

SHEET INDEX

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RECORD OF CHANGES

DWG ISS	PREV FURN	STD	KFR DISC	SEE NOTE

NOTES:

- GROUND RETURN
- UNLESS OTHERWISE SPECIFIED, RESISTANCE VALUES ARE IN OHMS, CAPACITANCE VALUES ARE IN MICROFARADS, VALUES PRECEDED BY THE SYMBOL + (PLUS) OR - (MINUS) ARE IN VOLTS
- BATTERY AND GROUND TERMINALS FOR INTEGRATED CIRCUITS

IC CODE	BAT. TERM.	GRD. TERM.
41AD	16	8
41AE		7,8
41BP		8
41BR		7,8
41CL		8
41CC		8
41CF		7,8
41CK		8
41U		8
41W	16	8
129A	24	12

SYMBOL
TAPE UNIT CONTROLLER
BOARD A
ELEMENT IDENT
A

TERM.	MOD	FUNCT	TERM.	LOC	TERM.	MOD	FUNCT	TERM.	LOC
BLBCV0	I		009	3A2	FSTFRCO	ØI		210	2H5
BLBCK1	I		318	3A1	FSTREVC0	ØI		112	2H5
IBGSTP0	I		008	3A3	FWDO	ØI		207	2H3
INF010	I		101	2A1	INF000	ØI		201	3A8
INF040	I		002	2A1	INF020	ØI		202	3A8
INF050	I		102	2A1	INF030	ØI		302	3A8
INF070	I		308	2A7	INF080	ØI		217	3A4
INIT0	I		219	2A7	INF090	ØI		212	2A5
LBEN1	I		304	3A7	INF100	ØI		213	2A6
PSTAT1	I		001	3A0	INF110	ØI		214	2A6
RCO	I		103	2A0	INF120	ØI		115	3A5
RMDINGB0	I		019	3A3	INF130	ØI		015	3A6
STBPP0	I		113	2A0	INITB0	ØI		205	2H7
TIMB0	I		106	2A3	MAINT0	ØI		007	3H7
WETRK10	I		105	2A9	MBTCINH1	ØI		006	2H3
BKSPAC0	Ø		110	2H5	RDBLKCO	ØI		010	2H5
CLARCRC0	Ø		311	2H6	READCO	ØI		011	2H5
ENRD0	Ø		004	2H0	TRCKA01	ØI		300	3H5
ENRD1	Ø		114	2H0	TRCKA11	ØI		303	3H5
INF140	Ø		203	3H4	TTF1	ØI		013	2H3
INF150	Ø		204	3H1	TTFR1	ØI		108	2H3
MAINT1	Ø		305	3H7	TTSF1	ØI		014	2H1
RDCL0	Ø		215	2H0	TTSR1	ØI		118	2H3
REVO	Ø		208	2H2	TUCRC1	ØI		301	2H0
RTA00	Ø		117	3H5	WENAA0	ØI		109	2H1
RTA10	Ø		317	3H6	WENAB1	ØI		003	2H2
RWTSTPC0	Ø		313	2H6	WRITE0	ØI		104	2H8
SFTCC0	Ø		312	2H6	WTB6	ØI		005	2H8
STBPC0	Ø		012	2H6	+5	P		000,119	3G7
STREQCO	Ø		310	2H6	GRD	G		200,319	3G7
SMTSTPC0	Ø		314	2H6					
TTF0	Ø		216	2H4					
TTFR0	Ø		016	2H5					
TTINIT0	Ø		209	2H8					
TTMSTP0	Ø		309	2H6					
TTREWC0	Ø		111	2H6					
TTSELO	Ø		315	3H7					
TTSF0	Ø		116	2H4					
TTSR0	Ø		316	2H4					
TUCCODE0	Ø		211	2H0					
WRCKTEND	Ø		107	2H1					
WRENAB0	Ø		100	2H2					
WTA00	Ø		218	3H5					
WTA10	Ø		017	3H6					

SYSTEM USED ON	DESIGN CONTROL
COMMON SYSTEMS	IH

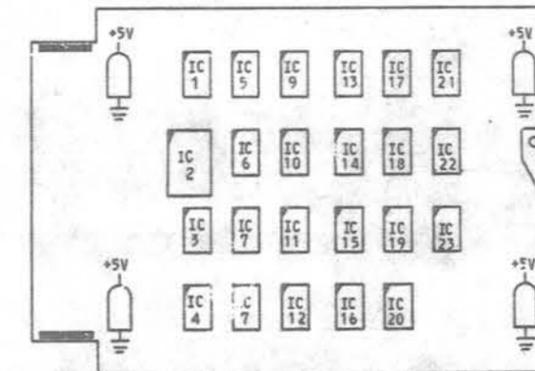
CURRENT DRAIN: 125mA

- BATTERY AND GROUND TERMINALS FOR THIS CIRCUIT PACK ARE AS FOLLOWS:

FUNCTION	TERMINAL
+5	000,119
GRD	200,319

- HORIZONTAL MOUNTING CENTERS AT 0.50 INCH.

6. INTEGRATED CIRCUIT LOCATION GUIDE:
(COMPONENT SIDE SHOWN)



UNMARKED COMPONENTS ARE FILTER CAPACITORS

SUPPORTING INFORMATION

CATEGORY	NO.
CIRCUIT PACK CODE	JK16
CONNECTOR ON FRAME	947C OR 947A
ACCEPTABLE SERIES	1-2,2

SHEET INDEX NOTES

- WHEN CHANGES ARE MADE IN THIS DRAWING ONLY THOSE SHEETS AFFECTED WILL BE REISSUED.
- THIS SHEET INDEX WILL BE REISSUED AND BROUGHT UP TO DATE EACH TIME ANY SHEET OF THE DRAWING IS REISSUED, OR A NEW SHEET IS ADDED.
- THE ISSUE NUMBER ASSIGNED TO A CHANGED OR NEW SHEET WILL BE THE SAME ISSUE NUMBER AS THAT OF THE FIRST SHEET.
- SHEETS THAT ARE NOT CHANGED WILL RETAIN THEIR EXISTING ISSUE NUMBER.
- THE LAST ISSUE NUMBER OF THE FIRST SHEET INDEX IS RECOGNIZED AS THE LATEST ISSUE NUMBER OF THE DRAWING AS A WHOLE.

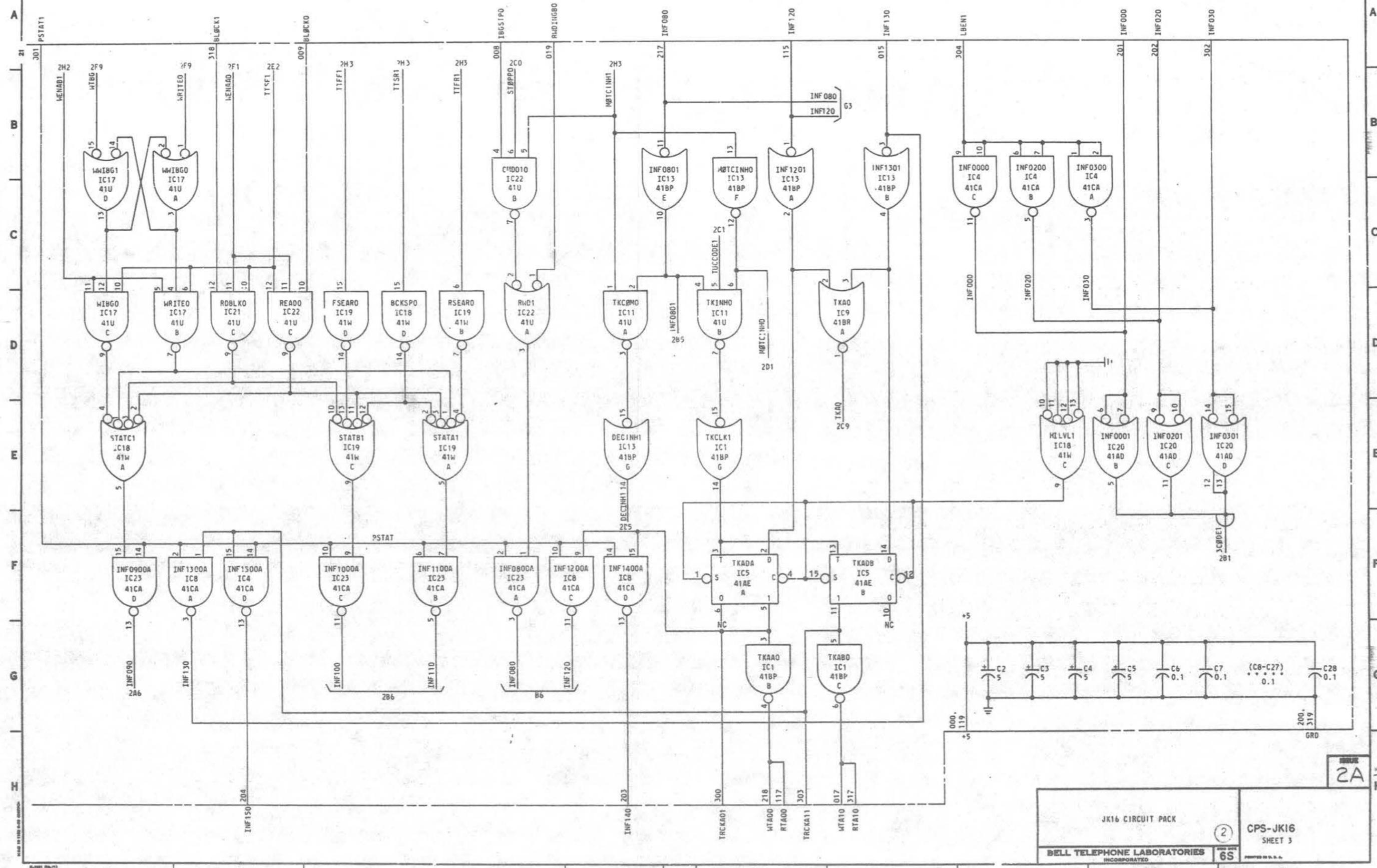
NOTICE- NOT FOR USE OR DISCLOSURE OUTSIDE THE BELL SYSTEM EXCEPT UNDER WRITTEN AGREEMENT.

ISSUE
2A

1N98	AT&CO STANDARD
JK16 CIRCUIT PACK	
CARTRIDGE TAPE TRANSPORT CONTROLLER, BOARD A CIRCUIT	
2	CPS-JK16 4 SHEETS
BELL TELEPHONE LABORATORIES INCORPORATED	65

PART OF CPS JK16

CARTRIDGE TAPE TRANSPORT CONTROLLER, BOARD A



CPS-JK16

JK16 CIRCUIT PACK

BELL TELEPHONE LABORATORIES INCORPORATED

65

CPS-JK16 SHEET 3

2A

PART OF CPS JK16

CARTRIDGE TAPE TRANSPORT CONTROLLER, BOARD A

COMPONENT LIST

INTEGRATED CIRCUIT

LOC CODE ELEM	IC1 41BP	IC2 129A	IC3 41U	IC4 41CA	IC5 41AE	IC6 41BP	IC7 41W	IC8 41CA	IC9 41BR	IC10 41CF	IC11 41U	IC12 41BP	IC13 41BP	IC14 41AE	IC15 41CC	IC16 41CK	IC17 41U	IC18 41W	IC19 41W	IC20 41AD	IC21 41U	IC22 41U	IC23 41CA	
ID	DESIG SH LOC																							
A	INFO701 287	DECODER 285	WIBG00 2E8	INFO300 3B8	TKA0A 3F5	REV1 204	MOTCINH1 2G3	INF1300A 3F1	TKA0 3D6	MOTREG 2E4	TKC0M0 3D4	RWNC1 2C7	INF1201 3B5	WRENAB 2F1	START 2E1	TUCCODE 2C1	WWIBG0 3B1	STATC1 3E0	STATA1 3E3	SP3 2A3	MSTP1 2E7	DESIG SH LOC	DESIG SH LOC	DESIG SH LOC
B	TKA00 3G5		MAINT0 2F7	INFO200 3B7	TKA0B 3F6	FFWD1 204	SP1 2A2	TKAP1 2D9	RDCLO 2E0		TKINH0 3D5	STPBR1 2C7	INF1301 3B6	RDENAB 2F0		WRITEG 3D1	HSTBPO 2F8	RSEARO 3D3	INFO001 3E8	MSTP0 2E7	RWD1 3D3	INFO000A 3F3		
C	TKA00 3G6		MAINT1 2F6	INFO000 3B7		FREV1 205	FWD1 2D4	INF1200A 3F4	FWD0 2F3		TKINHO 3D5	SP2 2A2	INIT0 2E7		WIBG0 3D0	HILVL1 3E7	STATB1 3E2	INFO001 3E8	MSTP0 2E7	INFO001 3E8	MSTP0 2E7	INFO100A 3F3		
D	SLTO 267		WRIT00 2E8	INF1500A 3F1		TFFRO 2F4	SCRC1 2D0	INF1400A 3F4	REVO 2F3		WRITENO 2D2	RCO 2B0	INIT1 2U7		WWIBG1 3B0	BCKSPO 3D2	FSEARO 3D2	INFO201 3E8	RDBLKO 3D1	READO 3D1	INFO000A 3F3			
E	WRIT1 2D8					TTSRO 2F4					WRCTENO 2G1	HC1 2A0	INFO001 3B4					INFO201 3E8	MSTPBR0 2D7	TINITO 2D7	INFO000A 3F3			
F	WRIT0 2D8					TTSFO 2G4						WRENAB0 2G2	MOTCINH0 3B5					INFO301 3E9			INFO000A 3F3			
G	TKCLK1 3E5											WRITPG 2G2	DECINH1 3E4											

CAPACITOR

DESIG	CODE
C1	KS-19774 L1, 20pF
[4] C2-C5	601A, 5
[25] C6-C28	KS-19774 L5, 0.1

RESISTOR

DESIG	CODE
R1	KS-20616 L1A, 10KΩ
R2	KS-20616 L1A, 2.2KΩ
R3	KS-20616 L1A, 2.2KΩ

CIRCUIT DESCRIPTION:

THIS CIRCUIT PACK IS ONE OF FOUR ASSOCIATED WITH THE CARTRIDGE TAPE TRANSPORT CONTROLLER PORTION OF THE TDC CIRCUIT. IT CONTAINS THE COMMAND DECODER, MOTION CONTROL, TRACK SELECTION, READ AND WRITE ENABLE REGISTERS, PRIMARY STATUS, AND MAINTENANCE CIRCUITRY.

THE 41CK, TUCCODE, AND ASSOCIATED GATES, INFO001, INFO201, AND INFO301 ARE USED TO RECOGNIZE THE PROPER 3/6 DEVICE CODE AND MINIMIZE LOADING ON THE SPI PARALLEL BUS. USING THE INPUT RCO AS A STROBE, THIS CIRCUITRY INHIBITS ALL COMMANDS WHICH DO NOT CARRY THE PROPER DEVICE CODE. OUTPUTS FROM TUCCODE STROBE THE 129A COMMAND DECODER. FROM INPUTS INFO90, INFO100, INFO110 AND GATED INFO80, THE COMMAND DECODER PULSES ONE OF ITS 16 OUTPUT COMMAND LEADS. THE 16 COMMANDS ARE: READ CONTINUOUS (READCO), READ-ONE-BLOCK (RDBLCO), WRITE (FEEDS WRIT1), WRITE IBG (FEEDS WWIBG1), BACKSPACE (BKSPACO), FAST FORWARD (FSTFRWCO), FAST REVERSE (FSTREVCO), REWIND (TTREWCO), STOP (STPPO), SET WRITE STOP (SWTSTPCO), RESET WRITE STOP (RWTSTPCO), SHIFT CMC (SCRCO), CLEAR CRC (CLRCRCCO), STATUS REQUEST (STREQCO), SET MAINTENANCE (MTCSETO), AND RESET MAINTENANCE (MTRCSETO). COMMANDS LISTED ABOVE WHICH REQUIRE ANY OF THE FOLLOWING MOTIONS OF THE TRANSPORT, SLOW FORWARD, SLOW REVERSE, FAST FORWARD, OR FAST REVERSE, FEED FWD1, REV1, FFWD1, AND FREV1, RESPECTIVELY. THE OUTPUTS FROM THESE GATES FEED THE 41CF, MOTREG, WHICH IS THE TAPE MOTION CONTROL REGISTER. THE 41CC, START, WHICH IS TRIGGERED BY TUCCODE1, STROBES MOTREG APPROXIMATELY 150 ns AFTER DECODER IS STROBED. THIS DELAY PROVIDES SETUP TIME FOR COMMANDS FROM THE DECODER. THE FOUR MOTION COMMANDS FROM MOTREG ARE BUFFERED BY TTSFO, TTSRO, TFFRO, AND TFRFRO, AND FED DIRECTLY TO THE TRANSPORT. A STOP COMMAND OR ANY ONE OF SEVERAL OTHER CONDITIONS ON JK16 WILL CAUSE STPPO TO PULSE LOW. THE LEADING EDGE OF THIS PULSE CLEARS MOTREG. LEAD INFO80 IS USED TO DESIGNATE MOTION COMMANDS. IT MUST BE IN A LOW STATE FOR THE 129A TO DECODE ANY OF THE EIGHT COMMANDS WHICH REQUIRE TRANSPORT MOTION. MOTCINH1 REMAINS IN A HIGH STATE IF ANY OF THE FOUR MOTION STATES ARE SET IN MOTREG. NOTE THAT IF INFO80 IS IN A LOW STATE AND MOTCINH1 IS IN A HIGH STATE, THEN DECINH1 WILL BE IN A HIGH STATE WHICH INHIBITS THE 129A DECODER. THIS CIRCUITRY REQUIRES THAT THE TRANSPORT BE IN A STOP STATE BEFORE ANY MOTION COMMAND CAN BE DECODED. THE EIGHT COMMANDS WHICH DO NOT REQUIRE MOTION ARE DECODED IRRESPECTIVE OF THE STATE OF MOTCINH1.

READ AND WRITE OPERATIONS ARE CONTROLLED BY TWO D-TYPE FLIP-FLOPS, RDENAB AND WRENAB, RESPECTIVELY. NOTE THAT ALL COMMANDS REQUIRING SLOW FORWARD MOTION OF THE TRANSPORT (HIGH STATE OF FWD1) WILL SET RDENAB.

A SHIFT CRC COMMAND ALSO SETS RDENAB. A WRITE OR WRITE IBG COMMAND, WHICH SETS BOTH RDENAB AND WRENAB TO CREATE A READ AFTER WRITE CONDITION, IS GATED THROUGH WRIT00 OR WIBG00 BY TKAP1. TKAP1 IS ACTIVE, OR IN A HIGH STATE, WHEN EITHER WETRK10 OR TKA0 IS IN A LOW STATE. LEAD WETRK10 REMAINS HIGH TO WRITE PROTECT INFORMATION ON THE TAPE PROGRAM TRACK, TRACK 1. TKA0 IS IN A HIGH STATE ONLY WHEN BOTH INFO120 AND INFO130 ARE IN HIGH STATES. A HIGH STATE ON BOTH INFO120 AND INFO130 INDICATE THE SELECTION OF TRACK 1.

GATED INFO120 AND INFO130 FEED TKA0A AND TKA0B, RESPECTIVELY. THESE TWO D-TYPE FLIP-FLOPS CONTROL TRACK SELECTION USING A 2-BIT BINARY CODE. NOTE THAT TKINH0 ONLY ALLOWS A CHANGE IN TRACK SELECTION WHEN THE TRANSPORT IS IN A STOP STATE, THAT IS, MOTCINH1 IS IN A LOW STATE.

PRIMARY STATUS OF THE CONTROLLER IS GENERATED BY A DISCRETE GATE ENCODER. SEVEN OF THE MOTION COMMANDS, WRITE IBG, WRITE, READ-A-BLOCK, READ, FAST FORWARD, BACKSPACE, AND FAST REVERSE ARE SELECTED BY GATES WWIBG0, WRITEG, RDBLKO, READO, FSEARO, BCKSPO, AND RSEARO, RESPECTIVELY. INPUTS BLBCK1 AND BLBCK0 ARE THE OUTPUT OF A FLIP-FLOP LOCATED ON JK18 WHERE BLBCK1 IS IN A HIGH STATE WHEN ONLY ONE BLOCK IS TO BE READ, THAT IS A READ-A-BLOCK OR A BACKSPACE COMMAND HAS BEEN ISSUED. (BACKSPACE IS ESSENTIALLY A REVERSE READ OPERATION, EXCEPT THAT NO DATA IS TRANSFERRED.) OUTPUTS FROM THESE SEVEN GATES, WHICH INDICATE THE OPERATING MODE OF THE TRANSPORT, SELECTIVELY FEED STATC1, STATB1, AND STATA1. THE OUTPUTS OF THESE THREE GATES GENERATE A 3-BIT CODE WHICH IS GATED THROUGH INFO900A, INFO1000A, AND INFO1100A BY PSTAT1. OUTPUTS FROM THESE THREE GATES RECREATE THE ORIGINAL STATES, ON I/O LEADS INFO90, INFO100, AND INFO110, WHICH WERE PRESENT WHEN THE COMMAND WAS ISSUED FROM THE PARALLEL BUS. PSTAT1 IS ACTIVE OR IN A HIGH STATE WHEN THE BUS IS PREPARED TO RECEIVE A REPLY FROM THE CONTROLLER.

CHD010 INDICATES WHETHER THE CONTROLLER IS IN A STOP STATE. ITS OUTPUT IS IN A HIGH STATE WHENEVER THE TRANSPORT IS EITHER STOPPED OR IN THE PROCESS OF STOPPING. WHEN A STOP COMMAND IS ISSUED, INPUT IBGSTPO, WHICH IS AN OUTPUT FROM JK18, GOES LOW IMMEDIATELY AND REMAINS LOW UNTIL STPPO GOES LOW. STPPO GOES LOW ONLY AFTER THE TRANSPORT HAS REACHED AN IBG ON THE TAPE AND WILL REMAIN LOW UNTIL THE TRANSPORT HAS REACHED A COMPLETE STOP, APPROXIMATELY 40 ms. AS STATED EARLIER, THE LEADING EDGE OF STPPO CLEARS MOTREG WHICH CAUSES MOTCINH1 TO GO LOW. THE OUTPUT OF CHD010 WILL REMAIN IN A HIGH STATE UNTIL MOTCINH1 IS DRIVEN HIGH AGAIN.

SINCE A REWIND OPERATION OF THE TRANSPORT IS NOT NORMALLY STOPPED BY THE CONTROLLER, PROVISIONS WERE MADE IN THE STATUS CIRCUITRY WHERE RWDING0, CAN OVERRIDE THE HIGH (OR STOP) STATE OF CHD010. IF THE TRANSPORT IS IN A REWIND MODE, RWDING0 WILL BE IN A LOW STATE. THIS CAUSES THE OUTPUT OF RWD1 TO GO HIGH, IRRESPECTIVE OF THE STATE OF CHD010. GATING OF RWD1 THROUGH INFO800A COMPLETES THE 4-BIT CODE WHICH INDICATES THE FUNCTIONAL STATUS OF THE TRANSPORT.

THE OUTPUT OF TKA0A FEED INFO1200A AND INFO1400A, AND THE OUTPUT OF TKA0B FEED INFO1300A AND INFO1500A. THESE FOUR GATES INDICATE THE STATUS OF THE TRACK SELECTED WHEN PSTAT1 IS ACTIVE. INFO000, INFO200, AND INFO300 ARE DRIVEN LOW BY LBEN1 WHENEVER A STATUS IS REQUESTED FROM THE TAPE CONTROLLER. THESE GATES DRIVE I/O LEADS INFO00, INFO20, AND INFO30, WHICH ARE THE ACTIVE 3 BITS OF THE TAPE CONTROLLER'S 3/6 DEVICE CODE.

INPUT INIT0 IS USED TO INITIALIZE THE CONTROLLER CIRCUITS. THE OUTPUT FROM INIT0 RESETS THE TAPE HAND GATE FLIP-FLOPS, MAINT1/MAINT0 AND MSTP1/MSTP0, RESETS RDENAB AND WRENAB AND CLEARS MOTREG WHICH COMPLETES INITIALIZATION OF JK18. MAINT1/MAINT0 CAN BE SET BY EITHER A MAINTENANCE COMMAND (PULSE ON MTCSETO) OR A MAINTENANCE STOP COMMAND (PULSE ON STPPO WHILE INFO70 IS IN A LOW STATE). IT IS RESET BY EITHER A RESET MAINTENANCE COMMAND (PULSE ON MTRCSETO) OR A PULSE ON INIT0. A LOW LEVEL FROM MAINTC GATED THROUGH SLTO WILL INHIBIT ALL INPUTS TO THE TRANSPORT AND UNDER NORMAL OPERATING CONDITIONS, CAUSE THE TRANSPORT TO STOP. SETTING OF THIS MAINTENANCE FLIP-FLOP ALSO ALLOWS THE CONTROLLER TO BE EXERCISED WITHOUT USE OF THE TRANSPORT. THE SECOND MAINTENANCE FLIP-FLOP MSTP1/MSTP0 CAN BE SET BY EITHER A MAINTENANCE STOP COMMAND AND RESET BY EITHER A RESET MAINTENANCE COMMAND OR A PULSE ON INIT0. WHEN MSTP1 IS IN A HIGH STATE, TTMSTPO GOES LOW. THIS WILL DISABLE THE TRANSPORT AND STOP ANY MOTION, IRRESPECTIVE OF WHAT MODE OF OPERATION THE TRANSPORT WAS IN. (A HIGH LEVEL ON TTSELO WILL NOT STOP A REWIND SEQUENCE.) A LOW PULSE FROM TTNIT0 WILL INITIALIZE THE TRANSPORT TO THE LOAD POINT ON TAPE. THIS PULSE IS THE COMBINATION OF A LOW LEVEL ON INPUT INFO70 AND A LOW PULSE ON MTRCSETO (RESET MAINTENANCE COMMAND).

CPS-JK16

2A

JK16 CIRCUIT PACK		CPS-JK16 SHEET 4	
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