcs (count) and weight data: set F-06-02 at "0 1 10"
- ❑ To print pcs, weight and unit weight data: set F-06-02 at "0 1 1 1"
- ❑ To print total data (accumulated by the [M+] key), press the [TOTAL] key so the count display shows the total, then press the [PRINT] key.
- ❑ If you are using the AD-8121's statistic functions, then set F-06-02 at "0 1#0" (# = 0 or 1) for pcs (count) data or "00 10" for weight data.
- ❑ MODE 1 and 2 of the AD-8121 can not print ID numbers.

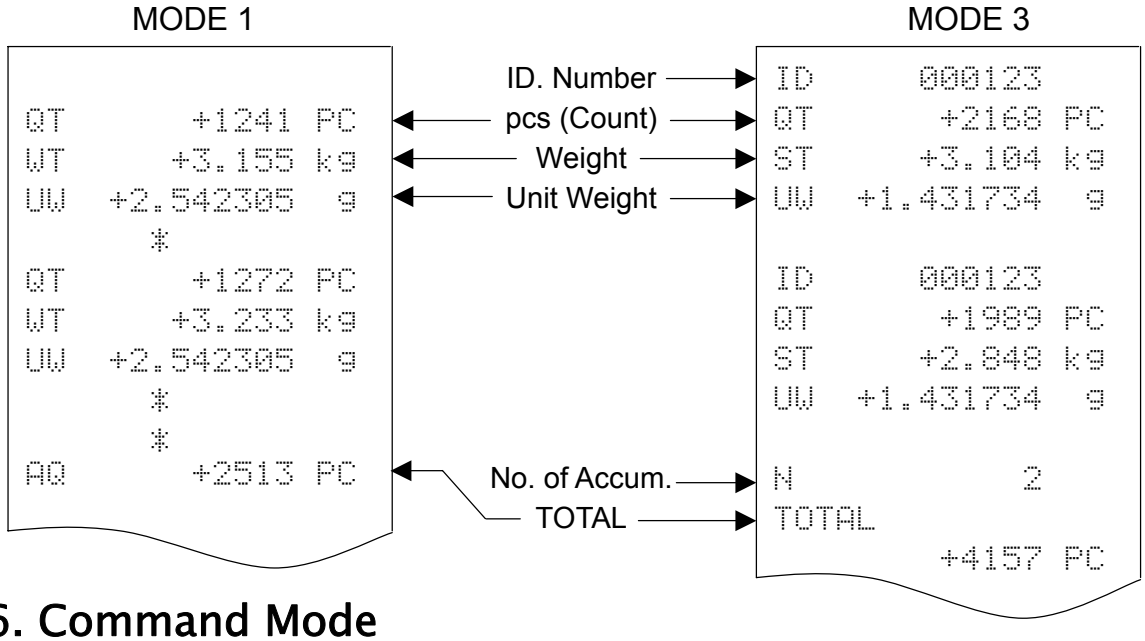
13-5. Connecting the AD-8121 Printer / MODE 3

❑ When using MODE 3 of the AD-8121 printer, printouts are obtained using the PRINT key (F-06-01 = 0), or auto-print mode A/B (F-06-01 =2 or 3).

❑ The total data (accumulated by the M+ key) will be printed along with the number of additions to **M+** memory.

⚠ The AD-8121 / MODE 3 does not have statistical functions.

AD-8121 Printout Sample



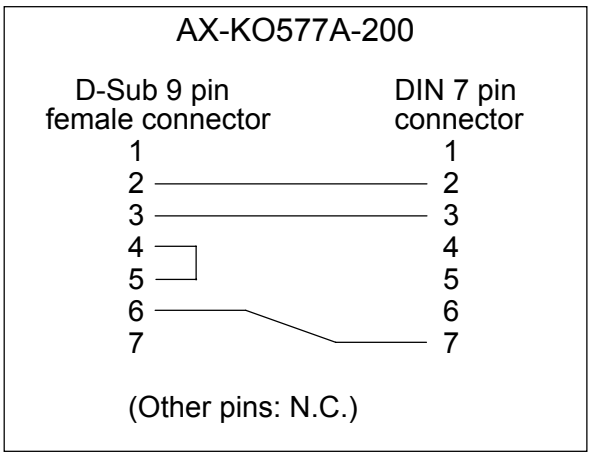
13-6. Command Mode

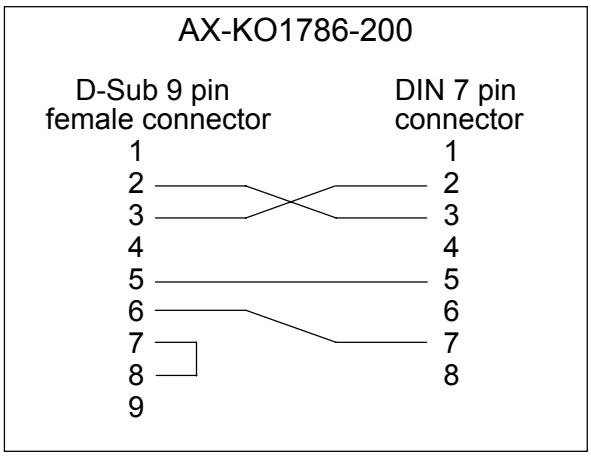
❑ In the command mode, the scale is controlled by commands that come from an external device, computer etc.

⚠ Do not set F-06-01="1" (stream mode) to use with the command mode. if you don't want to use command mode together with key mode or auto-print mode, set F-06-01="4" (command mode only).

❑ Use an optional cable below to connect with a computer.

AX-KO577A-200 RS-232C cable, for D-sub 25 pin, length 2m
AX-KO1786-200 RS-232C cable, for D-sub 9 pin, length 2m
(These cable have a DIN 7pin connector, but it can connect with the OP-03.)





Command List

Command	Definition	Notes
@	Start / stop continuous data transmission.	
A	Same as [RESET] key.	Key command
D	Set a known tare weight.	"D,1.23C_RL_F" sets the tare weight as "1.23kg".
E	Store the unit weight and other values in use to ID memory.	Refer to the data format. Refer F-01-05
F	Recall a unit weight from ID memory.	"F12C_RL_F" recalls from ID12.
G	Set a known unit weight.	"G,0.123C_RL_F" sets the unit weight as "0.123g" (or "0.123 lb").
J	Same as the [TOTAL] key.	Key command
K	Same as the [M+] key.	Key command
Q	Send data immediately.	Data depends on F-06-02
S	Send stable data after accepting command.	
T	Same as the [TARE] key.	Key command
X	Request a list of the F-Function parameters.	The last data terminates with <EOT> (04H)
Y	Request a list of the ID memory contents.	
Z	Same as the [ZERO] key.	Key command
ON	Start the scale from power on sequence	Refer to the data format for the reply.
?ID	Send the ID number in use.	
?QT	Send the pcs (count) data.	
?WT	Send the weight data.	
?UW	Send the unit weight in use.	
?AQ	Send the total (accumulated) **M+** memory count	
?AN	Send the number of additions to **M+** memory.	
?TR	Send the tare weight in use.	
?MR	Send the specified ID memory contents.	
MR	Store the unit weight and tare weight into the specified ID memory.	Refer to the data format for the reply.
ML	Store the comparator limits into the specified ID memory.	
CM	Clear the specified ID memory contents	"CM,1.2C_RL_F" clears content of id 12.
?FC	Send the specified F-Function setting.	Refer to the data format for the reply.
FC	Store the specified F-Function setting value.	

Acknowledgment and Error Codes

When the scale receives an external command, it reacts as follows:

- If the command requests a data reply, the scale will send the data.
  For other commands, the scale will send an acknowledgment <ACK><C_R><L_F> or <ACK> (see F-Function "F-09-02") upon acceptance of the command.

❑ If the command is [S], [T] or [Z], the scale will send a second acknowledgment <ACK><C_R><L_F> or <ACK> (see F-Function "F-09-02") when the command operation is completed.

If an error occurs, the scale will send an error code.

❑ The error format is [E][C][,][E][n][C][L_F], "n" being error number.

En	Definition	Notes
E0	Communication Error	Parity error, framing error, etc.
E1	Undefined command Error	Command does not exist for the scale.
E2	Scale not ready Error.	The scale is not in a state where a command could be expected.
E4	Too many characters Error	Command contains too many characters.
E6	Format Error	Command contains invalid characters.
E7	Out of range Error	Value is out of range. Tare weight is more than the capacity, etc.

Data Format

" ␣ " in examples below shows "Space" (20H).

❑ Examples below are for F-09-02="0000". <ACK>=06H.

❑ Store unit weight and other value in use (according to F-01-05).

Command [E][,][1][2][C][L_F] Stores to id-12. (E,000012$C_R$$L_F$ is acceptable.)

Reply [ACK][C][L_F]

❑ ID Number

Command [?][I][D][C][L_F]

Reply [I][D][,][0][0][0][0][1][2][C][L_F]

❑ PCS (Count) Data

Command [?][Q][T][C][L_F]

Reply

Q	T	,	+	0	0	0	0	1	2	3	4	␣	P	C	C	L_F Stable Positive Data
U	S	,	-	0	0	0	0	5	6	7	8	␣	P	C	C	L_F Unstable Negative Data
O	L	,	+	9	9	9	9	9	9	9	9	␣	P	C	C	L_F 'E' display

❑ Weight Data

Command [?][W][T][C][L_F]

Reply

S	T	,	+	0	0	1	.	2	3	4	6	␣	k	g	C	L_F Stable Positive Data
S	T	,	-	0	0	2	.	7	2	5	5	␣	l	b	C	L_F Stable Negative Data
U	S	,	-	0	0	1	2	.	3	4	6	␣	l	b	C	L_F Unstable Negative Data
U	S	,	+	0	0	0	5	.	5	9	3	␣	k	g	C	L_F Unstable Positive Data
O	L	,	+	9	9	9	9	.	9	9	9	␣	k	g	C	L_F 'E' display
O	L	,	-	9	9	9	9	.	9	9	9	␣	l	b	C	L_F '-E' display

❑ Unit Weight

Command

?	U	W	C	L_F

Reply

U	W	,	+	1	.	2	3	4	5	6	7	␣	␣	g	C	L_F
U	W	,	+	0	.	2	7	2	5	3	1	␣	l	b	C	L_F

❑ Total Count

Command

?	A	Q	C	L_F

Reply

A	Q	,	+	0	0	9	9	9	9	9	␣	P	C	C	L_F

❑ Accumulation Numbers

Command

?	A	N	C	L_F

Reply

A	N	,	0	0	0	0	1	2	3	4	C	L_F

❑ Tare Weight

Command

?	T	R	C	L_F

Reply

T	R	,	+	0	0	1	.	2	3	4	6	␣	k	g	C	L_F

❑ Request the scale to reply with the contents of ID memory.

Command

?	M	R	,	1	2	C	L_F

Request the contents of *id- 12*.

Reply

M	R	,	0	0	0	0	1	2	,	1	2	.	3	4	5	6	7	,	+	0	0	0
.	2	3	4	5	,	+	0	0	0	0	1	3	5	7	,	+	0	0	0	0	1	2
4	6	,	+	0	1	2	3	4	5	6	7	,	0	0	0	0	1	2	3	4	C	L_F

MR, ID number (6 digit), unit weight (8 digit including decimal point), tare weight (9 digit including sign and decimal point), upper limit (9 digit including sign), lower limit (9 digit including sign), total count (9 digit including sign), number of addition (8 digit) C_R L_F .

❑ Memorize (enter) unit weight and tare weight into a specified ID memory.

Command

M	R	,	1	2	,	1	.	2	3	,	0	.	3	4	5	C	L_F

ID # Unit Weight Tare Weight

Reply

ACK	C	L_F

ID Number: Maximum 6 digit
Unit Weight: Maximum 8 digit including decimal point
Tare Weight: Maximum 8 digit including decimal point (‘kg’ or ‘lb’ depends on *F-00* setting).

❑ Store the comparator limits into a specified ID memory.

Command

M	L	,	1	2	,	+	1	0	1	0	,	+	9	9	0	C	L_F

ID # Upper Limit Lowe Limit

Reply | ACK | C | L_F |

ID Number: Maximum 6 digit
Upper Limit: Maximum 9 digit including sign
Lower Limit: Maximum 9 digit including sign

❑ Request the scale to reply with the setting of F-Function.

Command | ? | F | C | , | 0 | 5 | 0 | 1 | C | L_F | Request to reply with the setting of F-05-01.

Reply | F | C | , | 0 | 5 | 0 | 1 | , | 0 | C | L_F | F-05-01 = 0

F-# Setting value

❑ Store the specified F-Function setting value

Command | F | C | , | 0 | 5 | 0 | 3 | , | + | 1 | 2 | 3 | 4 | C | L_F | Set “1234” as the Upper limit.

F-# Setting value

F-Function Number: 4 digits
Setting Value: Maximum 8 digits including sign.

Reply | ACK | C | L_F |

Command | O | N | C | L_F | Start with new settings.

Reply | ACK | C | L_F |

⚠ Having finished the "FC" command, send the "ON" command to start the scale with new settings. The scale replies <ACK> (06H) and starts.

13-6. Using UFC (Universal Flex Coms) Function

- ❑ The UFC function allows you to print out as you format the printer (UFC format).
- ❑ The scale can store the UFC format as text data. It will include parameters to replace with the count data, weight data and so on.
- ❑ The maximum number of text data is 384 characters.
- ❑ Terminator for the “PF” command is "C_R" or "C_RL_F".
- ❑ Using “PF” command, the text data has to be sent to the scale from the computer in advance. Then, connect the scale with the printer.
- ❑ When the [PRINT] key is pressed or by auto-print mode A/B, the scale will send the stored text data with the parameters replaced by the original data.

Store Text Data into the Scale Memory

Command

P	F	,	$	P	C	,	‘	T	E	X	T	‘	,	#	2	0	,	$	S	P	＊	2	,	&
$	C	R	,	$	L	F	,	$	W	T	,	$	C	R	,	$	L	F	C	L_F				

Terminator

Reply

ACK	C	L_F

The “PF” command sends text data that will include:

- ❑ Parameters for the scale data and control codes

Parameter	Data & Code
$PC	Count
$WT	Weight
$UW	Unit weight in use
$TR	Tare weight in use
$TL	Total count
$AN	Accumulation numbers

Parameter	Data & Code
$CD	ID number in use
$CP	Comparator result
$CM	Comma
$SP	Space
$CR	Carriage Return
$LF	Line Feed

⚠ These parameters must be used in capital letters.

- ❑ ASCII text string
  Text string is described in single quote marks as ‘Data’.
  The single quote itself is written as ’’(2 single quotes).
  Example: Text ‘ABC’ is described as ‘’’ABC’’’.
- ❑ The ASCII hexadecimal code
  The ASCII hexadecimal codes are written in the form “#" + 2 hexadecimal digits.
  This will mainly be used to send control codes that can’t be described as a text string.
  Example: #04 “EOT” of ASCII code
- ❑ Repeat data
  The control codes $SP, $CR and $LF can be used with “＊ + maximum 2 digit number”. That code will be repeated the number of times designated.
  Example: $LF＊9 Repeat “$LF” 9 times.
  $SP＊12 Put 12 “Spaces”.
- ❑ Link mark “&”
  If you will send more than 2 lines of data, attach “&” to the end of the first line. Then, the scale considers the data to be continued.

⚠ “Space” or “,” will be used to separate these data. You can skip them, but you cannot skip “,” after “PF”. You must start with “PF,”.

Data Format for the Scale Data

“ ␣” in examples below shows “Space” (20H).

Parameters for the scale data will be replaced by the format below when the scale sends them out.

⚠ Data has a fixed number of digits including a sign and a decimal point. The insignificant zeros are replaced by “Space (20H)” (except the ID number).

$PC	␣ ␣ ␣ ␣ + 1 2 3 4 ␣ P C	1234 pcs / 9 digit data + 3 digit unit
$WT	␣ ␣ + 4 . 3 2 1 0 ␣ k g	4.3210 kg / 9 digit data + 3 digit unit
$UW	+ 1 . 2 3 4 5 6 7 ␣ ␣ g	1.234567 g / 9 digit data + 3 digit unit
$TR	␣ ␣ + 1 . 2 3 4 5 ␣ k g	1.2345 kg / 9 digit data + 3 digit unit
$TL	␣ ␣ + 9 9 9 9 9 9 ␣ P C	999999 pcs / 9 digit data + 3 digit unit
$AN	␣ ␣ ␣ ␣ 1 2 3 4	1234 times / 8 digit data
$CD	0 0 0 0 1 2	ID Number 000012 / 6 digit data
$CP	O K	Result is “OK” / 2 characters
	␣ ␣	Result is not available.

Examples of PF command and AD-8121 Printout Sample

AD-8121 (*F-06-03*=” *0*” or “ *1*”)
(HC-***i*** → AD-8121)

```
ID 000012

Count
        +1234 PC
Unit Weight
    +1.234567  g
Weight
      +1.5235 kg

DATE 09/18/2005
TIME   12:34:56

  A&D HC-15Ki
```

“PF” Command
(Computer → HC-***i***)

```
PF,'ID␣',$CD,$CR,$LF,&
$CR,$LF,&
'Count',$CR,$LF,&
$SP*4,$PC,$CR,$LF,&
'Unit␣Weight',$CR,$LF,&
$SP*4,$UW,$CR,$LF,&
'Weight',$CR,$LF,&
$SP*4,$WT,$CR,$LF,&
$CR,$LF,&
#1B,#44,$CR,$LF,&
#1B,#54,$CR,$LF,&
$CR,$LF,&
'␣␣A&D␣HC-15Ki',$CR,$LF
```

Terminator codes

"␣" shows "Space.".

⚠ Normally the printer needs to receive the terminator, and do not forget to add the terminator code(s) to the end of text data.