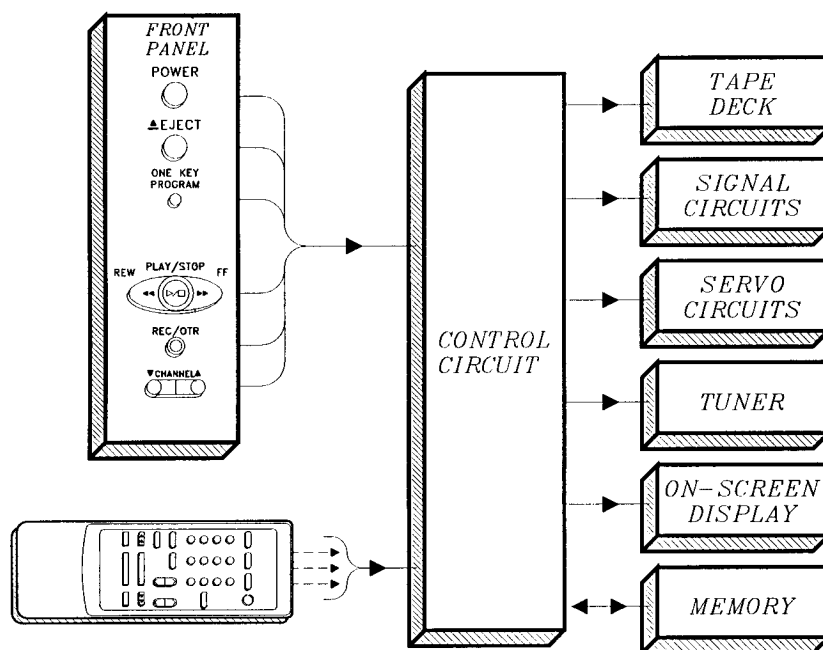


# EXPANDER

Mitsubishi Consumer Electronics America, Inc. -- Technical Publications Department

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## U-Deck -- Control Circuitry



Last month's *Expander* described the Tape Mode Position Circuitry in the U-Deck. This month's article covers the rest of the U-Deck's Control Circuitry. The Control Circuitry is basically the same

in all five models using the U-Deck. However, some differences exist due to model specific features. Table 1 lists the five VCRs using the U-Deck, and the model specific features of each model.

**MODEL SPECIFIC FEATURES**

MODEL	VHS HI FI	CABLE BOX CONTROL	DUAL REMOTE CODES	PERFECT TAPE	AV NETWORK
HS-U120					
HS-U270		YES	YES		BASIC
HS-U420	YES				
HS-U520	YES		YES	YES	ACTIVE
HS-U570	YES	YES	YES	YES	ACTIVE

Table 1

Additional features found on all models, include:

- Four Video Heads
- High Speed Fast Forward and Rewind
- Slow Motion
- Reverse Playback and Reverse Slow Motion
- Auto Tracking
- Auto Indexing in the Record mode

## DC Supplies--Clock--Reset

For a Microprocessor (uPC) to function:

- DC Power must be supplied to the IC.
- A Clock signal must be generated to time all operations.
- The IC must be Reset to its nominal starting point when power is initially applied.

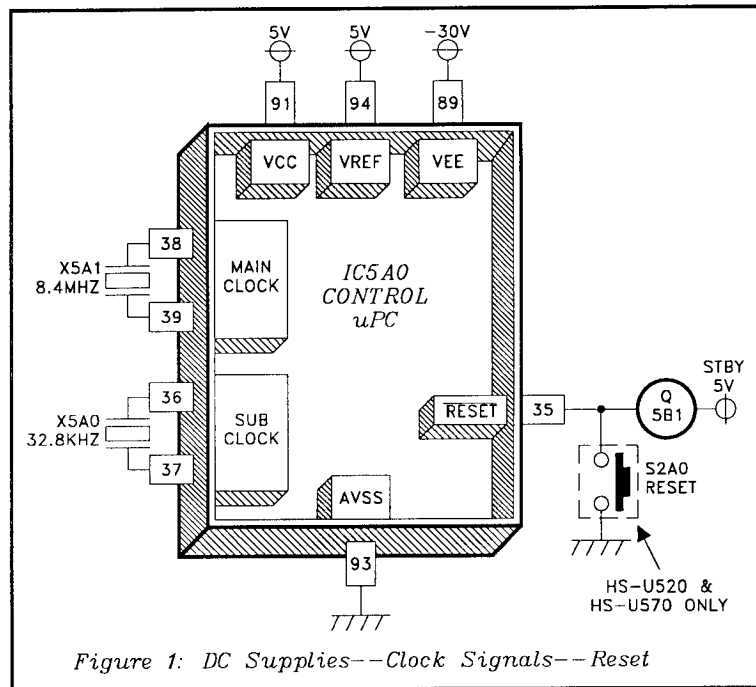


Figure 1: DC Supplies--Clock Signals--Reset

Figure 1 illustrates the circuitry providing these requirements in U-Deck VCRs.

**Three DC Supplies** are supplied to the uPC, IC5A0.

- 1) 5 volts at pin 91 (VCC) -- the main DC supply input for the uPC.
- 2) 5 volts at pin 94 (VREF) -- the 5 volt reference used in the uPC's operation.
- 3) -30 volts at pin 89 -- required to generate drive for the Fluorescent Display.

**Two Clock Signals** are generated to time the uPC's operations:

- 1) Main Clock (pins 38 and 39) -- generates an 8.4 MHZ Main Clock Signal.
- 2) Sub Clock (pins 36 and 37) -- generates a 32.8 KHZ Sub Clock Signal.

**A ground return** must be provided for the internal circuitry to function. The AVSS terminal at pin 93 provides the ground return for the uPC.

**Resetting** the uPC prevents computer lock up. When power is initially applied, the uPC must be Reset to its nominal state. Pin 35 is the RESET input for IC5A0. When pin 35 goes LOW, the uPC resets to its nominal state. When the uPC Resets, all user

programmed information is lost and must be reprogrammed.

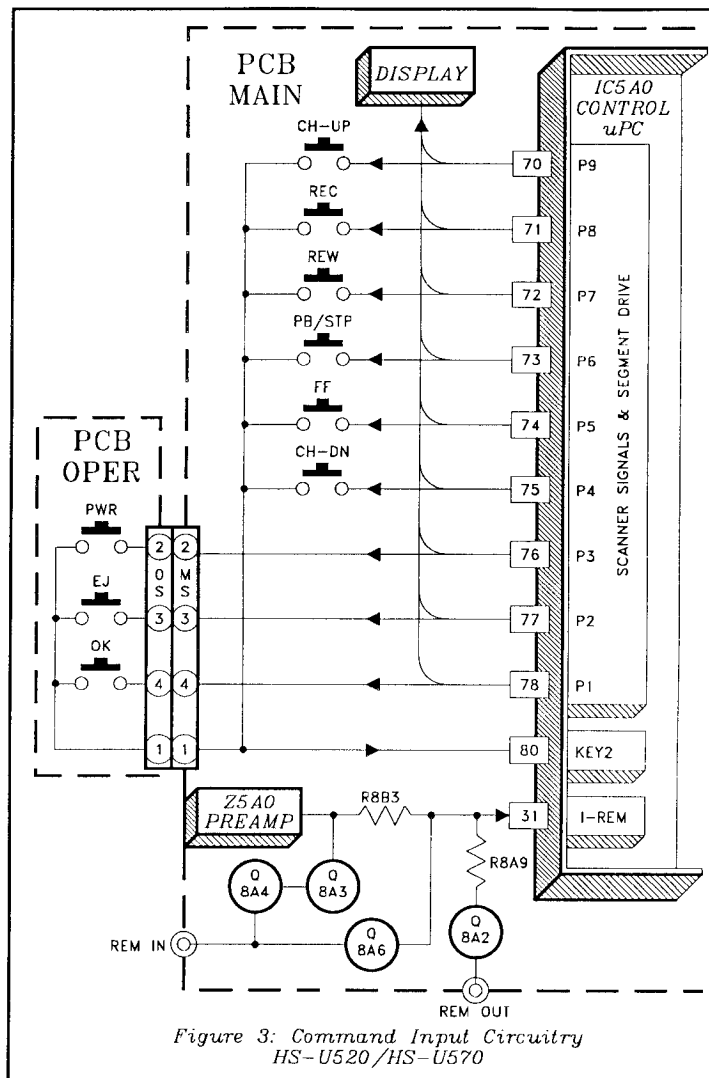
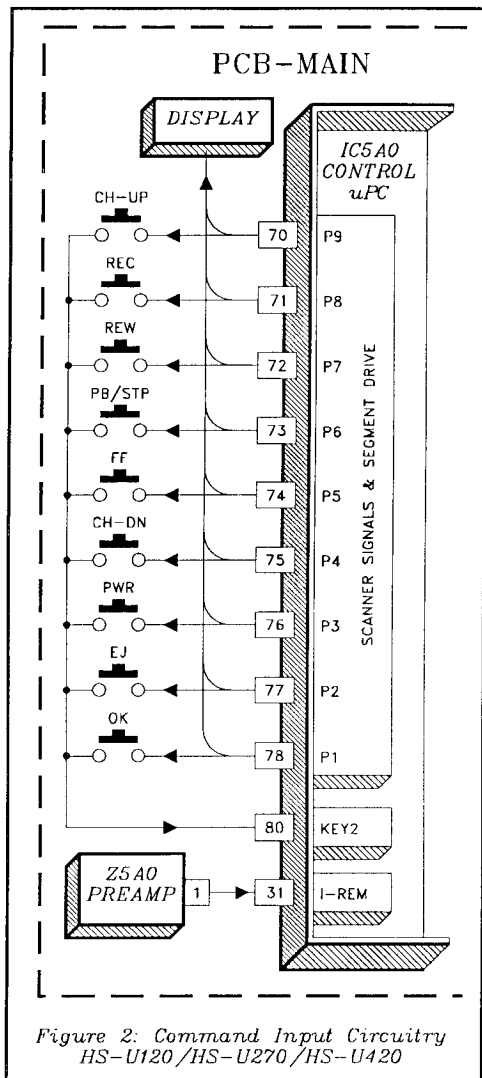
In models HS-U520 and HS-U570, there is a manual Reset Button on the rear of the VCR. When the button is pressed, the switch pulls the RESET line LOW. If computer lock up occurs during servicing, pressing the Reset button usually restores normal operation.

## Command Input Circuitry

There are some variations in the Command Input Circuitry between models. Figure 2 illustrates the circuitry in models, HS-U120, HS-U270, and HS-U420. Figure 3 shows the circuitry in models HS-U520, and HS-U570.

User commands originate from two sources, the Front Panel Control Buttons, or the Remote Control. The uPC responds to user commands by generating the logic to perform those commands.

**The Front Panel circuitry** is a Key Matrix configuration. Scanner Signals are output from pins 70 through 78 of IC5A0. Each scanner signal connects to one contact on a front panel switch. The remaining switch contacts are tied together and connected to a single Key Scan input, at pin 80 of the IC.



When a front panel button is pressed, the uPC recognizes the command from the scanner signal at pin 80, and generates the appropriate logic. Note that the Scanner Output Terminals also supply Segment Drive for the Fluorescent Display.

Electrically the Front Panel Input Circuitry is the same in all models. The only difference is the physical location of three buttons, POWER, EJECT and OK (One Key Programming).

In models HS-U520 and HS-U570, the three buttons are on the PCB-OPER board. On all other models, all buttons are located on the PCB-MAIN.

**The Remote Control** is used to enter most user commands. An infrared sensor, in the Remote Preamp

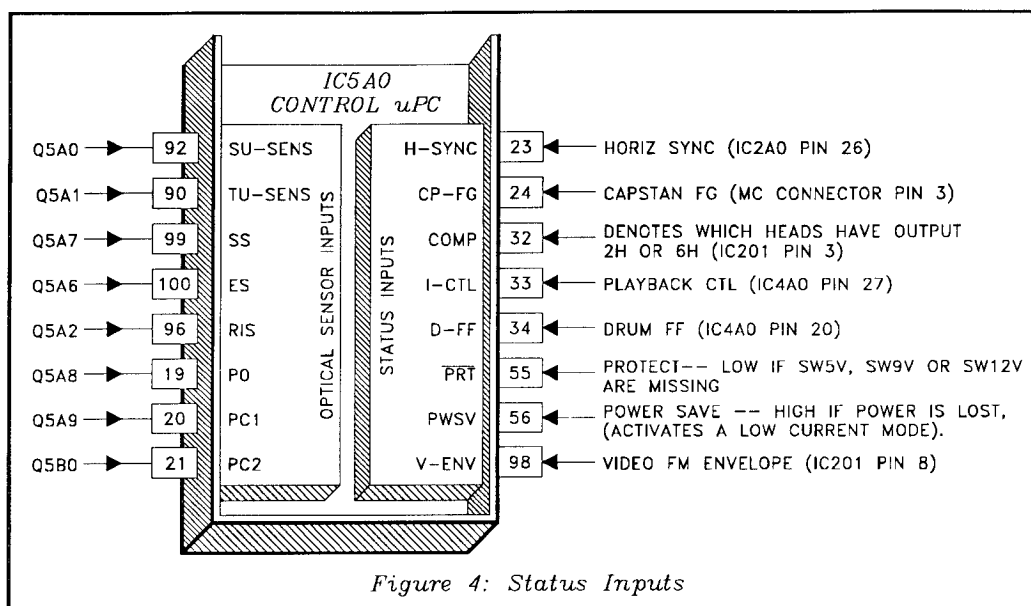
(Z5A0), receives signals from the Remote. The signals are amplified and directed to the uPC Remote input at pin 31.

**The HS-U520, and HS-U570, both feature Active A/V Networks.** This requires some changes in the Remote Input circuit, as shown in *Figure 3*. The signal from the Remote Preamp follows two paths:

- 1) Through R8B3 to pin 31 of the uPC.
- 2) Through R8B3, R8A9, and Q8A2 to the Remote Output Jack.

When signal is received at the Remote Input Jack:

- Q8A3 and Q8A4 removes any signal from Z5A0.
- Q8A6 directs the signal from the Remote Input Jack to pin 31 of the IC.



## Status Inputs

To monitor all VCR operations, the uPC also receives logic, or signals, from the various Status Sensors in the VCR. The Status Inputs, shown in *Figure 4*, are divided into two types, optical sensors and electrical sensors.

The increased use of **optical sensors** was described in last month's *Expander*. The Optical Sensor inputs, and their purpose, are given in *Table 2*.

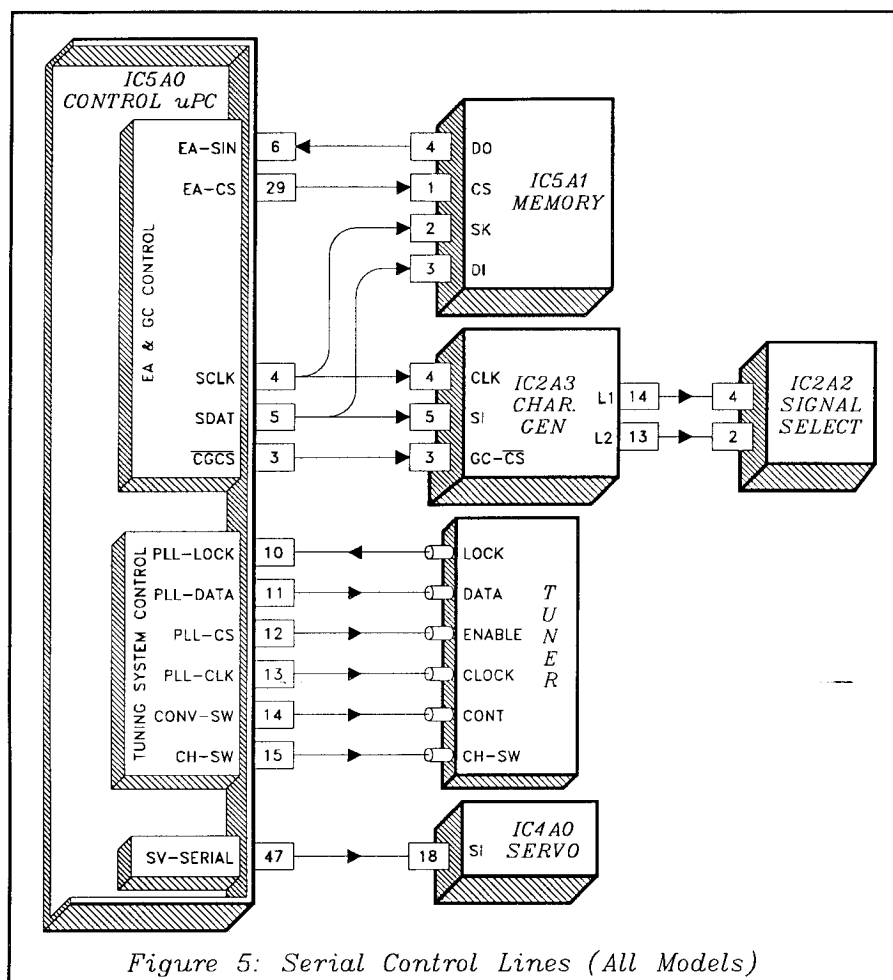
The **electrical sensor** inputs are the same as those on earlier VCRs. *Table 3* lists the inputs and their functions.

PIN NO.	ABBR.	DESCRIPTION
92	SU-SEN	Supply Reel Rotation Sensor
90	TU-SEN	Take Up Reel Rotation Sensor
99	SS	Start Sensor & Loading Motor Activation
100	ES	End Sensor
96	RIS	Record Inhibit Switch -- Senses if the Cassette Tab is missing
19-20-21	P0-PC1-PC2	Tape and Cassette Loading Status -- Senses Deck Mode Position

*Table 2: Optical Sensor Status Inputs*

PIN NO.	ABBR.	DESCRIPTION
23	H-SYNC	Horizontal Sync Pulse Detection
24	CP-FG	Used in determining Playback Tape Speed
32	COMP	Logic denotes which Heads (2H or 6H) have signal output. (Used during Special Effects.)
33	I-CTL	Used in determining Playback Tape Speed
34	D-FF	Denotes Drum Rotation
55	$\overline{\text{PRT}}$	Monitors the Switched 5V, 9V, and 12V supplies
56	PWSV	Activates the Power Save Mode if power is lost.
98	V-ENV	Used for Auto Tracking in models HS-U120 and HS-U270

*Table 3: Electrical Status Sensor Inputs*



## Output Commands

The logic generated to perform a command may be generated over a Serial Data line, and/or by parallel logic line outputs.

### Serial Outputs

The Serial Data output lines found in all five VCR models are shown in *Figure 5*. The Memory IC (IC5A1) stores current programmed data. Data being read from memory is directed to pin 6 of IC5A0 (EA-SIN). The SDAT terminal, at pin 5 of IC5A0, outputs data that is to be written in memory. All data transfer is timed by the SCLK signal from pin 4 of IC5A0.

The SDAT line also controls the Character Generator IC, IC2A3. Both IC5A1 and IC2A3 use the same Data and Clock lines. The CGCS line from pin 3 of IC5A0 enables IC2A3, and the EA-CS line from pin 29 enables IC5A1.

**Note that the L1 and L2 lines**, that control the Signal Selection circuitry, are output from IC2A3 rather than directly from the uPC.

**The Tuning System** is controlled by the PLL DATA line at pin 11 of the uPC.

- PLL-DATA -- outputs commands for the Tuning System.
- PLL-CLK -- times the transfer of data.
- PLL-CS -- enables the Tuner to accept data.
- PLL-LOCK -- Informs the uPC when the Tuning system is locked on a channel.

Two additional control lines are applied to the Tuner:

- 1) CONV-SW -- selects either the TV or Video mode.
- 2) CH-SW -- selects either channel 3 or 4 for the RF output channel in the Video mode.

PIN NO.	ABBR.	DESCRIPTION
7	$\overline{\text{PWV}}$	When LOW -- turns the VCR ON.
9	$\overline{\text{HPLS}}$	Used to generate substitute Vertical Sync during Special Effects.
22	P-V-SYNC	
25	$\overline{\text{SS-VSYNC}}$	
16	REC2	HIGH in Record --- places the signal circuits in the Record Mode.
26	$\overline{\text{EE}}$	A LOW activates the EE (Monitor) mode.
27	HASW	Selects the 2H or 6H Heads (HIGH=6H --- LOW=2H).
28	CROT	Chroma Rotation signal.
41	CPADJ0	Generates Capstan Slow Motion Drive.
42	CPADJ1	
43	CPADJ2	
44	CPADJ3	
45	O-UL	HIGH=Reverse Loading Motor Drive.
46	O-L	HIGH=Forward Loading Motor Drive.
48	CTL GAIN	Increases the CTL Amplifier gain during Index Search.
49	CP-FWD	Capstan direction (HIGH=Forward --- LOW= Reverse)
50	$\overline{\text{HFR}}$	LOW activates High Speed Fast Forward or Rewind.
51	DR-ON	Activates Drum Drive [ON=HIGH (2.5V) --- OFF=LOW]
52	2HDRADJ	Adjusts Drum Speed during 2H Special Effects.
53	6HDRADJ	Adjusts Drum Speed during 6H Special Effects.
54	$\overline{\text{SL}}$	A LOW removes Capstan Servo Drive during Slow, Still, and Stop.
57	TRICK1	During Special Effect --- Enables the Comparator to control Head Selection.
82	$\overline{2H}$	Controls Signal Circuitry Pre-emphasis & De-emphasis.
88	MUTE	HIGH -- mutes the sound.
95	QSTP	In Index Search --- Stops the tape when an Index is detected.

*Table 4: Common Parallel Outputs*

The **Servo circuitry** is controlled by the SV-SERIAL output at pin 47 of the uPC. Only the data line controls the Servo IC ... no clock line is used.

### Parallel Outputs

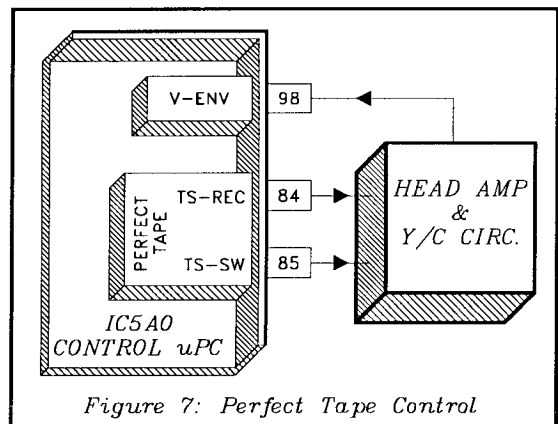
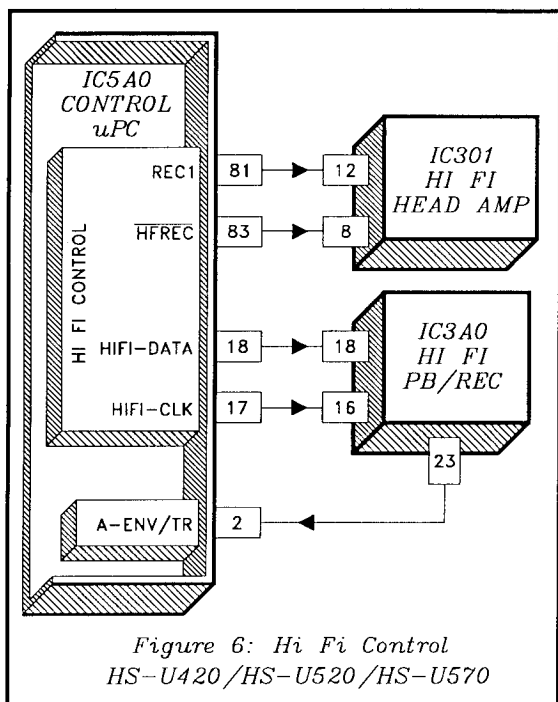
Most of the parallel outputs are similar to those in earlier VCRs, and are listed in *Table 4*.

The **Trick1** output at pin 57 is new to Mitsubishi VCRs. When in Special Effects, the logic on the Trick1 line allows Head Selection (2H or 6H) to be controlled by the COMP (Comparator) signal. The Envelope Comparator in the Head Amplifier, IC201, generates the COMP signal.

## Hi Fi Circuitry Control

The HS-U420, HS-U520 and HS-U570 all feature **VHS Hi Fi sound**. *Figure 6* shows the outputs controlling the HI Fi Circuitry. The REC1 and HFREC outputs, control the Hi Fi Head Amplifier circuits. The Hi Fi Signal Processing circuits are controlled by the HIFI-DATA line, and the HIFI-CLK signal times data transfer.

In VCRs with VHS Hi Fi, the Audio FM Envelope is used to determine correct tracking. A sample of the Audio Envelope is directed to the A-ENV input at pin 2 of the uPC. The uPC determines the optimum Tracking point from the amplitude of the Audio FM Envelope.



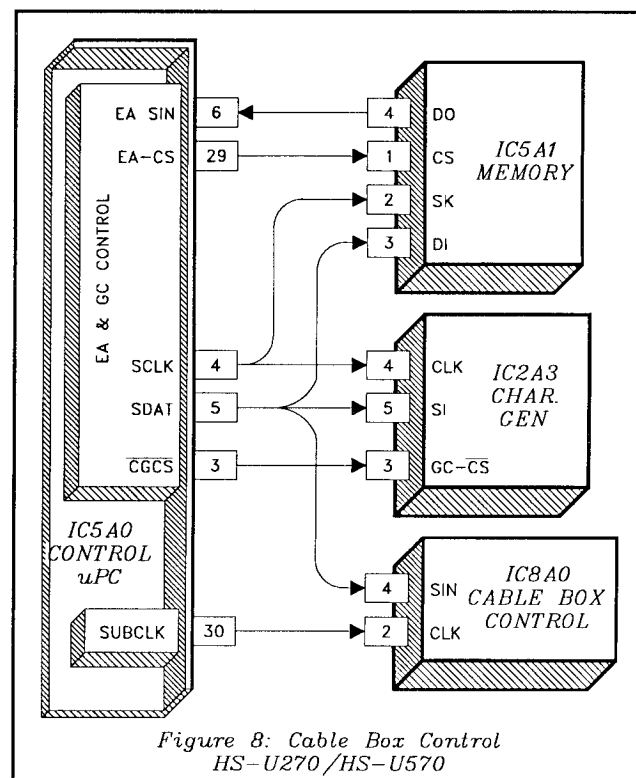
### Perfect Tape Evaluation

Perfect Tape Evaluation is featured in models HS-U520 and HS-U570. The two outputs controlling this feature are shown in Figure 7, TS-REC and TS-SW.

During Tape Evaluation the tape is stationary. The evaluation takes place on a single video track. First

a high frequency signal (6MHZ) is recorded and then played back. The process then repeats with a low frequency signal (3.5MHZ).

The playback signals are applied to the V-ENV input of the uPC. The condition of the tape is evaluated, and the results are displayed on the screen.



### Cable Box Control

Models HS-U270 and HS-U570, both feature Cable Box Control, as shown in Figure 8. The same Serial Data line that controls the Memory (IC5A1), and Character Generator (IC2A3), also controls the Cable Box Control circuitry in IC8A0.

The SUBCLK signal from pin 30 of IC5A0 times the transfer of data to IC8A0. Since a separate clock signal is used, a chip enable signal is not required.

## EXPANDER

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