b25d

SERVICE MANUAL

FISHER®

Vol. 4

Issue Number 1

- Mechanism Description
- Circuit Description

FVH-922

Video Cassette Recorder

THE FIRST NAME IN HIGH FIDELITY

1. The model FVH-922 is basically the same as the previous model FVH-825, except for the following differences:
   a) Video Circuit
      •HQ (High Quality picture) system is added.
      •Rotary two-head helical scan system
       Head select switch RE201 and Q209 has been deleted.
   b) Servo Circuit
      •SW30 DELAY control circuit (VR703 and peripheral circuit) has been deleted.
      •ADD VD control circuit (VR704 and peripheral circuit) has been deleted.
   c) Audio Circuit
      •The MTS input terminal (PA401) is connected to the TUNER (changed from the DECODER).
      •The CH MUTE terminal (PA402) is connected to the FREQ SYN PCB (changed from the PRESET PCB).
   d) Timer Circuit
      •A new circuit.
   e) Power Circuit
      •The FL tube heater circuit (ZD901) and the peripheral circuit have been deleted.
   f) Tuner Circuit
      •A new circuit.
   g) Frequency Shynthesizer Circuit
      •The model FVH-922 has the FREQUENCY SYNTHESIZER TUNING system, whereas the model FVH-825 has an electronic preset tuning system.
   h) Remote Receiver Circuit
      •A new circuit.

2. For ALL OTHER service information, consult the service manual for the FVH-825 Vol. 4.

TABLE OF CONTENTS

1. SPECIFICATIONS

General Specifications	
Television system	NTSC, Standard color system
Recording system	Rotary two-head helical scan system
Format	VHS standard
Tape width	1/2 inch
Tape speed	SP : 1.31″/sec. (33.35 mm/s)
	LP : 0.65″/sec. (16.67 mm/s)
	EP : 0.43″/sec. (11.12 mm/s)
Recording time	SP : 120 minutes with T-120 cassette
	LP : 240 minutes with T-120 cassette
	EP : 360 minutes with T-120 cassette
	EP : 480 minutes with T-160 cassette
Tape loading system	Automatic loading
Tuner channel selection system	111-channel, Digital Synthesizer Tuning system with UP & DOWN controls
Remote control (RVR-930)	18 function, wireless remote control, with direct channel access
Tuner channels	VHF: #2~#13
	UHF: #14~#83
	29 cable channels
RF converter	Built-in VHF converter
Converter output	Channel 3 or 4 selectable
Time indication	AM/PM 12-hour system
Timer	14 days, 4 prgorams
Tape counter	Separate 4-digit electronic display
Auto rewind system	Activated at end of tape when POWER switch is set to ON
Terminals	
Antenna input	VHF: F type, UHF: Screw × 2
Antenna output	VHF: F type, UHF: Screw × 2
Video input/output	RCA connector
Audio input/output	RCA connector
Camera remote pause	2.5 mm Ø jack
Electrical Specifications	
Video output level	1 Vp-p
Video output impedance	75 Ω
Audio output level	316 mV (−10 dBV)
Audio output impedance	600 Ω
Video input level	0.5 Vp-p~2.0 Vp-p
Video input impedance	75 Ω
Audio input level	316 mV (−10 dBV)
Audio input impedance	50 kΩ
Video S/N ratio	SP : More than 45 dB
	LP : More than 42 dB
	EP : More than 40 dB
Audio S/N ratio (normal stereo)	SP : More than 43 dB: More than 50 dB (Dolby NR ON)
	LP : More than 41 dB: More than 49 dB (Dolby NR ON)
	EP : More than 40 dB: More than 48 dB (Dolby NR ON)
Audio frequency response (normal stereo)	SP : 50 Hz~10 kHz
	LP : 60 Hz~7 kHz
	EP : 60 Hz~5.5 kHz
Other Specifications	
Power requirement	120 V AC, 60 Hz
Power consumption	32 Watts
Dimensions (W × H × D)	440 mm × 117 mm × 365 mm (17.32″ × 4.61″ × 14.37″)
Weight	17.3 lbs. (approximate)

Because its products are subject to continuous improvement, Fisher Corporation reserves the right to modify product designs and specifications without notice and without incurrind any obligation.

• TIMER MICROCOMPUTER PIN SIGNALS (IC151, LC6514B-3078)

Port	Pin	Function		I/O	I/O status
A_2	1	Key Matrix Scan Return signal		Input	Pulsed
A_3	2	Key Matrix Scan Return signal		Input	Pulsed
$\overline{INT}$	3	TAKE-UP pulse signal		Input	Pulsed
B_0	4	START signal		Input	Pulsed
B_1	5	SHIFT CLOCK signal		Input	Pulsed
B_2	6	DATA signal (FREQUENCY SYNTHESIZER→TIMER)		Input	Pulsed
C_0	7	PB signal		Input	Hi/Lo
C_1	8	REC signal		Input	Hi/Lo
C_2	9	TAPE F/FR signal		Input	Hi/Lo
C_3	10	50/60 Hz signal		Input	Pulsed
D_0	11	DATA signal (TIMER→FREQUENCY SYNTHESIZER)		Output	Hi/Lo
D_1	12	MEMORY STOP signal		Output	Hi/Lo
D_2	13	TIMER REC signal		Output	Hi/Lo
D_3	14	POWER ON signal		Output	Hi/Lo
E_0	15	Fluorescent display tube segment signal	Key matrix scan strobe signal	Output	Pulsed
E_1	16	Fluorescent display tube segment signal	Key matrix scan strobe signal	Output	Pulsed
E_2	17	Fluorescent display tube segment signal	Key matrix scan strobe signal	Output	Pulsed
E_3	18	Fluorescent display tube segment signal	Key matrix scan strobe signal	Output	Pulsed
$\overline{RES}$	19	RESET pulse		Input	Pulsed
TEST	20	TEST signal		Input	Hi/Lo
V_{SS}	21	Ground		—	—
OSC_1	22	External Clock signal		Input	AC
OSC_2	23	Internal Clock signal		Output	AC
F_0	24	Fluorescent display tube segment signal	Key matrix scan strobe signal	Output	Pulsed
F_1	25	Fluorescent display tube segment signal	Key matrix scan strobe signal	Output	Pulsed
F_2	26	Fluorescent display tube segment signal	Key matrix scan strobe signal	Output	Pulsed
F_3	27	Fluorescent display tube segment signal		Output	Pulsed
G_0	28	Converter control signal		Output	Hi/Lo
G_1	29	Fluorescent display tube grid signal		Output	Pulsed
G_2	30	Fluorescent display tube grid signal		Output	Pulsed
G_3	31	Fluorescent display tube grid signal		Output	Pulsed
H_0	32	Fluorescent display tube grid signal		Output	Pulsed
H_1	33	Fluorescent display tube grid signal		Output	Pulsed
H_2	34	Fluorescent display tube grid signal		Output	Pulsed
H_3	35	Fluorescent display tube grid signal		Output	Pulsed
I_0	36	Fluorescent display tube segment signal		Output	Pulsed
I_1	37	Fluorescent display tube segment signal		Output	Pulsed
V_P	38	−24V		Input	Hi/Lo
HOLD	39	Power down signal		Input	Hi/Lo
V_{DD}	40	+5V Power Supply		Input	Hi/Lo
A_0	41	Key Matrix Scan Return signal		Input	Pulsed
A_1	42	Key Matrix Scan Return signal		Input	Pulsed

2. CIRCUIT DESCRIPTION

2-1 VIDEO CIRCUIT

The video circuit of this model is the same as that of the model FVH-825 except for the addition of the HQ system. The following describes only the functions of the HQ system.

HQ (High Quality picture) SYSTEM

The HQ system in this model incorporates white clip expansion and detail enhancer technologies.

1) WHITE CLIP EXPANSION

During the recording process, the high frequencies contained in the luminance signal are emphasized before going into frequency modulation stage. Overshoot and undershoot appear in the video signal at this emphasis stage, and the overshoot is clipped at 170% (white clip level) on previous models, which results in some loss of brightness at the front edge. In this model, the white clip level is expanded up to 200%. Expansion of the white clip level during recording, produces pictures with sharp edges during playback.

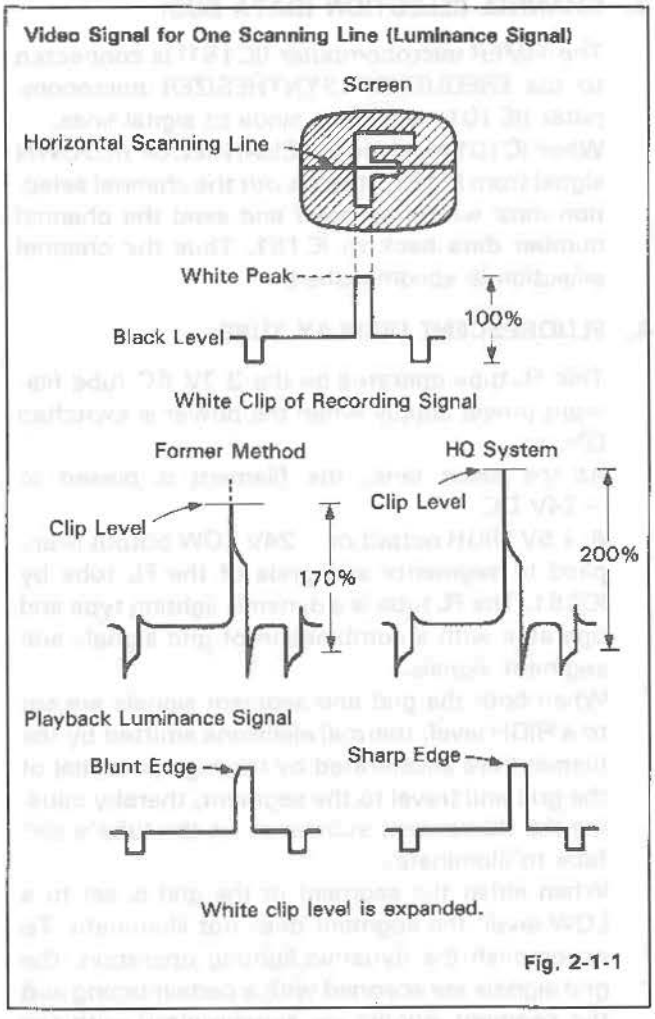


Fig. 2-1-1

2) DETAIL ENHANCER

In the playback mode, high frequencies contained in the luminance signal are attenuated. To compensate for this attenuation, frequencies between 1 MHz and 3 MHz are emphasized by the detail enhancer (IC206; SV02DEAN).

The enhancement level varies inversely compared to the luminance input signal level. (Refer to Fig. 2-1-2.)

The weaker the signal, the more it is emphasized.

The HQ system operates during recording only, and has no effect during playback of pre-recorded tapes.

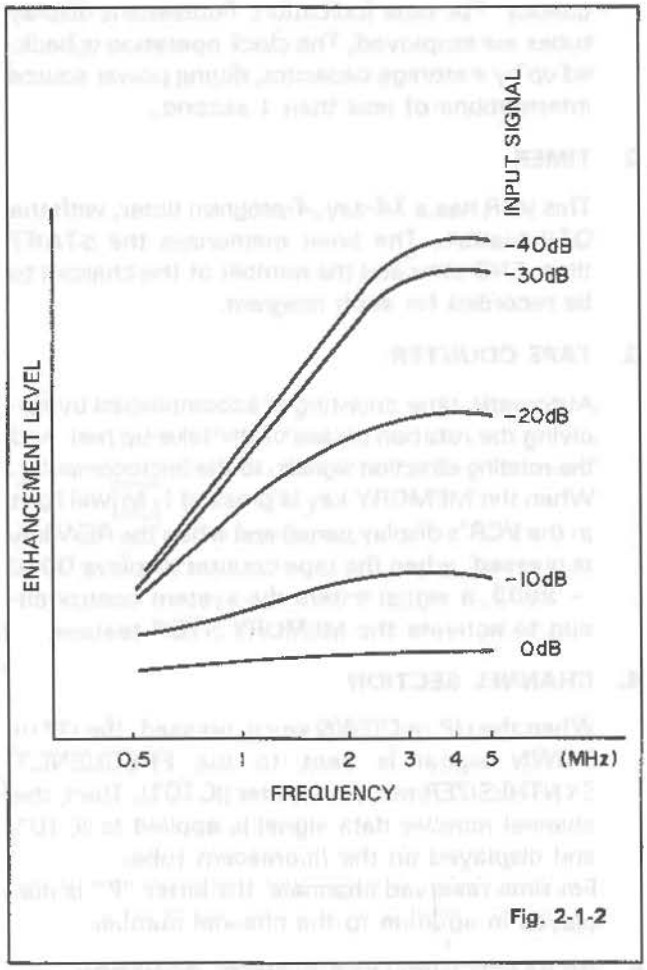


Fig. 2-1-2

2-2. TIMER CIRCUIT

2-2-1. GENERAL DESCRIPTION

The TIMER functions as follows under central-control microcomputers.

1. Clock: Present-hour indication
2. Timer: Timer and QTR indications
3. Tape Counter: Tape counting and memory stop indications
4. Channel Section: Receiving channel display
5. Infrared Wireless Remote Control
6. Fluorescent Display Tube Control (display of items 1 to 4 above)
7. Power ON/OFF Control
8. VCR/TV Selection

1. CLOCK

This clock operates on the AC power source frequency. For time indication, fluorescent display tubes are employed. The clock operation is backed up by a storage capacitor, during power source interruptions of less than 1 second.

2. TIMER

This VCR has a 14-day, 4-program timer, with the QTR feature. The timer memorizes the START time, END time and the number of the channel to be recorded for each program.

3. TAPE COUNTER

Automatic tape counting is accomplished by applying the rotation pulses of the take-up reel, and the rotating-direction signals, to the microcomputer. When the MEMORY key is pressed (M will light in the VCR's display panel) and when the REW key is pressed, when the tape counter displays 0000 — 9999, a signal enters the system control circuit to activate the MEMORY STOP feature.

4. CHANNEL SECTION

When the UP or DOWN key is pressed, the UP or DOWN signal is sent to the FREQUENCY SYNTHESIZER microcomputer (IC101). Then, the channel number data signal is applied to IC101 and displayed on the fluorescent tube.
For time-reserved channels, the letter "P" is displayed in addition to the channel number.

5. INFRARED WIRELESS REMOTE CONTROL

The remote control transmitter emits a pluse code modulated beam, which is received by the VCR's remote control receiver.

6. FLUORESCENT DISPLAY TUBE CONTROL

The fluorescent display tubes display each of items 1 through 4 (described above).

7. POWER ON/OFF CONTROL

The VCR's power is controlled by the POWER ON/OFF key. When the power is switched on, the POWER ON LED will light.

2-2-2. CIRCUIT FUNCTIONS

1. KEY MATRIX

The arranged key matrix receives input signals for the TIMER microcomputer (IC151). The input signals consist of 16 switching signals and 1 transistor switching signal. Segment signals are deciphered according to whether or not any of these switching signals enters the appropriate return input (pins 1, 2, 41 and 42 of IC151).

2. INITIAL RESET CIRCUIT

This circuit supplies reset pulse to pin 19 of IC151. A reset pulse is not issued when AC power is recovered during the capacitive back-up condition. Also, the reset procedure by removing the (AC PLUG) is disabled.
The timing for generating the reset pulse (active low) is decided by IC152.

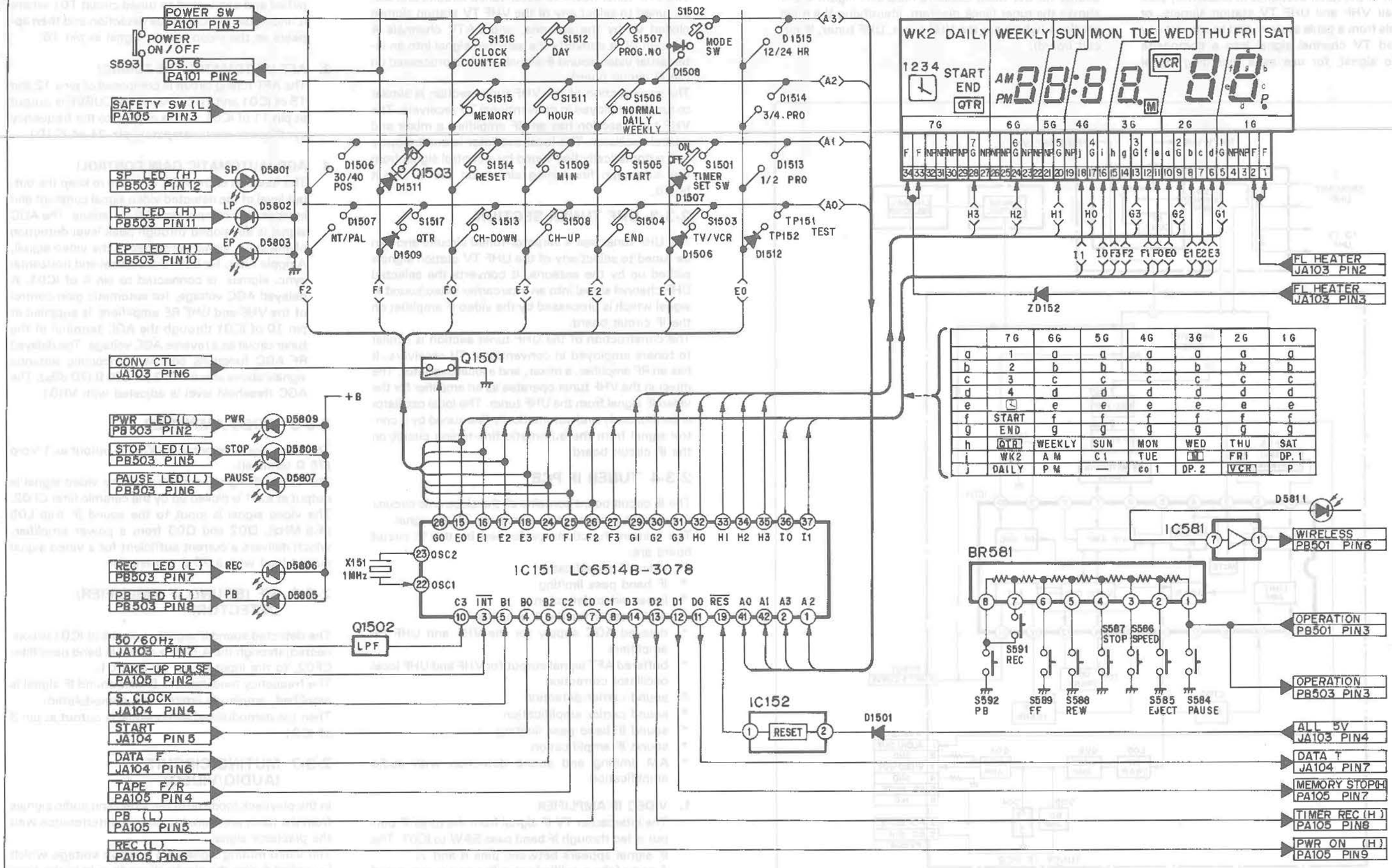
3. CHANNEL SELECTION (DATA BUS)

The TIMER microcomputer (IC151) is connected to the FREQUENCY SYNTHESIZER microcomputer (IC101) with four kinds of signal lines.
When IC101 receives the CHANNEL UP or DOWN signal from IC151, it reads out the channel selection data written-in itself and send the channel number data back to IC151. Thus the channel selection is accomplished.

4. FLUORESCENT DISPLAY TUBE

This FL tube operates on the 3.7V AC tube filament power supply when the power is switched ON.
At the same time, the filament is biased to −24V DC.
A +5V HIGH output or −24V LOW output is applied to segments and grids of the FL tube by IC151. The FL tube is a dynamic lighting type and operates with a combination of grid signals and segment signals.
When both the grid and segment signals are set to a HIGH level, thermal electrons emitted by the filament are accelerated by the high potential of the grid and travel to the segment, thereby causing the fluorescent substance on the tube's surface to illuminate.
When either the segment or the grid is set to a LOW level, the segment does not illuminate. To accomplish the dynamic lighting operation, the grid signals are scanned with a certain timing and the segment signals are synchronized with the respective grid signals.

TIMER BLOCK DIAGRAM



	7G	6G	5G	4G	3G	2G	1G
a	1	a	a	a	a	a	a
b	2	b	b	b	b	b	b
c	3	c	c	c	c	c	c
d	4	d	d	d	d	d	d
e		e	e	e	e	e	e
f	START	f	f	f	f	f	f
g	END	g	g	g	g	g	g
h	QTR	WEEKLY	SUN	MON	WED	THU	SAT
i	WK2	AM	C1	TUE	M	FRI	DP.1
j	DAILY	PM	—	CO 1	DP.2	VCR	P

Fig. 2-2-1

2-3 TUNER CIRCUIT

2-3-1 GENERAL

The function of the tuner section is to selectively pick up off-the-air VHF and UHF TV station signals, or CATV signals from a cable system, and to convert any one selected TV channel signal into a composite Video/Audio signal, for use as a recording signal source for the video cassette recorder. Figure 2-3-1 shows the tuner block diagram, identifying the main sections (which are the VHF tuner, UHF tuner, IF circuit board).

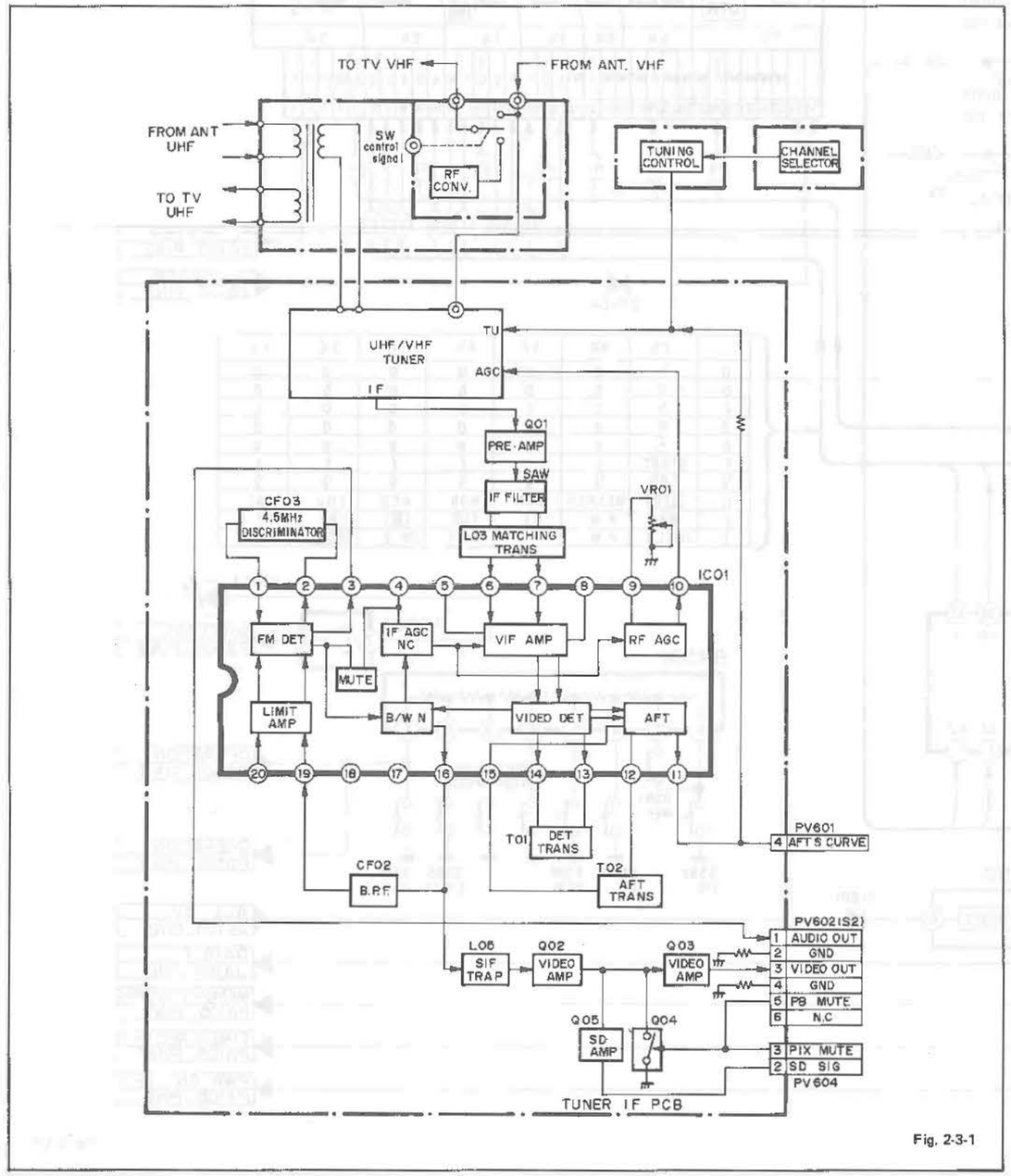


Fig. 2-3-1

2-3-2 VHF TUNER SECTION

The VHF tuner has 4 varactor-tuned circuits and can be tuned to select any of the VHF TV station signals picked up by the antenna, and CATV channels A through W. It converts the selected signal into an intercarrier video/sound IF signal which is processed on the IF circuit board.
The construction of the VHF tuner section is similar to tuners employed in conventional TV receivers. The VHF tuner section has an RF amplifier, a mixer and a local oscillator. The local oscillator is continuously and automatically fine-tuned by a control signal from the automatic fine-tuning circuit on the IF circuit board.

2-3-3 UHF TUNER SECTION

The UHF tuner has 4 varactor-tuned circuits and can be tuned to select any of the UHF TV station signals picked up by the antenna. It converts the selected UHF channel signal into an intercarrier video/sound IF signal which is processed by the video IF amplifier on the IF circuit board.
The construction of the UHF tuner section is similar to tuners employed in conventional TV receivers. It has an RF amplifier, a mixer, and a local oscillator. The mixer in the VHF tuner operates as an amplifier for the video IF signal from the UHF tuner. The local oscillator is continuously and automatically fine-tuned by a control signal from the automatic fine-tuning circuit on the IF circuit board.

2-3-4 TUNER IF PCB

The IF circuit board contains all the electronic circuits required to process the intercarrier TV IF signal.
The primary functions performed by the IF circuit board are:

* video IF amplification
* IF band pass limiting
* linear video detection
* AGC supply for the IF amplifier
* delayed AGC supply for the VHF and UHF RF amplifiers
* buffered AFT signal output for VHF and UHF local oscillator correction
* sound carrier detection
* sound carrier amplification
* sound IF band pass limiting
* sound IF amplification
* AM limiting and sound detection with audio amplification

1. **VIDEO IF AMPLIFIER**
   The intercarrier TV IF signal from the tuner IF output is fed through IF band pass SAW to IC01. The IF signal appears between pins 6 and 7.
   A part of the amplified video IF signal is connected to the low level detector. The 4.5 MHz sound IF signal output together with the video signal is at pin 16.

2. **VIDEO DETECTOR**
   The video signal at pins 13 and 14 of IC01 is amplified and connected to tuned circuit T01 where it undergoes synchronous detection and then appears as the video output signal at pin 16.

3. **AFT (AUTOMATIC FINE-TUNING)**
   The AFT tuning circuit is composed of pins 12 and 15 of IC01 and T02. The AFT S CURVE is output at pin 11 of IC01, and is applied to the frequency synthesizer microcomputer, pin 21 of IC101.

4. **AGC (AUTOMATIC GAIN CONTROL)**
   The function of the AGC circuit is to keep the output level of the detected video signal constant and independent of input signal fluctuations. The AGC signal is developed through peak level detection of the sync. signal contained in the video signal. A ripple filter, for both the vertical and horizontal sync. signals, is connected to pin 4 of IC01. A delayed AGC voltage, for automatic gain control of the VHF and UHF RF amplifiers, is supplied at pin 10 of IC01 through the AGC terminal of the tuner circuit as a reverse AGC voltage. The delayed RF AGC functions only with incoming antenna signals above about 3092 μV/300 Ω (70 dBμ). The AGC threshold level is adjusted with VR01.

2-3-5 VIDEO AMPLIFIER

The video signal detected by IC01 is output at 1 Vp-p (75 Ω terminal).
The sound IF signal, contained in the video signal is output at IC01 is picked up by the ceramic filter CF02. The video signal is input to the sound IF trap L05 (4.5 MHz). Q02 and Q03 from a power amplifier, which delivers a current sufficient for a video signal output load with a 75 Ω termination.

2-3-6 SIF (SOUND IF AMPLIFIER/ DETECTOR)

The detected sound IF signal at pin 16 of IC01 is connected, through the 4.5 MHz sound IF band pass filter CF02, to the input of pin 19 of IC01.
The frequency modulated 4.5 MHz sound IF signal is amplified, amplitude limited and demodulated.
Then the demodulated audio signal is output at pin 3 of IC01.

2-3-7 MUTING CIRCUIT (AUDIO/VIDEO)

In the playback mode both the video and audio signals from the tuner are muted to prevent interference with the playback signal.
The video muting signal is a positive voltage which is applied during the playback mode only to the base of Q04.

2-4 FREQUENCY SYNTHESIZER CIRCUIT

2-4-1 GENERAL

This PLL tuning circuit provides the power supply (12V) and the tuning voltage (0V to 33V) to operate the tuner circuit.
To obtain the tuning voltage, the PD (Phase Detection) output signal of the PLL IC TD6350P (IC102) is passed through the LPF (Low Pass Filter) composed of a transistor Q1007 and a FET Q1006.
The desired frequencies of broadcast stations can be selected by using the tuning voltage.
There are two methods of channel selection, direct channel selection using the 10 numbered keys on the remote control unit, and automatic channel selection using the CHANNEL UP and DOWN keys. The block diagram is shown in Fig. 2-4-1.

2-4-2 CIRCUIT OPERATIONS

1. FREQUENCY SYNTHESIZER (FREQ SYN) MICROCOMPUTER

The FREQ SYN microcomputer IC101 determines a receiving frequency according to the channel number signal. The PLL circuit operates according to the receiving frequency, thus selecting the channel.
The PLL circuit consists of a VCO (local oscillator) in the TU/IF unit, a counter, a phase comparator within the PLL IC102, and the LPF (Q1006, Q1007).
The FREQ SYN microcomputer also provides AFT operation to accurately track the actual, received frequency if it drifts slightly from the assigned frequency (f_N: nominal frequency). This AFT operation provides an automatic stop function at the tuning point of a channel's frequency, by referring to the sync. signal (SD signal from the TU/IF unit), and the AFT S-curve voltage. The AFT pull range is $f_N + 2.5$ MHz to $f_N - 2.5$ MHz in 62.5 kHz steps.

2. TV BAND SELECTOR

The Frequency Synth. IC101 applies binary switching signals to IC103, which correspond to the respective frequency band of the selected channel. IC103 outputs 12V to the tuner section which covers the selected TV band.

Truth Value in Band Selector

Port		Name of Band
F_1	F_0	
0	0	L BAND
0	1	H BAND
1	0	U BAND

3. LPF (Low Pass Filter)

The LPF consists of the transistor (Q1007) and the FET (Q1006). The PD output of a charge pump of the phase comparator within the PLL IC102 passes through the LPF, by which the PD output voltage is converted into a 0V to 33V DC. The DC voltage is supplied as a tuning voltage to the varactor diodes, which is part of a VCO (local oscillator) in the TU/IF unit. The oscillating frequency output of the VCO is divided by a programmable divider (each counter). When the resultant frequency is higher than the reference frequency ($f_r = 7.8125$ kHz), a high-level output appears at the PD terminal of PLL IC102. When it is lower, a low-level output appears. When the divided frequency is the same as the reference frequency, there is no output (floating condition).

4. LEVEL CONVERSION

The AFT S-curve output of the TU/IF varies from 0V to 12V. To apply this output to FREQ SYN microcomputer IC101 (power source is +5V), the output is level-converted by resistance dividing.

5. STATION DETECTOR (SD signal detection)

The SD signal is obtained by separating a horizontal sync signal (f_H) from the video signal.

6. MUTE SIGNALS

There are two mute signals; PIX MUTE and CH MUTE. The PIX MUTE and CH MUTE signals, which are issued from the FREQ SYN microcomputer IC101, operate to mute the video and audio signals in order to eliminate the inter station noise while changing the channel. The CH MUTE signal also mutes the noise which is generated at the audio output, when a channel without a broadcast signal is received.

7. INFRARED REMOTE CONTROL SIGNAL RECEIVER

The FREQ SYN microcomputer IC101 provides I/R remote control signal decoding. The decoding signals (PLAY, STOP, etc.), for the system control circuit are output in 4-bit signals at ports C_0 to port C_3 of the FREQ SYN microcomputer IC101, and applied to the system control circuit through the resistor array. Other remote control input signals (Power, CH up, down, etc.) are decoded, then applied to the timer microcomputer IC151 on data bus. The signals are arranged in the timer circuit.

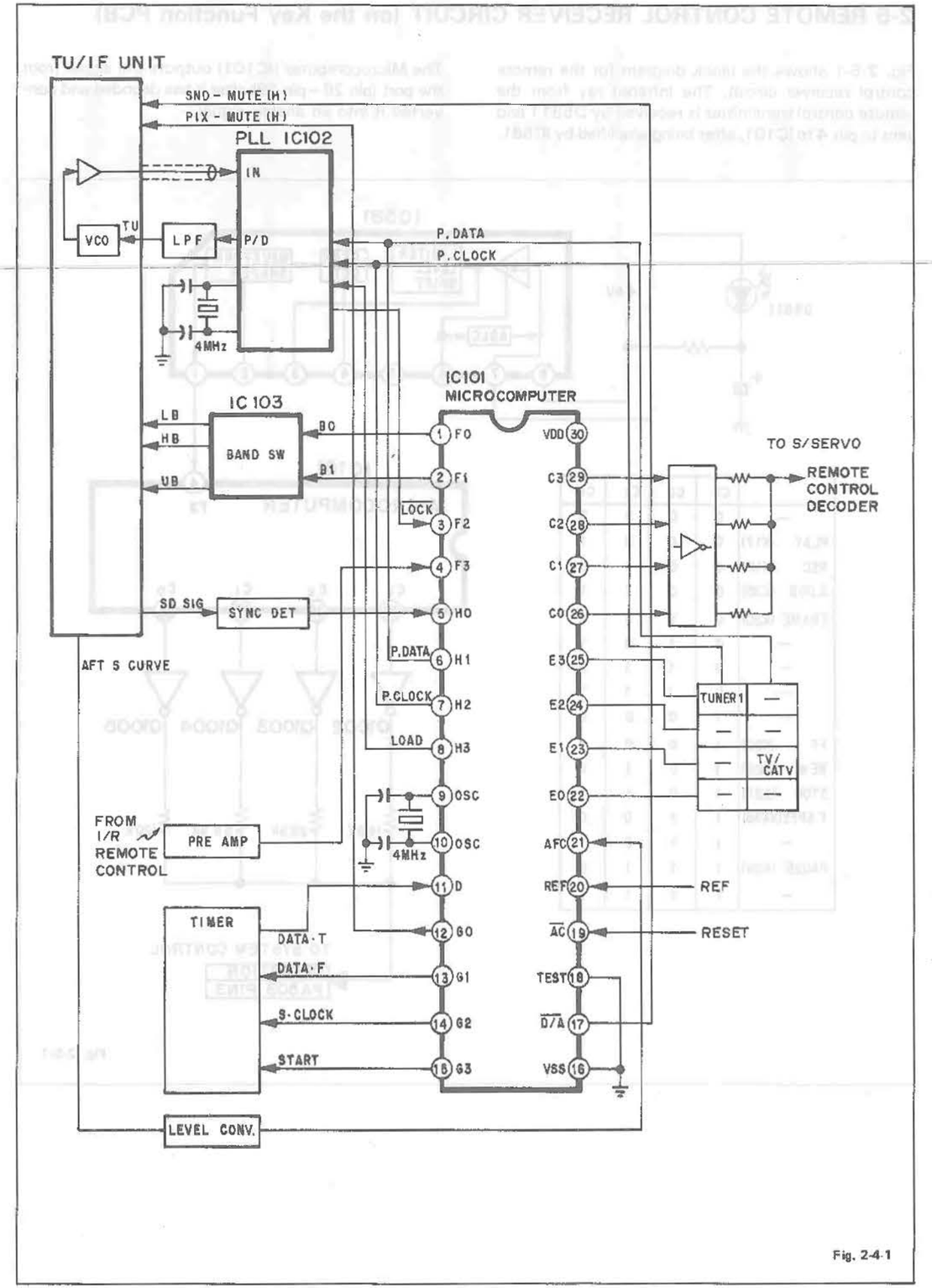
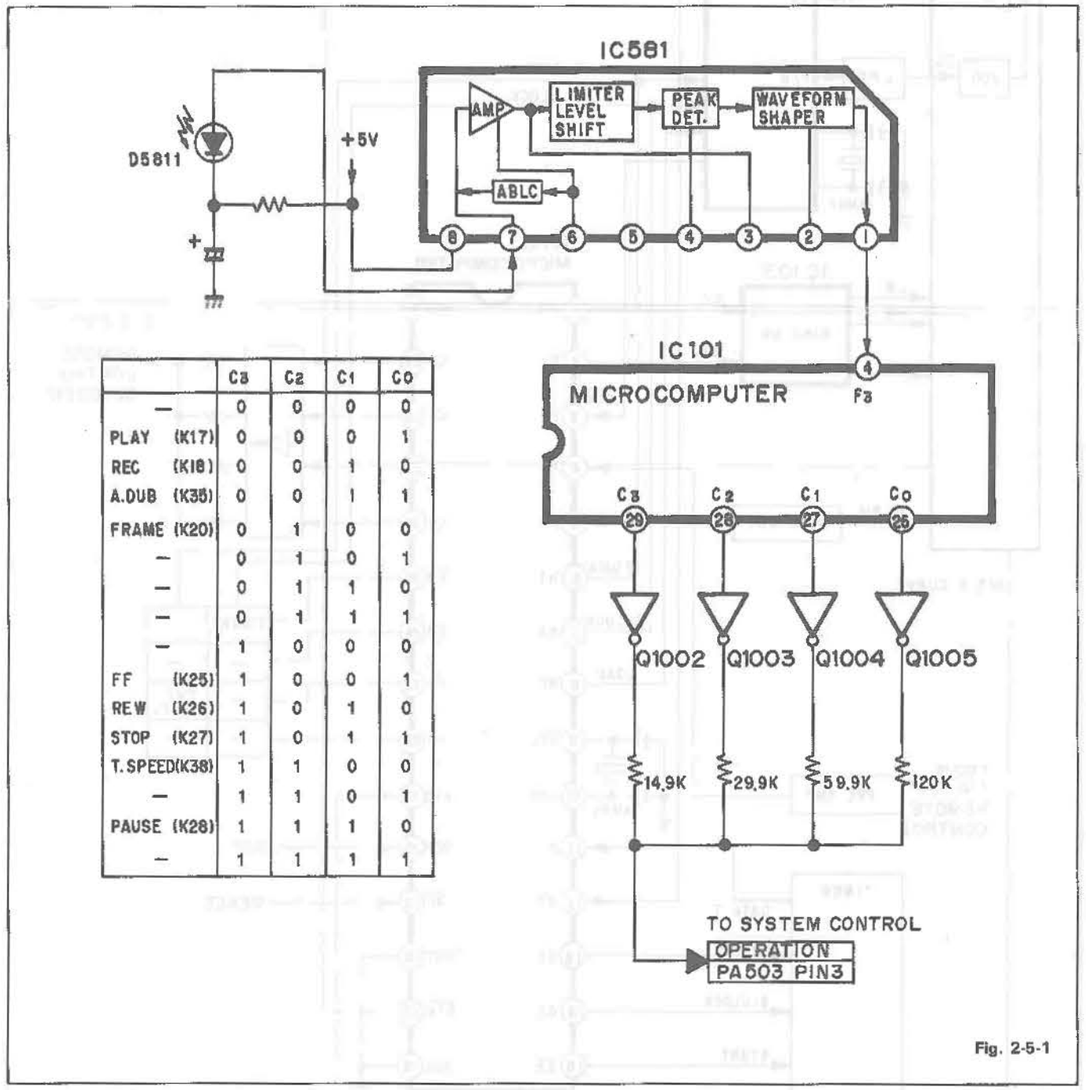


Fig. 2-4-1

2-5 REMOTE CONTROL RECEIVER CIRCUIT (on the Key Function PCB)

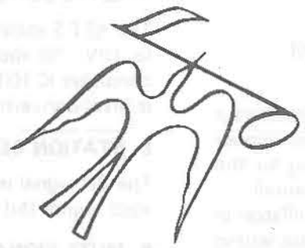
Fig. 2-5-1 shows the block diagram for the remote control receiver circuit. The infrared ray from the remote control transmitter is received by D5811 and sent to pin 4 to IC101, after being amplified by IC581.

The Microcomputer (IC101) outputs the signal from the port (pin 26 ~ pin 29) after it has decoded and converted it into an analog signal.



	C3	C2	C1	C0
—	0	0	0	0
PLAY (K17)	0	0	0	1
REC (K18)	0	0	1	0
A.DUB (K35)	0	0	1	1
FRAME (K20)	0	1	0	0
—	0	1	0	1
—	0	1	1	0
—	0	1	1	1
—	1	0	0	0
FF (K25)	1	0	0	1
REW (K26)	1	0	1	0
STOP (K27)	1	0	1	1
T.SPEED(K38)	1	1	0	0
—	1	1	0	1
PAUSE (K28)	1	1	1	0
—	1	1	1	1

Fig. 2-5-1



FISHER®
FISHER CORPORATION
21314 Lassen Street, Chatsworth, California 91311
U. S. A.

Model No. FVH-922 Vol. 4
WM-17491
Mar. '86/2,500
Printed in Japan. Cr