



VOLTAGE TUNABLE FILTER

3334

INSTRUCTION MANUAL

D: 505431

**VOLTAGE
TUNABLE
FILTER
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Instruction Manual**

Table of Contents

1. GENERAL DESCRIPTION	3
1.1 OUTLINE	3
1.2 SPECIFICATIONS	3
2. PREPARATIONS	5
2.1 UNPACKING.....	5
2.2 CONFIGURATION.....	5
3. OPERATIONS.....	6
3.1 NAMES AND OPERATIONS OF EACH PART.....	6
3.2 INSTALLING FILTER MODULES	8
3.3 8-POLE MF CHARACTERISTICS	12
3.4 4-POLE PSEUDO VESSEL LPF (PHASE LINEAR).....	12
3.5 CHANGING CUTOFF OR CENTER FREQUENCY	13
3.6 OFFSET ADJUSTMENT	13
4. PRINCIPLE OF OPERATION	14

1. General Description

1.1 Outline

This is a case for two channels of VT series hybrid filters such as VT-4BLA, 4BHA and 2BPA. This case including filter modules functions as a stand alone type voltage tunable filter. The model 3334 has several sockets for filter modules on the PC board, so that the user can install the modules easily.

It has two signal input and output connectors, and two potentiometers and input connectors for changing cutoff frequency or center frequency.

The model 3334 is very compact in size, that is 215mm(W) x 88mm(H) x 300mm(D).

1.2 Specifications

- 1) Number of channels 2
- 2) Mountable filter module per channel.

Type of filter	Module used	Quantity
LPF 4-pole MF	VT-4BLA	1
HPF 4-pole MF	VT-4BHA	1
BPF 2-pole pair	VT-2BPA	1
LPF 4-pole Pseudo Vessel	VT-4BLA	1
LPF 8-pole MF	VT-4BLA	2
HPF 8-pole MF	VT-4BHA	2

3) f_0 , f_c characteristics

Control mode Separated/Coupled(both channels are controlled by CH-1)

Setting Manual: 10-turn potentiometer

External voltage: +10mV to +10V

(Switchable by a toggle switch on the front panel)

Setting accuracy

Manual less than 3% at dial 10

non-linearity: 0.2% of Full-scale

External voltage \pm (3% of setting + 0.01% of maximum value of f_0 or f_c)

4) Controlling characteristics

Input

- Impedance approx. 1M Ω
- Voltage range +10mV to +10V
- Connector BNC-R mounted on the front and the rear panel.
Input connector for four channels simultaneous controlling with coupled mode is mounted on the rear panel.

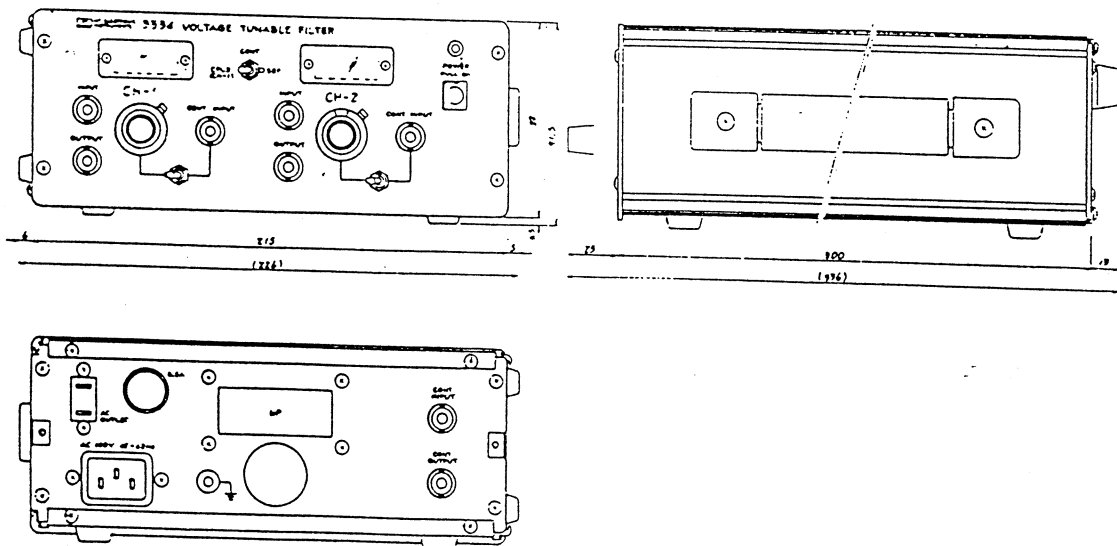
Output

- Function By using two units of 3334 which output the control voltage, f_0 and f_c of multi- channels can be controlled simultaneously.
- Impedance approx. 5 Ω
- Voltage range +10mV to +10V
- Connector BNC-R mounted on the rear panel

5) Filter characteristics Refer to the data book for VT series filter module

6) Others

- Power source AC 100V/120V/220V/240V(be specified at placing order),
48Hz to 62Hz
- Consumption approx. 150mA at AC 100V (when 4ea. of VT are installed)
- Dimensions 215(W) x 88(H) x 300(D)



2. Preparations

2.1 Unpacking

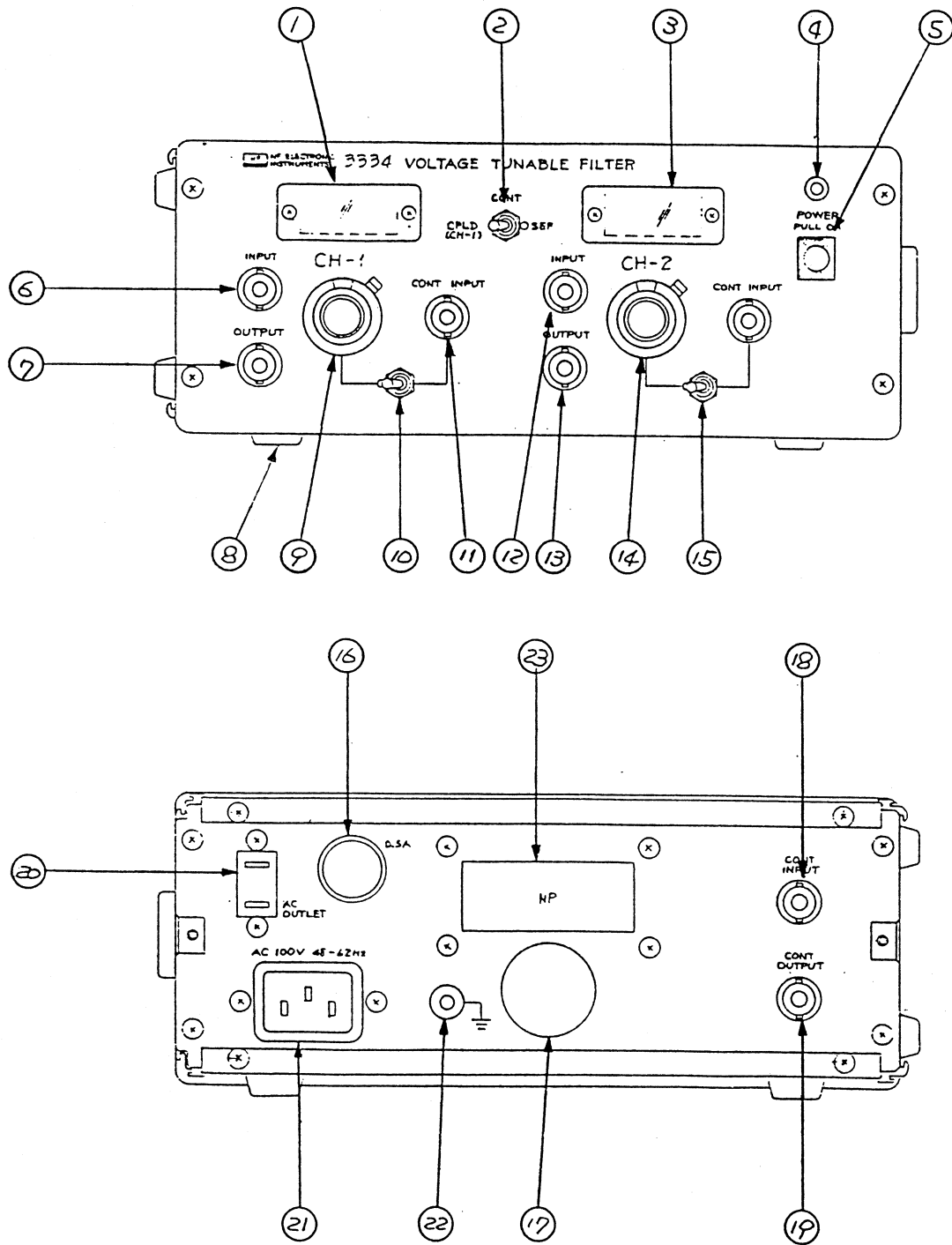
Be sure not to affect damages during transporting after unpacking the model 3334. Sufficient care is taken with the unit before shipping, however, a check of such items as loose knob and connectors, and make sure the contents listed below.

2.2 Configuration

Model 3334	1
Instruction Manual	1
Power cable	1
Jumper wire (including inside of the unit)	1

3. Operations

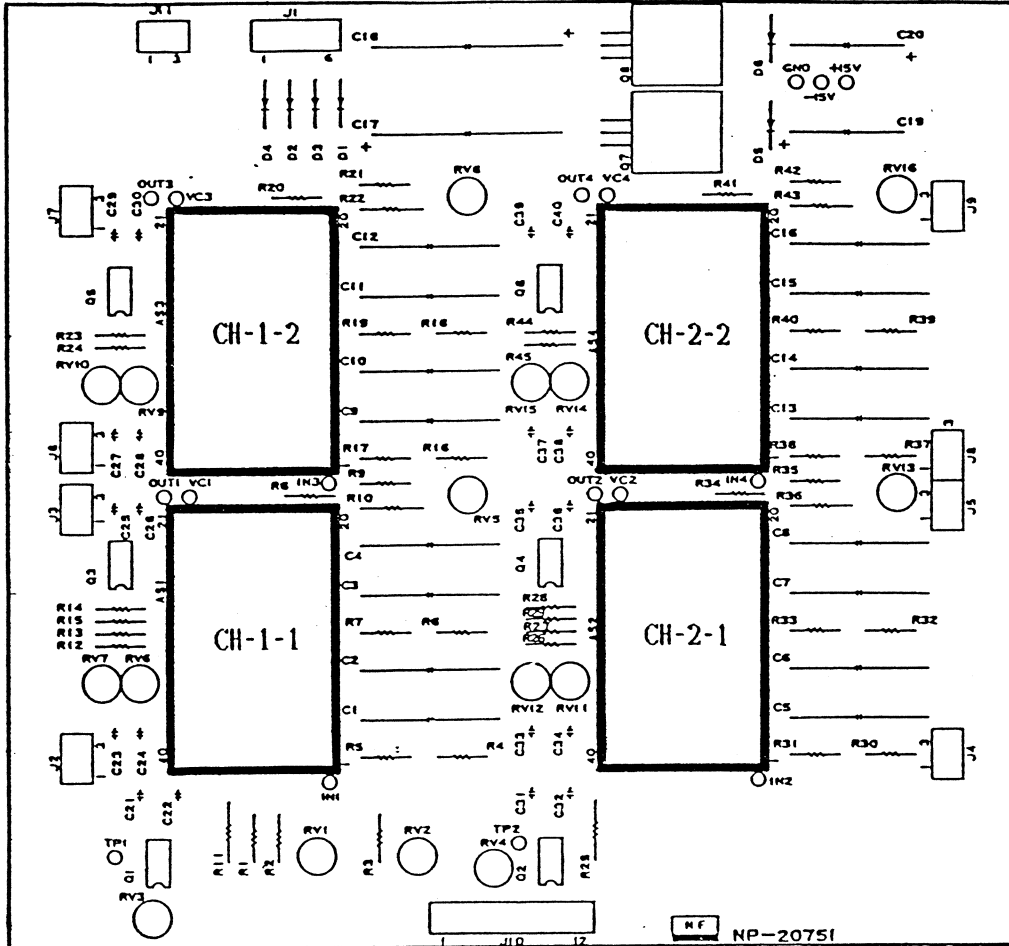
3.1 Names and operations of each part



- | | |
|------------------------------------|--|
| ① Card holder for CH-1 | The card which shows the model, cutoff frequency and center frequency of the installed filter can be inserted. |
| ② CPLD/SEP selection switch | Set this switch to CPLD side to desire coupled operation of CH-1 and CH-2. Set the switch to SEP position if CH-1 and CH-2 has to be operated independently. |
| ③ Card holder for CH-2 | Same as 1 |
| ④ Power indicator | This green lamp lights when turning on. |
| ⑤ Power switch | Pull this switch to turn on. |
| ⑥ Input | Input connector of CH-1. |
| ⑦ Output | Output connector of CH-1. |
| ⑧ Foot | |
| ⑨ Setting potentiometer | This potentiometer can be used for setting cutoff frequency and center frequency manually. |
| ⑩ Manual/External selection switch | Set this switch left-hand side for Manual operation and right-hand side for External operation. |
| ⑪ External voltage input | Input connector for external control voltage for cutoff frequency and center frequency. |
| ⑫ Input | Input connector for CH-2 input. |
| ⑬ Output | Output connector for CH-2 output. |
| ⑭ Setting potentiometer | Same as 9 |
| ⑮ Manual/External selection switch | Same as 10 |
| ⑯ Fuse holder | Fuse holder including 0.5A fuse inside |
| ⑰ Label | Inspected certification label |
| ⑱ Control input | Input for control voltage in order to operate with coupled mode for two or more 3334s. |
| ⑲ Control output | Output for control voltage. Connect from this to 18 of the other unit which is controlled |
| ⑳ AC outlet | |
| 21 AC receptacle | Insert power cable attached. |
| 22 GND | Connect this terminal to the earth. |

3.2 Installing filter modules

Four sockets for filter module are located on the PC board as follows:



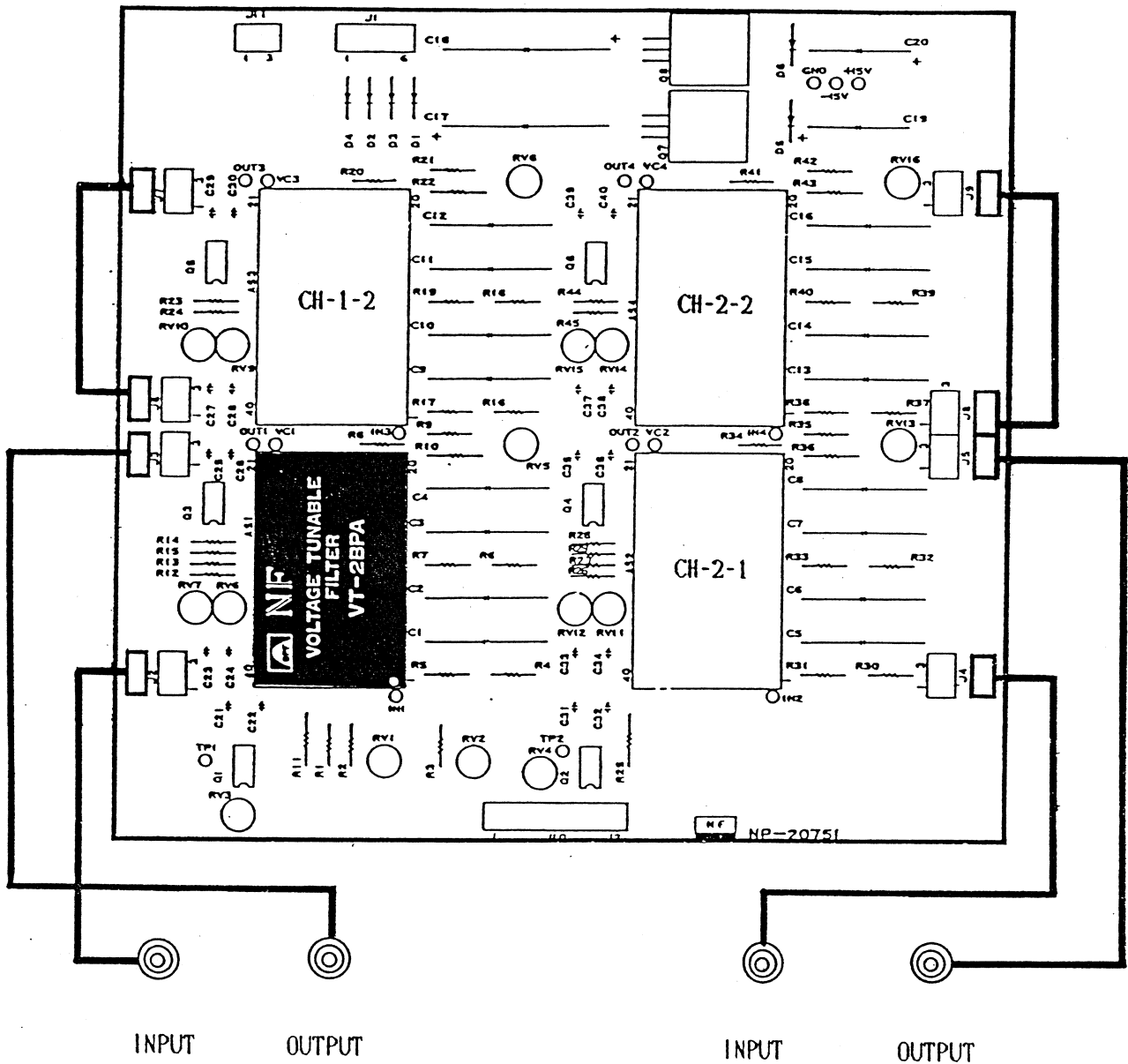
Front panel

A) The case of installing one module

	Type of filter	Module used	Quantity
1	LPF 4-pole MF	VT-4BLA	1
2	HPF 4-pole MF	VT-4BHA	1
3	BPF 2-pole pair	VT-2BPA	1

Three compositions shown above are available.

Install the VT filter to the socket on the PC board near the front panel side shown as follows.



Set the pin No.1 mark (white filled dot) of the module to the No.1 mark on the PC board. After confirming that all the leads of the filter module are inserted in the socket properly, press the module to fix it certainly.

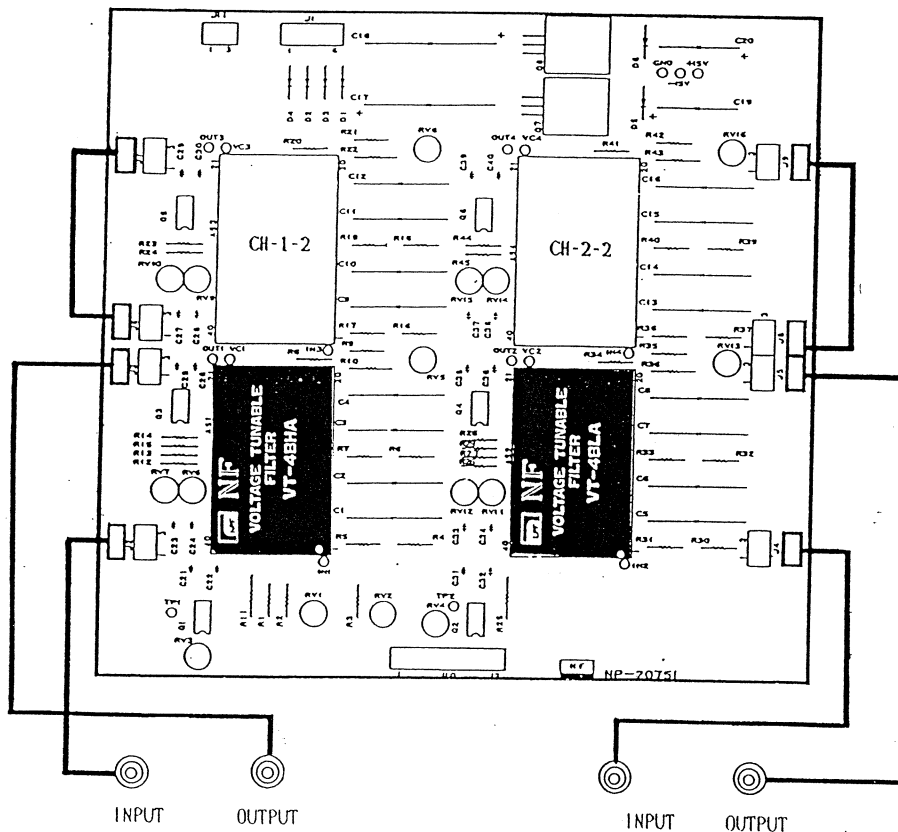
Caution: Pay attention to the direction of the module and insertion of all the leads of the module to the socket.

B) Installing one module per each channel

Type of filter	Module used	Quantity
2 channel LPF 4-pole MF	VT-4BLA	2
2 channel HPF 4-pole MF	VT-4BHA	2
2 channel BPF 2-pole pair	VT-2BPA	2
1 channel LPF 4-pole MF	VT-4BLA	1
1 channel HPF 4-pole MF	VT-4BHA	1
1 channel LPF 4-pole MF	VT-4BLA	1
1 channel BPF 2-pole pair	VT-2BPA	1
1 channel HPF 4-pole MF	VT-4BHA	1
1 channel BPF 2-pole pair	VT-2BPA	1

Six compositions shown above are available.

Install the VT filters to the socket on the PC board near the front panel side shown as follows. This figure shows 1 channel LPF 4-pole MF and 1 channel HPF 4-pole MF mode.

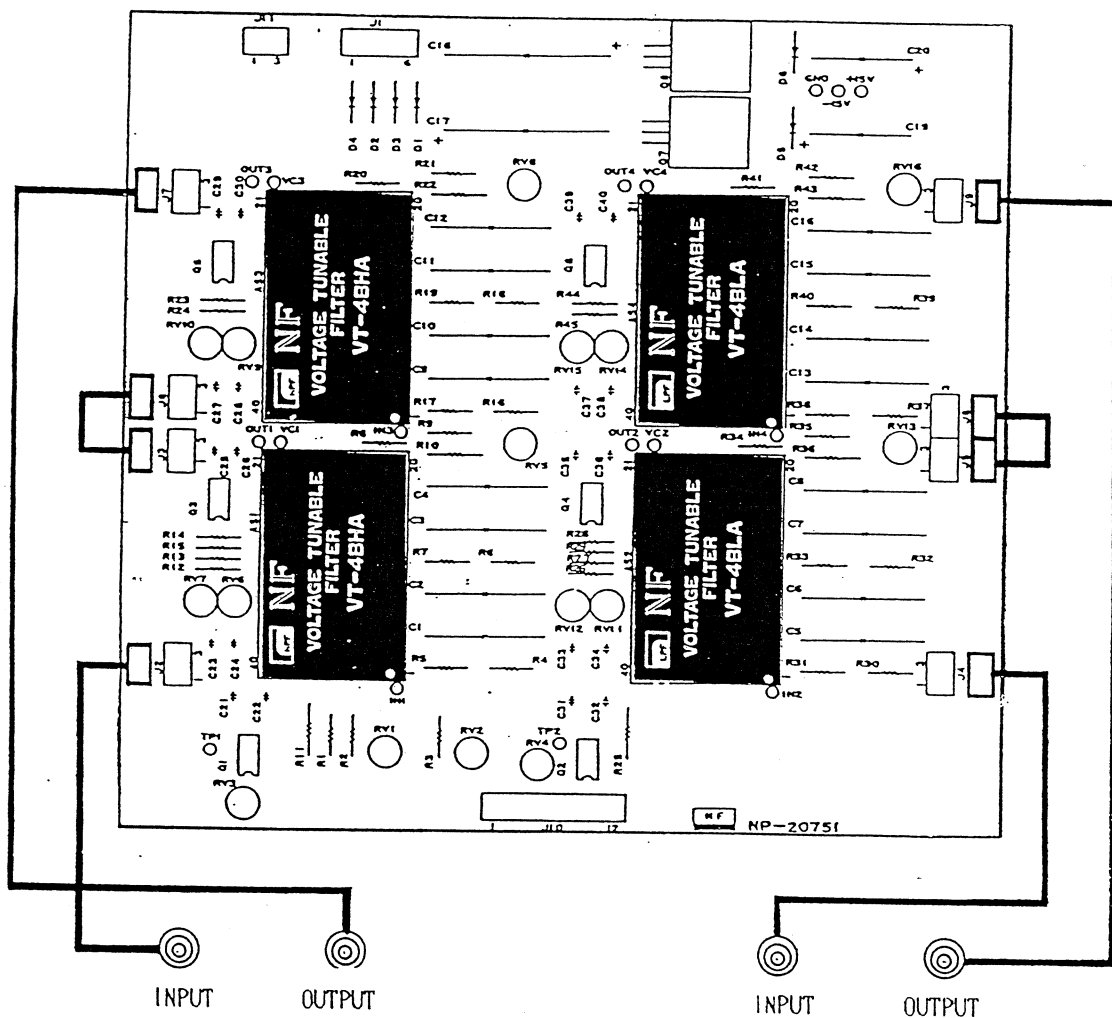


C) Installing two modules per each channel

Type of filter	Module used	Quantity
2 channel LPF 8-pole MF	VT-4BLA	4
2 channel HPF 8-pole MF	VT-4BHA	4
1 channel LPF 8-pole MF	VT-4BLA	2
1 channel HPF 8-pole MF	VT-4BHA	2

Three compositions shown above are available.

This figure shows 1 channel LPF 8-pole MF and 1 channel HPF 8-pole MF mode.



Additional four resistor per channel are required for LPF 8-pole MF mode. (Refer to 3.3)

Since jump wiring is different from the others, please pay attention to the wiring.

3.3 8-pole MF characteristics

It is possible to use two VT-4BLAs or two VT-4BHAs for cascade connection.

Install the desired filter modules as shown in 3.2 C) and solder four additional resistors per channel as shown below.

Stage No.	CH-1	CH-2	Resistance [Ω]
1	R5	R31	54.9k
2	R7	R33	3.83k
3	R16	R37	9.31k
4	R18	R39	2.67k

Since the resistance values shown in above table are only typical designed values, the most suitable value may be different from them due to individual deviation. The ideal MF characteristics can be obtain by adjusting resistors on stage 3 and 4 observing amplitude or frequency response near the cutoff frequency.

3.4 4-pole pseudo vessel LPF (Phase Linear)

Pseudo vessel characteristics can be obtain by using VT-4BLA and additional two resistors per channel.

Stage No.	CH-1	CH-2	Resistance [Ω]
1	R5	R31	59.0k
2	R7	R33	7.50k

Since the resistance values shown in above table are only typical designed values, the most suitable value may be different from them due to individual deviation. The ideal Phase Linear characteristics can be obtain by adjusting resistors on stage 2. Minimize the overshoot when rectangular wave is applied.

3.5 Changing cutoff or center frequency

Cutoff or center frequency can be shifted to lower by attaching external capacitors.

Calculation for the attaching external capacitors:

VT-4BLA:

$$C_{ext}[\text{pF}] = 250(100/F_c \text{ max}[\text{kHz}] - 1)$$

VT-4BHA, VT-2BPA:

$$C_{ext}[\text{pF}] = 250(100/F_c \text{ max}[\text{kHz}] - 5)$$

CH	No.	Parts Numbers
1	1	C1,C2,C3,C4
1	2	C9,C10,C11,C12
2	1	C5,C6,C7,C8
2	2	C13,C14,C15,C16

3.6 Offset adjustment

The output offset voltage of the VT series filters can be minimized by attaching external variable resistors and one resistor.

A) Installing one module per channel

CH-1 RV5: 20k Ω to 100k Ω R10: 1M Ω

CH-2 RV13: 20k Ω to 100k Ω R36: 1M Ω

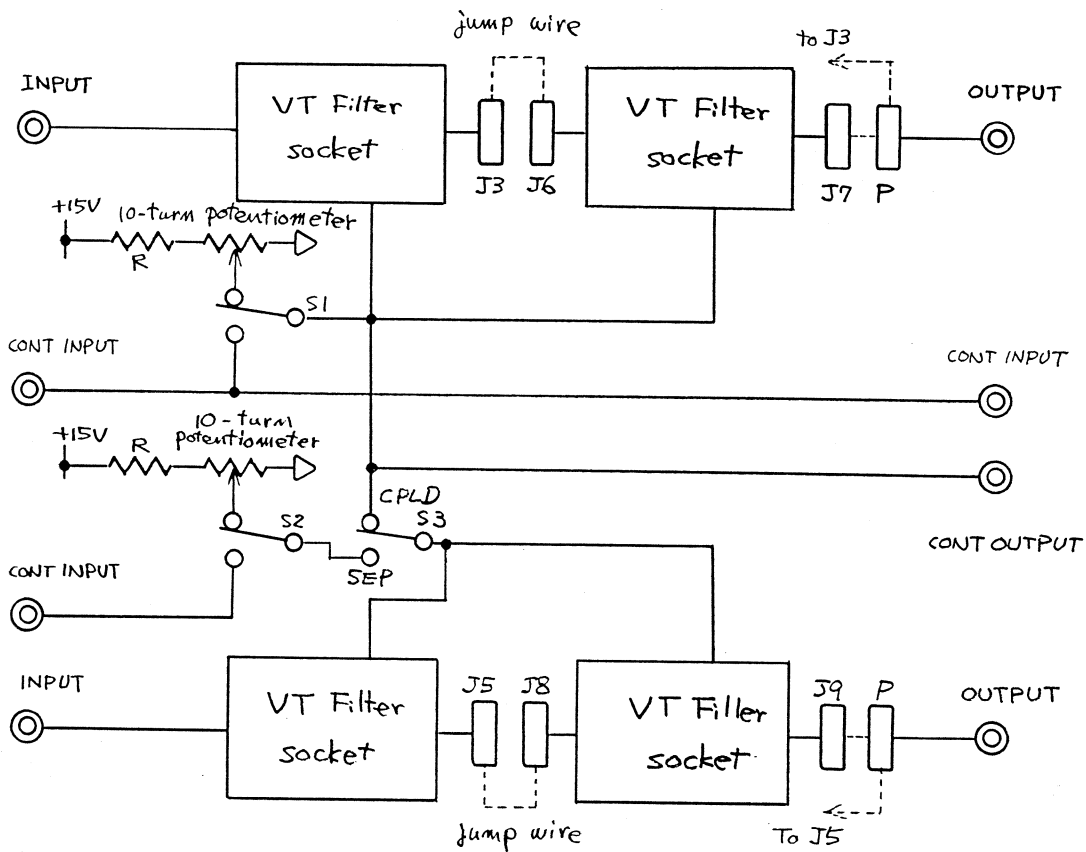
B) Installing two modules and cascade connection per channel

CH-1 RV8: 20k Ω to 100k Ω R22: 1M Ω

CH-2 RV16: 20k Ω to 100k Ω R43: 1M Ω

4. Principle of operation

Block diagram



* When the filters are used as cascade connection, the wire from each output connector has to connect to J7 or J9. Short circuit between J3 and J6, and J5 and J8.

* When one module per channel is used, the wire from each output connector has to connect to J3 or J5.

* Only the model VT-4BLA and VT-4BHA can be used as cascade connection.

WARRANTY

NF Corporation certifies that this instrument was thoroughly tested and inspected and found to meet its published specifications when it was shipped from our factory.

All **NF** products are warranted against defects in materials and workmanship for a period of one year from the date of shipment. During the warranty period of, **NF** will, at its option, either will repair the defective product without any charge for the parts and labor, or either repair or replace products which prove to be defective. For repair service under warranty, the product must be returned to a service center designated by **NF**. Purchaser shall prepay all shipping cost, duties, and taxes for the product to **NF** from another country, and **NF** shall pay shipping charge to returned the product to purchaser.

This warranty shall not apply to any defect, failure or damage caused by improper use, improper or inadequate maintenance and care or modified by purchaser or personnel other than **NF** representatives.

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