HA16662MP, HA16682MP

HDD Interface Circuit

Description

The HA16662MP/682MP monilithic IC is designed for ST-506 interface logics in hard disk drive memory systems.

Functions

- RS-422 receiver, driver pair
- ST-506 interface line driver
- Line receiver with hysteresis input threshold
- ST-506 interface logic
- Two-channel supply voltage monitor circuit for 5 V and 12 V
- Reset signal generator for microprocessor
- Write gate signal and write fault signal generator for R/W amp. IC.

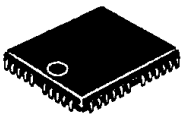
Features

- Can directly connect with MPU: 6301V, 6301X, 6305V, 8049, etc.
- Reduces number of logic components for I/O interface
- No external TTLs and RS-422 receiver driver
- Write inhibit input for embedded servo system
- Highly reliable fail-safe with write inhibit functions for power-on period and abnormal supply voltage
- Small surface mount package (MSP: mini-square-package) for high density PCB

Ordering Information

Type No.	Package
HA16662MP, HA16682MP	MP-44

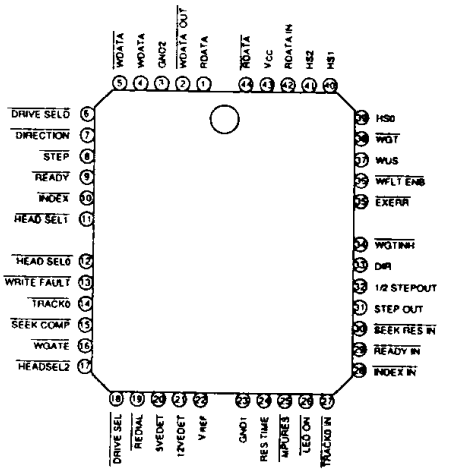
HA1662MP/682MP



(MP-44)

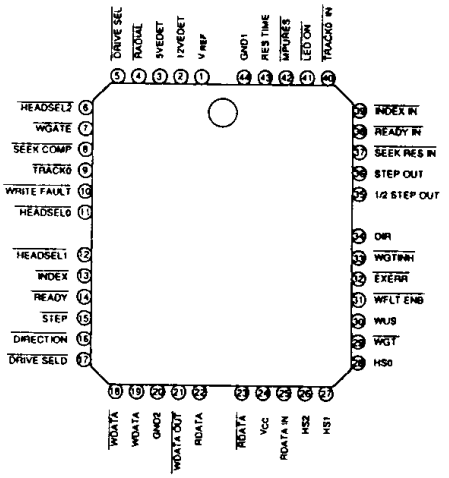
Pin Arrangement

HA16662MP



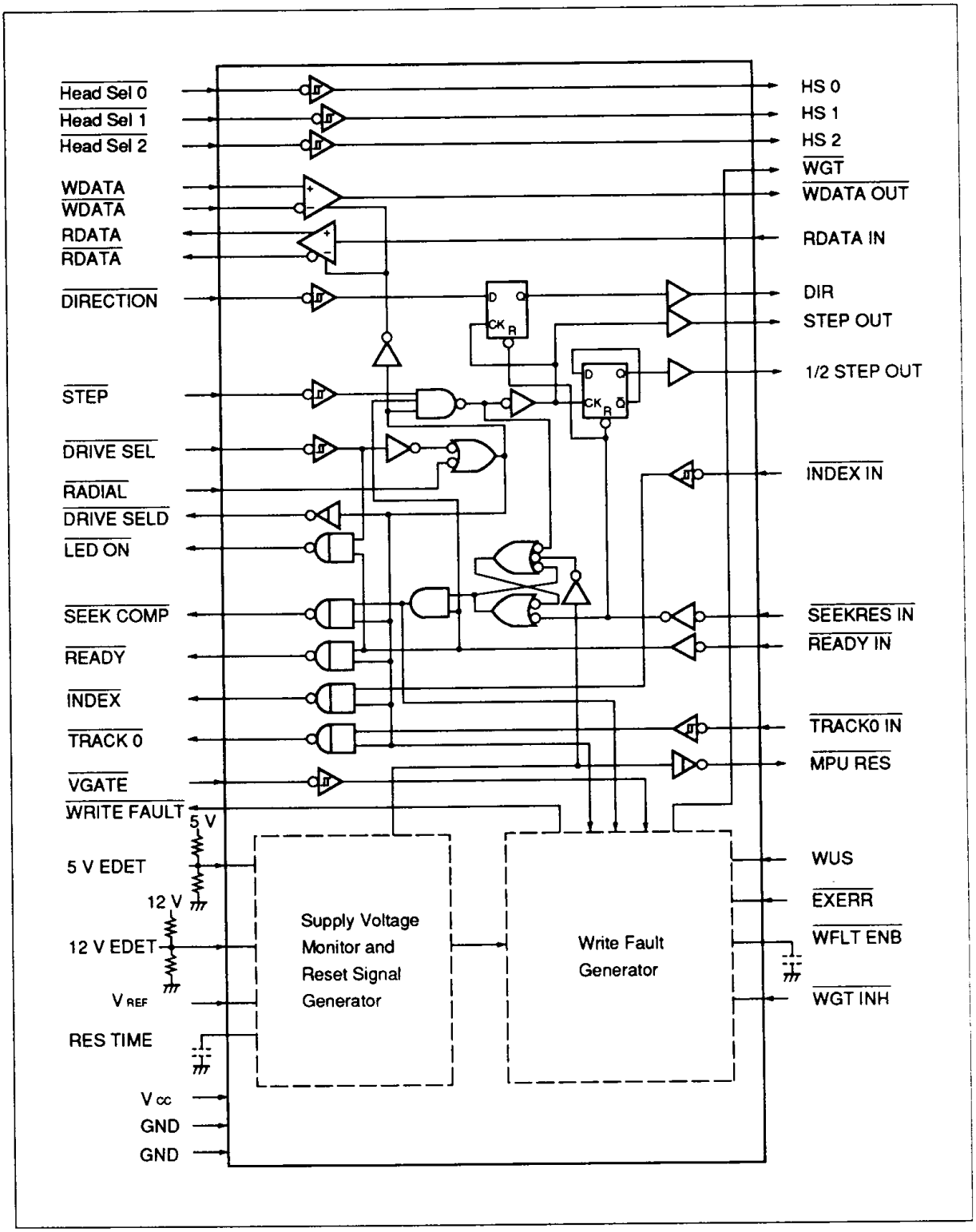
(TOP VIEW)

HA16682MP



(TOP VIEW)

Block Diagram



Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings	Unit	Notes
Supply voltage	V_{CC}	7	V	
Input voltage 1	V_{IN1}	7	V	1
Input voltage 2	V_{IN2}	V_{CC}	V	2
Differential input voltage	V_{DIN}	±7	V	3
Output voltage 1	V_{OUT1}	7	V	4
Output voltage 2	V_{OUT2}	V_{CC}	V	5
Differential output voltage	V_{DOUT}	5.5	V	6
Output current 1	I_{OUT1}	50	mA	7
Output current 2	I_{OUT2}	10	mA	8
Output current 3	I_{OUT3}	10	mA	9
Output current 4	I_{OUT4}	–0.4	mA	10
Differential output current	I_{DOUT}	30	mA	11
Operating temperature range	Topr	0 to +70	°C	
Storage temperature range	Tstg	–55 to +125	°C	
Power dissipation	P_T	750	mW	

The absolute maximum ratings are limiting values, to be applied individually, beyond which the device may be permanently damaged. Functional operation under any of these conditions is not guaranteed. Exposing a circuit to its absolute maximum rating for extended periods of time may affect the device's reliability.

Notes:
1. Applies to schmit-trigger inputs and other inputs equivalent to 74LS04:
   $\overline{\text{HEAD SEL 0}}$ – $\overline{\text{HEAD SEL 2}}$ $\overline{\text{DIRECTION}}$, $\overline{\text{STEP}}$, $\overline{\text{DRIVE SEL}}$, $\overline{\text{TRACK 0 IN}}$, $\overline{\text{INDEX IN}}$, RDATAIN, $\overline{\text{SEEK RES IN}}$, $\overline{\text{READYIN}}$, WUS, $\overline{\text{EXERR}}$, $\overline{\text{WGTINH}}$, $\overline{\text{WGATE}}$
2. Applies to the following inputs:
   5 V EDET, 12 V EDET, V_{REF}, RESTIME, $\overline{\text{WFLTENB}}$, $\overline{\text{RADIAL}}$
3. Applies to the following differential receiver inputs:
   WDATA, $\overline{\text{WDATA}}$
4. Applies to the following open collector outputs in the off mode:
   $\overline{\text{DRIVESELD}}$, $\overline{\text{LED ON}}$, $\overline{\text{SEEK COMP}}$, $\overline{\text{READY}}$, $\overline{\text{INDEX}}$, $\overline{\text{TRACK 0}}$, $\overline{\text{WRITE FAULT}}$, $\overline{\text{MPURES}}$
5. Applies to the following outputs when high:
   HS 0 - HS 2, $\overline{\text{WGT}}$, $\overline{\text{WDATAOUT}}$, DIR, STEP OUT, 1/2 STEP OUT
6. Applies to the following differential driver outputs when high:
   RDATA, $\overline{\text{RDATA}}$
7. Applies to the following open collector outputs in the on mode:
   $\overline{\text{DRIVE SELD}}$, $\overline{\text{LED ON}}$, $\overline{\text{SEEK COMP}}$, $\overline{\text{READY}}$, $\overline{\text{INDEX}}$, $\overline{\text{TRACK 0}}$, $\overline{\text{WRITE FAULT}}$
8. Applies to the following open collector output in the on mode:
   $\overline{\text{MPURES}}$
9. Applies to the following outputs when low:
   HS 0 - HS 2, $\overline{\text{WGT}}$, $\overline{\text{WDATA OUT}}$, DIR, STEP OUT, 1/2 STEP OUT
10. Applies to the same outputs as note 9 when high:
11. Applies to the following differential driver outputs:
    RDATA, $\overline{\text{RDATA}}$

Electrical Characteristics (Ta = 25°C)

Item	Pin	Symbol	Min	Typ	Max	Unit	Test Condition
Supply voltage range		V_{CC}	4.5	5.0	5.5	V	
High level input threshold voltage	$\overline{\text{HEADSEL 0}}$, $\overline{\text{HEADSEL 1}}$, $\overline{\text{HEADSEL 2}}$, $\overline{\text{DIRECTION}}$, $\overline{\text{STEP}}$, $\overline{\text{DRIVESEL}}$, $\overline{\text{WGATE}}$, $\overline{\text{TRACK0 IN}}$, $\overline{\text{INDEX IN}}$, $\overline{\text{WGATE}}$,	V_{T1+}	—	1.7	—	V	V_{CC} = 5 V
Low level input threshold voltage		V_{T1-}	—	0.9	—	V	V_{CC} = 5 V
Hysteresis		V_{HYS1}	—	0.8	—	V	V_{CC} = 5 V
High level input current		I_{IH1}	—	—	20	µA	V_{CC} = 5.5 V, V_{IN} = 2.7 V
Low level input current		I_{IL1}	–0.4	—	—	mA	V_{CC} = 5.5 V, V_{IN} = 0.4 V
Differential input voltage	WDATA, $\overline{\text{WDATA}}$	V_{DIN}	1.0	—	—	V	–5.5 V < V_{CM} < 5.5 V
High level differential input current		I_{IN1+}	—	—	1	mA	V_{IN} = +5.5 V, other V_{IN} = 0
Low level differential input current		I_{IN1-}	–1.5	—	—	mA	V_{IN} = –5.5 V, other V_{IN} = 0
Input hysteresis		V_{DHYS}	—	50	—	mV	V_{CC} = 5 V, V_{CM} = 0 V
High level output voltage 1	$\overline{\text{WDATAOUT}}$	V_{OH1}	2.7	—	—	V	V_{CC} = 4.75 V, $\overline{\text{WDATA}}$ = 0 V, WDATA = 1 V, I_{OH} = –0.44 mA
High level output voltage 2		V_{OH2}	2.5	—	—	V	V_{CC} = 4.5 V, $\overline{\text{WDATA}}$ = 0 V WDATA = 1 V, I_{OH} = –0.44 mA
Low level output voltage 1		V_{OL1}	—	—	0.4	V	V_{CC} = 4.5 V, V_{DIN} = 1.0 V I_{OL} = 4.0 mA
Low level output voltage 2		V_{OL2}	—	—	0.45	V	V_{CC} = 4.5 V, V_{DIN} = 1.0 V I_{OL} = 8.0 mA
High impedance output current 1		I_{ZOUT1}	—	—	50	µA	V_{CC} = 5.5 V, V_O = 2.4 V
High impedance output current 2		I_{ZOUT2}	–50	—	—	µA	V_{CC} = 5.5 V, V_O = 0.4 V

Electrical Characteristics (Continued)

Item	Pin	Symbol	Min	Typ	Max	Unit	Test Condition
High level input voltage 1	RDATAIN	V_{IH1}	2.0	—	—	V	V_{CC} = 4.5 V
Low level input voltage 1		V_{IL1}	—	—	0.8	V	V_{CC} = 5.5 V
High level input current 2		I_{IH2}	—	—	20	µA	V_{CC} = 5.5 V, V_{IN} = 2.7 V
Low level input current 2		I_{IL2}	–0.36	—	—	mA	V_{CC} = 5.5 V, V_{IN} = 0.4 V
High level output voltage 3	RDATA, $\overline{\text{RDATA}}$	V_{OH3}	2.5	—	—	V	V_{CC} = 4.75 V, I_{OH} = –20 mA
High level output voltage 4		V_{OH4}	2.2	—	—	V	V_{CC} = 4.5 V, I_{OH} = –20 mA
Low level output voltage 3		V_{OL3}	—	—	0.5	V	V_{CC} = 4.5 V, I_{OL} = 20 mA
High impedance output current 3		I_{ZOUT3}	—	—	50	µA	V_{CC} = 5.5 V, V_{OUT} = 2.5 V
High impedance output current 4		I_{ZOUT4}	–50	—	—	µA	V_{CC} = 5.5 V, V_{OUT} = 0.5 V
Low level output voltage 4	$\overline{\text{DRIVE SELD}}$, $\overline{\text{SEEK COMP}}$, $\overline{\text{READY}}$, $\overline{\text{INDEX}}$, $\overline{\text{TRACK0}}$, $\overline{\text{WRITE FAULT}}$, $\overline{\text{LED ON}}$	V_{OL4}	—	—	0.4	V	V_{CC} = 4.5 V, I_{OL} = 48 mA
High level output current 1		I_{OH1}	—	—	250	µA	V_{CC} = 4.5 V, V_{OH} = 5.5 V
High level input voltage 2	$\overline{\text{SEEK RESIN}}$, $\overline{\text{READY IN}}$, $\overline{\text{WGTINH}}$, WUS	V_{IH2}	2.0	—	—	V	V_{CC} = 4.5 V
Low level input voltage 2		V_{IL2}	—	—	0.8	V	V_{CC} = 5.5 V
High level input current 3		I_{IH3}	—	—	20	µA	V_{CC} = 5.5 V, V_I = 2.7 V
Low level input current 3		I_{IL3}	–0.4	—	—	mA	V_{CC} = 5.5 V, V_I = 0.4 V

Electrical Characteristics (Continued)

Item	Pin	Symbol	Min	Typ	Max	Unit	Test Condition
High level input voltage 3	$\overline{\text{RADIAL}}$	V_{IH3}	2.0	—	—	V	
Low level input voltage 3		V_{IL3}	—	—	0.8	V	
High level input current 4		I_{IH4}	–0.5	—	—	mA	V_{CC} = 5.5 V, V_I = 2.7 V
Low level input current 4		I_{IL4}	–1.2	—	—	mA	V_{CC} = 5.5 V, V_I = 0.4 V
High level output voltage 5	HS 0, HS 1, HS 2, $\overline{\text{WGT}}$, DIR, STEP OUT, 1/2 STEP OUT,	V_{OH5}	2.7	—	—	V	V_{CC} = 4.75 V, V_I = 0.8 V I_{OH} = –0.4 mA
High level output voltage 6		V_{OH6}	2.5	—	—	V	V_{CC} = 4.5 V, V_I = 0.8 V I_{OH} = –0.4 mA
Low level output voltage 5		V_{OL5}	—	—	0.4	V	V_{CC} = 4.5 V, V_I = 2 V, I_{OL} = 4 mA
Low level output voltage 6		V_{OL6}	—	—	0.5	V	V_{CC} = 4.5 V, V_I = 2 V, I_{OL} = 8 mA
Low level output voltage 7	$\overline{\text{MPURES}}$	V_{OL7}	—	—	0.4	V	V_{CC} = 4.5 V, V_I = 2 V, I_{OL} = 8 mA
High level output current 7		I_{OH7}	—	—	250	µA	V_{CC} = 4.5 V, V_I = 0.8 V, V_{OH} = 5.5 V
High level input threshold voltage	$\overline{\text{EXERR}}$, $\overline{\text{WFLTENB}}$	V_{T2+}	—	1.7	—	V	V_{CC} = 5 V
Low level input threshold voltage		V_{T2-}	—	0.9	—	V	V_{CC} = 5 V
Hysteresis		V_{HYS2}	—	0.8	—	V	V_{CC} = 5 V
High level input current		I_{IH5}	—	—	20	µA	V_{CC} = 5.5 V, V_{IN} = 2.7 V
Low level input current		I_{IL5}	–0.4	—	—	mA	V_{CC} = 5.5 V, V_{IN} = 0.4 V
Internal charge up resistance	$\overline{\text{WFLTENB}}$	R_C	140	200	260	Ω	

Electrical Characteristics (Continued)

Item	Pin	Symbol	Min	Typ	Max	Unit	Test Condition
Sense voltage range 1	5VEDET	V_{SVR1}	0	—	V_{CC} −1.0	V	$V_{CC} \geqq 2$ V
Input bias current 1		I_{IB1}	—	40	60	µA	V_{CC} = 5.5 V, 5VEDET = 2.4 V, V_{REF} = 2.5 V, 12VEDET = 2.9 V
Input bias current 2		I_{IB2}	—	—	2	µA	V_{CC} = 5.5 V, 5VEDET = 5.5 V, V_{REF} = 2.5 V, 12VEDET = 2.9 V
Hysteresis		V_{HYS3}	—	(140)	—	mV	V_{REF} = 2.5 V, R_1 = 1.3 kΩ, R_2 = 1.8 kΩ (Figure 1)
Sense voltage level 1		V_{SVL1}	2.48	2.50	2.52	V	V_{REF} = 2.5 V, V_{CC} = 5 V
Sense voltage range 2	12VEDET	V_{SVR2}	0	—	V_{CC} −1.0	V	$V_{CC} \geqq 2$ V
Input bias current 3		I_{IB3}	—	35	50	µA	V_{CC} = 5.5 V, 12VEDET = 2.4 V, V_{REF} = 2.5 V, 5VEDET = 2.9 V
Input bias current 4		I_{IB4}	—	—	2	µA	V_{CC} = 5.5 V, 12VEDET = 5.5 V, V_{REF} = 2.5 V, 5VEDET = 2.9 V
Hysteresis		V_{HYS4}	—	(270)	—	mV	V_{REF} = 2.5 V, R_1' = 5.6 kΩ R_2' = 1.8 kΩ (Figure 1)
Sense voltage level 2		V_{SVL2}	2.48	2.50	2.52	V	V_{REF} = 2.5 V, V_{CC} = 5 V
Applied reference voltage range	VREF	V_{REF}	2	—	V_{CC} −1.0	V	(Note)
Input bias current 5		I_{IB5}	−3.0	−1.0	—	µA	V_{CC} = 5.5 V, 5VEDET = 12VEDET = 2.9 V, V_{REF} = 2.5 V
Input bias current 6		I_{IB6}	—	—	2	µA	V_{CC} = 5.5 V, 5VEDET = 12VEDET = 0 V, V_{REF} = 5.5 V

Electrical Characteristics (Continued)

Item	Pin	Symbol	Min	Typ	Max	Unit	Test Condition
High level input threshold voltage	RESTIME	V_{T3+}	—	2/3 Vcc	—	V	Vcc = 5 V
Low level input threshold voltage		V_{T3-}	—	6/10 Vcc	—	V	Vcc = 5 V
Capacitor change up current		I_{CHG}	0.5	1	2	µA	Vcc = 5 V
Dissipation current	Vcc	I_{CC}	—	—	135	mA	Vcc = 5.5 V

Note: When applied reference voltage becomes less than 0.6 V, supply voltage monitor circuit generates the supply fault signal.

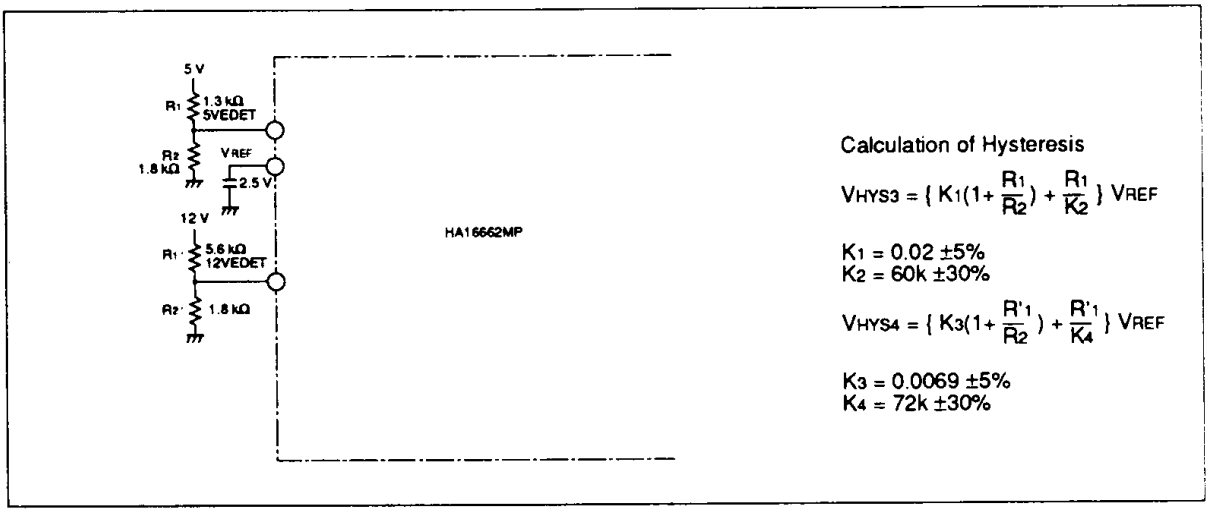


Figure 1 Test Circuit

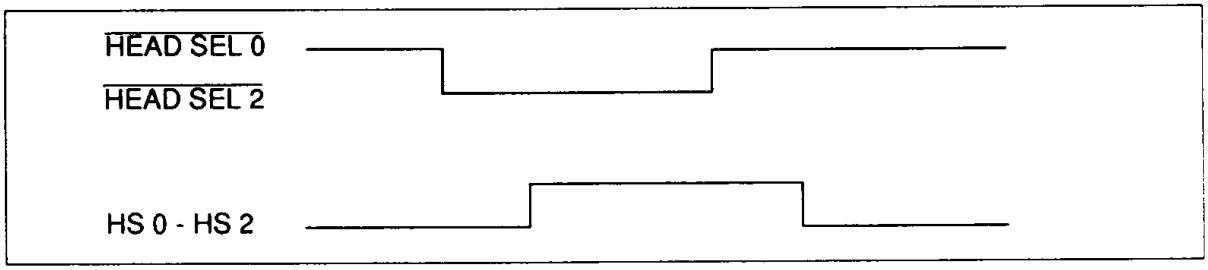


Figure 2 $\overline{\text{HEAD SEL 0}}$ – $\overline{\text{HEAD SEL 2}}$ → HS 0 – HS 2 Timing

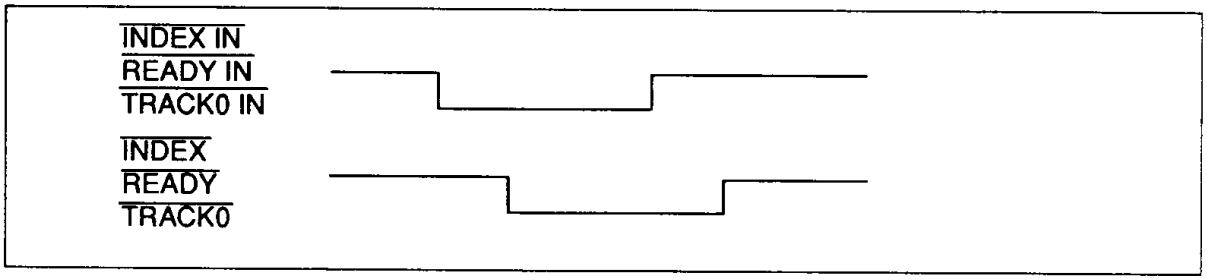


Figure 3 $\overline{\text{INDEX IN}} \rightarrow \overline{\text{INDEX}}$, $\overline{\text{READY IN}} \rightarrow \overline{\text{READY}}$, $\overline{\text{TRACK0 IN}} \rightarrow \overline{\text{TRACK0}}$ Timing

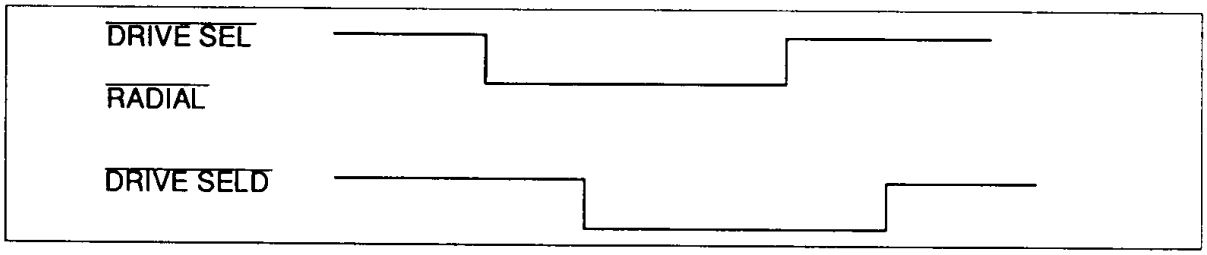


Figure 4 $\overline{\text{DRIVE SEL}}$, $\overline{\text{RADIAL}} \rightarrow \overline{\text{DRIVE SELD}}$ Timing

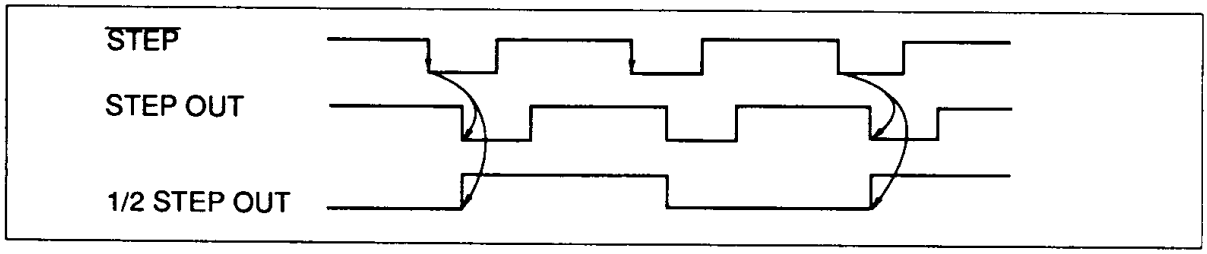


Figure 5 $\overline{\text{STEP}} \rightarrow$ STEP OUT, 1/2 STEP OUT

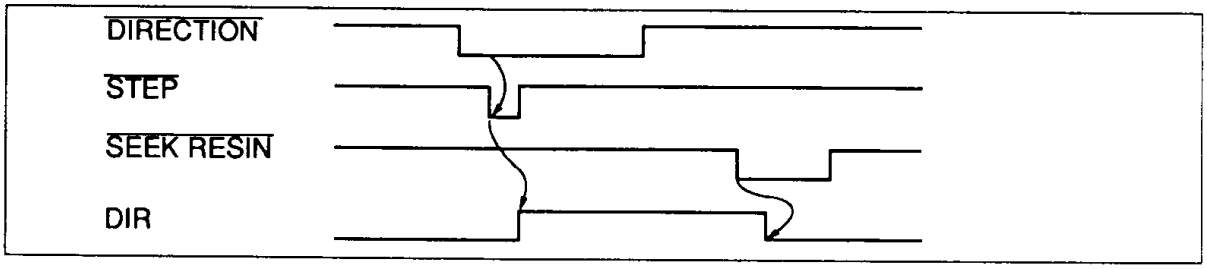


Figure 6 $\overline{\text{DIRECTION}} \rightarrow$ DIR

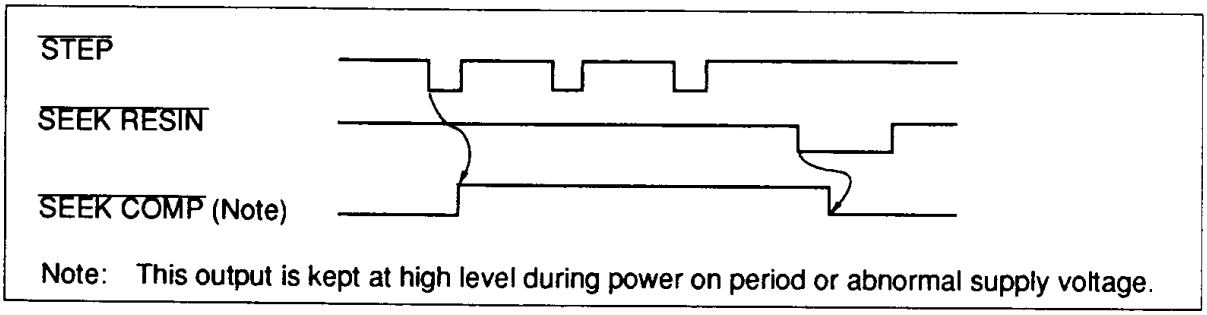


Figure 7 $\overline{\text{SEEK COMP}}$

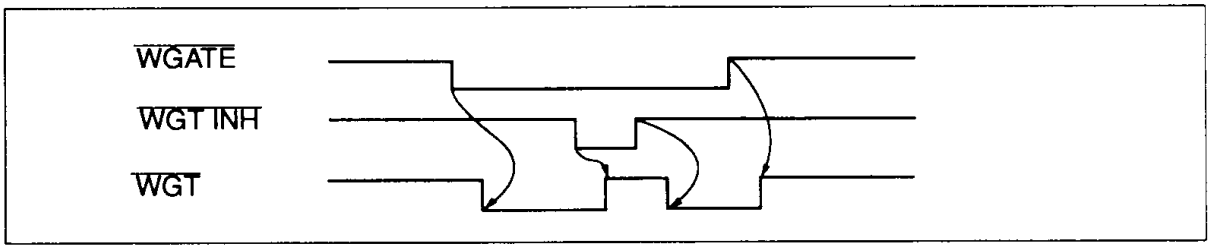


Figure 8 $\overline{\text{WGATE}}$, $\overline{\text{WGT INH}} \rightarrow \overline{\text{WGT}}$

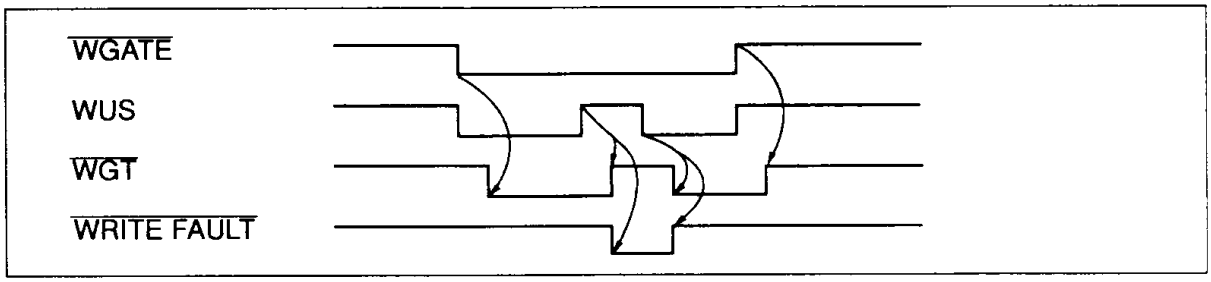


Figure 9 $\overline{\text{WGATE}}$, WUS $\rightarrow$ $\overline{\text{WRITE FAULT}}$, $\overline{\text{WGT}}$

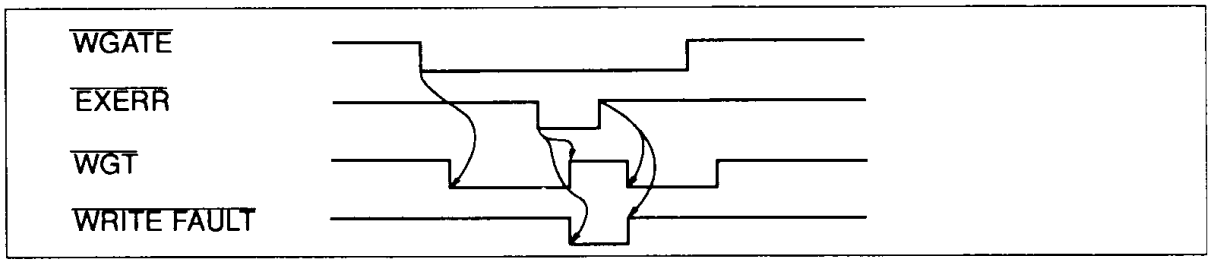


Figure 10 $\overline{\text{WGATE}}$, $\overline{\text{EXERR}} \rightarrow \overline{\text{WRITE FAULT}}$, $\overline{\text{WGT}}$

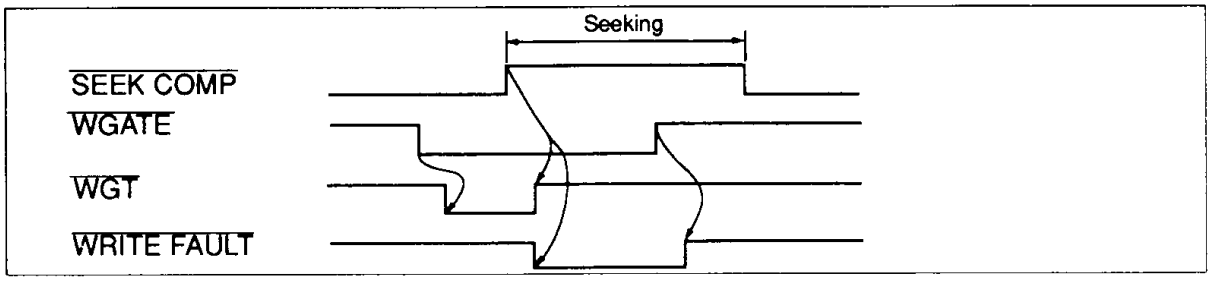


Figure 11 $\overline{\text{WGATE}}$ (Seeking) $\rightarrow$ $\overline{\text{WRITE FAULT}}$, $\overline{\text{WGT}}$

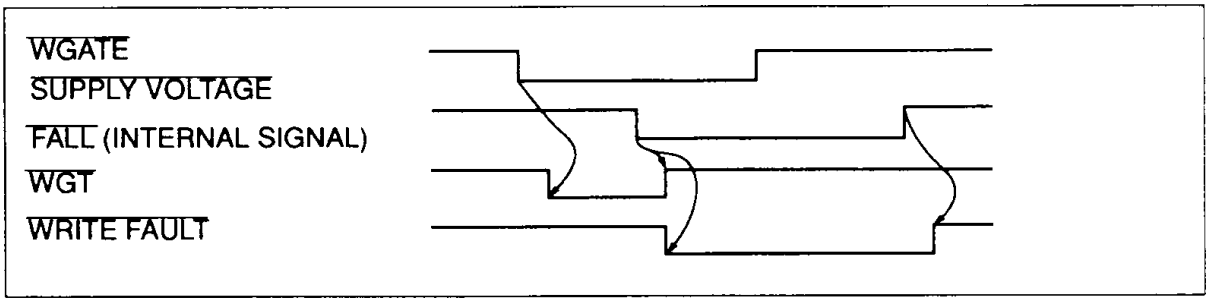


Figure 12 Low Supply Voltage $\rightarrow$ $\overline{\text{WRITE FAULT}}$, $\overline{\text{WTG}}$

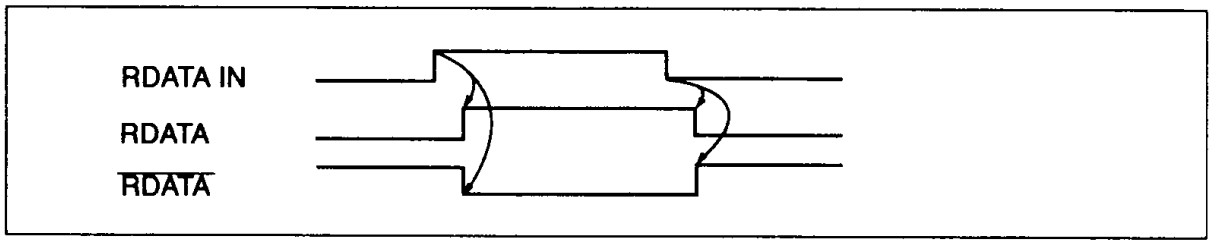


Figure 13 RDATA IN → RDATA, $\overline{\text{RDATA}}$

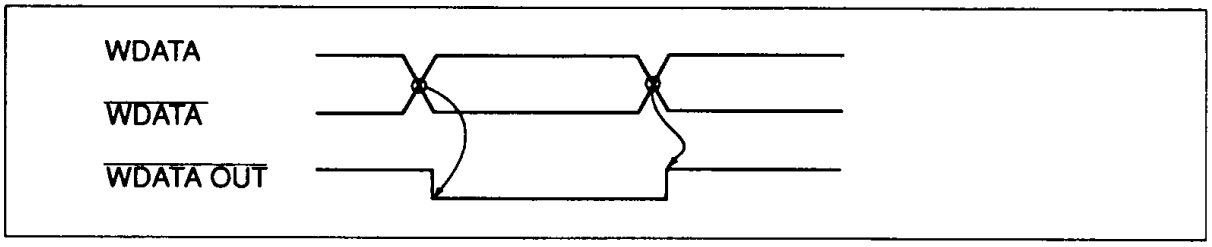


Figure 14 WDATA, $\overline{\text{WDATA}}$ → $\overline{\text{WDATA OUT}}$

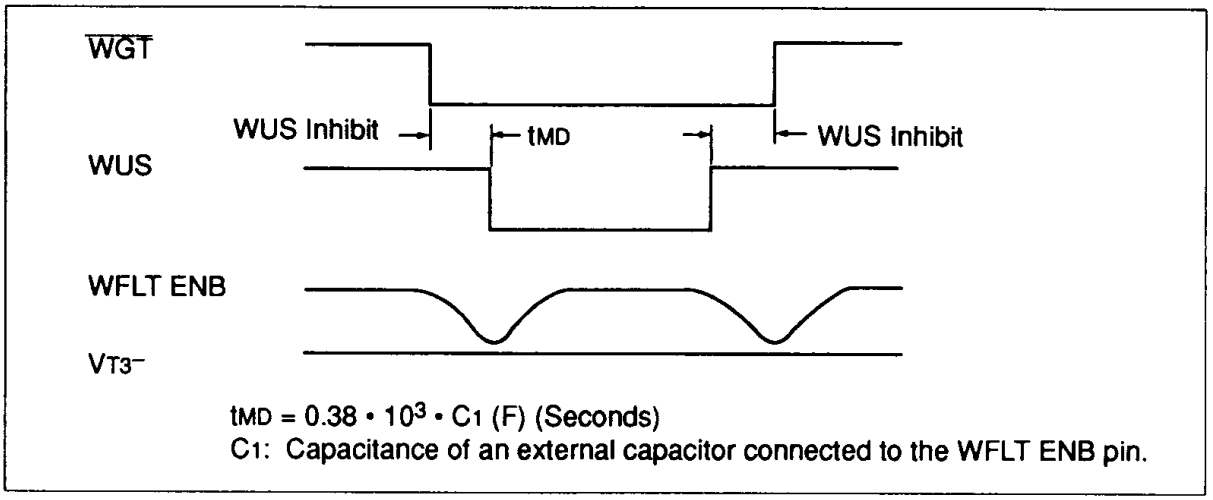


Figure 15 $\overline{\text{WFLT ENB}}$ Timing

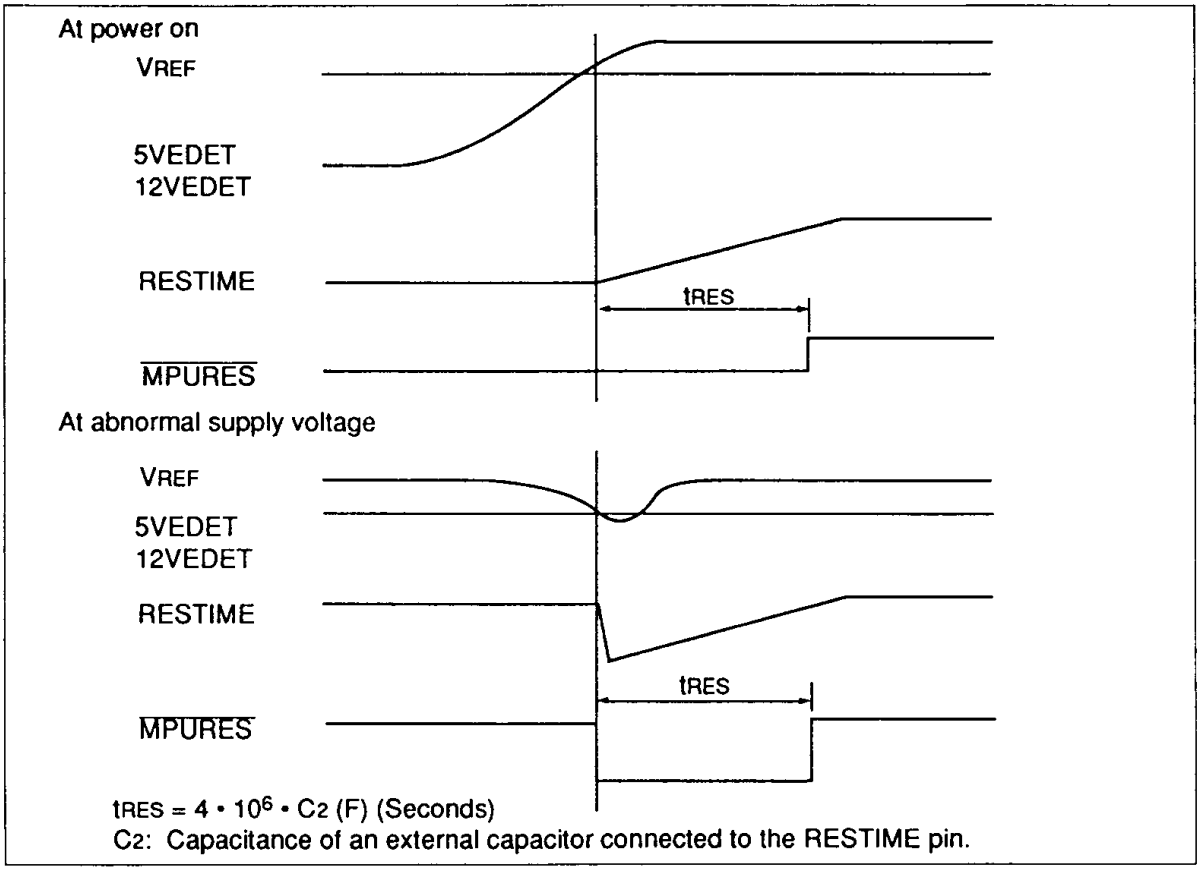


Figure 16 $\overline{\text{MPU RES}}$ Pulse Timing

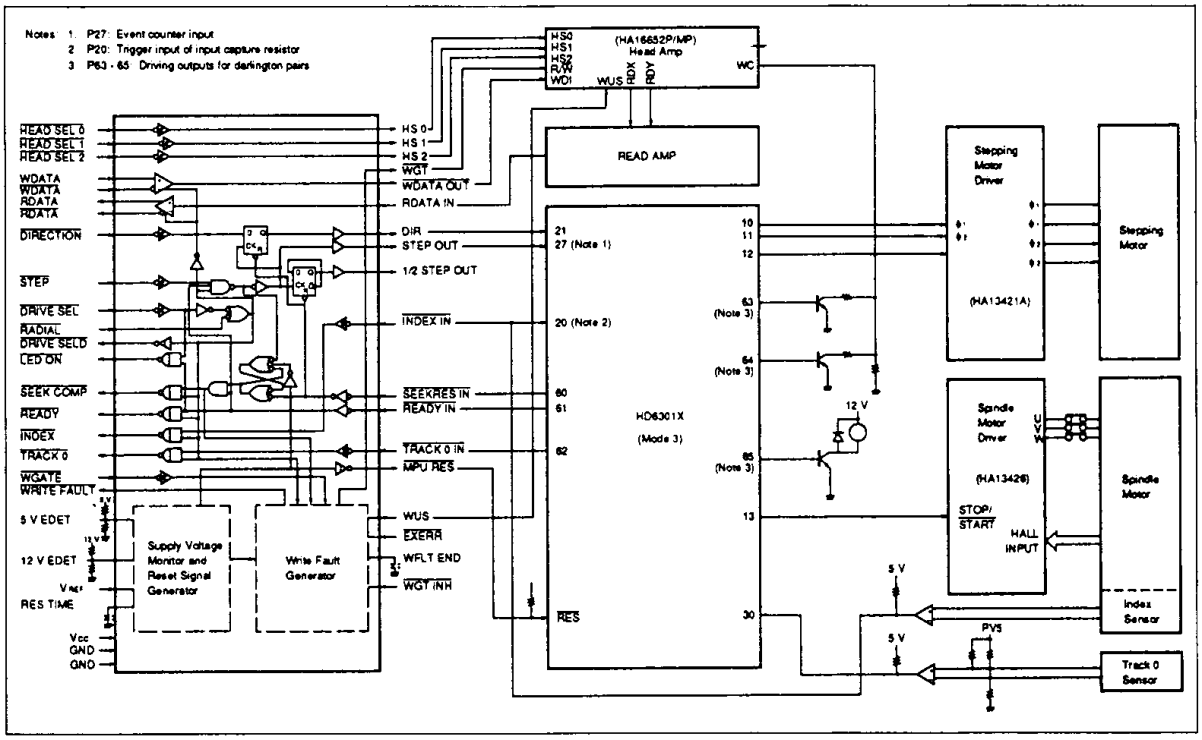


Figure 17 HA16662MP Application Example