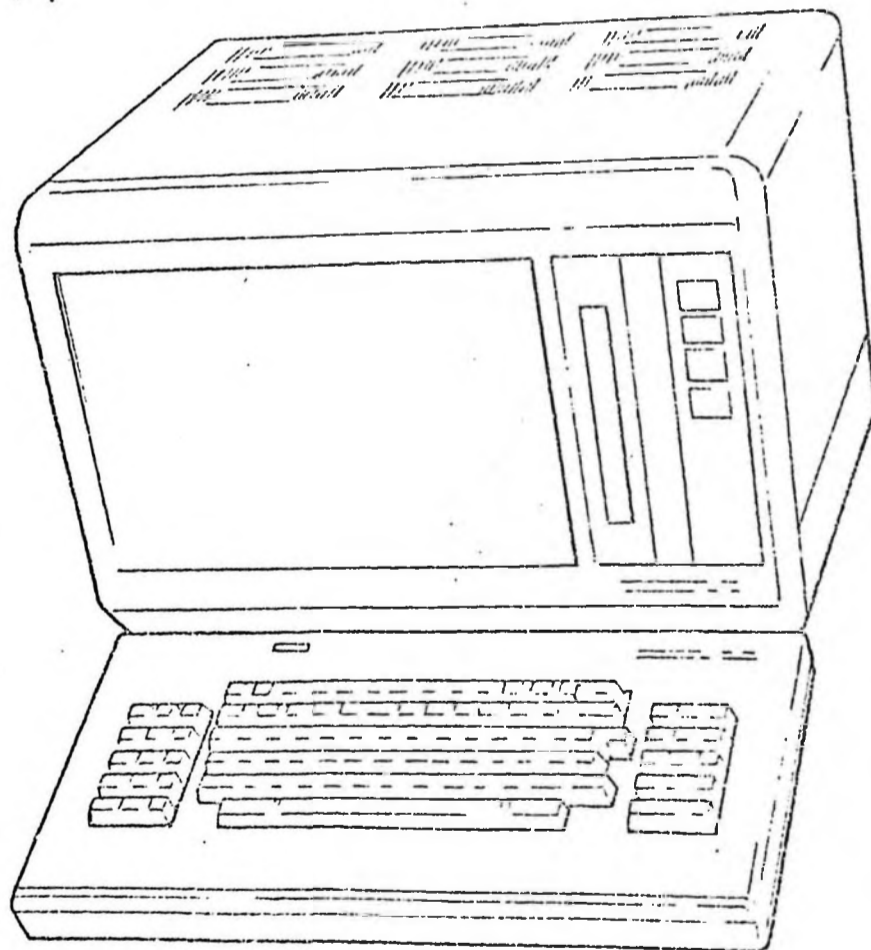# TANDBERG

TDV 2114 INTELLIGENT DISPLAY TERMINAL

Operating Instructions

PRELIMINARY

INTRODUCTION

1. GENERAL

The TDV 2100 series of digital displays has a wide range of possible versions. This operating manual will only describe the operating of a single display unit. Further information on specific versions are given in additional manuals.

1.1 Definitions

The term "Remote Computer" will be used in this manual to denote any type of equipment (computer or peripheral) that your display unit is to communicate with.

The term "Local Computer" when applicable means the computer within the cabinet of the display.

2. THE KEYBOARD

Four versions of keyboard will be standard:
— ECMA international
— ECMA national
— NORWEGIAN standard
— "TTY" version

In addition system applications will have keyboards with layouts adapted to each system. Customer specified keyboards are available on request.

2.1 Alpha numeric keys

The keys marked with alpha numeric symbols will be referred to as display character keys because they can all be displayed on the screen. Upper and lower case letters are standard. All the display character keys generate characters in the ASCII code which are stored in the memory of the display logic. See "Display character keys", page 11. The space key can be considered a display character key giving an empty character location on the screen.

2.2 Encoded functional keys

These keys generate ASCII codes which are used to control the operation of the display such as selecting display mode, erase text and move the cursor.

Some operations require a combination of keys to be depressed. See "Encoded functional keys", page 14.

2.3 Un-encoded functional keys

These keys are used to establish and control communication with the Remote Computer, and do not generate characters in the ASCII code. See "Un-encoded functional keys", page 14.

2.4 Repeat

All the encoded keys will start repeating the character if they are not released within 1.5 seconds. (Adjustable from 1 to 2 seconds.) The character will be repeated 10 times per second as long as the key is depressed. (Adjustable from 10 to 20 times per second.) See "Writing", page 7.

2.5 Intensity

The intensity of the displayed characters may be adjusted with a potentiometer positioned above the keys to the left.

2.6 Indicators

There are eight emitting diodes (LEDs) functioning as status indicators placed above the keys on the keyboard. They will be identified with text below each indicator. See "Indicators", page 12.

3. DISPLAY

3.1 Display area

The display area on the screen has 25 text lines, each with 80 character locations. The text may be typed with the alpha-numeric keys on the keyboard or it may be received as ASCII codes from the Remote or Local Computer.

The ASCII codes for all characters and spaces on one page are stored in a memory in the display logic.

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3.2   Roll mode

If the display is in the conversational mode, the whole page will roll up one line after the eightieth character has been written on the bottom line. Roll up can also be done by depressing the roll up key, or by line feed, or by receiving the appropriate code. Roll down can be done by depressing the roll down key or by receiving the appropriate code. By throwing a switch in the display logic, the cursor will stop at the end of each line, and line feed and carriage return keys must be used. See "Roll mode", page 13.

3.3   The cursor

The cursor indicates where the next character will be written. When a character has been entered, the cursor moves one character position to the right. The cursor can be moved wither by depressing the space key or by receiving the ASCII code for space from the Remote Computer (destructive space). The cursor can be moved to any location on the screen with the curcor control keys or by corresponding codes from the Remote Computer (non destructive movements). This enables the operator to place the text where he wants it. There are four different ways to display the cursor. See "Cursor Control", page 7.

3.4   Display modes

There are several different ways to display the character on the screen. Some modes may be obtained by depressing different combination of keys on the keyboard or by receiving the appropriate codes from the Remote Computer. Other modes are factory strapped options. See "Display modes", page 10.

4.   TRANSMITTING AND RECEIVING

4.1   Transmitting and receiving data

The type of communication link between your display unit and the Remote Computer affects the communication mode. If the link allows full duplex it means that sending can take place in both directions at the same time.

Half duplex means that transmitting can take place in both directions, but not at the same time.

Before you can transmit and receive data your display unit must be connected to the Remote Computer via a suitable communication link and must be set up to comply with the terminal at the Remote Computer and with the restrictions imposed by the communication link. In general this will involve selecting internal or external echo, full or half duplex, baud rate, 1 or 2 stop bits, parity checking and generating. When parity checking and generating is wanted, even or odd parity must be selected in accordance with the system.

4.2   Echo

Echo means that the characters entered from your keyboard are not only sent to the Remote Computer, but are also displayed on the screen of your display unit. The echo can be either internal or external.

Internal echo means that the characters are sent back to your own screen at the same time as they are sent to the Remote Computer.

External echo means that the characters are first sent to the Remote Computer which then re-transmits them to your display where they will apear on the screen.

Communication over long distances will usually go via a telephone line with a modem at each end. In this event it will depend on the telephone channel whether or not full duplex is possible. For full duplex operation over the same line it will be necessary to ensure that the carrier frequencies for sending and receiving are different. See "Initial Setting up", page 5.

4.3   On-line/Off-line

Because a telephone line is paid for per unit time used, you will normally not have your display unit connected to the Remote Computer all the time, but let it remain in the Off-line mode when you are not transmitting. Before any communication with the Remote Computer can take place, your display unit must be On-line (connected to the Remote Computer). This can be done through a procedure that is somewhat depending on the system, but the LINE key is normally used. See "Making contact with the Remote Computer", page 13.

When the display unit is Off-line all keys except the LINE key will affect the operation of your own terminal only. Normally you will be starting in TOS monitor (Tandberg Operating System), so before going further you must decide what program you are going to use. By depressing the T-key, the unit will be in the teletype mode. See "Initial Setting up", page 5.

4.4 Adapting your display unit to the data system

Your display unit has some switches that must be set in particular positions to match the communication link and the configuration of the system at the Remote Computer. The conditions to be set are parity yes or no, odd or even parity, 1 or 2 stop bits, data transmission rate, echo internal/external. See "Initial Setting up", page 5.

Special information for the programmer

A table of relevant codes for functional characters and the display unit's response to them is provided, in addition to the complete table of ASCII codes. See tables on pages 15, 16, and 17.

CAUTION!
Do not cover the ventilation slots on top of the display unit by placing books or other objects over them. Appropriate ventilation is required to prevent the components from overheating.

The Random Access Memory is of the semiconductor type. Make sure that it does not contain anything of interest before power is turned off.
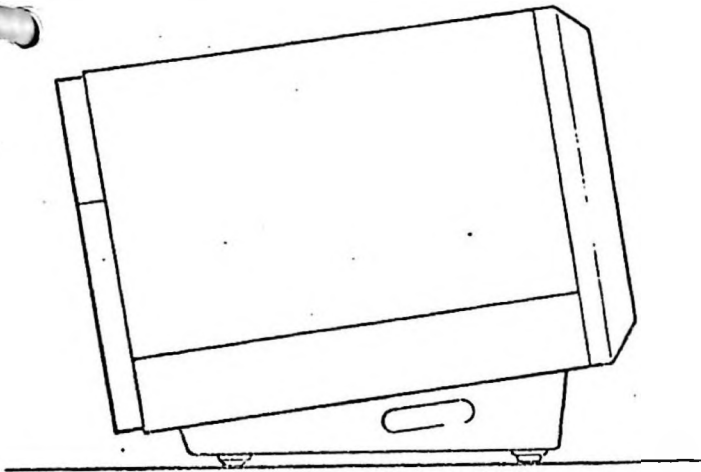
Remove the diskette from the drive before power is turned off. Otherwise false data may be written as the voltage drop.
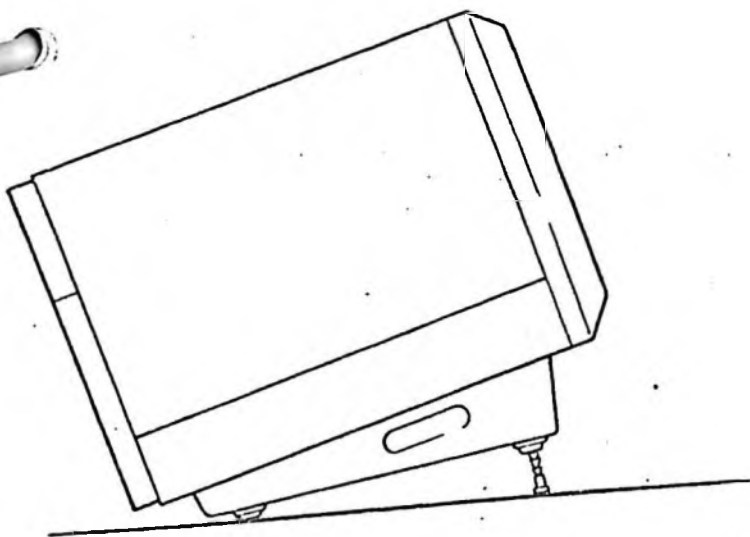
INSTALLING

Avoid direct sunlight or bright light from any other source directly on the screen. Also avoid intense light behind the display as this may prove tiring to the operator's eyes.

The TDV 2100 Display Unit family is designed to give the operator a convenient working position. The viewing screen has a slope of eight degrees from the vertical. If a greater slope is desired, extendable supported legs are provided towards the front of the base. The legs have four notches and fully extended they will give the screen a slope of 16 degrees from the vertical. See figure.
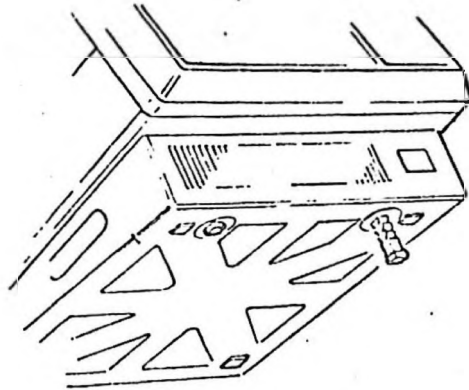
The legs can be pulled straight out and each has four spring loaded notches. To push the leg back in, turn it 90 degrees either to the right or left and push at all the way in. Then turn it back to the original position.

Underside view of the
base with one leg extended.

Sideview of the TDV 2114
without legs in use.

Sideview of the TDV 2114
with the legs fully extended.

If required, the keyboard may be placed up to about one meter (40") from the display unit by means of a built in cable. This allows the display to be located where it is most convenient for your application. The keyboard should be placed at a height that allows the operator (to have) a relaxed working position.

CAUTION!
Do not cover the ventilation slots on top of the display unit by placing books or other objects over them. Appropriate ventilation is required to prevent the components from overheating.
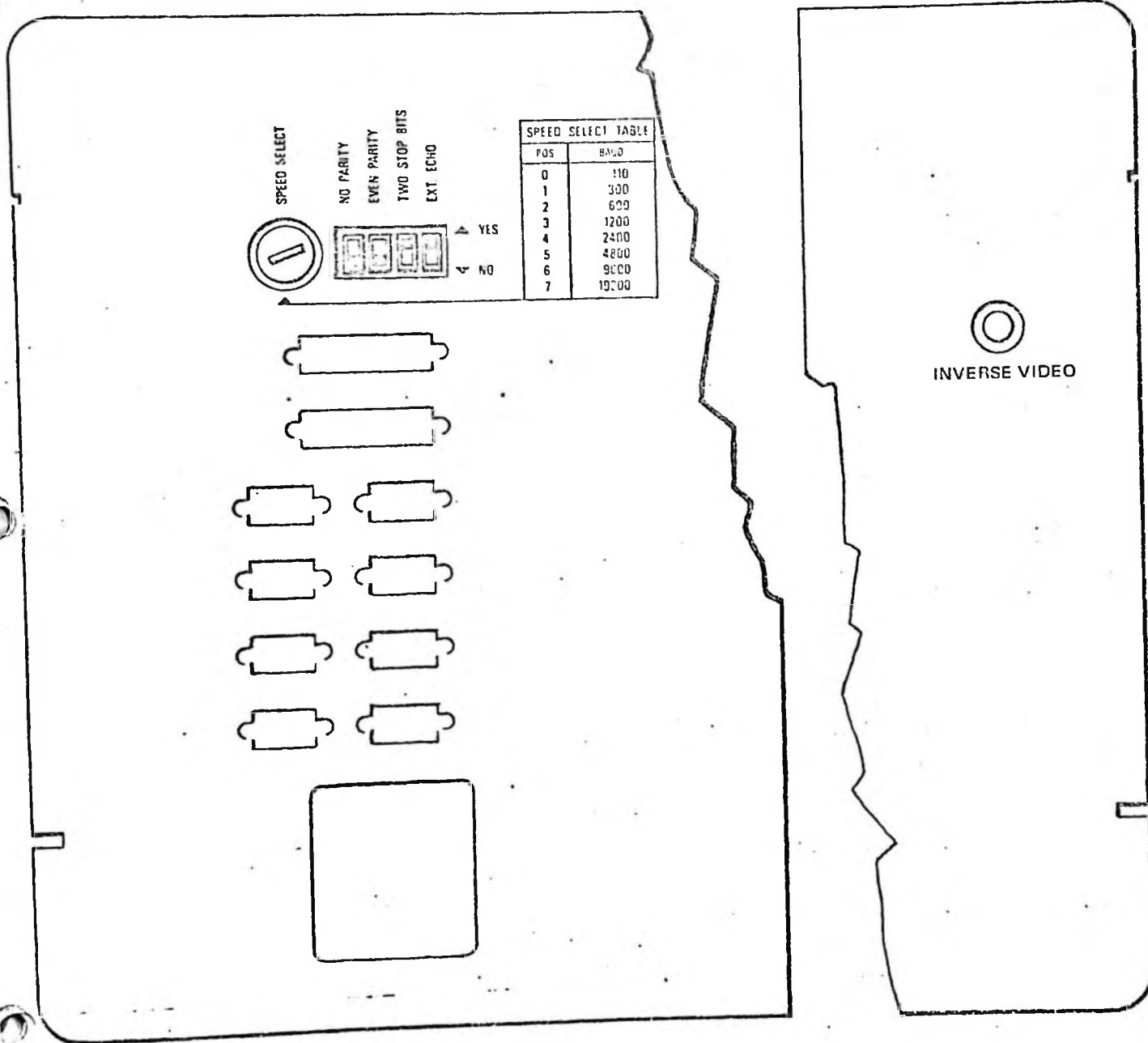
INITIAL SETTING UP

There are several jumpers and switches that have to be positioned to set the display unit in the desired mode. Most of these switches and jumpers are placed on the circuit boards and will be factory set.

The operator has access to six switches on the back cover of the unit. These switches are:

- Transmission speed selector
- No parity switch
- Even parity select switch
- Two stop bits switch
- External echo switch
- Inverse video switch

See figure.

- SPEED SELECT determines the clock frequencies used in the synchronous interface. A table on the back panel gives switch positions and baud rates.
- NO PARITY switch must be set to NO if checking of received data and adding of parity bit to transmitted data is required.
- EVEN PARITY switch is effective only when the NO PARITY switch is in the NO position. Choise between even or odd parity.
- Two STOP BITS switch must be set to agree with the number of stop bits used in the system.
- EXT. ECHO switch must be set in the NO position when the link is half duplex.
- INVERSE VIDEO can be obtained by depressing the switch on the Video Display 2 board. A hole in the right back panel gives access to it.

SPEED SELECT TABLE	
POS	BAUD
0	110
1	300
2	600
3	1200
4	2400
5	4800
6	9600
7	19200

SPEED SELECT

NO PARITY
EVEN PARITY
TWO STOP BITS
EXT ECHO

YES
NO

INVERSE VIDEO

Switching the power on

The unit's on/off switch, labelled I and O, is located on the lower right hand side of the unit, towards the front. I is short for IN, meaning power on, O stands for OUT, meaning power off. When the power is on the POWER ON indicator on the keyboard lights. The Reset pushbutton and the volume control for the bell are located below the screen.

Reset pushbutton
Bell volume control
Power switch
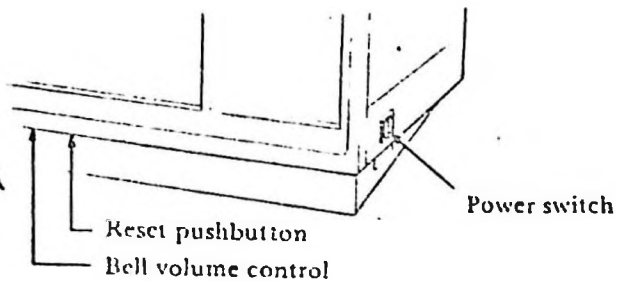
Adjusting the intensity

The intensity of the displayed characters can be adjusted with an intensity control located on the upper left hand side of the keyboard.
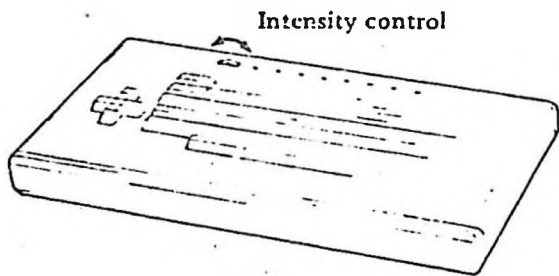
Intensity control

A preset adjustment inside the unit makes it possible to turn the intensity completely off with the intensity control.

After the power has been turned on

When the power is turned on, several steps take place automatically, such as:

— The whole screen is erased.
— The cursor moves home and one period mark is written.
— The CPU counter starts counting from zero.
— Normally the display enters the program TOS (Tandberg Operating System).

By depressing the A key the whole screen will be automatically filled with all the alpha numeric characters and the symbols on the keyboard. Press the RESET button below the screen to bring the unit back into TOS.

To check the TDV 2114 in the local mode, depress the T key. The display unit is then in the TTY mode and any alpha numeric character or symbol on the keyboard can be written on the screen.

Press the RESET button to bring the unit back into TOS.

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Cursor control

The cursor indicates where the next character will be written. When a character has been entered, the cursor moves one character position to the right. The cursor can be moved either by depressing the SPACE bar or by receiving the ASCII code for SPACE from the Remote or Local Computer (destructive space). The cursor can also be moved to any location on the screen with the cursor control keys, or by corresponding codes from the Remote or Local Computer, or by direct cursor address sequence. This enables the operator to place the text where he wants it.

There are four different ways to display the cursor:

Steady underscore

— a short line of steady intensity in the space below the text line.

Blinking underscore

— the intensity alternates between off and preselected intensity level.

Steady block

— the cursor occupies the total area of the whole character, including the underscore position.

Blinking block

— the intensity alternates between off and preselected intensity level.

The desired mode is selected on the Display Logic II board and will be factory preset.

When the cursor comes to the last position on a line the next movement depends on which of the two factory strapped modes the unit is in:

A When the last character has been written, the cursor will remain in the same position. The latest entered character will replace the previous.

B. When the last character has been written, the cursor moves to the first position on the next line. This mode is called Automatic Carriage Return Line Feed.

Direct Cursor Addressing is a standard feature and means that the cursor can be programmed to move directly to any position on the screen.

To move the cursor the code 10 hex must be received by the display logic. This sets the Cursor Load mode. The binary value of the two subsequent codes are interpreted as Line Number and Column Number respectively.

It is possible to use Direct Cursor Addressing from the keyboard, i.e. for test purposes. The CTRL + P keys will give the code 10 hex. Then the characters giving the binary values corresponding with the desired line and column must be entered. See example below.
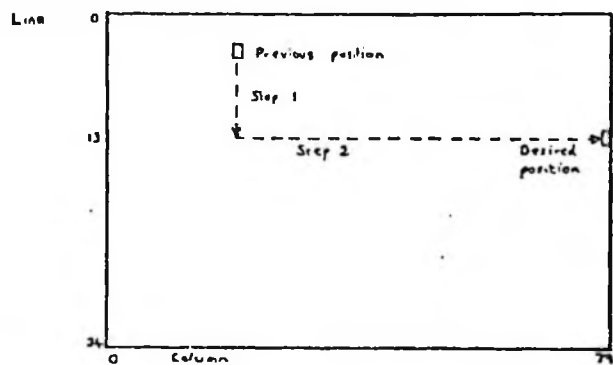


Example: Move the cursor
to line 13, column 79.

Use keys CTRL + P or DLE to obtain code 10 hex. Key CR equals 13 decimal which is the desired line number. Key O equals 79 decimal which is the desired column number.

Moves the cursor up on line each time the key is depressed. The cursor stops in the top line. The action is repetitive if the key is depressed longer than the preset time (1 to 2 seconds).

The cursor always indicates the position of the next character to be written. By moving the cursor, the text can be positioned in the desired place on the screen.

Moves the cursor one character position to the right each time the key is depressed until the end of the line is reached. The next time the key is depressed, the cursor moves to the beginning of the line below. The action is repetitive.

Moves the cursor to the beginning of the same line.
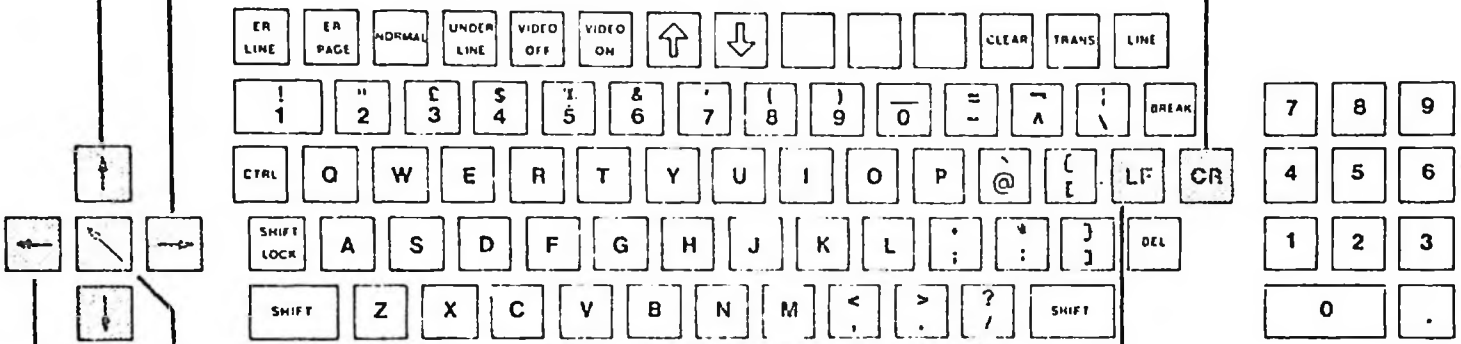
Moves the cursor one position to the right and erases any character already in that position.

Brings the cursor back to home position, e.g. the top left hand corner of the screen.

Moves the cursor to the same position on the line below. When cursor already is in the bottom line all lines above will roll one line up, but the cursor remains in the bottom line.

Moves the cursor to the same position on the line below. The action is repetitive. The cursor stops in the bottom line.

Moves the cursor one character position to the left (backspace). The action is repetitive. The cursor stops at the beginning of the line.

ERASING

The effect of each erasing key is to generate an
ASCII code which will erase text from the screen.
Whether or not the same thing happens at the
Remote and Local Computer depends on how the
system is set up.

Erases the whole line
and moves the cursor
to the beginning of the
line.

Erases the whole page
and leaves the cursor
in the home position.

The Erase Line function can be alternatively accomplished by depressing the
CTRL and D keys simultaneously
(shown in full colour).

Moves the cursor one position to the right and erases
any character already in that position.
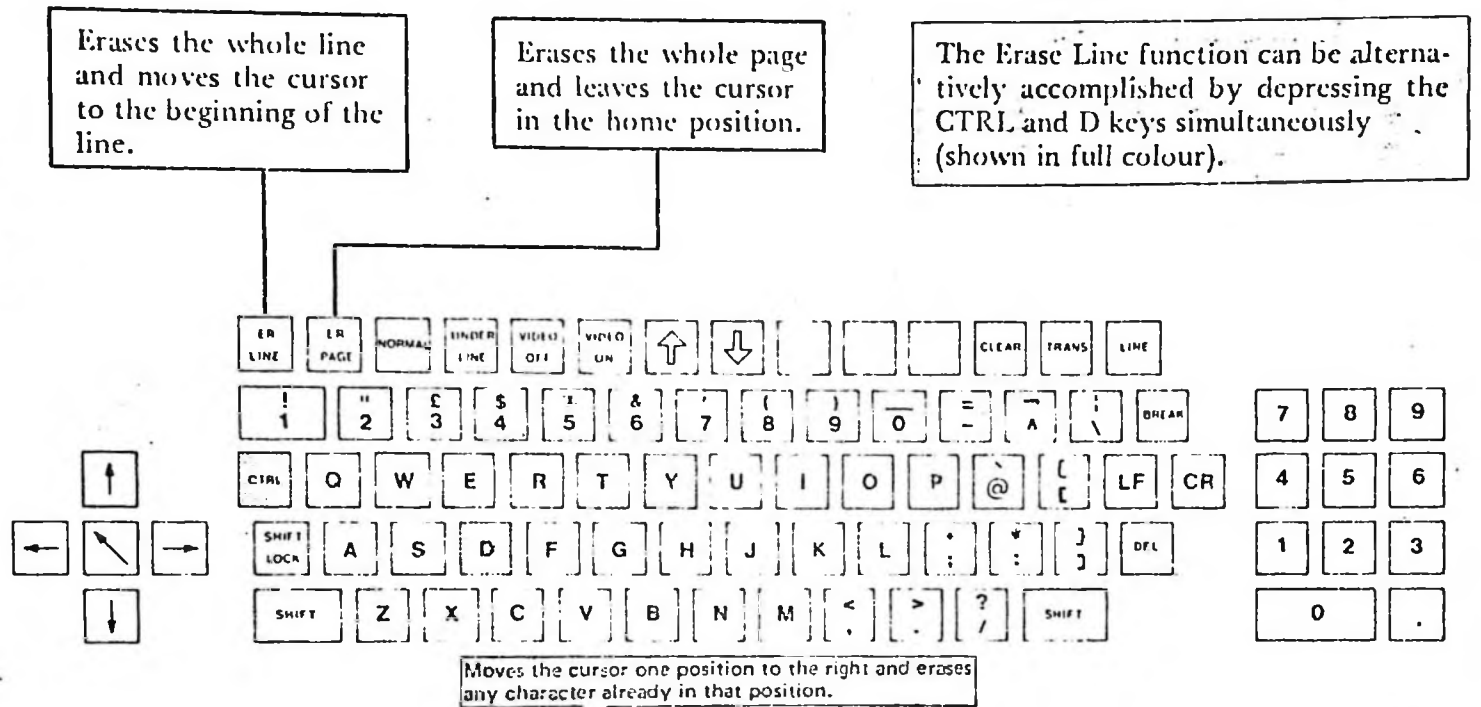
NOTE! The key shaded grey will also erase
although it is not its main function.

DISPLAY MODES

The display modes has two modes, UNDERLINE/
NORMAL or ATTRIBUTE. It will be factory pre-
set in the desired mode.

In the UNDERLINE/NORMAL mode, any of the
25 x 80 characters can be underlined. The under-
lining will start when the UNDERLINE code is re-
ceived, either from the CPU or the keyboard. It
will end when a NORMAL code is received.

The code initiating the ATTRIBUTE mode takes
up one character position, but is displayed as a
space. The characters following the ATTRIBUTE
code may be displayed in any of the following
modes:

Inverted	— displays the character with the background colour against an area with the normal display colour.
Blink	— alternating between normal intensity and off (3.1 Hz).
Intens	— reduced, but steady intensity
Underline	— a short line below the charac- ter which is displayed with normal and steady intensity.
Invisible	— the character is not displayed on the screen.
Normal	— normal and steady intensity.

The attribute character decides how to display the
video from that attribute character to the next
attribute character or to the bottom of the page.

TDV 2115 is normally operated in the underline
mode only.

In the ATTRIBUTE mode, several keys have to be
depressed in sequence to obtain the desired mode.
NORMAL mode will end the ATTRIBUTE charac-
ter sequence.

MODE	KEYS TO USE	HEX CODE
Inverse video	UNDERLINE SHIFT + A NORMAL	0E 41 0F
Blink	UNDERLINE any number, e.g. 0 NORMAL	0E 30 0F
Low intensity	UNDERLINE SPACE NORMAL	0E 20 0F
Underline	UNDERLINE SHIFT + Q NORMAL	0E 51 0F
Invisible	UNDERLINE a NORMAL	0E 61 0F
Normal	UNDERLINE q NORMAL	0E 71 0F

DISPLAY CHARACTER KEYS

The keys within the coloured line generate both upper and lower case letters and symbols according to whether or not one of the SHIFT keys is depressed.

These keys generate the numbers from zero to nine, same as the number keys within the coloured line.
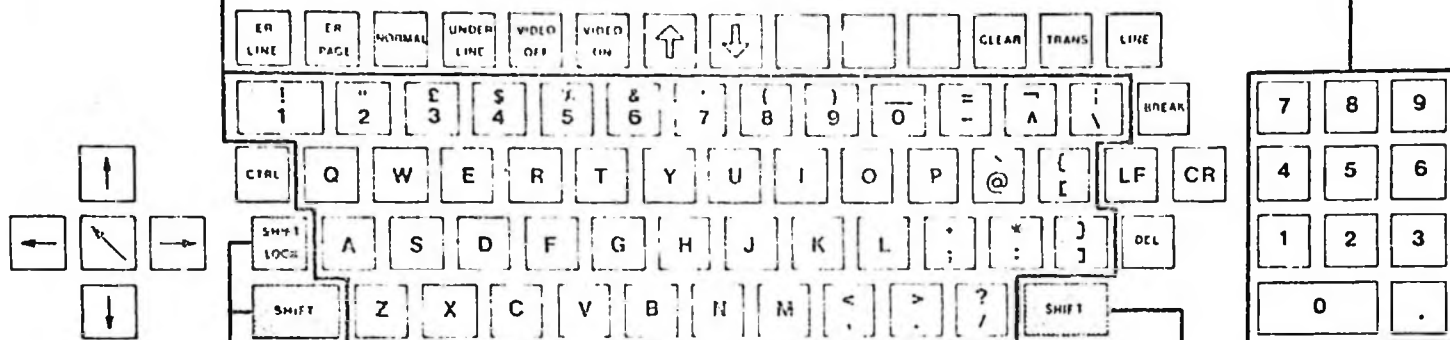
Depress the SHIFT key to generate upper case letters and symbols. The SHIFT LOCK key will lock the keyboard in upper case mode. The SHIFT key will release the SHIFT LOCK.

This key has the same function as the one on the left hand side of the keyboard.

The SPACE key can be considered as a display character key generating a blank character.

Repeat. Any letter or symbol will be repeated 10 times per second (factory adjustable from 10 to 20 times) if the key is not released within 1,5 second (factory adjustable from 1 to 2 seconds). This applies to all the encoded keys.

See pages 19 to 22 for tables of ASCII and hexadecimal and the effect of the codes.

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INDICATORS

The eight indicators on the keyboard are labelled, from left to right, as shown in the table below:

POWER ON	Lights when the power is on.
ON LINE	The ON LINE indicator can be factory strapped in one of two modes, indicating that a) the unit is ready to receive from the Modem, b) the unit is ready to both transmit to and receive from the Modem. Lights when an on-line request from the unit has been granted.
CARRIER	Lights when the Modem receives a carrier wave.
ERROR	Lights when a perity error occurs in the received data. To disable thus function, the NO PARITY switch on the connector board must be in the NON PARITY position. To cancel the ERROR light, depress the CLEAR key.
ENQUIRY	Lights when the code ENQ (05 hex) is received.
ACK	Lights when the code ACK (06 hex) is received.
NACK	Lights when the code NACK (15 hex) is received.
WAIT	Lights when the LINE key (on-line request from the unit) has been depressed and the unit awaits the acknowlegde signal.

The ENQUIRY, ACK, and NACK indicators may be used at the users discretion. Multi terminal buyers may also have the indicators marked at their discretion. They will light when the display unit receives the codes 05, 06, and 15 (hex) respectively. Switching the three indicators off depends on which of two factory strapped modes are chosen:

a) With the CLEAR key
b) By receiving the code 16 (hex)

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ROLL MODE

The TDV 2115/16 can be factory preset in one of two modes to determine how the cursor will behave after the eightieth character on a line has been written.

In the AUTOMATIC CARRIAGE RETURN/LINE FEED mode, the cursor will automatically move to the beginning of the next line when the eightieth character on a line has been written. When the eightieth character on the last line has been written, the unit will roll the page up one line and keep writing on the last line.

In the NOT AUTOMATIC CR/LF mode, the cursor will remain in the eightieth character position until it is moved by a cursor control code.

The unit can be factory preset to prevent roll up in the AUTOMATIC CR/LF mode. In this case the last line on the page will be rewritten.

MAKING CONTACT WITH THE REMOTE COMPUTER

The display will normally be connected to a Remote Computer through a communication link. If the distance is relatively short, it may be a cable, if it is long, a modem and telephone line may be employed.

Depress the LINE key to request an allowance to go ON LINE. If this is not possible or something is wrong with the cable or modem, the WAIT indicator lights.

When everything is ready and the request granted, the ON LINE indicator lights.

NOTE! The LINE key works in the toggle mode. Depress once to go ON LINE and once more to go off line.

TRANSMITTING AND RECEIVING DATA

When connection with the REMOTE Computer is established (the ON LINE indicator lights), the display unit is ready to receive data. When the CARRIER indicator lights it means that the REMOTE COMPUTER is ready to transmit.

When the communication link is half duplex, the ON LINE indicator can be factory preset to indicate either that the unit is on-line and ready to transmit or on-line only.

When the link is half duplex, the EXT ECHO switch at the back of the display must be set to give internal echo.

To start transmitting from the local mode, depress the LINE key and then the TRANS key. The ON LINE indicator will then light.

To go back to transmitting after having received data (the CARRIER indicator has gone dark), depress the TRANS key (which is of the toggle type) again. The ON LINE indicator will come on. To go off-line, depress the LINE key once.

ENCODED FUNCTIONAL KEYS

The encoded functional characters are not displayed, but control functions in the display unit or in the Remote Computer, some of the functional characters are used for messages between terminals.
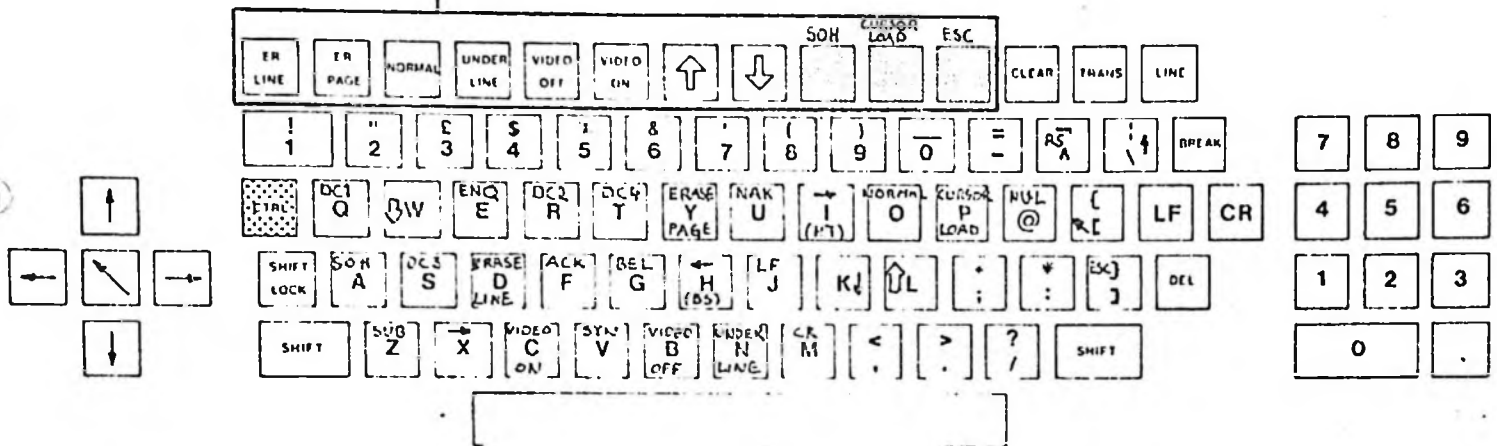
The functional character codes mentioned above and all the additional encoded functional character codes can be generated when the CTRL key and the appropriate alpha key (marked with text or symbol in colour) are depressed simultaneously.

The VIDEO OFF blanks the whole screen except the cursor.

See pages 19 to 22 for tables of ASCII and hexadecimal and the effect of the codes.

UN-ENCODED FUNCTIONAL KEYS

The un-encoded functional keys, shaded in the figure below, grounds a DC line when depressed.

Some establish and control communication with the Remote Computer and some help generate upper case characters.

How to generate the ASCII codes on the ECMA INTERNATIONAL version keyboard

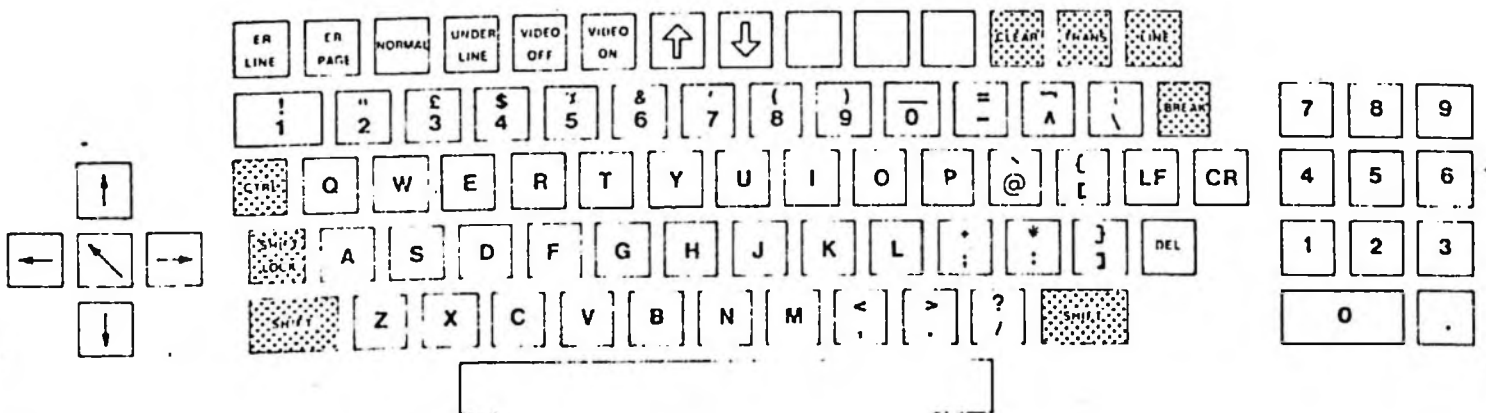| Hexa-decimal	Octal	Binary	Symbol	Key
00	000	0 000 000	NUL	CTRL + @
01	001	1	SOH	CTRL + A
02	002	10	VIDEO OFF (STX)	VIDEO OFF (CTRL + B)
03	003	11	VIDEO ON (ETX)	VIDEO ON (CTRL + C)
04	004	100	ERASE LINE	ER. LINE (CTRL + D)
05	005	101	ENQ	CTRL + E
06	006	110	ACK	CTRL + F
07	007	111	BEL	CTRL + G
08	010	1 000	← (BS)	← (CTRL + H)
09	011	1 000	HT	CTRL + I
0A	012	1 010	LF	LF (CTRL + J)
0B	013	1 011	↓	↓ (CTRL + K)
0C	014	1 100	ROLL UP (FF)	CTRL + L
0D	015	1 101	CR	CR (CTRL + M)
0E	016	1 110	UNDERLINE (SO)	UNDERLINE (CTRL + N)
0F	017	1 111	NORMAL (SI)	NORMAL (CTRL + O)

Hexa-decimal	Octal	Binary	Symbol	Key
20	040	100 000	SP	SPACE
21	041	100 001	!	SHIFT + !
22	042	100 010	"	SHIFT + "
23	043	100 011	£	SHIFT + £
24	044	100 100	$	SHIFT + $
25	045	100 101	%	SHIFT + %
26	046	100 110	&	SHIFT + &
27	047	100 111	'	SHIFT + '
28	050	101 000	(	SHIFT + (
29	051	101 001	)	SHIFT +)
2A	052	101 010	*	SHIFT + *
2B	053	101 011	+	SHIFT + +
2C	054	101 100	,	,
2D	055	101 101	-	-
2E	056	101 110	.	.
2F	057	101 111	/	/

Hexa-decimal	Octal	Binary	Symbol	Key
10	020	10 000	CURSOR LOAD (DLE)	CURSOR LOAD (CTRL + P)
11	021	10 001	DC1	CTRL + Q
12	022	10 010	DC2	CTRL + R
13	023	10 011	DC3	CTRL + S
14	024	10 100	DC4	CTRL + T
15	025	10 101	NAK	CTRL + U
16	026	10 110	SYN	CTRL + V
17	027	10 111	(ETB)	⇩ (CTRL + W)
18	030	11 000	→ (CAN)	→ (CTRL + X)
19	031	11 001	ERASE PAGE (EM)	ER. PAGE (CTRL + Y)
1A	032	11 010	SUB	CTRL + Z
1B	033	11 011	ESC	(CTRL + [)
1C	034	11 100	↑ (FS)	↑ (CTRL + \)
1D	035	11 101	↖ (GS)	↖ (CTRL +])
1E	036	11 110	RS	CTRL + ^)
1F	037	11 111	US	CTRL + SHIFT + Q

Hexa-decimal	Octal	Binary	Symbol	Key
30	060	110 000	0	0
31	061	110 001	1	1
32	062	110 010	2	2
33	063	110 011	3	3
34	064	110 100	4	4
35	065	110 101	5	5
36	066	110 110	6	6
37	067	110 111	7	7
38	070	111 000	8	8
39	071	111 001	9	9
3A	072	111 010	:	:
3B	073	111 011	;	;
3C	074	111 100	<	SHIFT + <
3D	075	111 101	=	SHIFT + =
3E	076	111 110	>	SHIFT + >
3F	077	111 111	?	SHIFT + ?

Hexa-decimal	Octal	Binary	Symbol	Key
40	100	1 000 000	@	@
41	101	1 000 001	A	SHIFT + A
42	102	1 000 010	B	SHIFT + B
43	103	1 000 011	C	SHIFT + C
44	104	1 000 100	D	SHIFT + D
45	105	1 000 101	E	SHIFT + E
46	106	1 000 110	F	SHIFT + F
47	107	1 000 111	G	SHIFT + G
48	110	1 001 000	H	SHIFT + H
49	111	1 001 001	I	SHIFT + I
4A	112	1 001 010	J	SHIFT + J
4B	113	1 001 011	K	SHIFT + K
4C	114	1 001 100	L	SHIFT + L
4D	115	1 001 101	M	SHIFT + M
4E	116	1 001 110	N	SHIFT + N
4F	117	1 001 111	O	SHIFT + O

Hexa-decimal	Octal	Binary	Symbol	Key
60	140	1 100 000	`	SHIFT + `
61	141	1 100 001	a	A
62	142	1 100 010	b	B
63	143	1 100 011	c	C
64	144	1 100 100	d	D
65	145	1 100 101	e	E
66	146	1 100 110	f	F
67	147	1 100 111	g	G
68	150	1 101 000	h	H
69	151	1 101 011	i	I
6A	152	1 101 010	j	J
6B	153	1 101 011	k	K
6C	154	1 101 100	l	L
6D	155	1 101 101	m	M
6E	156	1 101 110	n	N
6F	157	1 101 111	o	O

Hexa-decimal	Octal	Binary	Symbol	Key
50	120	1 010 000	P	SHIFT + P
51	121	1 010 001	Q	SHIFT + Q
52	122	1 010 010	R	SHIFT + R
53	123	1 010 011	S	SHIFT + S
54	124	1 010 100	T	SHIFT + T
55	125	1 010 101	U	SHIFT + U
56	126	1 010 110	V	SHIFT + V
57	127	1 010 111	W	SHIFT + W
58	130	1 011 000	X	SHIFT + X
59	131	1 011 001	Y	SHIFT + Y
5A	132	1 011 010	Z	SHIFT + Z
5B	133	1 011 011	[	[
5C	134	1 011 100	\	\
5D	135	1 011 101	]	]
5E	136	1 011 110	^	^
5F	137	1 011 111	_	SHIFT +

Hexa-decimal	Octal	Binary	Symbol	Key
70	160	1 110 000	p	P
71	161	1 110 001	q	Q
72	162	1 110 010	r	R
73	163	1 110 011	s	S
74	164	1 110 100	t	T
75	165	1 110 101	u	U
76	166	1 110 110	v	V
77	167	1 110 111	w	W
78	170	1 111 000	x	X
79	171	1 111 001	y	Y
7A	172	1 111 010	z	Z
7B	173	1 111 011	{	SHIFT + {
7C	174	1 111 100	:	SHIFT + :
7D	175	1 111 101	}	SHIFT + }
7E	176	1 111 110	|	SHIFT + ⌐
7F	177	1 111 111	DEL.	DEL.

b4	b3	b2	b1	Row / Column	0	1	2	3	4	5	6	7
				b7	0	0	0	0	1	1	1	1
				b6	0	0	1	1	0	0	1	1
				b5	0	1	0	1	0	1	0	1
0	0	0	0	0	NUL	CURSOR LOAD (DLE)	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	VIDEO OFF (STX)	DC2	"	2	B	R	b	r
0	0	1	1	3	VIDEO ON (ETX)	DC3	£	3	C	S	c	s
0	1	0	0	4	ERASE LINE (EOT)	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN (LAMP CLEAR)	&	6	F	V	f	v
0	1	1	1	7	BEL	ROLL DOWN (ETB)	'	7	G	W	g	w
1	0	0	0	8	← (BS)	→ (CAN)	(	8	H	X	h	x
1	0	0	1	9	HT	ER PAGE (EM)	)	9	I	Y	i	y
1	0	1	0	10(A)	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11(B)	↑ (VT)	ESC	+	;	K	Æ	k	æ
1	1	0	0	12(C)	ROLL UP (FF)	↓ (FS)	,	<	L	Ø	l	ø
1	1	0	1	13(D)	CR	\ (GS)	-	=	M	Å	m	å
1	1	1	0	14(E)	UNDER LINE (SO)	RS	.	>	N	|	n	|
1	1	1	1	15(F)	NORMAL (S1)	US	/	?	O	□	o	DEL

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Effect of the codes in the TDV 2114

Hex code	Octal code	Signal name	The TDV 2114's reaction to the code
00	000	NUL	No reaction.
01	001	SOH	No reaction.
02	002	VIDEO OFF (STX)	Blanks the screen without erasing the memory. Leaves the cursor on.
03	003	VIDEO ON (ETX)	Cancels the STX code, makes the page re-appear on the screen.
04	004	ERASE LINE (EOT)	Erases the line, moves the cursor to the beginning of the line.
05	005	ENQ	The ENQUIRY light comes on.
06	006	ACK	The ACK light comes on.
07	007	BEL	Gives an audible tone that can be adjusted to desired level.
08	010	(BS)	Moves the cursor one character position to the left. The cursor will stop and remain in first character position on the line.
09	011	HT	No reaction.
0A	012	LF	Moves the cursor to the same position on the line below. Rolling when in bottom line.
0B	013	(VT)	Moves the cursor to same position on the line below. It will stop on the bottom line.
0C	014	ROLL UP (FF)	Shifts the page up one line and erases the bottom line.
0D	015	CR	Moves the cursor to the first position on the same line.
0E	016	UNDERLINE (S0)	The alpha numeric characters following this code will be underlined on the screen. The underlining will end when the NORMAL code is received.
0F	017	NORMAL (S1)	The alpha numeric characters following this code will be displayed normally.
10	020	CURSOR LOAD (DLE)	Sets the DIRECT CURSOR ADDRESSING mode. The next two character codes entered give line number and column number.
11	020	DC1	No reaction.
12	002	DC2	No reaction.
13	023	DC3	No reaktion.
14	024	DC4	No reaction.
15	025	NAK	The NAK light comes on.
16	026	SYN. (LAMP CLEAR)	By presetting a switch, the code may be used to cancel the illuminated indicators ENQUIRY, ACK, and NAK.
17	027	ROLL DOWN (ETB)	Shifts the page down one line and erases the top line.
18	030	(CAN)	Moves the cursor one character position to the right without erasing anything from the memory. If the cursor is in the last position on the line it will move to the first position on the line below when the display unit is in the AUTOMATIC CR/LF mode.
19	031	ER PAGE (EM)	Erases the whole page and moves the cursor to the home position.
1A	032	SUB	No reaction.
1B	033	ESC	No reaction.
1C	034	(FS)	Moves the cursor to the same position on the line above. When in top line it stays there.
1D	035	(GS)	Moves the cursor to the home position.
1E	036	RS	No reaction.
1F	037	US	No reaction.
20	040	SP	A character appearing as a space on the screen (destructive space).
21 . . . 7E	041 . . . 176		The ordinary alpha numeric characters (94) which are read into the memory and displayed on the screen.
7F	177	DEL	No reaction.

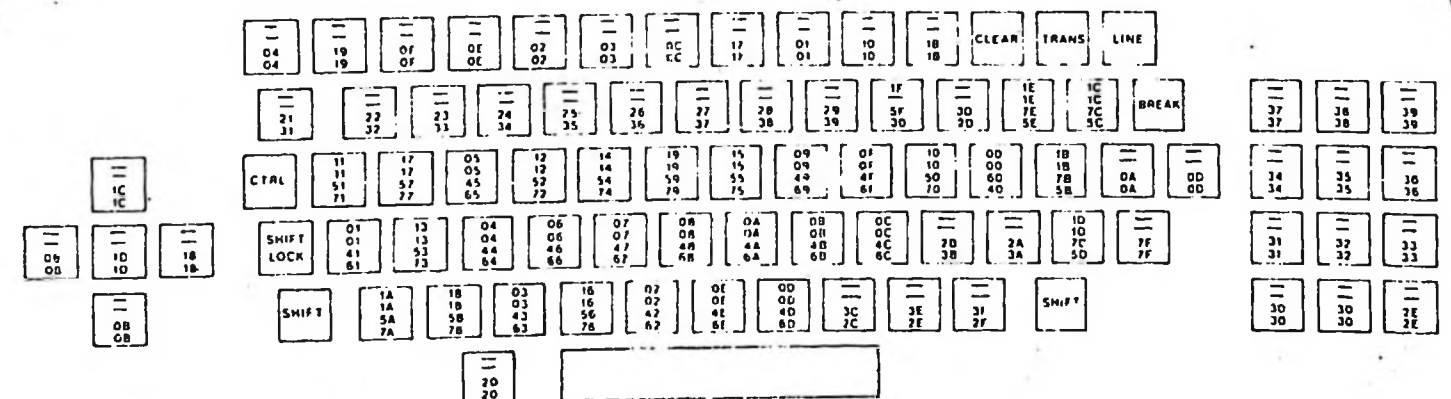TTY-VERSION KEYBOARD

HEXADECIMAL CODES FOR TTY-VERSION KEYBOARD

NORWEGIAN STANDARD KEYBOARD

HEXADECIMAL CODES FOR NORWEGIAN STANDARD KEYBOARD

```
CTRL-SHIFT
   CTRL
  SHIFT
 UNSHIFT
```

EACH KEY HAS FOUR POSSIBLE MODES
— MEANS THAT NO CODE IS GENERATED
KEYS WITH TEXT ARE DC FUNCTION KEYS

Keyboard layouts and
hexadecimal codes.

ECMA - NATIONAL VERSION KEYBOARD

HEXADECIMAL CODES FOR ECMA NATIONAL VERSION KEYBOARD

ECMA - INTERNATIONAL VERSION KEYBOARD

HEXADECIMAL CODES FOR ECMA - INTERNATIONAL VERSION KEYBOARD

CTRL+SHIFT
CTRL
SHIFT
UNSHIFT

EACH KEY HAS FOUR POSSIBLE MODES
— MEANS THAT NO CODE IS GENERATED
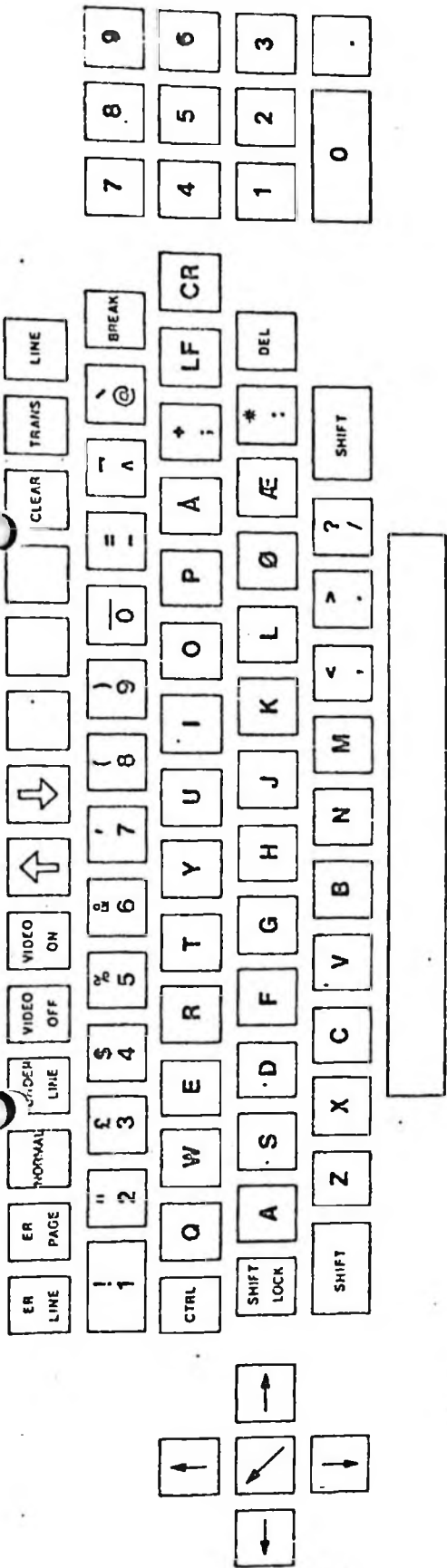KEYS WITH TEXT ARE DC FUNCTION KEYS

Keyboard layouts and
hexadecimal codes.

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ECMA-NATIONAL VERSION KEYBOARD

HEXADECIMAL CODES FOR ECMA NATIONAL VERSION KEYBOARD

| CTRL+SHIFT |
| CTRL |
| SHIFT |
| UNSHIFT |

EACH KEY HAS FOUR POSSIBLE MODES

-- MEANS THAT NO CODE IS GENERATED

KEYS WITH TEXT ARE DC FUNCTION KEYS