

1



11
10
9
8
7
6
5
4
3

:la

x
fb
v

de
dh
fk
nk
x
ik

v
gh
ge
ib
kb
me

mh
kk
x
mn
r

:lb

x
ba
v
nb
x

gb
v
ee
eh
gk
kk

mh
me
kb
x
mn
r

:lc

x
kk
v
mh

me
kb
gb
ee
eh
hl

x
mn
r

:ld

x
ak
v
nk
x

11
10
7
6
5
4
3

gk
v
eh
ee
gb
kb
me
mh
kk

x
mn
r

:le
x

lk
v
mh
me
kb
gb

ee
eh
gk
ik
ib
x

mn
r

:lf
x
me

v
ce
ag
ak
x
fc

v
fi
x
mn
r

:lg

x
nb
v
pe
ph
mk
gk
eh
ee
gb
jb

le
lh
jk
x

mn
r

:lh
x
ab
v
nb
x

hb
v
fe
fh
hk
nk

x
mn
r

:li
x

ce
v
cg
eg
ee
ce

x
gc
v
gf
mf
x

mc
v
mi
x
mn
r

:lj
x

mb
v
od
of
mh
fh
fd

x
ce
v

cg
eg
ee
ce

x
mn
r

:lk

11
10
7
6
5
4
3

x
cb
v

nb
x
jb
v
ek
x

hd
v
nl
x
mn
r

:ll

x
md
v
mj

x
mq
v
ba
be
x

mn
r

:lm

v
ea

x
ha
v
fb
fd
hf

fg
fh
hk
nk
x
hf

v
nf
x
mn
r

:ln

x
fb
v
nb
x

hb
v
ff
fh

11
10
7
6
5
4
3

hk
nk
x
mn
r

:lo
x
kb
v
hb
fe
fh
hk
kk
mh
me
kb
x
mn
r

:lp
x
pb
v
eb
x
hb
v
fe
fg
hk
kk
mq
me
kb
x
mn
r

:lq
x
fk
v
pk
pm
x
hk
v
fh
fe
hb
kb
me
mh
kk
x
mn
r

11
10
9
8
7
6
5
4
3

:lr

x

md

v

gd

x

fb

v

gd

ff

fh

gj

x

mn

r

:ls

x

kb

v

md

mh

lj

ij

hh

gd

ed

de

di

fj

x

mn

r

:lt

x

db

v

dj

x

ae

v

ke

mf

mh

lj

x

mn

r

:lu

x

db

v

kb

md

mq

ki

ci

x

mk

v
ki
x
mn
r

:lv
x
db
v
mf
dj
x
mn
r

:lv
x
da
v
md
ga
mj
dm
x
mn
r

:lx
x
db
v
nl
x
dj
v
na
x
mn
r

:ly
x
db
v
mf
x
dj
v
oe
ob
x
mn
r

:lz
x
dc
v
di
mb

11
10
7
6
5
4
3

m
x
m
r



11
12
7
6
5
4
3

:space

x
mn
r

:excla

x
af
v
if

x
lf
v
mg
nf
me

lf
x
mn
r

:quote

x
ad
v
dd
x
ah

v
dh
x
mn
r

:number

x
ka
v
cf
x

kf
v
ck
x
eb
v

ej
x
ib
v
ij
x
mn
r

:dollar

x
bj
v
bd
db
eb

11
10
9
8
7
6
5
4
3

gd
gh
ij
jj
lh
la
x
af
v

nf
x
mn
r

iaccr
x
ah
v
cd
x
mn
r

:accl
x
ad
v
ch
x
mn
r

:lparn
x
ag
v
ce
ke
nh
x
mn
r

:rparn
x
ae
v
ca
ka
nd
x
mn
r

:aster
x
gb
v
gk
x
dd

11
10
7
6
5
4
3

v
ki
x
dh
v
kc
x
mn
r

:plus

x
gb
v
gk
x
cf
v
lf
x
mn
r

:contra

x
mf
v
mg
oe
mf
x
mn
r

:minus

x
gb
v
gk
x
mn
r

:period

x
le
v
lf
mf
me
le

x
mn
r

:sla

y
ak
x
v
bj

11
10
9
8
7
6
5
4
3

x
mn
r

:bsla

x
aa
v
nl
x
mn
r

:colon

x
le
v
lf
mf
me
le
x
fe
v
ff
gf
ge
fe
x
mn
r

:semcln

x
mf
v
mo
oe
mf
x
ff
v
fg
gg
ge
fe
x
mn
r

:less

x
cd
v
gb
kd
x
mn
r

:great

x
cb
y
qd
kb
x
mn
r

:equal

x
eb
v
ek
x
ib
v
ik
x
mn
r

:quest

x
eb
v
bc
af
bl
ek
if
mf
x
mn
r

:lbk

x
ai
v
af
mf
mj
x
mn
r

:rbk

x
ac
v
af
mf
mb
x
mn
r

:cmflx

x
bc

v
af
bf
x
mn
r

:under

x
na
v
nn
x
mn
r

:at

v
aa
ak
mk
ma
x
ck
v
cd
kd

kl
x
mn
r

:lbr

x
ai
v
bf
ff
gd
hf
lf
nf
x
mn
r

:rbr

x
ac
v
bf
ff
gh
hf
lf
nb
x
mn
r

:or

x
af
v
nf
x
mn
r

:itild

x
ai
v
dh
ad
db

x
mn
r

:null

r

:percent

v
ak
ab
eb
ef
af
x
hg
v
hk
lk
lg
hg
x
mn
r

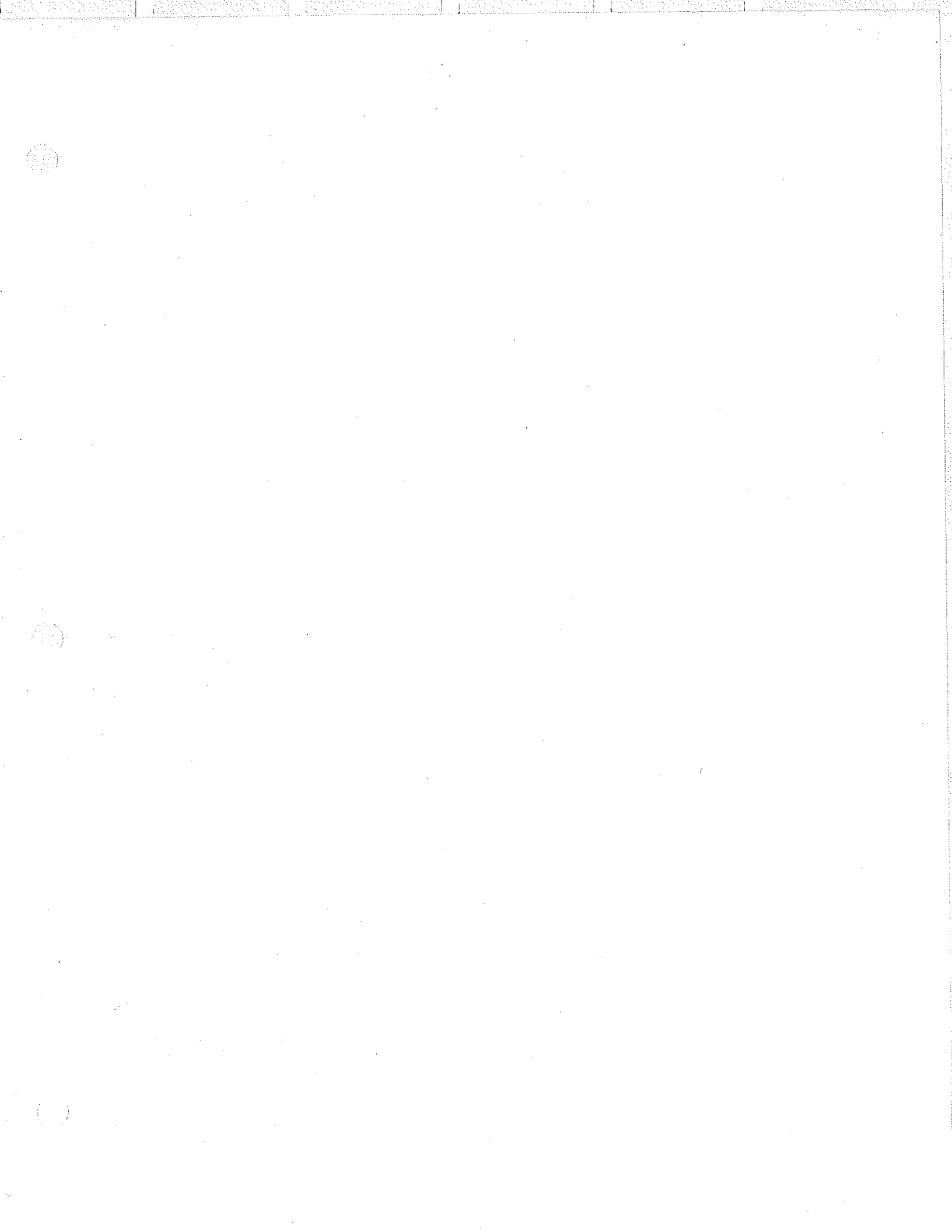
:amper

x
mk
v
ki
gf
ee
dd
cd
ae
af
bg
cg
ef
fe
gc
ib
kc
ld
mf
lh

11
10
9
8
7
6
5
4
3

1k
x
mn
r

11
10
9
7
6
5
4
3



GRAPHIC 2 SCOPE CODES

CHAR.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0	0	0	0														

PARAM

CHARACTER 1										CHARACTER 2							
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0	0	0	1	SET	3	SET	L.P.	S/A	E	C _X	C _Y	SET	SC ₀	SC ₁	SET	I ₀	I ₁
				BUNK LIGHT PEN				SYMMETRY				SCALE		INTENSITY			
										→ 0 = ACCUM							
										→ 1 = SET							

LONG VEC.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0	0	1	0	CONTROL	YES	±20	Δ ₀	Δ ₁	Δ ₂	Δ ₃	Δ ₄	Δ ₅	Δ ₆	Δ ₇	Δ ₈	Δ ₉	
					Y=1	±1											

00 → LOAD HOLDING REGISTER ONLY

01 → LOAD REG., DRAW INVISIBLE, CLEAR REG'S.

10 → LOAD REG., DRAW VIS. EXCEPT STARTING POINT, CLEAR REG'S.

11 → LOAD REG., DRAW INVIS. EXCEPT END POINT (WHICH IS VIS.), CLEAR REG'S.

X-Y

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0	0	1	1	0	INT	YES	±20	0	1	2	3	4	5	6	7	8	9
					Y=1	±1											
					0 → INVISIBLE	1 → VISIBLE					COORDINATE						
									0 → NO DELAY				1 → SETTLING DELAY				

SHORT VEC.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0	1	0	0	CONTROL	±20	Δ ₀	Δ ₁	Δ ₂	Δ ₃	Δ ₄	±20	Δ ₀	Δ ₁	Δ ₂	Δ ₃	Δ ₄	
					Y=1	±1											

00 → NOP

ΔX COMPONENT

ΔY COMPONENT

01, 10, 11 → SAME AS IN LONG VEC.

INCR

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0	1	0	1	REPEATS	INT	DIRECTION	REPEATS	INT	DIRECTION								

INT: 0 → INVIS
1 → VIS.

INCR 1

INCR 2

DIR:



SLAVE

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
0	1	1	0	STOP	COND STOP											LP	INT

0 → NOP
1 → MAIN CRT
2-7 → SLAVE CRT'S

0 → OFF
1 → ON

TRAP

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1																	

E-1012-A-3 (9-65)

ISSUE	ENGR	TITLE	BELL TELEPHONE LABORATORIES INCORPORATED
	DRAWN		NO. OF SHEETS PER SET

ECR 700504 Enable Continuous Run. The cycle control is set to the continuous-run state.

ESS 700524 Enable Single-Step. The cycle control is set to the single-step state.

To start the scope after a display-trap flag, stop flag or conditional-stop flag has stopped the cycling, the following instruction is used:

CØN 700545 CONTinue. A CDF is performed. The cycle control is set to the continuous-run state and the data-request signal is turned on. The display starts at the location currently in the display address register.

To start the scope at a specific address, the following instruction is used:

BEG 700547 BEGin. (WDA followed by CØN). The display is started at the location specified by the 13 low-order bits of the AC.

WDBC 700605 Write Display Buffer and Continue. The contents of the AC are written into the display buffer register. The data-request signal is turned off. The display cycle control is set to the continuous-run state. Execution of the command transferred to the display buffer is begun. When this command is completed, the next command will be

taken from the location indicated by the display address register and normal continuous cycling will then take place.

- LDB 700612 Load Display Buffer. The display buffer register is loaded into the AC.
- WDBS 700625 Write Display Buffer and Single-Step. The contents of the AC are written into the display buffer register. The data-request signal is turned off. The display cycle control is set to the single-step state. Execution of the command transferred to the display buffer is begun. When this command is completed, the data-request signal is turned on and the display awaits further instructions.
- ELP 700701 Enable the Light Pen. The light pen is activated so that light sensed within the field of view of the pen will turn the light-pen flag on. This function can also be accomplished using a parameter-mode display command.
- DLP 700721 Disable the Light Pen. The light pen is disabled so that light sensed within the field of view of the pen will not turn the light-pen flag on. This function can also

be performed by a parameter-mode display command.

Note: The ability of the pen to respond to light within the field of view is determined by the last LP control IOT or parameter-mode display command (with LP control bits set) that has been given. Thus, if a parameter-mode word enables the light pen and a DLP instruction is then executed by the computer, the pen is disabled until another parameter-mode word or IOT changes the status of the pen.

RLPE	700722	Resume after <u>L</u> ight <u>P</u> en stoppage with pen <u>E</u> nabled. The light-pen flag stops the display. This instruction causes resumption from the exact point of stoppage. The light-pen flag is turned off and the light pen is left enabled.
RLPD	700723	Resume after <u>L</u> ight <u>P</u> en stoppage with pen <u>D</u> isabled. Same as RLPE except the light pen is disabled.
RAEF	700742	<u>R</u> esume <u>A</u> fter <u>E</u> dg <u>e</u> s <u>F</u> lag. The edges flag stops the display. This instruction causes resumption from the exact point of stoppage. All edge flags are cleared.

Note: If an RLPD or RLPE is given with the edges flag on, the display will not resume until an RAEF is also given. Similarly, with the light-pen flag on, an RAEF will not cause resumption until an RLPE or RLPD is given. This

method of operation allows the light-pen-flag programming and the edge-flag programming to be separate uncoupled modules. Simultaneous light-pen flag and edges flag will not cause problems in the order of processing.

ECS	701001	<u>Enable Conditional Stop</u> . The conditional-stop feature for slave-mode words is enabled.
LDA	701012	<u>Load Display Address</u> . The display address register is loaded into the 13 low-order bits of the AC. The 5 high-order bits of the AC are cleared. The display address register always points one beyond the display command being executed under normal cycling.
DCS	701021	<u>Disable Conditional Stop</u> . The conditional-stop feature for slave-mode words is disabled.
LPM	701032	<u>Load Parameter-Mode</u> command. The parameters settable by a parameter-mode command are loaded into the AC in the following format: The prefix 0001 is loaded into the high-order bits. Bits 4,6,8,12 and 15 are set to 1. The remaining bits are loaded as follows: AC5 - Blink AC7 - LP enable AC9 - Exchange axes AC10 - Complement X component AC11 - Complement Y component AC13-- Scale 0 AC14 - Scale 1 AC16 - Intensity 0 AC17 - Intensity 1

Thus, the parameters are loaded in the format of a parameter-mode command.

LDS 701052 Load Display Status. The display flags and conditions are loaded into the AC in the following format:

	<u>Bit is 0</u>	<u>Bit is 1</u>
AC0 - Display-Trap Flag	off	on
AC1 - Edges Flag	off	on
AC2 - Light-Pen Flag	off	on
AC3 - Stop Flag	off	on
AC4 - Conditional-Stop Flag	off	on
AC5 - Pushbuttons Flag	off	on
AC6 - Console-Keyboard Flag	off	on
AC7 - Data-Phone Flag	off	on
AC8 - Byte Scan	1st byte	2nd byte
AC9 - Conditional-Stop Enable	off	on
AC10 - Immediate Stop	off	enabled
AC11 - Cycle Control	continuous	single-step
AC12 - Data Request	busy	ready
AC13 - Override	disabled	enabled
AC14 - Right Edge Flag	off	on
AC15 - Left Edge Flag	off	on
AC16 - Top Edge Flag	off	on
AC17 - Bottom Edge Flag	off	on

EIS 701401 Enable Immediate Stop. The immediate-stop condition is enabled.

LX 701412 Load X. The X deflection register is loaded into the low-order 10 bits of the AC. The high-order 8 bits are cleared.

EOV 703401 Enable OVerride. The override condition is enabled (scope beam turned off).

LY 703412 Load Y. The Y deflection register is loaded into the low-order 10 bits of the AC. The high-order 8 bits are cleared.

DØV 703421 Disable Override. The override condition is disabled (scope beam turned on).

SCK 704301 Skip on Console-Keyboard flag. If the console-keyboard flag is on indicating that a key has been depressed, the next instruction is skipped.

ØCK 704302 Or Console Keyboard. The code for the currently depressed key is or-gated into the AC. If no key is currently depressed, the AC is unchanged. The bit format is as follows:

AC11 - KB0
AC12 - KB1
AC13 - KB2
AC14 - KB3
AC15 - KB4
AC16 - KB5
AC17 - KB6

CCK 704304 Clear Console Keyboard. The console-keyboard flag is cleared.

LCK 704312 Load Console Keyboard. The AC is cleared and then an ØCK is performed.

SPB 704401 Skip on Push-Buttons flag. If the pushbutton flag indicating that any pushbutton has been pushed is on, the next instruction is skipped.

\emptyset PB 704402 Or Push Buttons. The status of the pushbuttons is or-gated into the AC. If no pushbutton is currently depressed, the AC is unchanged. The bit format is as follows:

- AC0 - PB0
- AC1 - PB1
- AC2 - PB2
- AC3 - PB3
- AC4 - PB4
- AC5 - PB5
- AC6 - PB6
- AC7 - PB7

CPB 704404 Clear Push Buttons. The pushbuttons flag is cleared.

LPB 704412 Load Push Buttons. The AC is cleared and then an \emptyset PB is performed.

WBL 704424 Write Button Lights. The lights in the pushbuttons corresponding to the 1-bits in the AC are turned on. The previous status of the lights is lost. The bit format for the lights is the same as for the corresponding pushbuttons as given in \emptyset PB.

LBL 704432 Load Push Button Lights. The AC is cleared. The pushbutton lights status is loaded into the AC. The bit format is the same as for the corresponding pushbuttons as given in \emptyset PB.

Note: The following IOT (7045x2) applied only to G-2 terminals equipped with the Sylvania Data Tablet option.

LTX	704512	Load the <u>Tablet X</u> coordinate. Bits 8-17 of the AC are loaded with the X coordinate of the tablet stylus. Bit 0 is set if the data are valid. Bit 0 & 1 are set if the stylus is touching the surface of the tablet and the data are valid. Bits 0, 1 & 2 are set if the stylus is pressed against the surface of the tablet and the data are valid. The remaining bits are cleared.
LTY	704552	Load the <u>Tablet Y</u> coordinate. (Same as LTX but for Y coordinate).

Note: The following IOT (7045xx) applies only to the PDP-7 implementation.

EIM 704501 Enable the Interrupt Mask. Those bits in the interrupt mask corresponding to 1-bits in the AC are turned on. Any previously enabled interrupts remain enabled. The bit assignment from the AC is:

- AC0 - Display-Trap Flag
- AC1 - Edges Flag
- AC2 - Light-Pen Flag
- AC3 - Stop Flag
- AC4 - Conditional-Stop Flag
- AC5 - Pushbutton Flag
- AC6 - Console-Keyboard Flag
- AC7 - Data-Phone Flag

LIM 704512 Load Interrupt Mask. The interrupt mask is loaded into the AC. The bit format is the same as for the control formats given for EIM. The remaining bits of the AC are cleared.

DIM 704521 Disable Interrupt Mask. Those bits of the interrupt mask corresponding to 1-bits in the AC are turned off. Any previously disabled interrupts remain disabled. AC bit assignment is the same as for EIM.

W. H. Ninke

W. H. Ninke

P. E. Rosenfeld

P. E. Rosenfeld

Copy to

Messrs. R. C. Allen - IH
G. L. Baldwin - MH
E. R. Chenette - AL
C. Christensen - MH
P. G. Dowd - MH
D. Edelson - MH
V. A. Fasciano - MH
R. D. Freeman - MH
J. D. Gabbe - MH
Mrs. J. H. Grantham - MH
Messrs. A. D. Hause - MH
J. P. Henderson - HO
H. M. Kalish - MH
B. G. King - MH
P. S. Kopel - MH
J. Leighton - BU
H. S. Magnuski - MH
N. Miller - MH

Messrs. T. J. O'Connor - MH
E. N. Pinson - MH
R. F. Ratliff - CB
W. C. Ridgway, III - WH
Mrs. M. F. Robbins - HO
Messrs. L. Rosler - MH
P. M. Sherman - MH
E. Sitar - MH
Mrs. L. I. Stukas - MH
Messrs. J. F. Swanson - WL
J. W. Timko - WL
D. S. Watson - WL
L. W. Weigle - HO
Mrs. E. E. Yamip - MH
Messrs. G. L. Young - HO
E. E. Zajac - MH