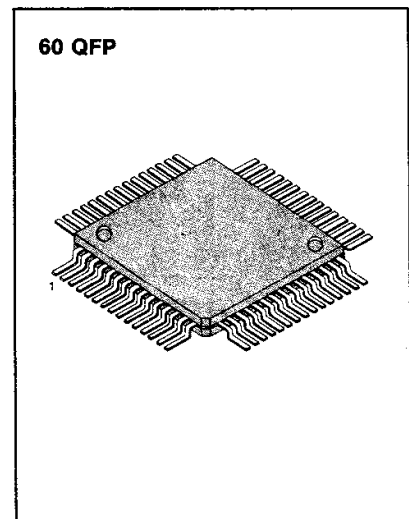


1 CHIP DIGITAL SERVO PROCESSOR FOR VCR

KA8320 is a VCR servo IC that includes analog amps.
And it can use for various head type VCR set.

FUNCTION

- 4 Head switching logic
- DAC output by switched capacitor
- C-Sync separator
- Digital noise rejection
- VISS function
- DFG, CFG frequency compensation amp
- Power On reset (Preventing Overflow)
- Frame servo
- VISS code write-in and detecting.



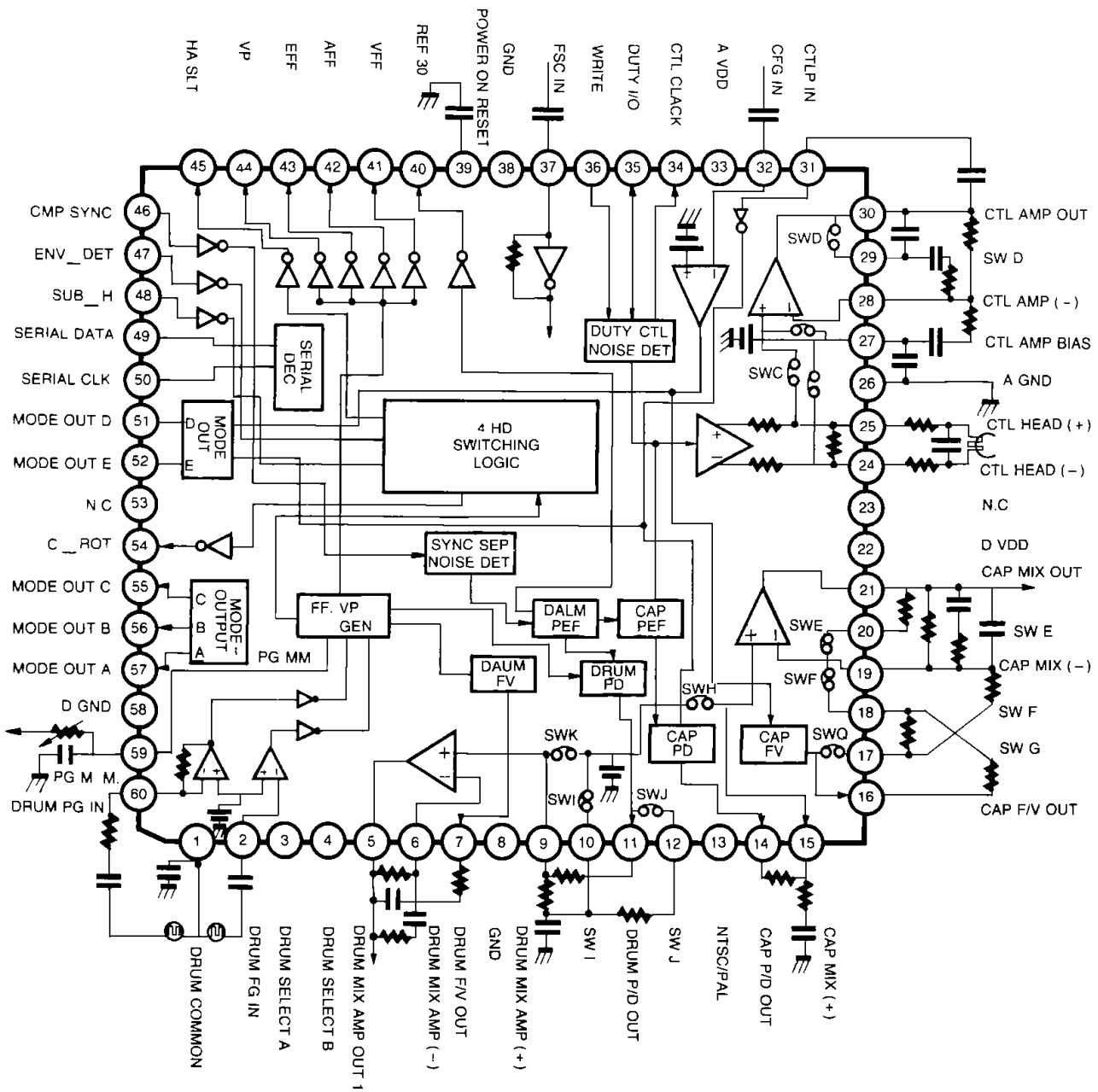
ORDERING INFORMATION

| Device | Package | Operating Temperature |
|--------|---------|-----------------------|
| KA8320 | 60QFP | - 10 ~ 75°C |

FEATURES

- Can be used for 6 kind of various head type.
- Stable DFG, CFG operation by internal limiter amp.
- 70 various search speed available.
- 10 various fine slow speed available
- X distance compensation by 7 bit serial data.
- Tracking control by 7 bit serial data.
- Quasi V-Sync position resetting by serial data.
- Minimizing color vibration and spreading by H-Sync discrete integrating f_H compensation.
- Noise and on H-Sync detecting for ble back screen.
- 3 kind of head switching output.
- Frame memory available.
- Digital noise rejection for analog input stage.
- CFG, CTL pulse count down for 2/4/6 detecting.
- High speed access by non-linear PD out.
- CTL pulse amp that has high frequency characteristics, high gain, high speed rising at power-on.

BLOCK DIAGRAM



PIN DESCRIPTION

| PIN NO. | FUNCTION | DESCRIPTION | | | | | | | | | | | | | | | | | |
|---------|-------------------|---|--------|---|---|---|---|---|--------|--------|--------|---|-----|-----|-----|---|------|------|------|
| 1 | DROM COMMON | COMMON OF DFG/DPG. DC VIAS 2.5V | | | | | | | | | | | | | | | | | |
| 2 | DRUM FG IN | DFG LIMMITER AMP IN | | | | | | | | | | | | | | | | | |
| 3 | DRUM SELECT A | OPEN = "M" <table border="1" data-bbox="870 411 1417 615"> <thead> <tr> <th>B</th> <th>A</th> <th>H</th> <th>M</th> <th>L</th> </tr> </thead> <tbody> <tr> <td>H</td> <td>2 HEAD</td> <td>2 HEAD</td> <td>2 HEAD</td> </tr> <tr> <td>M</td> <td>DA4</td> <td>DA4</td> <td>DA4</td> </tr> <tr> <td>L</td> <td>TEST</td> <td>TEST</td> <td>TEST</td> </tr> </tbody> </table> | B | A | H | M | L | H | 2 HEAD | 2 HEAD | 2 HEAD | M | DA4 | DA4 | DA4 | L | TEST | TEST | TEST |
| B | | | A | H | M | L | | | | | | | | | | | | | |
| H | 2 HEAD | 2 HEAD | 2 HEAD | | | | | | | | | | | | | | | | |
| M | DA4 | DA4 | DA4 | | | | | | | | | | | | | | | | |
| L | TEST | TEST | TEST | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | | |
| 5 | DRUM MIX AMP OUT | INPUT IMPEDANCE IS BELOW 2K Ω OUTPUT DYNAMIC RANGE 0~5V | | | | | | | | | | | | | | | | | |
| 6 | DRUM MIXX AMP OUT | | | | | | | | | | | | | | | | | | |
| 9 | IN | | | | | | | | | | | | | | | | | | |
| 15 | CADSTAN MIX AMP | | | | | | | | | | | | | | | | | | |
| 19 | IN | | | | | | | | | | | | | | | | | | |
| 21 | CADSTAN MIX OUT | | | | | | | | | | | | | | | | | | |
| 7 | DRUM FV OUT | WITCHED CAPACIOR DA OUT | | | | | | | | | | | | | | | | | |
| 16 | CAPSTAN FV OUT | | | | | | | | | | | | | | | | | | |
| 11 | DRUM PD OUT | SWITCHED CAPACITOR DA OUT | | | | | | | | | | | | | | | | | |
| 14 | CADSTAN PD OUT | | | | | | | | | | | | | | | | | | |
| 13 | NTSC/PAL | H: NTSC L: PAL | | | | | | | | | | | | | | | | | |
| 24 | CTL HEAD - | REC CTL OUT | | | | | | | | | | | | | | | | | |
| 25 | CTL HEAD + | | | | | | | | | | | | | | | | | | |
| 27 | CTL AMP BIAS | OPEN LOOP GAIN NO OSCILLATION OUTPUT DYNAMIC RANGE 0~5V | | | | | | | | | | | | | | | | | |
| 28 | CTL AMP (-) | | | | | | | | | | | | | | | | | | |
| 30 | CTL AMP OUT | | | | | | | | | | | | | | | | | | |
| 31 | CTL PUSE IN | 2.5V INTERNAL VIAS | | | | | | | | | | | | | | | | | |
| 32 | CFG IN | | | | | | | | | | | | | | | | | | |
| 34 | CTL CLOC | | | | | | | | | | | | | | | | | | |

PIN DESCRIPTION (Continued)

| PIN NO. | FUNCTION | DESCRIPTION | | | | | | | | | |
|-------------|---------------------------|--|-------------|-----------|-----------|---------|--------------------------|----------------------|-------------|--------------------------|------------------|
| 35 | DUTY I/O | <table border="1"> <thead> <tr> <th></th> <th>DUTY MODE</th> <th>VISS MODE</th> </tr> </thead> <tbody> <tr> <td>H</td> <td>DATA = "0" DUTY = 60%</td> <td>VISS NOT DETECTED</td> </tr> <tr> <td>L</td> <td>DATA = "1" DUTY = 27%</td> <td>VISS DETECTED</td> </tr> </tbody> </table> | | DUTY MODE | VISS MODE | H | DATA = "0" DUTY = 60% | VISS NOT DETECTED | L | DATA = "1" DUTY = 27% | VISS DETECTED |
| | DUTY MODE | VISS MODE | | | | | | | | | |
| H | DATA = "0" DUTY = 60% | VISS NOT DETECTED | | | | | | | | | |
| L | DATA = "1" DUTY = 27% | VISS DETECTED | | | | | | | | | |
| 36 | WRITE | H: CTL OVERWRITE (PB) L: NORMAL | | | | | | | | | |
| 37 | f_{sc} IN (3 f_{sc}) | INPUT SENSITIVITY ABOVE 150m V_{p-p} (f_{sc}) 350m V_{p-p} (3 f_{sc}) | | | | | | | | | |
| 39 | POWER ON RESET | PREVENT COVERENT FLOW TO CTL HEAD FIN BY RESETTING AT POWER-ON. YOU MUST ATTACH A 0.01mf CAPACITOR TO GND | | | | | | | | | |
| 40 | REF 30 | SERVO REFERENCE SIGNAL | | | | | | | | | |
| 41 | VFF | VIDEO HEAD SWITCHING PULSE | | | | | | | | | |
| 42 | AFF | AUDIO HEAD SWITCHING PULSE | | | | | | | | | |
| 43 | EFF | EXTRA HEAD SWITCHING PULSE | | | | | | | | | |
| 44 | VP | QUASI VERTICAL PULSE OUT | | | | | | | | | |
| 45 | HA-SLT | 4 HEAD AMP SELECTING OUT | | | | | | | | | |
| 46 | CMP SYNC | <table border="1"> <thead> <tr> <th>BIT</th> <th>6 2 1 0</th> <th></th> </tr> </thead> <tbody> <tr> <td></td> <td>0 1 1 1</td> <td>C SYNC INPUT</td> </tr> <tr> <td></td> <td>1 1 1 1</td> <td>EX-RESET INPUT</td> </tr> </tbody> </table> | BIT | 6 2 1 0 | | | 0 1 1 1 | C SYNC INPUT | | 1 1 1 1 | EX-RESET INPUT |
| BIT | 6 2 1 0 | | | | | | | | | | |
| | 0 1 1 1 | C SYNC INPUT | | | | | | | | | |
| | 1 1 1 1 | EX-RESET INPUT | | | | | | | | | |
| 47 | ENV DETECT | ENVELOPE DETECT IN | | | | | | | | | |
| 48 | SUB-H | 4 HEAD LOGIC SUB INPUT | | | | | | | | | |
| 49 | SERIAL DATA | | | | | | | | | | |
| 50 | SERIAL CLOCK | | | | | | | | | | |
| 51 | MODE D | | | | | | | | | | |
| 52 | OUTPUT E | <table border="1"> <thead> <tr> <th>BIT 3 2 1 0</th> <th>D</th> <th>E</th> </tr> </thead> <tbody> <tr> <td>0 1 1 1</td> <td>CFG C/D</td> <td>CTL C/D</td> </tr> <tr> <td>BIT 1 1 1 1</td> <td>CFG</td> <td>CFG 30</td> </tr> </tbody> </table> <p>CFG C/D: CFG COONTED DOWN OUT CTL C/D: CTL COONTED DOWN OUT (COUNT DOWN RATIO IS DEPENDS ON SEARCHU SPEED) CFG: 30 CAPSTAN PUASE REFERENCE 30Hz (CFG COUNTED DOWN OUT)</p> | BIT 3 2 1 0 | D | E | 0 1 1 1 | CFG C/D | CTL C/D | BIT 1 1 1 1 | CFG | CFG 30 |
| BIT 3 2 1 0 | D | E | | | | | | | | | |
| 0 1 1 1 | CFG C/D | CTL C/D | | | | | | | | | |
| BIT 1 1 1 1 | CFG | CFG 30 | | | | | | | | | |

PIN DESCRIPTION (Continued)

| PIN NO. | FUNCTION | DESCRIPTION | | | | | | | | | | | | | | | | | | | | |
|---------------|-----------------------------------|--|---------------|---------------|---|---|-----------|----|----|----|-----------|----|----|----|-----------|----------------------|-------|---------------|-----------|-----------------------------------|------------|------------|
| 54 | C-ROT | COLOR ROTATION OUT | | | | | | | | | | | | | | | | | | | | |
| 55 | MODE C OUT | <table border="1"> <thead> <tr> <th>BIT 5 4 2 1 0</th> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>0 0 1 1 1</td> <td>SP</td> <td>SP</td> <td>LP</td> </tr> <tr> <td>0 1 1 1 1</td> <td>SP</td> <td>EP</td> <td>LP</td> </tr> <tr> <td>1 0 1 1 1</td> <td>CTL DELAY COUNTER</td> <td>H-OSC</td> <td>NOISE DET.</td> </tr> <tr> <td>1 1 1 1 1</td> <td>CAPSTAN PHASE DETECT OUT</td> <td>DRUM FG</td> <td>DRUM PG</td> </tr> </tbody> </table> | BIT 5 4 2 1 0 | A | B | C | 0 0 1 1 1 | SP | SP | LP | 0 1 1 1 1 | SP | EP | LP | 1 0 1 1 1 | CTL DELAY COUNTER | H-OSC | NOISE DET. | 1 1 1 1 1 | CAPSTAN PHASE DETECT OUT | DRUM FG | DRUM PG |
| BIT 5 4 2 1 0 | A | | B | C | | | | | | | | | | | | | | | | | | |
| 0 0 1 1 1 | SP | | SP | LP | | | | | | | | | | | | | | | | | | |
| 0 1 1 1 1 | SP | | EP | LP | | | | | | | | | | | | | | | | | | |
| 1 0 1 1 1 | CTL DELAY COUNTER | | H-OSC | NOISE DET. | | | | | | | | | | | | | | | | | | |
| 1 1 1 1 1 | CAPSTAN PHASE DETECT OUT | DRUM FG | DRUM PG | | | | | | | | | | | | | | | | | | | |
| 56 | MODE B OUT | | | | | | | | | | | | | | | | | | | | | |
| 57 | MODE A OUT | | | | | | | | | | | | | | | | | | | | | |
| 59 | PG M.M. | | | | | | | | | | | | | | | | | | | | | |
| 60 | DRUM PG IN | | | | | | | | | | | | | | | | | | | | | |

ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

| Characteristics | Symbol | Value | Unit |
|-----------------------|-------------|------------|------------------|
| Supply VTG | V_{CCMAX} | 6.0 | V |
| Power Dissipation | P_D | 500 | mW |
| Operating Temperature | T_{OPR} | - 10 ~ 70 | $^\circ\text{C}$ |
| Storage Temperature | T_{STG} | - 40 ~ 125 | $^\circ\text{C}$ |

ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$)

| Characteristic | Symbol | Test Condition | Min | Typ | Max | Unit |
|-----------------------------|-----------|---|------|------|------|------------------|
| Supply Current | I_{CC} | | 8.0 | 30 | 42 | mA |
| 2 Value Output Voltage | V_{OL} | Unload | — | 0.0 | 0.05 | V |
| 2 Value Output Voltage | V_{OH} | Unload | 4.9 | 5.0 | — | V |
| 2 Value Output Voltage | V_{IL} | Load Current = 2mA | — | 0.6 | 1.2 | V |
| 2 Value Output Voltage | V_{IH} | Load Current = 2mA | 3.8 | 4.4 | — | V |
| Pull pu Output Voltage | V_{OL} | Unload | 0.0 | 0.1 | 0.3 | V |
| Pull up Output Voltage | V_{OH} | Unload | 4.9 | 5.0 | — | V |
| Pull up Output voltage | V_{IL} | Load Current = 2mA | — | 0.6 | 1.2 | V |
| Pull up Resistance | R_H | | 6.0 | 9.0 | 13.0 | $\text{K}\Omega$ |
| 3 Value Output Voltage | V_{OL} | Unload | 0.0 | 0.2 | 0.4 | V |
| 3 Value Output Voltage | V_{OM} | Unload | 2.3 | 2.5 | 2.8 | V |
| 3 Value Output Voltage | V_{OL} | Unload | 4.6 | 4.8 | 5.0 | V |
| 3 Value Output Voltage | V_{IL} | Load Current = 1mt | — | 0.6 | 1.2 | V |
| 3 Value Output Voltage | V_{IH} | Load Current = 1mA | 3.8 | 4.4 | — | V |
| 3 Value Input Resistance | R_M | | 6.0 | 9.0 | 13.0 | $\text{K}\Omega$ |
| REC CTL Output Voltage | V_{CTL} | Unload, Potential Pin 29 and Pin 30 | 4.6 | 4.8 | 5.0 | V |
| REC CTL Output Impedance | R_{CTL} | $I \leq 3\text{mA}$, Add Pin 29 and Pin 30 | 300 | 550 | 1000 | Ω |
| 2 Value Input V_{TH} | V_{TH} | | 1.5 | 2.5 | 3.5 | V |
| 2 Value Input Pull up R_1 | R_{H1} | | 6.0 | 9.0 | 13.0 | $\text{K}\Omega$ |
| 2 Value Input Pull up R_2 | R_{H2} | | 18.5 | 28.0 | 42.0 | $\text{K}\Omega$ |
| 3 Value Input V_{TH} | V_{TH1} | L/M V_{TH} | 1.0 | 1.4 | 1.9 | V |
| 3 Value Input V_{TH} | V_{TH2} | M/H V_{TH} | 3.1 | 3.5 | 4.0 | V |

ELECTRICAL CHARACTERISTICS (Continued)

| Characteristic | Symbol | Test Condition | Min | Typ | Max | Unit |
|-------------------------------|---------------|---------------------|-------|-------|------|-------------------|
| 3 Value Input Voltage | V_M | | 2.0 | 2.5 | 2.9 | V |
| 3 Value Input Resistance | R_{M1} | | 18.5 | 28.0 | 42.0 | K Ω |
| 3 f_{SC} Input Sensitivity | $V_{3f_{SC}}$ | | — | — | 350 | mV _{P-P} |
| f_{SC} Input Sensitivity | | | — | — | 150 | mV _{P-P} |
| Schmitt Input Voltage 1 | V_{IS1} | | 2.2 | 2.5 | 2.8 | V |
| CTLP Schmitt Input V_{TH} | V_{+TH1} | Normal Speed | 120 | 150 | 180 | mV _{OP} |
| CTLP Schmitt Input V_{TH} | V_{-TH1} | Normal Speed | -180 | -150 | -120 | mV _{OP} |
| CTLP Schmitt Input V_{TH} | V_{+TH2} | Middle Search Speed | 240 | 300 | 360 | mV _{OP} |
| CTLP Schmitt Input V_{TH} | V_{-TH2} | Middle Search Speed | -360 | -300 | -240 | mV _{OP} |
| CTLP Schmitt Input V_{TH} | V_{-TH3} | High Search Speed | -680 | -600 | -520 | mV _{OP} |
| CTLP Schmitt Input V_{TH} | V_{+TH4} | Viss Detect | 850 | 1000 | 1150 | mV _{OP} |
| CTLP Schmitt Input V_{TH} | V_{-TH4} | Viss Detect | -1150 | -1000 | -850 | mV _{OP} |
| Limit AMP Voltage | V_{IS2} | | 2.2 | 2.5 | 2.8 | V |
| Limit AMP Input Sensitivity | V_{LMA} | | — | — | 10 | mV _{P-P} |
| D.PG Input Voltage 2 | V_{IS3} | | 2.2 | 2.5 | 2.8 | V |
| PG Schmitt Input V_{TH} | V_{+TH} | | 380 | 480 | 580 | mV _{OP} |
| PG Schmitt Input V_{TH} | V_{-TH} | | 140 | 190 | 240 | mV _{OP} |
| DPG AMP Feedback R | R_{DP2} | | 80 | 100 | 120 | K Ω |
| DPG AMP Input R | R_{DP1} | | 8 | 10 | 12 | K Ω |
| Analog S/W ON R | R_{ASW} | | 150 | 300 | 500 | Ω |
| Power on Reset Input V_{TH} | V_{43TH} | | 2.9 | 3.5 | 4.1 | V |
| Power on Reset Pull up R | R_{43} | | 24.0 | 36.0 | 52.0 | K Ω |
| Sync Input V_{TH} | V_{50TH} | DC Input | 1.5 | 2.5 | 3.5 | V |
| Sync Input Voltage | V_{50} | | 1.8 | 2.3 | 2.8 | V |
| Sync Input Sensitivity | V_{SYC} | Duty 10% | 150 | 230 | 310 | mV _{P-P} |
| Sync Input Impedance | R_{50} | | 18.5 | 28.0 | 42.0 | K Ω |
| M.M. V_{TH} | $V_{TH\ M.M}$ | | 2.2 | 2.5 | 2.8 | V |
| CTLP AMP Gain | A_{CTL} | $f = 10\text{KHz}$ | 57 | 60 | 62 | dB |
| CTLP AMP Gain | A_{CTLO} | Open Loop Gain | — | 85 | — | dB |
| Drum Add AMP Gain | AD | $f = 1\text{KHz}$ | 57 | 60 | 62 | dB |
| Drum Add AMP Gain | AD_O | Open Loop Gain | — | 85 | — | dB |
| CAP. Add AMP Gain | AC | $f = 1\text{KHz}$ | 57 | 60 | 62 | dB |
| GAP. Add AMP Gain | ACO | Open Loop Gain | — | 85 | — | dB |

FUNCTION SPEC**1. DFG**

| | DFG | COUNTER CLOCK | COUNTER BIT | FV-GAIN | DRUM PD ADJ |
|------|-----------|---------------|-------------|------------|---------------|
| NTSC | 719.36 Hz | $f_{sc}/2$ | 11 BIT | 60.75 mV/% | 596Hz ~ 306Hz |
| PAL | 600.00 Hz | $f_{sc}/3$ | 11 BIT | 60.13 mV/% | 496Hz ~ 758Hz |

2. DPG

| | | S/H FREQ. | COUNTER CLOCK | COUNTER BIT | PD GAIN | |
|------|--------------------|-----------|---------------|-------------|------------|------------|
| | | | | | KP 1 | KP 2 |
| NTSC | Phase Detect | 29.97Hz | $f_{sc}/4$ | 11 BIT | 1.092 V/ms | 3.277 V/ms |
| | f_H Compensation | 3.93KHz | $f_{sc}/4$ | 11 BIT | 1.092 V/ms | 3.277 V/ms |
| PAL | Phase Detect | 25Hz | $f_{sc}/4$ | 11 BIT | 1.353 V/ms | 4.059 V/ms |
| | f_H Compensation | 3.91Hz | $f_{sc}/4$ | 11 BIT | 1.353 V/ms | 4.059 V/ms |

3. CPG

| | | S/H FREQ. | COUNTER CLOCK | COUNTER BIT | | PD GAIN | | | |
|------|-----|-----------|---------------|-------------|--------|------------|------------|------------|------------|
| | | | | | KP 1 | | KP 2 | | |
| | | | | | NORMAL | + 6 dB | NORMAL | + 6 dB | |
| NTSC | | 29.97 Hz | $f_{sc}/8$ | 11 BIT | 10 BIT | 0.546 V/ms | 1.092 V/ms | 1.639 V/ms | 3.277 V/ms |
| PAL | PB | 25 Hz | $f_{sc}/8$ | 11 BIT | 10 BIT | 0.677 V/ms | 1.353 V/ms | 2.030 V/ms | 4.059 V/ms |
| | REC | 25.22Hz | | | | | | | |

4. CFG

| | | | | CFG FREQ. | S/H FREQ. | COUNTER CLOCK | COUNTER BIT | FV GAIN | |
|------|-----------------|--------|----|------------------------------|------------|---------------|-------------|------------|------------|
| NTSC | NORMAL & SEARCH | NORMAL | SP | SEE CAPSTAN F/V CENTER FREQ. | 1078.9 Hz | $f_{sc}/2$ | 11 BIT | 40.50 mV/% | |
| | | | LP | | 539.6 Hz | $f_{sc}/4$ | | | |
| | | | EP | | 359.6 Hz | $f_{sc}/6$ | | | |
| | | + 6 dB | SP | | 1078.9 Hz | $f_{sc}/2$ | 10 BIT | | 81.00 mV/% |
| | | | LP | | 539.5 Hz | $f_{sc}/4$ | | | |
| | | | EP | | 359.6 Hz | $f_{sc}/6$ | | | |
| | SLOW | SLOW A | SP | 809.1 Hz | $f_{sc}/2$ | 11 BIT | 54.00 mV/% | | |
| | | | LP | 404.6 Hz | $f_{sc}/4$ | | 54.00 mV/% | | |
| | | | EP | 269.7 Hz | $f_{sc}/6$ | | 54.00 mV/% | | |
| | | SLOW B | SP | 581.7 Hz | $f_{sc}/2$ | 11 BIT | 75.12 mV/% | | |
| | | | LP | 404.6 Hz | $f_{sc}/4$ | | 54.00 mV/% | | |
| | | | EP | 269.7 Hz | $f_{sc}/6$ | | 54.00 mV/% | | |
| PAL | NORMAL & SEARCH | NORMAL | SP | SEE CAPSTAN F/V CENTER FREQ. | 756.7 Hz | $f_{sc}/4$ | 11 BIT | 35.76 mV/% | |
| | | | LP | | 378.4 Hz | $f_{sc}/8$ | | | |
| | | + 6 dB | SP | | 756.7 Hz | $f_{sc}/4$ | 10 BIT | | 71.52 mV/% |
| | | | LP | | 378.4 Hz | $f_{sc}/8$ | | | |
| | SLOW | SLOW A | SP | 567.5 Hz | $f_{sc}/4$ | 11 BIT | 47.68 mV/% | | |
| | | | LP | 283.7 Hz | $f_{sc}/8$ | | 47.68 mV/% | | |
| | | SLOW B | SP | 378.4 Hz | $f_{sc}/4$ | 11 BIT | 71.52 mV/% | | |
| | | | LP | 283.7 Hz | $f_{sc}/8$ | | 47.68 mV/% | | |

5. CAPSTAN FV CENTER FREQUENCY (KHz)

| SERIAL BIT 11 10 9 8 | FORWARD | | | | | REVERSE | | | | |
|-------------------------|----------------------|--------|--------|--------|--------|---------------------|--------|--------|--------|-------|
| | NTSC | | | PAL | | NTSC | | | PAL | |
| | SP | LP | EP | SP | LP | SP | LP | EP | SP | LP |
| 0 0 0 0 | 1.079 | 0.539 | 0.360 | 0.757 | 0.378 | 1.079 | 0.539 | 0.360 | 0.757 | 0.378 |
| 0 0 0 1 | 2.158 | 1.079 | 0.719 | 1.513 | 0.757 | 2.158 | 1.079 | 0.719 | 1.513 | 0.757 |
| 0 0 1 0 | 3.236 | 1.618 | 1.079 | 2.270 | 1.135 | 3.236 | 1.618 | 1.079 | 2.270 | 1.135 |
| 0 0 1 1 | 4.455 | 2.158 | 1.438 | 3.109 | 1.513 | 4.138 | 2.158 | 1.438 | 2.921 | 1.513 |
| 0 1 0 0 | 5.569 | 2.697 | 2.517 | 3.886 | 1.891 | 5.174 | 2.697 | 2.517 | 3.651 | 1.891 |
| 0 1 0 1 | 7.796 | 3.898 | 3.236 | 5.441 | 2.720 | 7.242 | 3.621 | 3.236 | 5.111 | 2.556 |
| 0 1 1 0 | 10.024 | 5.012 | 7.796 | 6.996 | 3.498 | 9.312 | 4.655 | 7.242 | 6.572 | 3.286 |
| 0 1 1 1 | 11.584 | 5.569 | 3.712 | 8.049 | 3.886 | 9.988 | 5.173 | 3.449 | 7.092 | 3.651 |
| 1 0 0 0 | 12.743 | 12.743 | 12.743 | 8.854 | 8.854 | 10.986 | 10.986 | 10.986 | 7.801 | 7.801 |
| 1 0 0 1 | 13.901 | 13.901 | 13.515 | 9.659 | 9.659 | 11.985 | 11.985 | 11.652 | 8.510 | 8.510 |
| 1 0 1 0 | 15.060 | 15.060 | 15.060 | 10.464 | 10.464 | 12.984 | 12.984 | 12.984 | 9.219 | 9.219 |
| 1 0 1 1 | 16.218 | 7.239 | 4.826 | 11.269 | 5.052 | 13.983 | 6.725 | 4.483 | 9.928 | 4.762 |
| 1 1 0 0 | 17.376 | 8.353 | 5.569 | 12.074 | 5.830 | 14.981 | 7.759 | 5.173 | 10.637 | 5.494 |
| 1 1 0 1 | 18.535 | 9.467 | 6.311 | 12.879 | 6.607 | 15.980 | 8.794 | 5.864 | 11.346 | 6.227 |
| 1 1 1 0 | SLOW | | | | | | | | | |
| 1 1 1 1 | SEE 4. CFG | | | | | | | | | |
| CAPSTAN PD ADJ | NTSC - 7.2 ~ 8.4% | | | | | PAL - 8.0 ~ 9.6% | | | | |

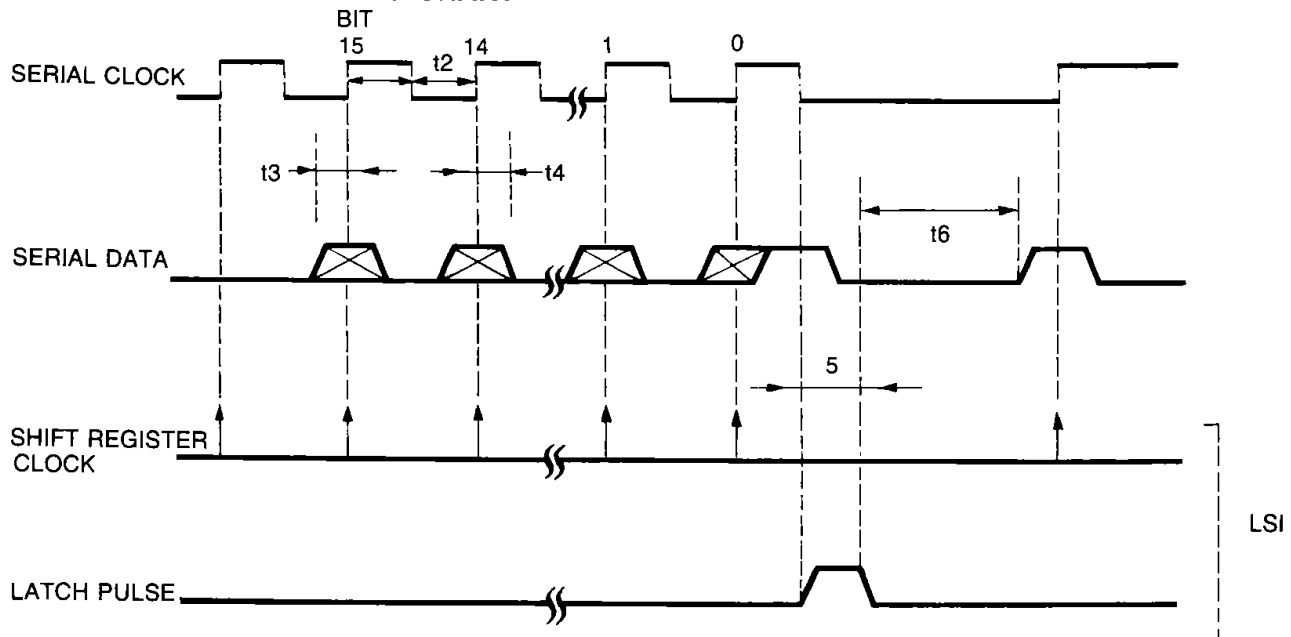
6. CAPSTAN GAIN

| SWG | SWF | +6 dB | NTSC SP | NTSC LP | NTSC EP | PAL SP | PAL LP |
|-----|-----|-------|-------------------------------|-----------------|---------------|-------------------------------|-----------------|
| OFF | OFF | OFF | SLOW | SLOW X1 | SLOW X1, 2 | SLOW | SLOW X1 |
| ON | OFF | OFF | X1, 2 | X2, 3, 4, 5 | X3, 4, 7 | X1, 2 | X2, 3, 4, 5 |
| OFF | ON | OFF | X3, 4 | X7, 9 | X9, 10, 13 | X3, 4 | X7, 9 |
| ON | ON | OFF | X5, 7, 9 | X10, 13, 15, 17 | X15, 17, 21 | X5, 7, 9 | X10, 13, 15, 17 |
| ON | ON | +6 dB | X10, 11, 12, 13 14, 15, 16 | X22, 24, 26 | X33, 35, 39 | X10, 11, 12, 13 14, 15, 16 | X22, 24, 26 |

7. CTL SCHMITT VTH

| VTH | NTSC SP | NTSC LP | NTSC EP | PAL SP | PAL LP |
|-------------------------------|---|--|---|---|--|
| ± 150 mV ± 30 mV | SLOW | SLOW X1 | SLOW X1 | SLOW | SLOW X1 |
| ± 300 mV ± 60 mV | X1, 2 | X2, 3, 4, 5 | X2, 3, 4, 7 | X1, 2 | X2, 3, 4, 5 |
| ± 600 mV ± 80 mV | X3, 4, 5, 7, 9, 10, 11, 12, 13 14, 15, 16 | X7, 9, 10, 13, 15, 17, 22, 24 26 | X9, 10, 13, 15, 17, 21, 33, 35 39 | X3, 4, 5, 7, 9, 10, 11, 12, 13 14, 15, 16 | X7, 9, 10, 13, 15, 17, 22, 24 26 |
| ± 1000 mV ± 150 mV | 111 MODE D7 = 1 | | | | |

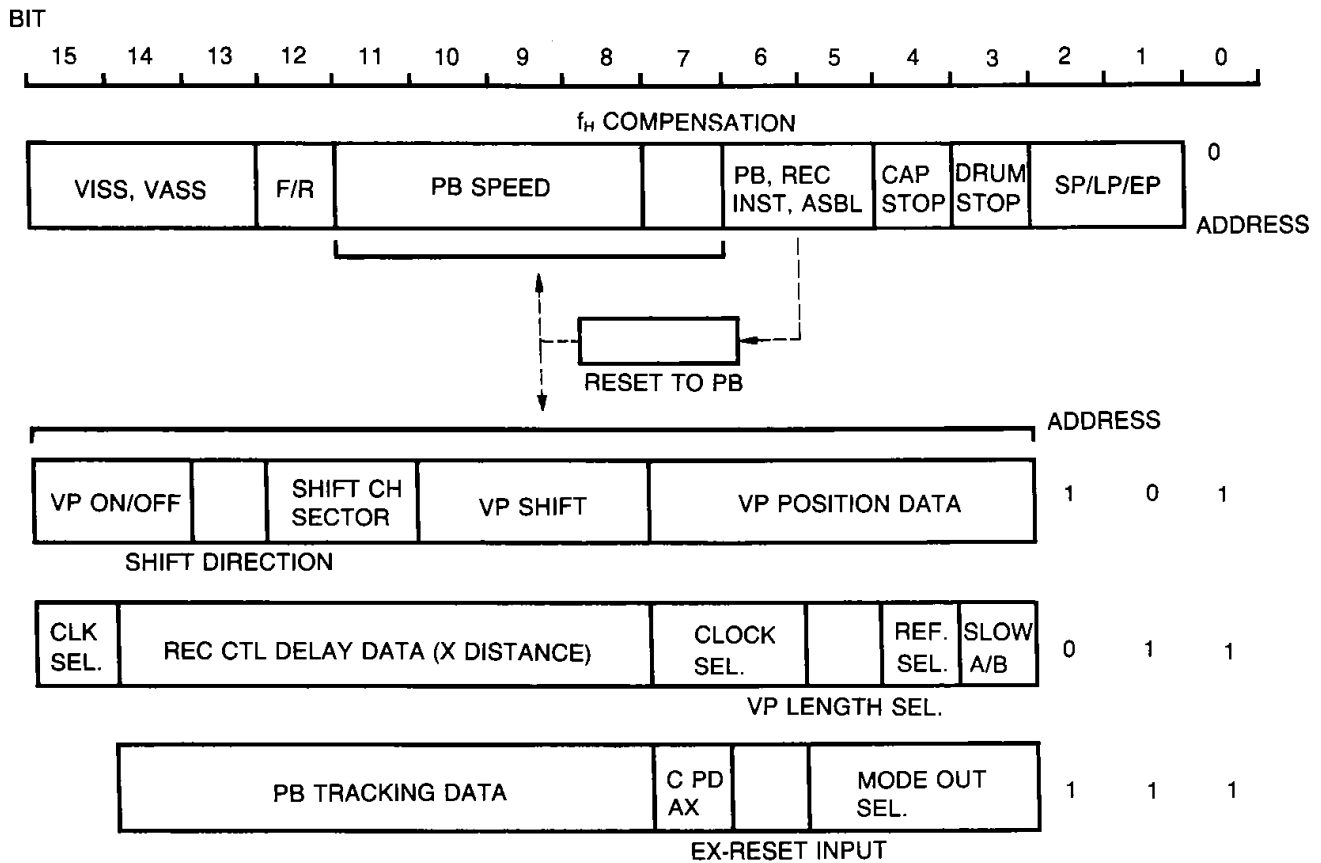
8. SERIAL INPUT TIMING CHART



$$t_1 \geq 1\mu\text{s}, t_2 \geq 1\mu\text{s}, t_3 \geq 0.3\mu\text{s}, t_4 \geq 0.3\mu\text{s}, t_5 \geq 0.5\mu\text{s}, t_6 \geq 0.5\mu\text{s}$$

- ① Previous 16 bit data become valid when serial data become "H" at serial clock negative edge.
- ② Serial data and clock are "L" state at t_6 after data latch and this period must be over 500ns.
- ③ Serial input is pulled-up by 10K Ω and be careful on tire delay. If you want to increase speed, then add a pull-up resistor externally.

9. SERIAL DATA INPUT REGISTER



- ① KA8320 includes 53 bit register. LSB 2~0 bit is the address of each register.
- ② AT POWER-ON, whole register presetted.
- ③ PB speed, f_H compensation, VP control register is resetted automatically when current mode changed into other mode except PB mode.
- ④ Capstan P/D fixed register is resetted at normal high-speed.

10. SERIAL DATA TABLE 1

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Notes | | | | |
|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|-----------------------------|------|------|------|------|
| | | | | | | | | | | | | | 0 | 0 | 0 | SP | | | | |
| | | | | | | | | | | | | | 0 | 1 | 0 | LP | | | | |
| | | | | | | | | | | | | | 1 | 0 | 0 | EP | | | | |
| | | | | | | | | | | | | 0 | | | 0 | DRUM STOP & CAP PD FIX | | | | |
| | | | | | | | | | | | | 1 | | | 0 | DRUM ON | | | | |
| | | | | | | | | | | | 0 | | | | 0 | CAPSTAN STOP | | | | |
| | | | | | | | | | | | 1 | | | | 0 | CAPSTAN ON | | | | |
| | | | | | | | | | 0 | 0 | | | | | 0 | REC | | | | |
| | | | | | | | | | 0 | 1 | | | | | 0 | ASBL | | | | |
| | | | | | | | | | 1 | 0 | | | | | 0 | INST | | | | |
| | | | | | | | | | 1 | 1 | | | | | 0 | PB | | | | |
| | | | | | | | | 0 | 1 | 1 | | | | | 0 | NOR | | | | |
| | | | | | | | | 1 | 1 | 1 | | | | | 0 | f _H Alignment ON | | | | |
| | | | | | | | | | | | | | | | | NTSC | | PAL | | |
| | | | | 0 | 0 | 0 | 0 | | 1 | 1 | | | | | 0 | SP×1 | LP×1 | EP×1 | SP×1 | LP×1 |
| | | | | 0 | 0 | 0 | 1 | | 1 | 1 | | | | | 0 | 2 | 2 | 2 | 2 | 2 |
| | | | | 0 | 0 | 1 | 0 | | 1 | 1 | | | | | 0 | 3 | 3 | 3 | 3 | 3 |
| | | | | 0 | 0 | 1 | 1 | | 1 | 1 | | | | | 0 | 4 | 4 | 4 | 4 | 4 |
| | | | | 0 | 1 | 0 | 0 | | 1 | 1 | | | | | 0 | 5 | 5 | 7 | 5 | 5 |
| | | | | 0 | 1 | 0 | 1 | | 1 | 1 | | | | | 0 | 7 | 7 | 9 | 7 | 7 |
| | | | | 0 | 1 | 1 | 0 | | 1 | 1 | | | | | 0 | 9 | 9 | 21 | 9 | 9 |
| | | | | 0 | 1 | 1 | 1 | | 1 | 1 | | | | | 0 | 10 | 10 | 10 | 10 | 10 |
| | | | | 1 | 0 | 0 | 0 | | 1 | 1 | | | | | 0 | 11 | 22 | 33 | 11 | 22 |
| | | | | 1 | 0 | 0 | 1 | | 1 | 1 | | | | | 0 | 12 | 24 | 35 | 12 | 24 |
| | | | | 1 | 0 | 1 | 0 | | 1 | 1 | | | | | 0 | 13 | 26 | 39 | 13 | 26 |
| | | | | 1 | 0 | 1 | 1 | | 1 | 1 | | | | | 0 | 14 | 13 | 13 | 14 | 13 |
| | | | | 1 | 1 | 0 | 0 | | 1 | 1 | | | | | 0 | 15 | 15 | 15 | 15 | 15 |
| | | | | 1 | 1 | 0 | 1 | | 1 | 1 | | | | | 0 | 16 | 17 | 17 | 16 | 17 |

10. SERIAL DATA TABLE 1 (Continued)

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Notes |
|----|----|----|----|----|----|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 1 | 1 | 0 | | 1 | 1 | | | | | 0 | SLOW ① CAP P/D FIX |
| | | | | 1 | 1 | 1 | 1 | | 1 | 1 | | | | | 0 | SLOW ② CAP P/D FIX, DRUM P/D FIX |
| | | | 0 | | | | | | | | | | | | 0 | FWD |
| | | | 1 | | | | | | | | | | | | 0 | REV |
| 0 | 0 | 0 | | | | | | | | | | | | | 0 | DUTY DET. MODE |
| 0 | 0 | 1 | | | | | | | | | | | | | 0 | DUTY DET. MODE VISS REC FF RESET |
| 0 | 1 | 0 | | | | | | | | | | | | | 0 | VISS MODE |
| 0 | 1 | 1 | | | | | | | | | | | | | 0 | VISS MODE, VISS REC FF RESET |
| 1 | 0 | 0 | | | | | | | | | | | | | 0 | VISS MODE, VISS DET. FF RESET |
| 1 | 0 | 1 | | | | | | | | | | | | | 0 | VISS MODE, VISS DET. FF RESET VISS REC FF RESET |
| 1 | 1 | 0 | | | | | | | | | | | | | 0 | VISS MODE, VISS WRITE |
| 1 | 1 | 1 | | | | | | | | | | | | | 0 | WRITE MODE, VISS REC FF RESET |

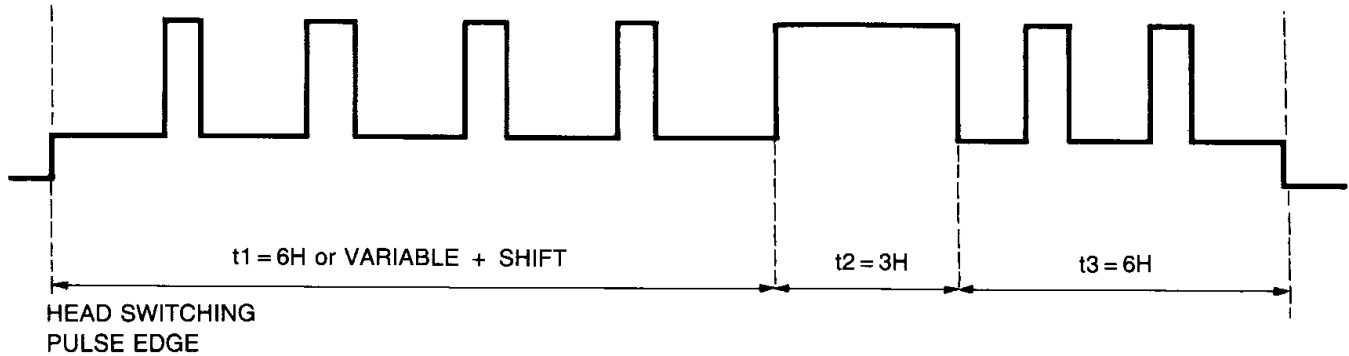
11. SERIAL DATA TABLE 2

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Notes | | | | | |
|----|-----|----|----|----|----|---|---|---|-----|---|---|---|-----|---|---|-------|------------------------------------|-----------|------------|--------|-------------|
| | MSB | | | | | | | | | | | | | | | | | | | | |
| | * | * | * | * | * | * | * | | | | | | | 1 | 1 | 1 | PB. TRACKING DATA | | | | |
| | | | | | | | | | | | | | | | | | (MODE CTL) | | | | |
| | | | | | | | | | | | | | | | | | A | B | C | D | E |
| | | | | | | | | | | | | 0 | 1 | 1 | 1 | | | | | CFG/CD | CTL C/D |
| | | | | | | | | | | | | 1 | 1 | 1 | 1 | | | | | CFG | CFG30 (REC) |
| | | | | | | | | | | 0 | 0 | | 1 | 1 | 1 | | SP | SP | LP | | |
| | | | | | | | | | | 0 | 1 | | 1 | 1 | 1 | | SP | EP | LP | | |
| | | | | | | | | | | 1 | 0 | | 1 | 1 | 1 | | CTL DELAY COUNTER | H-OSC OSC | NOISE DET. | | |
| | | | | | | | | | | 1 | 1 | | 1 | 1 | 1 | | CAP PD | DRUM FG | DRUM PG | | |
| | | | | | | | | 0 | | | | | 1 | 1 | 1 | | P.CTL SCHMITT 3 | | | | |
| | | | | | | | | 1 | | | | | 1 | 1 | 1 | | P.CTL SCHMITT $\pm 1000mVop$ C.P/D | | | | |
| | | | | | | | | 0 | | | | | | | | | PIN50 C.SYNC | | | | |
| | | | | | | | | 1 | | | | | | | | | PIN50 EX-RESET | | | | |
| | | | | | | | | | MSB | | | | LSB | | | | | | | | |
| | | | | | | | | * | * | * | * | * | 1 | 0 | 1 | | VP POSITION DATA | | | | |
| | | | | | 0 | 0 | 0 | | | | | | 1 | 0 | 1 | | VP SHIFT QUANTITY 0.1H | | | | |
| | | | | | 0 | 0 | 1 | | | | | | 1 | 0 | 1 | | VP SHIFT QUANTITY 0.5H | | | | |
| | | | | | 0 | 1 | 0 | | | | | | 1 | 0 | 1 | | VP SHIFT QUANTITY 1.0H | | | | |
| | | | | | 0 | 1 | 1 | | | | | | 1 | 0 | 1 | | VP SHIFT QUANTITY 1.5H | | | | |
| | | | | | 1 | 0 | 0 | | | | | | 1 | 0 | 1 | | VP SHIFT QUANTITY 2.0H | | | | |
| | | | | | 1 | 0 | 1 | | | | | | 1 | 0 | 1 | | VP SHIFT QUANTITY 2.5H | | | | |
| | | | | | | | | | | | | | | | | | | | CH1 | | CH2 |
| | | | 0 | 0 | | | | | | | | | 1 | 0 | 1 | | VP SHIFT SELECT | | FIX | | FIX |
| | | | 0 | 1 | | | | | | | | | 1 | 0 | 1 | | VP SHIFT SELECT | | FIX | | SHIFT |
| | | | 1 | 0 | | | | | | | | | 1 | 0 | 1 | | VP SHIFT SELECT | | SHIFT | | FIX |
| | | | 1 | 1 | | | | | | | | | 1 | 0 | 1 | | VP SHIFT SELECT | | SHIFT | | SHIFT |
| | | 0 | | | | | | | | | | | 1 | 0 | 1 | | VP SHIFT DIRECTION (+) | | | | |
| | | 1 | | | | | | | | | | | 1 | 0 | 1 | | VP SHIFT DIRECTION (-) | | | | |
| 0 | 0 | | | | | | | | | | | | 1 | 0 | 1 | | VP OFF (L LEVEL OUTPUT) | | | | |
| 0 | 1 | | | | | | | | | | | | 1 | 0 | 1 | | VP 3 VALUE (M LEVEL OUTPUT) | | | | |
| 1 | 0 | | | | | | | | | | | | 1 | 0 | 1 | | VP ON (3 VALUE OUTPUT) | | | | |
| 1 | 1 | | | | | | | | | | | | 1 | 0 | 1 | | VP MONITOR CUT (H LEVEL OUTPUT) | | | | |

12. SERIAL DATA TABLE 3

| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Notes | |
|----|-----|----|----|----|----|---|-----|---|---|---|---|---|---|---|---|-----------------------------------|-----------|
| | MSE | | | | | | LSB | | | | | | | | | | |
| | * | * | * | * | * | * | * | | | | | | 0 | 1 | 1 | REC CTL DELAY (X VALUE ALIGNMENT) | |
| | | | | | | | | | | | 0 | | 0 | 1 | 1 | REF SEL NOR | |
| | | | | | | | | | | | 1 | | 0 | 1 | 1 | REF SEL FIELD DET | |
| | | | | | | | | | | 0 | | | 0 | 1 | 1 | VP SEL NOR | |
| | | | | | | | | | | 1 | | | 0 | 1 | 1 | VP SEL +6H | |
| 1 | | | | | | | | 0 | 0 | | | | 0 | 1 | 1 | CLOCK SEL 3 f _{sc} | |
| 0 | | | | | | | | 1 | 1 | | | | 0 | 1 | 1 | CLOCK SEL f _{sc} | |
| | | | | | | | | | | | | | 0 | 0 | 1 | 1 | SLOW A |
| | | | | | | | | | | | | | 1 | 0 | 1 | 1 | SLOW B |
| | | | | | | | | | | | | | 0 | 0 | 0 | 1 | TEST MODE |

13. VERTICAL PULSE



At slow or x2 play mode, t1 adjusted, else CH1-CH2 VP position would be fixed.

| | | | |
|--------|----|---------|---------|
| MODE | | CH1 | CH2 |
| 2 HEAD | | FIX | FIX |
| DA-4 | SP | FIX | VARYING |
| | SP | VARYING | FIX |

Position adjustment by serial data 5 bit is as follows. while fixed value is about 6.0H.

| | | |
|------|-----------------------|--------------|
| NTSC | $64 (41.5-N)/f_{sc}$ | 3.0H ~ 11.7H |
| PAL | $64 (43.75-N)/f_{sc}$ | 2.9H ~ 9.9H |

① VP SHIFT

| BIT | 13 | 12 | 11 | 10 | 9 | 8 | | 3 | 2 | 1 | SHIFT |
|-----|----|----|----|----|---|---|--|---|---|---|-------|
| | | | | 0 | 0 | 0 | | | | | 0.0 H |
| | | | | 0 | 0 | 1 | | | | | 0.5 H |
| | | | | 0 | 1 | 0 | | | | | 1.0 H |
| | | | | 0 | 1 | 1 | | 1 | 0 | 1 | 1.5 H |
| | | | | 1 | 0 | 0 | | | | | 2.0 H |
| | | | | 1 | 0 | 1 | | | | | 2.5 H |

② VP SHIFTING CH & SHIFTING DIRECTION

(⊕⊖ means delaying direction)

| BIT | 13 | 12 | 11 | 10 | 9 | 8 | | 3 | 2 | 1 | CH-1 | CH-2 |
|-----|--------|----|----|----|---|---|--|---|---|---|---------|---------|
| | 0 1 | 0 | 0 | | | — | | | | | FIX | FIX |
| | 0 | 0 | 1 | | | — | | | | | FIX | ⊕ SHIFT |
| | 1 | 0 | 1 | | | — | | | | | FIX | ⊖ SHIFT |
| | 0 | 1 | 0 | | | — | | 1 | 0 | 1 | ⊕ SHIFT | FIX |
| | 1 | 1 | 0 | | | — | | | | | ⊖ SHIFT | FIX |
| | 0 | 1 | 1 | | | — | | | | | ⊖ SHIFT | ⊕ SHIFT |
| | 1 | 1 | 1 | | | — | | | | | ⊕ SHIFT | ⊖ SHIFT |