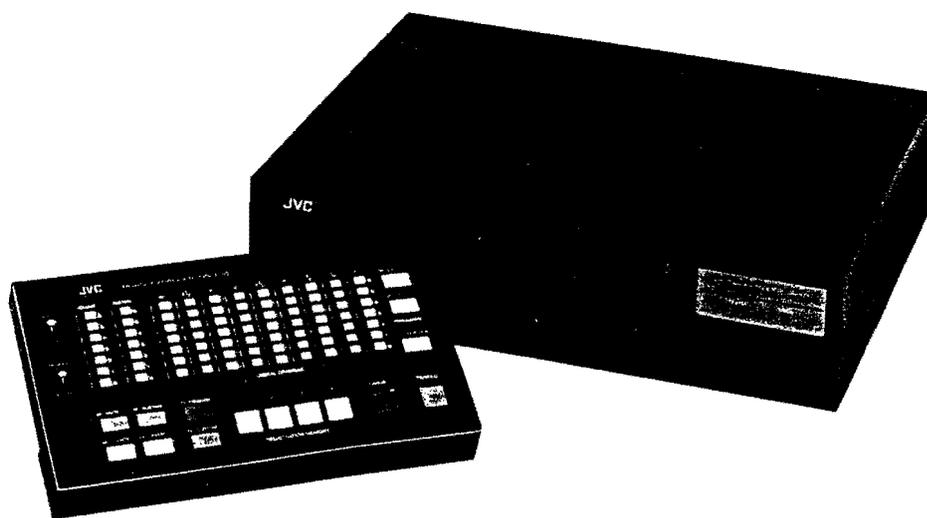# JVC | OWNER'S MANUAL

System Keyboard

ORGAN EXPANDER NS-T90

BEDIENUNGSANLEITUNG: Orgel Erweiterungsmodul NS-T90
MANUEL DU PROPRIETAIRE: Extension d'orgue NS-T90

IMPORTANT (in the United Kingdom)

Mains Supply (AC 240 V~ , 50 Hz only)

Do not make any connection to the Larger terminal coded E or coloured Green. The wires in the mains lead are coloured in accordance with following code:

Blue to N (Neutral) or Black
Brown to L (Live) or Red
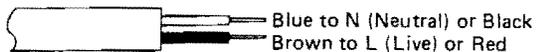
If these colours do not correspond with the terminal identifications of your plug, connect as follows:
Blue wire to terminal coded N (Neutral) or coloured Black.
Brown wire to terminal L (Live) or coloured Red.
If in doubt — consult a qualified electrician.

WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

CAUTIONS
● For AC operation, use only the power cord provided to prevent danger.
● Disconnect the AC plug when not in use.
● To prevent electric shock, do not remove screws, covers or cabinet. No user-serviceable parts inside. Refer servicing to qualified service personnel.

Voltage selector
The voltage selector is located on the rear of the instrument. Before connecting the power cord to an AC outlet, check that the correct voltage (120 V, 220 V or 240 V) for your area has been selected.

Thank you for purchasing this JVC NS-T90 Organ Expander. Before operation, please read these instructions carefully to get the best possible performance and extend the service life of the unit. After reading, retain for furture reference.

PRECAUTIONS

● Use only the power cord provided.
● Disconnect the power cord immediately in the event of an electrical storm.
● In the event repair is required, see your local dealer or JVC-authorised service agency. Do not attempt any internal adjustments or repairs.
● Avoid storing the instrument
  — under the direct rays of the sun;
  — near a heater, stove, fireplace or other heat source;
  — in extremely dusty environments or places subject to high vibrations.
● To clean the unit, use a dry cloth or one moistened with water or a neutral detergent.
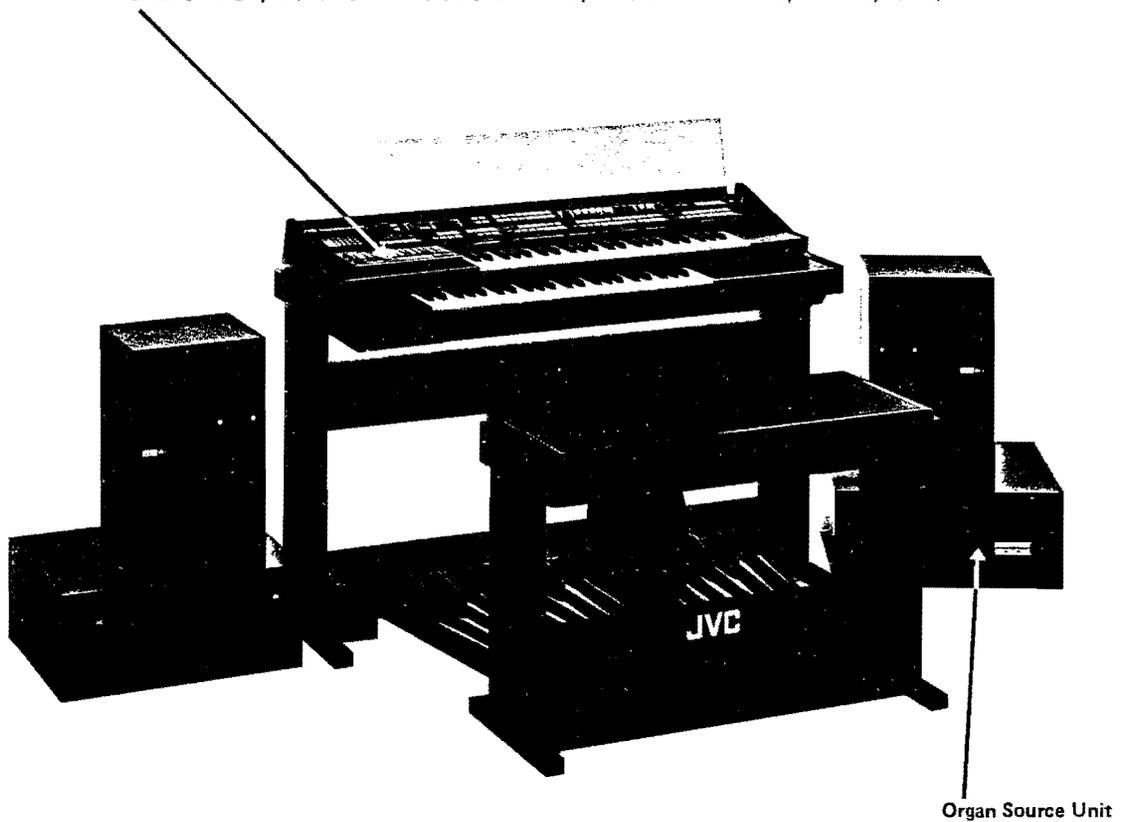
CONTENTS

FEATURES

JVC's new NS-T90 is a 9-band organ expander designed for easy operation in a system configuration with MIDI terminals and a fully digital operating system.

The NS-T90 consists of an organ source unit and a remote control unit. Generally, install the organ source unit in a position where it will not interfere with playing and the remote control unit where it is easiest to operate.
When connected to the JVC NS-50/70 System Keyboard, the remote control unit can be placed on the keyboard.

Installation example (NS-T90 Remote Control Unit placed on the NS-70 System Keyboard)

Organ Source Unit

CONNECTIONS

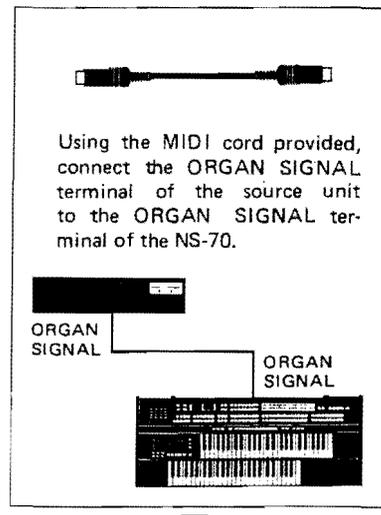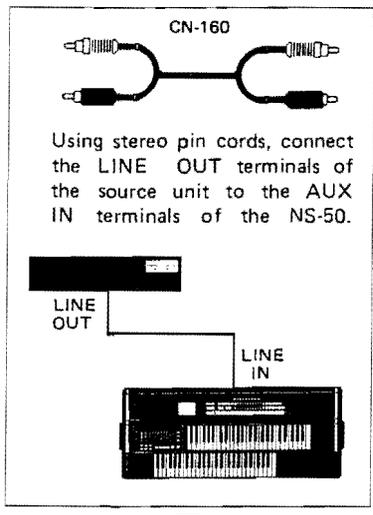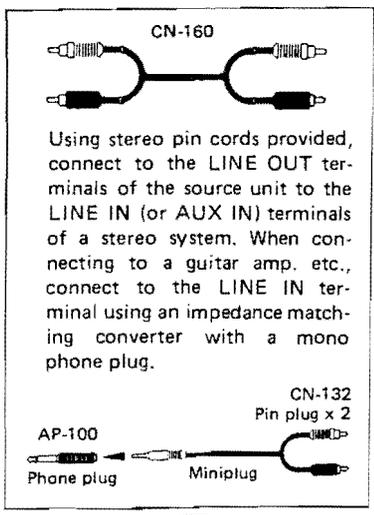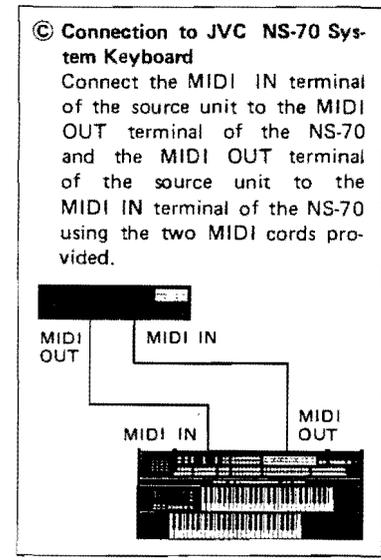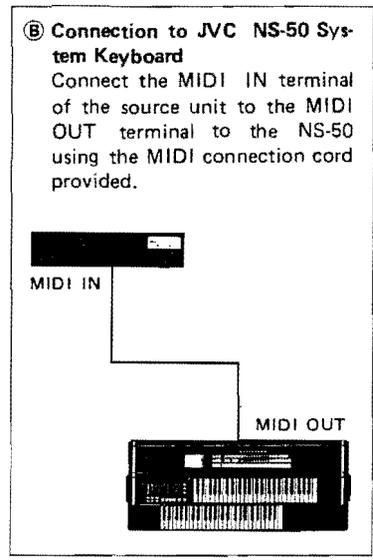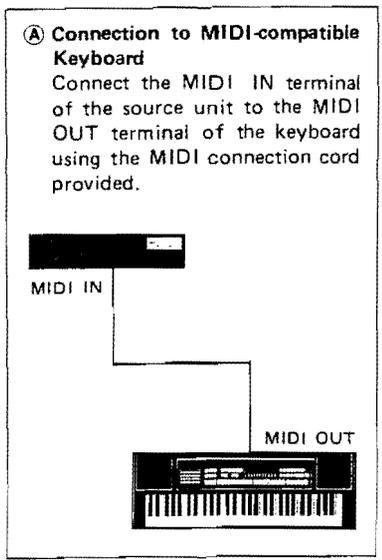| VOLTAGE SELECTOR	AC INPUT ~	POWER SWITCH	ORGAN SIGNAL	—LINE OUT— R　L	REMOTE	——————MIDI—————— IN　OUT　THRU	—CHANNEL— UPPER LOWER

ON
AUTO
OFF
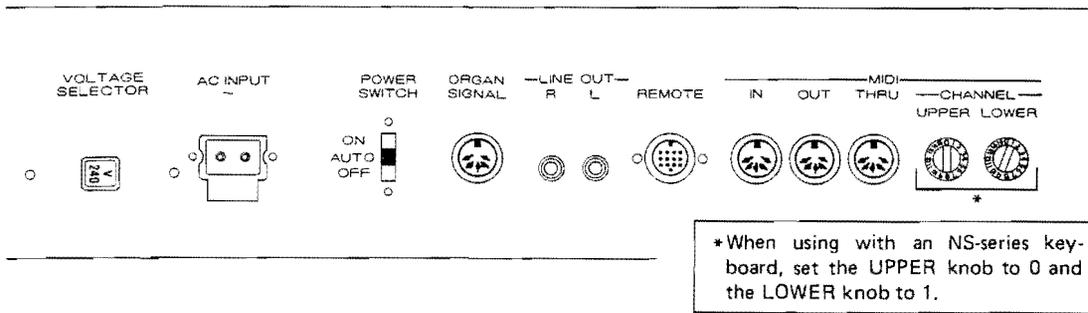
*When using with an NS-series keyboard, set the UPPER knob to 0 and the LOWER knob to 1.

● The connections differ with different keyboards.
(Do not connect the power cord until all other connections have been completed.)

Ⓐ Connection to MIDI-compatible Keyboard

Connect the MIDI IN terminal of the source unit to the MIDI OUT terminal of the keyboard using the MIDI connection cord provided.

MIDI IN

MIDI OUT

Ⓐ

Ⓑ Connection to JVC NS-50 System Keyboard

Connect the MIDI IN terminal of the source unit to the MIDI OUT terminal to the NS-50 using the MIDI connection cord provided.

MIDI IN

MIDI OUT

Ⓑ

Ⓒ Connection to JVC NS-70 System Keyboard

Connect the MIDI IN terminal of the source unit to the MIDI OUT terminal of the NS-70 and the MIDI OUT terminal of the source unit to the MIDI IN terminal of the NS-70 using the two MIDI cords provided.

MIDI OUT   MIDI IN

MIDI IN   MIDI OUT

Ⓒ

CN-160

Using stereo pin cords provided, connect to the LINE OUT terminals of the source unit to the LINE IN (or AUX IN) terminals of a stereo system. When connecting to a guitar amp. etc., connect to the LINE IN terminal using an impedance matching converter with a mono phone plug.

CN-132
Pin plug x 2

AP-100

Phone plug　Miniplug

Ⓐ

CN-160

Using stereo pin cords, connect the LINE OUT terminals of the source unit to the AUX IN terminals of the NS-50.

LINE OUT

LINE IN

Ⓑ

Using the MIDI cord provided, connect the ORGAN SIGNAL terminal of the source unit to the ORGAN SIGNAL terminal of the NS-70.

ORGAN SIGNAL

ORGAN SIGNAL

Ⓒ

Connect the remote control unit to the source unit

Using the 13-pin connector provided, connect the REMOTE terminal of the source unit to the REMOTE terminal of the remote control unit.

REMOTE

REMOTE
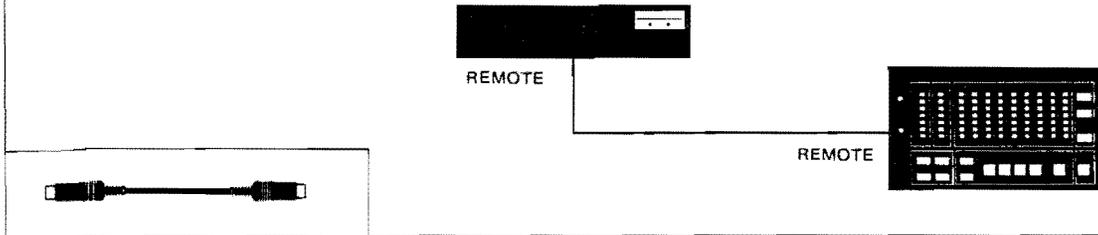
● Connection must be done using the cords provided.

MIDI THRU terminal

When using two or more Organ Expander units to operate the Upper, Lower or Pedal Keyboard separately with each independent registration, or when using with another MIDI-equipped instrument or extension unit, connect the MIDI THRU terminal of the source unit to the MIDI IN terminal of the other equipment.


Voltage selector

The voltage selector is located on the rear of the organ source unit. Before connecting the power cord to an AC outlet, make sure that the correct voltage (120 V, 220 V or 240 V) for your area has been selected.

240 V

AC Power Connection

● Connect the power cord to an AC outlet. (The STANDBY indicator on the front of the source unit will light.)

ON
AUTO
OFF

AC INPUT   POWER SWITCH

ON
AUTO
OFF
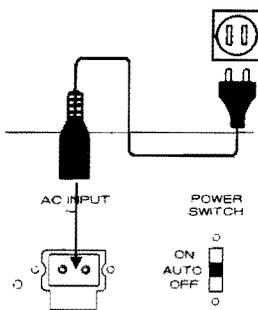
● Set the power switch to ON.

ON — Power is supplied continuously. (The POWER LED on the front panel of the source unit will light.)

ON
AUTO
OFF

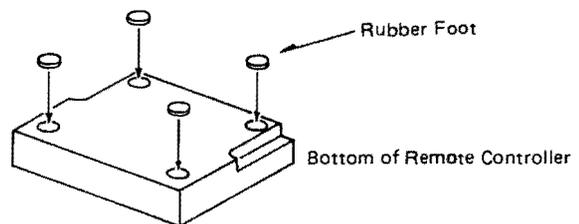**AUTO** — When the power of the NS-70 is switched on, power will automatically be supplied to the source unit.

ON
AUTO
OFF

OFF — Power will not be supplied.

CAUTION:

Rubber Foot

Bottom of Remote Controller

When the Remote Controller is used on either side of panel of NS-50/NS-70, make sure that the Rubber Feet enclosed are attached to the bottom of the unit as shown, to prevent slippage.

CONTROL PANEL OF REMOTE CONTROL UNIT

❶ PITCH
Controls the pitch. A4 = 440 Hz when set to the center click position.

❷ VOLUME
Adjusts the overall volume.

❸ SUSTAIN
Selects the length of the sustain from 0 to 6 and switches sustain ON and OFF. The higher the number, the longer the sustain time.

❹ TREMOLO SPEED
Varies the speed of the tremolo effect.

❺ MUTE
Press to mute sound from this unit (the indicator lights). Press again to restore the sound (the indicator goes off).

❻ UPPER/LOWER
When the unit is connected to the NS-50/70 and the UPPER switch is set to ON, the sound from the organ expander can be obtained by playing the upper manual of the keyboard. In the same way, when the LOWER switch is set to ON, the organ expander sound is obtained when playing the lower manual.

When the NS-T90 is used with an NS-series keyboard, set the MIDI CHANNEL UPPER switch knob on the rear panel of the Source Unit to 0 and the LOWER knob to 1.

———CHANNEL——
UPPER LOWER
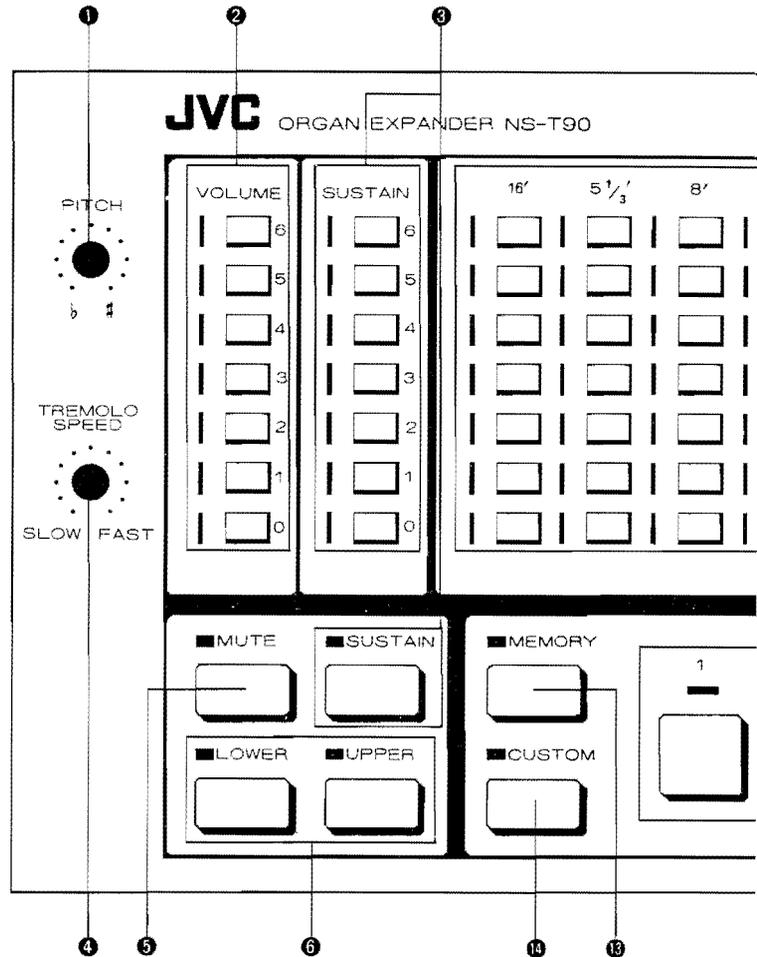
Selecting the sound

CANCEL ❿
When this switch is pressed, all digital drawbars are set to thier 0 positions.

MEMORY ❸
To store the sound effects (digital drawbars, volume, sustain, percussive, key click, tremolo and upper/lower) you have selected after pressing the CANCEL switch, press the MEMORY switch together with one of the REGISTRATION MEMORY switches ❿ 1 to 4.

CUSTOM ❿
To recall a stored effect, press the CUSTOM switch to ON (the LED lights) and press the REGISTRATION MEMORY switch in which the desired effect is stored.

—5—
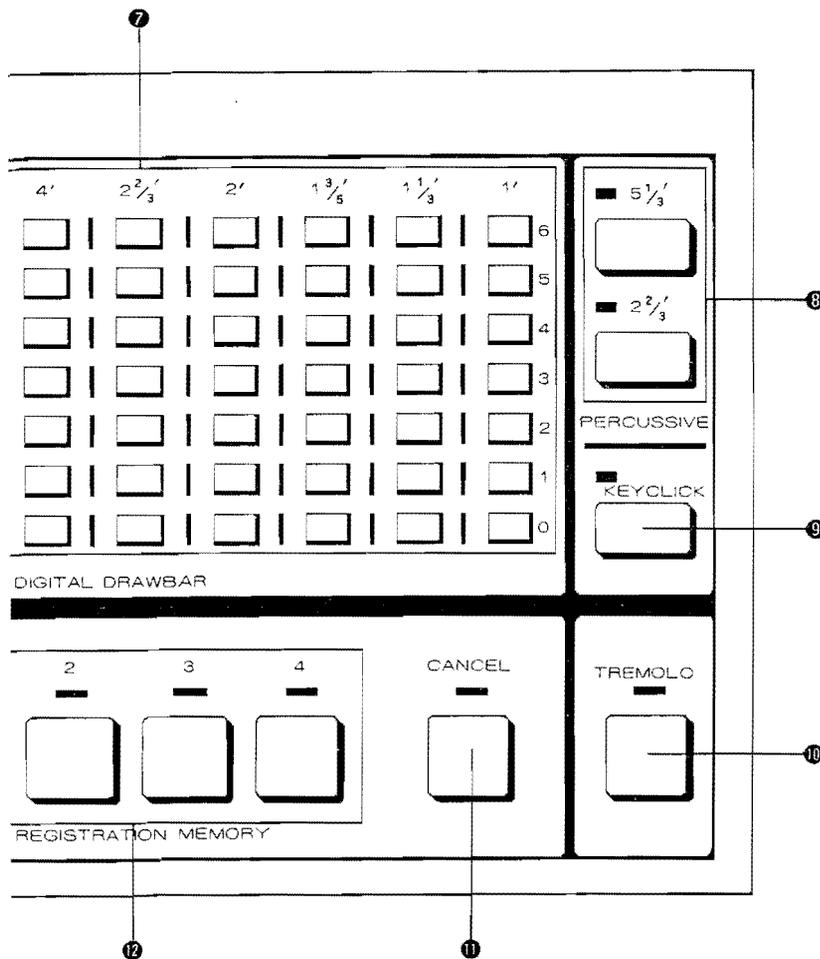
❼ Digital Drawbars
(See page 7 for operation and effect.)

❽ PERCUSSIVE
Adds attack to the voice and makes its rise time shorter. There are two attacks, 5-1/3' and 2-2/3'; these can be combined as required.

❾ KEY CLICK
A quick, muffled attack can be added to the voice to create the click sound which is unique to the jazz organ.

❿ TREMOLO
When this switch is pressed, the LED lights, and a tremolo or rotating speaker effect is heard. Pressing again turns the LED off, and a chorus effect is heard. Pressing again turns the LED off, and a chorus effect is heard.
The rate of each effect can be varied using the TREMOLO SPEED control.

⓫ CANCEL

⓬ REGISTRATION MEMORY switches

⓭ MEMORY

⓮ CUSTOM
(For switches ⓫ to ⓮ , see "Selecting the sound" below.)

When one of the REGISTRATION MEMORY switches is pressed with the CUSTOM LED off, a preset tone is recalled. The preset tones are as follows:

SWITCH / VOICE	Vol-ume	Sus-tain	16'	5⅓'	8'	4'	2⅔'	2'	1⅗'	1⅓'	1'	Sustain ON/OFF	Percussive 2-2/3'	Percussive 5-1/3'	Key Click
1 Full Organ	6	1	4	O	6	6	5	6	3	3	4	ON	OFF	OFF	OFF
2 Reed Organ	6	2	O	O	2	4	6	6	5	4	2	ON	OFF	OFF	OFF
3 Jazz Organ	6	O	6	6	6	4	O	O	O	O	O	ON	OFF	ON	ON
4 Extra Voice	6	6	O	O	6	O	O	O	5	3	4	ON	OFF	OFF	OFF

● The settings of Upper/Lower ❻ switches are not stored in the preset voices above. When using one of these voices, set the UPPER and LOWER switches as desired.

● The voice setting data and registration data of the NS-T90 can be stored in the Custom Combination Memory of the NS-70 or into the optional Digital Memory Pack (NS-M10).

DRAWBARS AND SOUND CREATION

Drawbars

These are used to create the basic sounds of an organ. The numbers represent the lengths of pipes in a pipe organ; the longer the pipe, the lower the pitch and vice versa. The NS-T90 has 9 drawbars and the volume of each can be adjusted between 1 and 6. Organ tones can be reproduced using the drawbars and volume control.

This 9-drawbar system with pipe lengths from 1' to 16' is called a "full-coupler" system which is the most comprehensive available with an electronic organ.

Relation between pipe length and pitch

The basic drawbar is 8' which is used as the center of the sound spectrum; other notes are added to this to modify the voice.

| Drawbars | 16' | 5-1/3' | 8' | 4' | 2-2/3' | 2' | 1-3/5' | 1-1/3' | 1' |
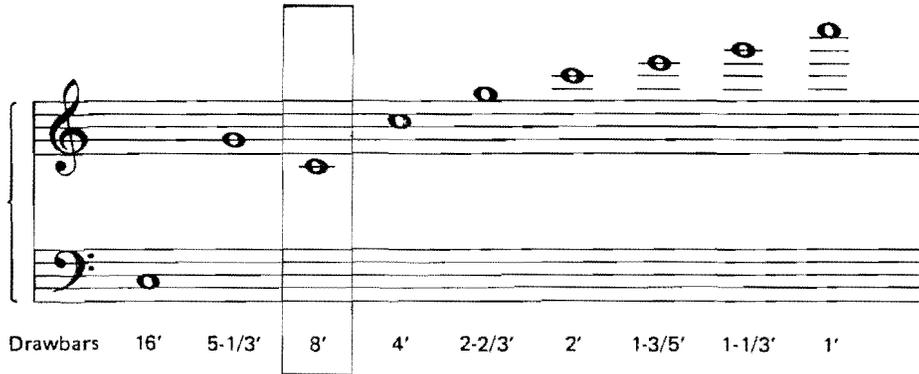
Four basic voices of full-coupler system

Flute, reed/brass, diapason and strings are the four basic organ voices which can be produced by a combination of drawbars, or, of the basic frequency and its harmonics. Each voice uses a setting as shown below.


```
O  O  6  3  O  O  O  O  O
```
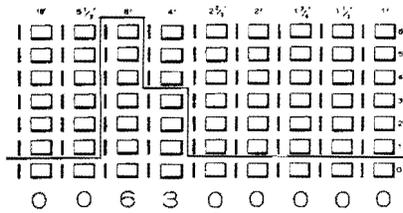
1. Flute

Mainly uses the 8' and 4' drawbars; occasionally some 2-2/3' is used.


```
O  O  3  5  6  5  4  3  2
```
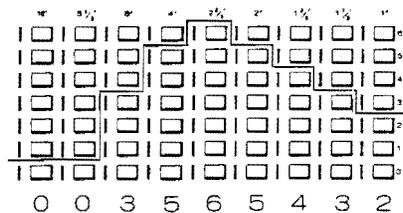
2. Reed/brass

Generally uses the center drawbars with a little more 2-2/3' than 8'.


```
O  O  6  5  4  3  2  1  1
```
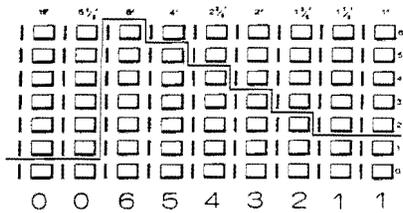
3. Diapason

Includes strong 8' and 4' components with decreased harmonics.


```
O  O  3  4  4  4  4  4  3
```
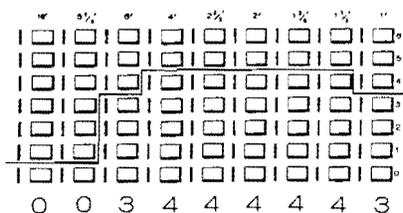
4. Strings

8' and 4' notes are relatively weak and higher harmonics relatively strong.

Drawbar Setting (Registration) Chart

Flute

Voice		16'	5⅓'	8'	4'	2⅔'	2'	1⅗'	1⅓'	1'	Remarks
Organ	1	6	O	3	O	O	O	O	O	O	Bass Flute A
〃	2	6	O	4	1	O	O	O	O	O	〃 B
〃	3	6	1	3	O	O	1	O	O	O	〃 C
〃	4	O	O	6	O	O	2	O	O	O	Flute A
〃	5	O	O	6	3	O	1	O	O	O	〃 B
〃	6	O	O	6	2	O	O	O	O	O	〃 C
〃	7	O	O	O	6	O	3	O	O	O	Soprano Flute A
〃	8	O	O	O	6	O	3	O	O	1	〃 B
〃	9	O	O	O	6	O	2	O	1	O	〃 C
〃	10	O	O	O	O	O	6	O	O	3	Piccolo

Reed/Brass

Voice		16'	5⅓'	8'	4'	2⅔'	2'	1⅗'	1⅓'	1'	Remarks
Organ	1	O	6	6	5	5	3	O	O	O	Trumpet A
〃	2	2	6	5	4	3	2	O	O	O	Flugel horn
〃	3	3	6	4	3	3	2	O	O	O	Tenor Sax
〃	4	O	O	3	O	6	O	O	O	O	Clarinet A
〃	5	O	O	3	O	6	O	O	1	O	〃 B
〃	6	O	O	6	O	6	O	2	3	O	Block Flute
〃	7	O	2	3	4	5	4	3	2	1	Trumpet B
〃	8	2	3	4	5	5	5	4	3	O	〃 C
〃	9	6	6	O	2	2	O	O	O	O	Bassoon
〃	10	6	6	3	O	O	O	O	O	O	Baritone Sax

Strings

Voice		16'	5⅓'	8'	4'	2⅔'	2'	1⅗'	1⅓'	1'	Remarks
Organ	1	O	O	4	4	3	4	2	3	4	Strings A
〃	2	O	O	5	6	2	6	2	2	4	〃 B
〃	3	O	O	3	5	3	5	3	3	5	〃 C
〃	4	3	O	5	6	3	4	4	2	5	Bright Strings A
〃	5	3	O	4	5	2	4	4	2	5	〃 B
〃	6	3	1	6	6	4	6	6	6	6	〃 C
〃	7	6	O	6	6	O	O	O	O	O	Cello A
〃	8	6	O	6	6	O	4	O	O	2	〃 B
〃	9	6	2	4	2	1	O	O	O	O	Contra Bass A
〃	10	6	3	6	3	O	O	O	O	O	〃 B

Diapason

Voice		16'	5⅓'	8'	4'	2⅔'	2'	1⅗'	1⅓'	1'	Remarks
Organ	1	O	O	6	6	5	5	4	4	3	8' Diapason A
〃	2	O	O	6	6	4	4	3	3	2	〃 B
〃	3	O	O	6	6	3	3	2	1	O	〃 C
〃	4	6	4	5	3	2	1	O	O	O	16' Diapason A
〃	5	6	5	6	5	4	4	3	3	2	〃 B
〃	6	6	4	6	4	2	2	1	1	O	〃 C
〃	7	O	O	O	6	5	4	3	2	1	Soprano Diapason A
〃	8	O	O	O	6	6	5	3	2	1	〃 B
〃	9	O	O	O	6	6	3	3	1	1	〃 C
〃	10	O	O	5	4	3	2	O	O	O	Soft Diapason

MIDI (MUSICAL INSTRUMENT DIGITAL INTERFACE)

MIDI is an international standard for the transmission of digital signals between electronic musical instruments and between instruments and computers.

The NS-T90 is MIDI-compatible and accepts sound source data from a keyboard or synthesizer equipped with a MIDI interface, stores and reads out data from the memory of an NS-series keyboard or computer, or works in combination with them.

Fig. 1 shows examples of how bytes (each consisting of 8 bits) of information are used in the MIDI system in groups consisting of status bytes, the first bit of which is 1 and data bytes, the first bit of which is 0.
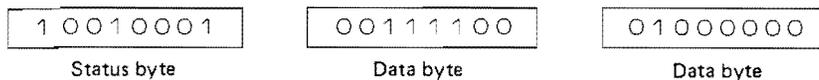
1 0 0 1 0 0 0 1	0 0 1 1 1 1 0 0	0 1 0 0 0 0 0 0
Status byte	Data byte	Data byte

Fig. 1 Examples of MIDI data

Since it is difficult to remember these binary representations which consist of 0s and 1s, bytes are normally divided into two hexadecimal (base 16) numbers as shown in Fig. 2. To distinguish hexadecimal numbers from decimal numbers, the letter "H" is added following the number. The MIDI data represented by the examples in Fig. 1 (above) are 91H, 3CH, and 4CH respectively.

The status byte representing the function is important in the MIDI system. If the status byte has a value from 80H to EFH, it is a "channel message" which independently controls the MIDI channel (1 to 16). The first 4 bits represent the function and the last 4 bits, the channel.

Binary	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
Hexadecimal	0 H	1 H	2 H	3 H	4 H	5 H	6 H	7 H	8 H	9 H	A H	B H	C H	D H	E H	F H

Fig. 2 Binary-Hexadecimal Conversion Table

Channel messages used in the NS-T90 are as follows:

```
X  =  Channel number* (channels 1 to 16 are represented by 0H — FH)
kk =  Key number (Middle C4 — 3CH)
vv =  Key touch (1 — 7FH, increases according to value)
```

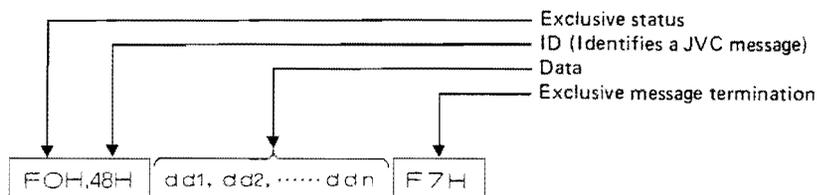|			
8XH,	kk,	vv	Note OFF
9XH,	kk,	00	Note OFF
9XH,	kk,	vv	Note ON
BXH,	40H,	7FH	Sustain ON
BXH,	40H,	00H	Sustain OFF
BXH,	5CH,	7FH	Tremolo ON (Chorus OFF)
BXH,	5CH,	00H	Tremolo OFF (Chorus ON)
BXH,	5DH,	7FH	Chorus ON (Tremolo OFF)

*When the NS-T90 is used with an NS-series keyboard, set the MIDI CHANNEL UPPER switch on the rear panel of the organ source unit to 0, and set the LOWER switch to 1.

—CHANNEL—
UPPER LOWER
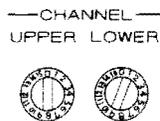
Note:
When changing the setting of MIDI channels on the rear panel of the souuce unit with the power on, be sure to re-set the UPPER/LOWER switches on the remote control unit.

Apart from the above, the contents of the registration memory produced by operating the NS-T90, or switch settings stored using the combination memory switches of the NS-50/70, are received and transmitted using exclusive messages. These are as follows.

Exclusive status
ID (Identifies a JVC message)
Data
Exclusive message termination

F0H,48H	dd1, dd2, ······ddn	F7H

The data has the following functions:
1) To request the contents of the registration memory.
2) To transmit the contents of the registration memory to an external component.
3) To receive/transmit select switch data of the registration memory corresponding to the switch setting of the NS-70.

TROUBLESHOOTING

- The NS-T90 begins operation approx. one second after the POWER switch is turned on.
- When the connection cables are plugged in or disconnected during operation, the NS-T90 may malfunction. If this happens, turn the power off and reconnect the cables.
- When the MIDI channel selectors are turned during operation, the NS-T90 may malfunction. To change the MIDI channel, first turn the UPPER and LOWER switches off.
- When equipment not conforming to MIDI standards is connected to the NS-T90, it may malfunction. Do not connect such equipment.
- The UPPER (or LOWER) LED of the remote control unit may flicker, indicating MIDI data has been falsely received/transmitted. When this happens, press its switch so that the LED goes off, and repeat the operation.

LEDs on the remote control unit light abnormally.
- When the remote contorl unit is moved during operation, the LEDs may seem to flicker. This is because LEDs flash repeatedly at high speeds, and is not a malfunction.

The stored settings cannot be obtained.
- When the NS-T90's power is not turned on for over 2 weeks, the data stored in the Custom Memory will be lost. For storage, use the Digital Memory Pack NS-M10 (optional) on the NS-70.

SPECIFICATIONS

Number of corresponding keys:	61 ($C_2 - C_7$, 5 octaves) (Notes in this range are converted to produce the notes of the lowest and highest octaves.)
Range:	$C_1 - C_9$, 8 octaves (To produce 1-3/5', 1-1/3' and 1' notes, notes in this range are converted to the highest octave.)
Remote Control Unit	
Degital Drawbars	9: 16', 5-1/3', 8', 4', 2-2/3', 2', 1-3/5', 1-1/3', 1' Digitally controlled 0 to 6 (7-step, with LEDs)
Registration Memody	Preset: 4 Custom: 4 Memory, Cancel
Effect	Sustain ON/OFF, Sustain length (digital, 7-step) Percussive Effect (percussive: 5-1/3', 2-2/3', Key Click) Termolo/Chorus Mute Upper, Lower (channel selector) Pitch Control, Tremolo Speed Master Volume (digital, 7-step)
Dimensions	250(W) x 27(H) x 145(D) mm
Weight	0.8 kg

Source Unit (Main Unit)	
Terminals	MIDI IN, MIDI OUT, MIDI THRU Remote, Line Out (stereo), Organ Signal
Others	MIDI channel selectors (Upper, Lower) Power switch (ON, AUTO, OFF) Stand By, Power On, Voltage Selector
Power Supply	AC 120/220/240 V, 50/60 Hz
Power consumption	20 W
Dimensions	377(W) x 94(H) x 307(D) mm
Weight	5.3 kg
Accessories	MIDI cord x 3, Stereo Pin cord x 1, 13-pin cord x 1, AC power cord x 1, Rubber foot x 4

Design and specification subject to change without notice.