Title:

FORMAT 8000 DISPLAY SYSTEM

A/S REGNECENTRALEN

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Abstract:

The FORMAT 8000 Display System is a general purpose display system, which includes RC 3500, RC 811, RC 812 as basic components. The RC 3500 provides the external I/O interface for the FORMAT 8000 Display System's attachment to an RC 8000 computer. The FORMAT 8000 System is compatible with the IBM 3270 display system.

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The FORMAT 8000 Display System is a general purpose display system, which can be tailored to meet the needs of all alphanumeric display applications.

The FORMAT 8000 Display System includes the following basic components:

- RC 3500 General Purpose Controller
- RC 811 Display
- RC 812 Keyboard
- Printer

The RC 3500 provides the external I/O interface for the FORMAT 8000 Display System's attachment to an RC 8000 data processing system. It directs the operation of a number of attached FORMAT 8000 terminals and printers depending on the wanted capacity of the attached devices:

up to 32 per RC 3500 if 480 character capacity,
up to 16 per RC 3500 if 1920 character capacity.

The RC 811 Display provides image display of data received from the RC 8000. An RC 811 Display with an attached RC 812 Keyboard enables the user to enter, modify, or delete data on the display, and to cause the revised display to be returned to the RC 8000 for additional processing.

The display format may be chosen among 700 different display formats by varying the number of lines and number of characters per line up to a maximum of 1920 characters per display, for example:

12 lines of 40 characters each,
24 lines of 80 characters each.

The standard character generator in the RC 811 Display includes small as well as capital letters. The character set is shown in appendix A. The single character is composed by a 5 horizontal x 8 vertical dot matrix.

The RC 812 Keyboard layout is shown in appendix B. Special keyboard functions may be delivered upon request if it is possible to implement the functions as extensions to the standard FORMAT 8000 keyboard functions.

The printer provides printed copy of data received at a display station from the RC 8000. The printer is managed locally in the RC 3500, making it possible for the user to operate in some way, even if the RC 8000 is disconnected.

Functional Control Capabilities. 2.1

General. 2.1.1

The FORMAT 8000 system features a number of functional control capabilities. These make it possible to use the FORMAT 8000 system in applications ranging from conversational inquiry systems to complex data input systems that incorporate format control and built-in data checks. The functional control capabilities of the FORMAT 8000 include, among others, the following:

- Format control by data field
- Null suppression - data compaction
- Addressing and/or updating of any character position on the display
- Printout
- Program attention
- Program tabulation

Format Control by Data Field. 2.1.1.1

The FORMAT 8000 can define different data fields using attribute characters generated by the application program. A data field can commence at any character position on the display. It is established by an attribute character that defines the area extending to the next attribute character. Each attribute character occupies one character position in the display memory, and on the display a space is displayed at this position.

Each attribute character can impart the following attributes to the field that it precedes:

- Protected
- Unprotected
- Numeric input
- Alphanumeric input
- Displayable/Non-displayable
- Tab stop
- Modified/Not modified

Null Suppression - Data Compaction. 2.1.1.2

By suppressing all insignificant characters, it is possible to reduce substantially the length of a message that is to be transmitted to/from the FORMAT 8000. Insignificant characters are entered into the display memory as null characters.

Character Addressing. 2.1.1.3

In the FORMAT 8000, each position on the display can be addressed individually, and the computer can thus write at any character position. Since addresses can be included in a message as many times as desired, it is possible to scatter a single message throughout different locations on the display. The addressing procedure also permits modification of individual attribute characters and data characters.

Printout. 2.1.1.4

In order to ensure that the user can operate in some way even if the communication line or the central computer breaks down, the control of line printers etc. is managed locally in the FORMAT 8000 system.

Single hardcopies may be produced in one operation.

Program Attention. 2.1.1.5

Special program attention keys are provided so that the operator can communicate quickly with the application program without being obliged to enter a message onto the display. When a program attention key is depressed, a read operation is initiated in which the only information transmitted is the identity of the program attention key.

Program Tabulation. 2.1.1.6

Program tabulation commands are issued by the computer, thus causing subsequent text to be written in the next unprotected field. As a result, no position address has to be sent, thereby minimizing message length.

Keyboard Functions. 2.2

General. 2.2.1

Functionally, the keyboard keys can be classified as follows:

1. Data entry keys for:
   - Letters, digits, and symbols
2. Edit keys for:
   - Cursor control
   - Tabulation
   - Erasing
   - Insertion or deletion of data
3. Operational keys for:
   - Display reset
   - Initiation of hard copy printing
   - Initiation of data transmission
4. Program function keys
5. Program attention keys

Data Entry Keys. 2.2.2.

The data entry keys are used to enter alphanumeric characters and special symbols. Their functions are:

SHIFT	Selects upper or lower case characters.
LOCK	When activated, the keyboard shifts permanently from upper case to lower case or from lower case to upper case.
CHARACTER	The characters are displayed at the cursor position, after which the cursor is moved forward to the next position.
SPACE	The cursor is moved one position to the right, and any character located at the cursor's original position is erased.

Edit Keys. 2.2.3

The edit keys carry out keyboard editing functions. The standard keys and their functions are:

Cursor control: 	Moves the cursor one position in the direction indicated by the arrow on the key. The cursor is moved repeatedly as long as the key is kept depressed. Wraparound takes place.
New line NL	Moves the cursor to the first position on the next line. If the cursor was positioned on the last line, it is moved to the first position on the first line.
Carriage return CR	Moves the cursor to the first position on the same line.
Home 	Moves the cursor to the first position on the first line.

Back tab ← ←	Moves the cursor to the first position in the previous unprotected field. If the cursor was positioned in an unprotected field, it is moved to first position in the same unprotected field. Wraparound takes place.
Tab → →	Moves the cursor to the first position in the next unprotected field. Wraparound takes place.
Insert character	If the cursor is placed in an unprotected field, the character at the cursor position and all subsequent characters in the field will be moved one position to the right.
Delete character	Erases the character at the cursor position and moves subsequent characters in the same field one position to the left.
Erase line	Erases all characters starting at the cursor position and extending to either the last position on the same line or to the last position in the unprotected field, if met before.
Erase field	Erases all characters starting at the cursor position and extending to the last position in the unprotected field.
Erase input	Erases all unprotected fields on the display.
Insert line	Moves the line, on which the cursor is positioned, and all following lines in the same unprotected field down one line, thus providing a blank line at the cursor position. The contents of the last line in the unprotected field are lost. The last line must not contain any attribute character.
Delete line	Deletes the line at the cursor position and moves all following lines up one line, thus providing a blank bottom line in the same unprotected field.

MARK, MOVE — These keys move a whole character string from one position on the display to another position on the display. The MARK key is used to identify the source character string. The MOVE key is used to identify the position of the destination for the move operation. When the source character string is identified by two activations of the MARK key, the cursor is duplicated at the start and end of the source string. The actual move operation is performed when the MOVE key is activated.

Operational Keys. 2.2.4

The functions of the operational keys are:

RESET — When this key is depressed, the keyboard will be unlocked.

A lamp in the key may be turned on or blinking. When the lamp is turned on, input is inhibited. When the lamp is blinking, input is inhibited, and some error has occurred at the hardcopy printer. The lamp is turned off by depressing the key.

CLEAR — When this key is depressed, the entire display is erased including protected fields. The central computer is simultaneously notified that the entire display has been erased.

System error — When the FORMAT 8000 system recognizes that the central computer is not available, the lamp in the key is turned on. The lamp is turned off the first time a message is received from the central computer.

Print — When depressed, a local printout on the printer of the display image is initiated. The lamp in the key is turned on, when the printing takes place. The keyboard is unlocked during the operation, so typing may proceed. If some error occurs at the printer, this will become indicated by a blinking lamp in the RESET key. Printing is possible even if the SYSTEM ERROR is turned on.

SEND — This key initiates transmission to the central computer. The lamp in the key is turned on until a message is received from the central computer.

Program Function Keys. 2.2.5

The keyboard contains up to 12 program function keys designated PF1 through PF12. When a program function key is depressed, transmission to the central computer is initiated. Information about which program function key was depressed is sent along with the transmitted text.

Program Attention Keys. 2.2.6

The keyboard may contain up to 3 program attention keys designated PA1 through PA3. When any of the program attention keys is depressed, transmission to the computer is initiated. The message that is sent contains only information about which program attention key was depressed.

The application program in RC 8000 communicates with a group of FORMAT 8000 displays. Input from the displays is initiated by operators pressing a send key at the display terminals. The input data from the terminals is directed to the application program in RC 8000 in one stream of display data. The application program may process the display data one at a time and output some appropriate response to the display terminal in question by means of the procedures described in:

"FORMAT 8000 ALGOL PROCEDURES
wait_trans, open_trans, close_trans, next_field"
(RCSL: 52-AA491).

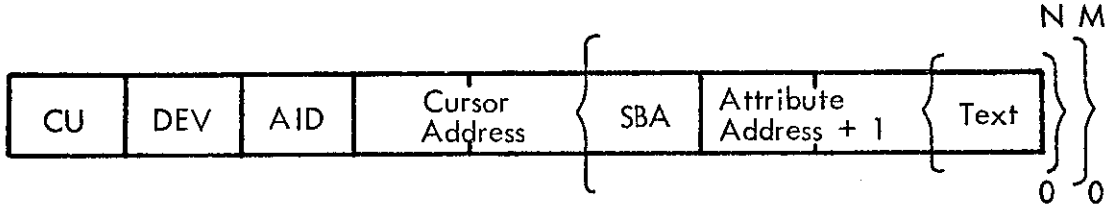
Input. 3.1

When an operator presses a send key, a display data record is generated with one of the following two formats:

Read Modified Format,

Short Read Format.

Read Modified Format. 3.1.1



The format begins with a five-character heading, consisting of the character pair CU, DEV which identifies the display to the application program. Appendix C shows the possible values of CU/DEV.

The AID (Attention Identification) character identifies, which SEND-key initiated generation of the input in question. Appendix D shows the connection between key, AID-value, and input format.

A two-character cursor address follows the AID character and indicates the position of the cursor, when a send-key was activated. Appendix E shows the possible cursor address byte combinations.

Following the heading is the alphanumeric data of each modified field. The data for each field is preceded by a Set Buffer Address (SBA) order code followed by the two-byte buffer address of the first character position in that field (the attribute address + 1).

The buffer location at which the search begins for attribute bytes that define modified fields is buffer address 0. The search for modified-field attribute bytes ends when the last buffer location is checked.

If the last modified field is wrapped from the last buffer location to the first location, the operation is terminated after all data in the field are scanned (nulls are suppressed).

If the buffer does not contain a wrapped modified field, the modified data stream is terminated, when the last modified field is scanned; at the end of the operation, the buffer address is set to 0.

If the buffer is formatted (contains fields), but none of the fields has been modified, the input consists of the five-byte heading only.

If the buffer is unformatted (contains no fields) the input consists of the five-byte heading followed by all alphanumeric data in the buffer (nulls are suppressed), even when part or all of the data have not been modified. Since an unformatted buffer contains no attribute bytes, no SBA codes or address characters are included in the input and the modification of data cannot be determined. Scanning starts at address 0 and continues to the end of the buffer. At the end of the operation, the buffer address is set to 0.

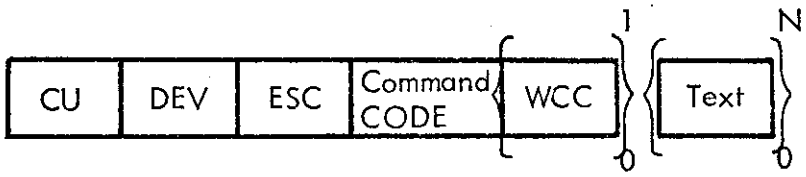
Short Read Format. 3.1.2

This format is generated if a PA or CLEAR key is activated. The input consists of the shown three-byte heading only. The AID byte identifies the key that was pressed.

See appendix D.

Output. 3.2

The application program controls the FORMAT 8000 terminal by generating an output record with the format:



CU/DEV identifies the display. Appendix C shows the possible values of CU/DEV.

ESC is a control character with the internal value 27.

Command Code indicates the command which is executed at the addressed terminal.

Appendix F lists the commands, and associated codes, that can be executed by the FORMAT 8000 terminal.

WCC is a write control character which controls the operation of the Write and Erase/Write commands (see 3.2.1.1).

Text contains display data and/or orders. The orders that can be executed by the FORMAT 8000 display terminal are:

Start Field (SF)

Set Buffer Address (SBA)

Insert Cursor (IC)

Program Tab (PT)

Repeat to Address (RA)

Erase Unprotected to Address (EUA)

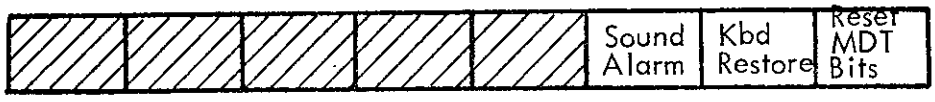
Commands. 3.2.1

The Write and Erase/Write commands are used to load, format, and selectively erase device buffer data. These commands can also initiate certain device operations such as resetting the keyboard and sounding the audible alarm. Write and Erase/Write operations are identical except that Erase/Write causes complete erasure of the buffer in question before the write operation is started. Thus, Erase/Write is used to load the buffer with completely new data, whereas Write can be used to modify existing buffer data.

WRITE Command. 3.2.1.1

The bytes received by the FORMAT 8000 terminal for Write command operation consist of a command code, a write control character (WCC), and any orders and/or new buffer data needed to modify the existing buffer contents.

The WCC byte has the following format:



Bit	0	1	2	3	4	5	6	7

Bit 5: The Sound Alarm bit. When set to 1, sounds the audible alarm at the device in question at the end of the operation, if that device has an audible alarm.

Bit 6: The Keyboard Restore bit. When set to 1, restores operation of the keyboard at the end of the operation and resets the lamp in the RESET key.

Bit 7: Reset MDT bits. When set to 1, all MDT bits in the existing buffer data of the device are reset before any data is written or orders are executed.

Orders (see 3.2.2) and buffer data can follow the WCC character. Buffer data can be written into any specified location of the buffer without erasing or modifying data in the other buffer locations. Data characters are stored in successive buffer locations until an order is encountered in the data stream which alters the buffer address, or until all the data have been entered. During the write operation, the buffer address is advanced one location as each character is stored.

The buffer location where data entry starts depends upon the following:

The starting location should be specified by a Set Buffer Address order that follows the WCC (see 3.2.2.2), else the starting location will be the buffer address containing the cursor.

ERASE/WRITE Command. 3.2.1.2

This command is performed in two steps. First the entire buffer is cleared to nulls, the cursor positioned to location 0, and the buffer address reset to 0. Next a normal Write command is executed. If no WCC is present, the Erase/Write command will not erase the display.

ERASE ALL UNPROTECTED Command. 3.2.1.3

This command has the format:

CU	DEV	ESC	?

and performs four functions at the device:

1. All unprotected buffer character locations are cleared to nulls.
2. The MDT bit for each unprotected field is reset to 0.
3. The keyboard is unlocked.
4. The cursor is repositioned to the first character location in the first unprotected field of the buffer.

If the entire buffer is protected, display data is not cleared and MDT bits are not reset. However, the keyboard is unlocked, and the cursor repositioned to buffer address 0.

Orders. 3.2.2.

Orders can be included in Write or Erase/Write command data streams, either alone or intermixed with buffer data. The orders are executed as they are received. They are not stored in the buffer. By means of the commands it is possible to:

1. position, define, and format data being written into the buffer,
2. erase selected unprotected data in the buffer, and
3. reposition the cursor.

Start Field (SF) Order. 3.2.2.1

The character following the SF order code is stored at the current buffer address as an attribute character. The attribute character defines the start of a field, and the characteristics for all character locations contained in that field:

a. Protected/unprotected

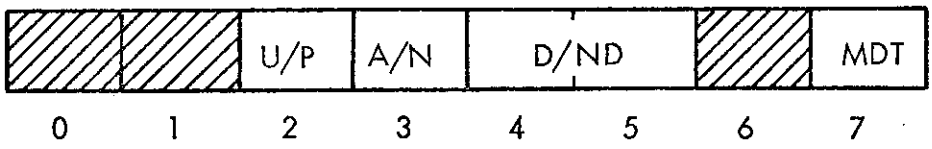
b. Alphanumeric/numeric

c. Displayable/non-displayable

d. Tab stop positions (first character position of unprotected fields)

e. Modified/not modified

The format of the attribute character is:



Bit 2: 0 ~ unprotected
1 ~ protected

Bit 3: 0 ~ alphanumeric
1 ~ numeric

Bit 4 & 5: 00 ~ display
11 ~ nondisplay

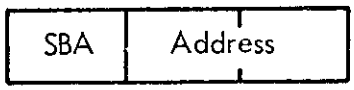
Bit 7: Modified Data Tag (MDT); identifies modified fields during Read Modified format generation.

0 ~ field has not been modified

1 ~ field has been modified by the operator. Can also be set by program in output data stream.

Upon entry of a character into the last character position of an unprotected field, the cursor automatically skips the next field if defined as numeric and protected (bit 2,3 = 1,1) and is positioned to the first character location of the next unprotected field.

Set Buffer Address (SBA) Order. 3.2.2.2

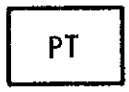


The two characters following the SBA order code specifies a new buffer address from which write operations are to start or continue. Appendix E lists the two-byte code for each possible address.

Insert Cursor (IC) Order. 3.2.2.3

The cursor is repositioned to the location specified by the current buffer address. Execution of this order does not change the current buffer address.

Program Tab (PT) Order. 3.2.2.4

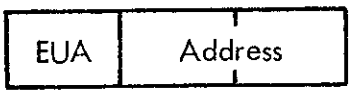


The current buffer address is advanced to the address of the first character position of the next unprotected field. Wraparound takes place. If an attribute character for an unprotected field is not found, the buffer address is set to location 0.

Repeat to Address (RA) Order. 3.2.2.5

The specified character is stored from the current buffer address and ending at (but not including) the specified stop address. Wraparound takes place.

Erase Unprotected to Address (EUA) Order. 3.2.2.6



Nulls are inserted in all unprotected buffer character locations, from the current buffer address and ending at (but not including) the specified stop address. Wraparound takes place.

b_7	b_6	b_5	b_4	b_3	b_2	b_1		0	0	0	0	1	1	1	1
								0	0	1	1	0	0	1	1
								0	1	0	1	0	1	0	1
								0	1	2	3	4	5	6	7
			0	0	0	0	0				0	@	P	`	p
			0	0	0	1	1			!	1	A	Q	a	q
			0	0	1	0	2			"	2	B	R	b	n
			0	0	1	1	3			#	3	C	S	c	s
			0	1	0	0	4			$	4	D	T	d	t
			0	1	0	1	5			%	5	E	U	e	u
			0	1	1	0	6			&	6	F	V	f	v
			0	1	1	1	7			'	7	G	W	g	w
			1	0	0	0	8			(	8	H	X	h	x
			1	0	0	1	9			)	9	I	Y	i	y
			1	0	1	0	10			*	:	J	Z	j	z
			1	0	1	1	11			+	;	K	Æ	k	æ
			1	1	0	0	12			,	<	L	Ø	l	ø
			1	1	0	1	13			-	=	M	Å	m	å
			1	1	1	0	14			.	>	N	^	n	~
			1	1	1	1	15			/	?	O	_	o	

Character Generator No. 2.

Character Generator No. 1.

Character Generator No. 3.

Replaced by Dwg. No.

due to ECN

Replaces Dwg. No.

Design Check

Dwg. Office Check

Drawn by

Designed by

A/S REGNECENTRALEN

Unit	Distribution of the Binary Addresses for RC 3260-1	AA494
RC35-811		
Dwg. No. A23431	DANSK KARAKTER GENERATOR RC8000/RC811	A-1

b_7	b_6	b_5	b_4	b_3	b_2	b_1		0	0	0	0	1	1	1	1
								0	0	1	1	0	0	1	1
								0	1	0	1	0	1	0	1
								0	1	2	3	4	5	6	7
			0	0	0	0	0				0	@	P	\	p
			0	0	0	1	1			!	1	A	Q	a	q
			0	0	1	0	2			"	2	B	R	b	r
			0	0	1	1	3			#	3	C	S	c	s
			0	1	0	0	4			$	4	D	T	d	t
			0	1	0	1	5			%	5	E	U	e	u
			0	1	1	0	6			&	6	F	V	f	v
			0	1	1	1	7			'	7	G	W	g	w
			1	0	0	0	8			(	8	H	X	h	x
			1	0	0	1	9			)	9	I	Y	i	y
			1	0	1	0	10			*	:	J	Z	j	z
			1	0	1	1	11			+	;	K	[	k	{
			1	1	0	0	12			,	<	L	\	l	|
			1	1	0	1	13			-	=	M	]	m	}
			1	1	1	0	14			.	>	N	^	n	~
			1	1	1	1	15			/	?	O	_	o	

Character Generator No. 2.

Character Generator No. 1.

Character Generator No. 3.

Replaced by Dwg. No.

due to ECN

Replaces Dwg. No.

Design Check

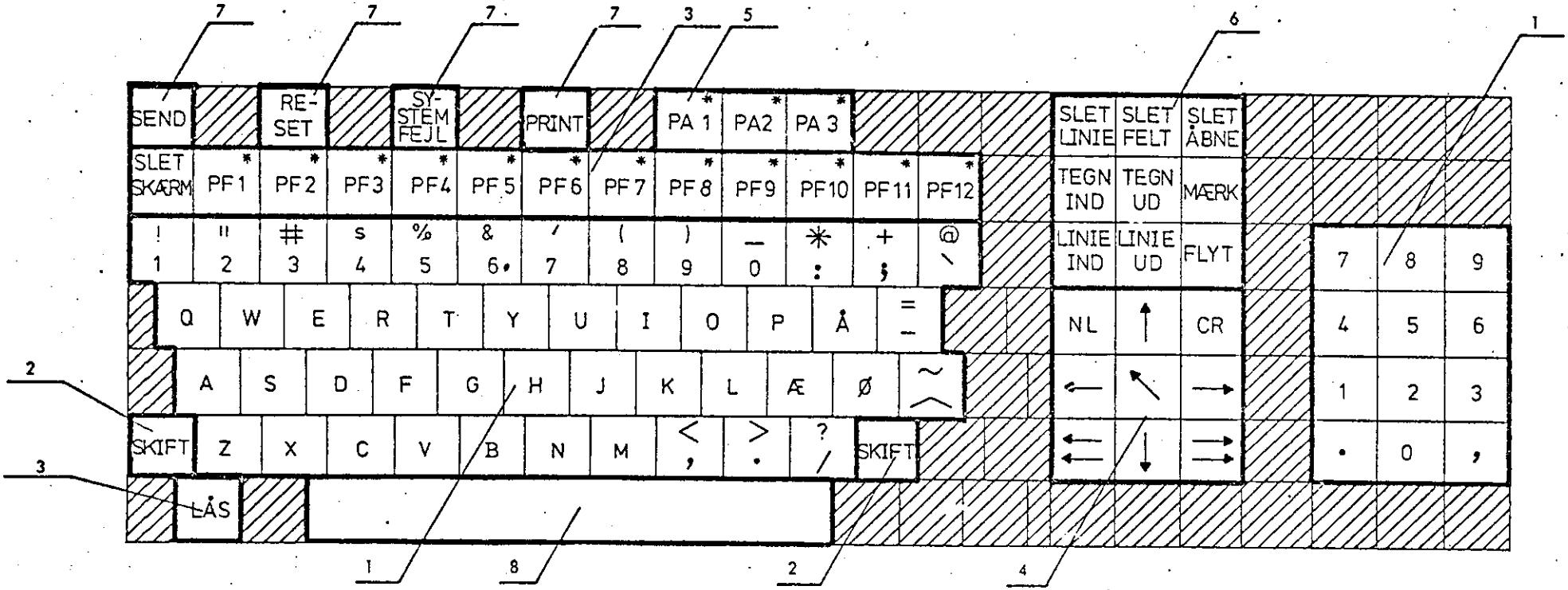
Dwg. Office Check

Drawn by

Designed by

A/S REGNECENTRALEN

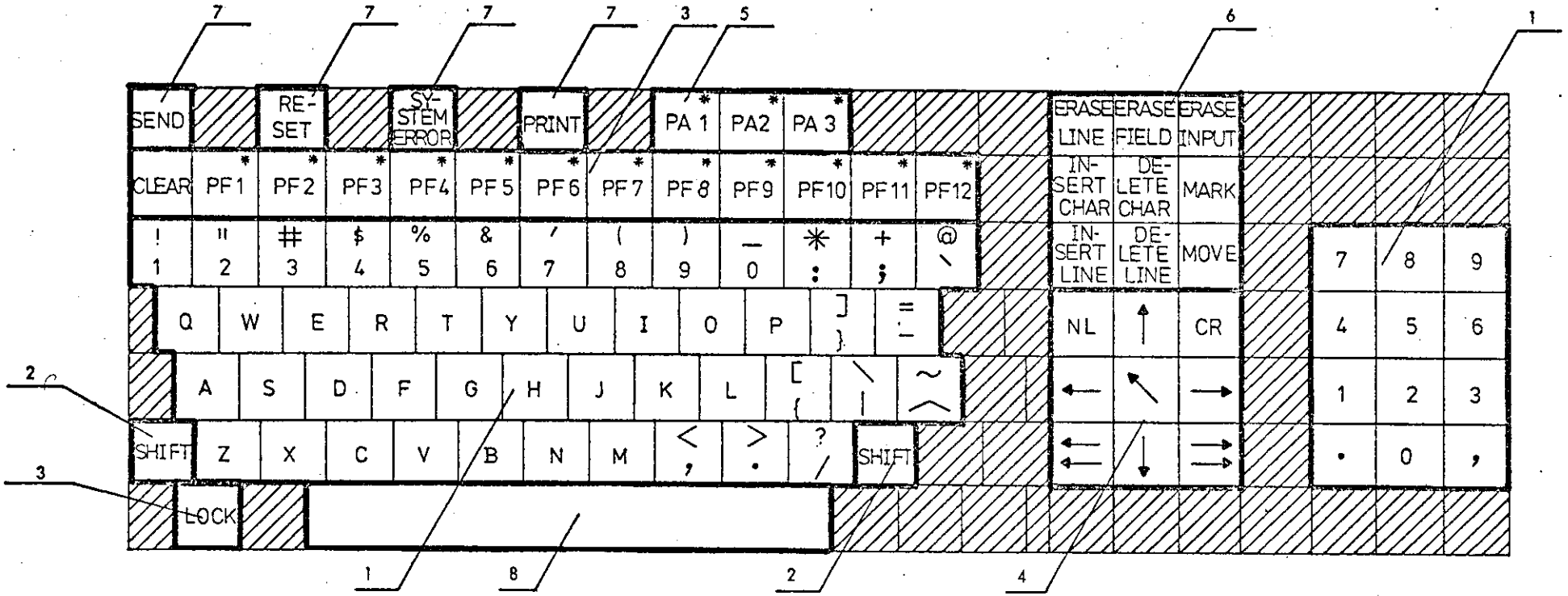
Unit		
RC35-811	Distribution of the Binary Addresses for RC 3260-1	AA494
Dwg. No. A23431	ASCII KARAKTER GENERATOR RC8000/RC811	A-2



1) GRÅ, hvid gravering.
2) SORT, hvidt lys og sort gravering.
3) SORT, hvid gravering.
4) BLÅ, hvid gravering.
5) RØD, hvid gravering.
6) GUL, sort gravering.
7) RØD, rødt lys og hvid gravering.
8) GRÅ mellemrumstangent.

TASTER MÆRKET (*) GRAVERES AFHÆNGIG AF APPLIKATION.

A/S REGNECENTRALEN	drawn by: OKJ	unit: RC8000 RC812	scale: --	drawing nr: A12536
	checked:	Dansk tastatur layout	material: --	
	760220		add treatment: --	
	1 pages / 1 page		total number pr unit: 1	



1) GRÅ, hvid gravering.
2) SORT, hvidt lys og sort gravering.
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4) BLÅ, hvid gravering.
5) RØD, hvid gravering.
6) GUL, sort gravering.
7) RØD, rødt lys og hvid gravering.
8) GRÅ mellemrumstangent.

TASTER MÆRKET (*) GRAVERES AFHÆNGIG AF APPLIKATION.

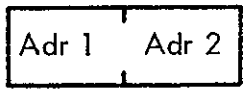
A/S REGNE CENTRALEN	drawn by	CKJ	unit: RC8000/RC812 ASCII tastatur layout	scale -- drawing nr A12537
	checked			material --
		760220		add. treatment --
	1 pages	1 page		total number of unit 1

CU/DEV Addressing

CU/DEV Decimal	Value	Graphic
0	64	@
1	193	undef.
2	194	-
3	195	-
4	196	-
5	197	-
6	198	-
7	199	-
8	200	-
9	201	-
10	74	J
11	75	K
12	76	L
13	77	M
14	78	N
15	79	O
16	80	P
17	209	undef.
18	210	-
19	211	-
20	212	-
21	213	-
22	214	-
23	215	-
24	216	-
25	217	-
26	90	Z
27	91	Æ
28	92	Ø
29	93	Å
30	94	^
31	95	_

AID Configurations

Keyname	Value	Graphic	Input Format
SEND	176	undef.	Read Modified
PF1	49	1	- -
PF2	50	2	- -
PF3	51	3	- -
PF4	52	4	- -
PF5	53	5	- -
PF6	54	6	- -
PF7	55	7	- -
PF8	56	8	- -
PF9	57	9	- -
PF10	58	:	- -
PF11	126	=	- -
PF12	159	undef.	- -
PA1	37	%	Short Read
PA2	184	undef.	- -
PA3	44	,	- -
CLEAR	216	undef.	- -



Conversion from two-byte buffer address to integer buffer address:

Algorithm:

char:= get first char
address 1:= (char and 63) shift 6
char:= get second char
address 2:= char and 63
address:= address 1 + address 2

Conversion from integer buffer address to two-byte buffer address:

Algorithm:

address 1:= table ((address shift - 6) and 63)
address 2:= table (address and 63)

where table must have the contents:

; 0-31 64, 193, 194, 195, 196, 197, 198, 199, 200, 201, 74,
75, 76, 77, 78, 79, 80, 209, 210, 211, 212, 213, 214,
215, 216, 217, 90, 91, 92, 93, 94, 95

; 32-63 45, 47, 83, 84, 85, 86, 87, 88, 89, 90, 137, 44, 37,
216, 184, 63, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57,
58, 126, 159, 176, 61, 34

Command	Value	Graphic
Write	49	1
Erase/ Write	53	5
Erase All Unprotected	63	?

Control character	Value
ESC	27
SF	29
SBA	17
IC	19
PT	9
RA	20
EUA	18