

**INSTRUCTION  
MANUAL  
FV-901DM**



**YAESU MUSEN CO., LTD.**

TOKYO JAPAN

# SYNTHEZIZED SCANNING VFO

## FV-901DM



### GENERAL DESCRIPTION

The FV-901DM external VFO for the FT-901 series of transceivers provides a new dimension in operating versatility. Featuring PLL synthesis in 100 Hz steps, the FV-901DM may be tuned by means of the main dial, or via manual or automatic scanning controls. As well, the operator may select from as many as 40 positions of frequency memory, programmed by a front panel pushbutton. A memory backup feature allows the memorized frequencies to be held even though the VFO and transceiver are turned off.

Frequency control may be exercised in a variety of combinations, using the FT-901DM main dial, the FT-901DM memory circuitry, the FV-901DM main dial, and the FV-901DM memory bank. Any of these components may be selected to provide control of the transmit, receive, or transceive frequency. A clarifier control on the front panel of the FV-901DM allows precise tuning between the 100 Hz synthesizer steps, or to follow a drifting signal stored in memory.

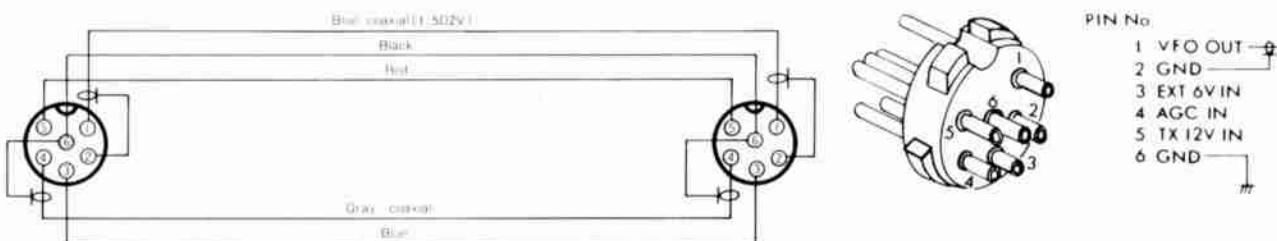
The following pages will describe in detail the operation of the FV-901DM synthesized scanning VFO. As this apparatus is significantly advanced over other VFO's on the market, the operator is urged to read this manual thoroughly before attempting operation.

## SPECIFICATIONS

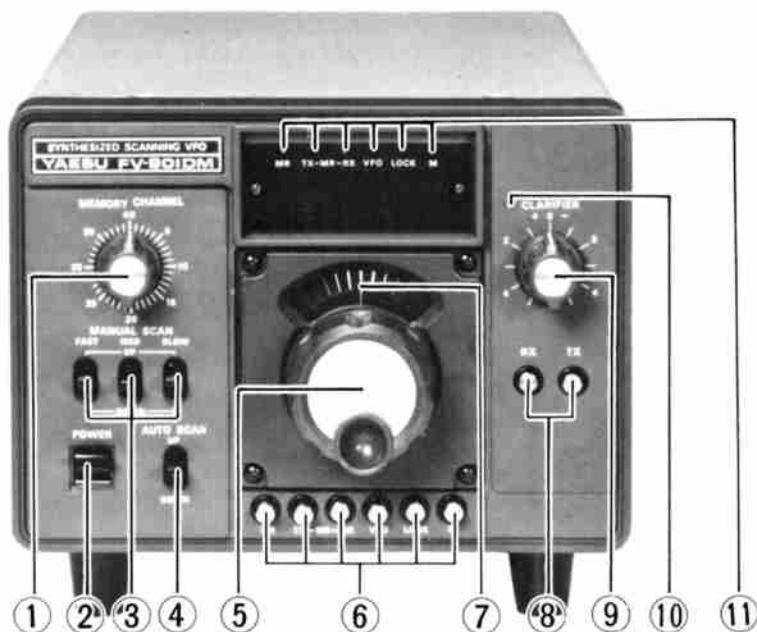
Frequency range	: 5.55–4.95 MHz
Output level	: 150 mV RMS into 50 ohms
Stability (+25°C)	: $\pm 300$ Hz in first hour after 1 minute warm-up $\pm 50$ Hz after 1 hour $\pm 1$ kHz over temperature range $-10^{\circ}\text{C} - +60^{\circ}\text{C}$
Memory channels	: 40
Clarifier	: $\pm 2.5$ kHz offset of transmit, receive, or transceive frequencies, on dial or memory mode
Power requirements	: 100/110/117/200/220/234 volts AC, 50/60 Hz 13.5 volts DC, negative ground (use only optional DC cable)
Power consumption	: AC – 13 VA (5.4 VA memory backup mode) DC – 0.53 amps (0.12 amps memory backup mode)
Case size	: 210(W) x 154(H) x 320(D) mm
Weight	: Approx. 4 kg.

## ACCESSORIES

- 1) AC Power Cord 1
- 2) Connection Cable 1
- 3) Ground Cable 1
- 4) Fuse (0.5 A) 1



## CONTROLS AND SWITCHES



### (1) MEMORY CHANNEL

The MEMORY CHANNEL selector switch chooses up to 40 frequencies stored by the M button. These frequencies can be used for control of the transmit, receive, or transceive frequency, as described in the "Operation" section.

### (2) POWER

This is the main power switch for the VFO.

### (3) MANUAL SCAN switches

These switches select the scanning rate for the PLL scanner. When activated, they will select slow, medium, or fast scanning rate, depending on the desires of the operator.

### (4) AUTO SCAN

The automatic scanner will, when activated, scan at the medium speed until a signal is received, then stop. This feature is very useful for checking a band for activity.

### (5) TUNING DIAL

This is the main manual tuning dial for the FV-901DM. When control is said to be by the "FV-901DM VFO," it should be understood that control is by the FV-901DM main tuning dial.

### (6) SELECT switches

These switches determine the operating mode of the FV-901DM.

MR is used for recall of a memorized frequency for control of the transceive frequency.

TX MR is used for recall of a memorized frequency for control of the transmit frequency, with receive frequency control being on the main tuning dial.

RX MR is used for recall of a memorized frequency for control of the receive frequency, with transmit frequency control being on the main tuning dial.

VFO selects operation via the main tuning dial or the scanning functions for control of the transceive frequency.

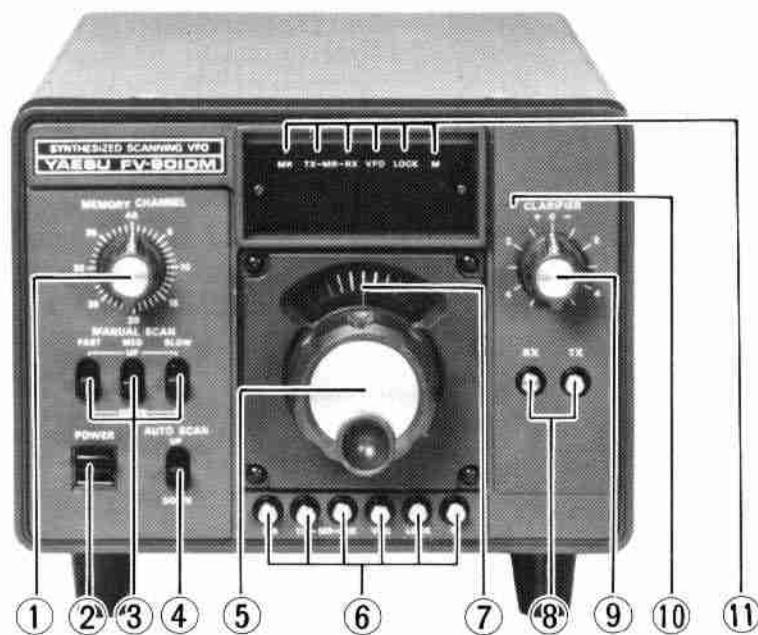
LOCK is used in conjunction with the main tuning dial. With the VFO button pressed, pressing the LOCK button will cause the VFO frequency to be locked, regardless of the setting of the dial. A second press of the LOCK button returns control to the main tuning dial.

M is a momentary switch for inserting a frequency into one of the 40 memory positions.

### (7) ANALOG READOUT

The main tuning dial uses an analog frequency display. The major calibration markings represent

## CONTROLS AND SWITCHES



### (1) MEMORY CHANNEL

The MEMORY CHANNEL selector switch chooses up to 40 frequencies stored by the M button. These frequencies can be used for control of the transmit, receive, or transceive frequency, as described in the "Operation" section.

### (2) POWER

This is the main power switch for the VFO.

### (3) MANUAL SCAN switches

These switches select the scanning rate for the PLL scanner. When activated, they will select slow, medium, or fast scanning rate, depending on the desires of the operator.

### (4) AUTO SCAN

The automatic scanner will, when activated, scan at the medium speed until a signal is received, then stop. This feature is very useful for checking a band for activity.

### (5) TUNING DIAL

This is the main manual tuning dial for the FV-901DM. When control is said to be by the "FV-901DM VFO," it should be understood that control is by the FV-901DM main tuning dial.

### (6) SELECT switches

These switches determine the operating mode of the FV-901DM.

MR is used for recall of a memorized frequency for control of the transceive frequency.

TX MR is used for recall of a memorized frequency for control of the transmit frequency, with receive frequency control being on the main tuning dial.

RX MR is used for recall of a memorized frequency for control of the receive frequency, with transmit frequency control being on the main tuning dial.

VFO selects operation via the main tuning dial or the scanning functions for control of the transceive frequency.

LOCK is used in conjunction with the main tuning dial. With the VFO button pressed, pressing the LOCK button will cause the VFO frequency to be locked, regardless of the setting of the dial. A second press of the LOCK button returns control to the main tuning dial.

M is a momentary switch for inserting a frequency into one of the 40 memory positions.

### (7) ANALOG READOUT

The main tuning dial uses an analog frequency display. The major calibration markings represent

## INSTALLATION

The FV-901DM may be situated almost anywhere in the operating room, depending on the operator's preferences. However, excessively warm locations, such as on top of an amplifier, should be avoided, if only to allow proper air circulation for the other equipment.

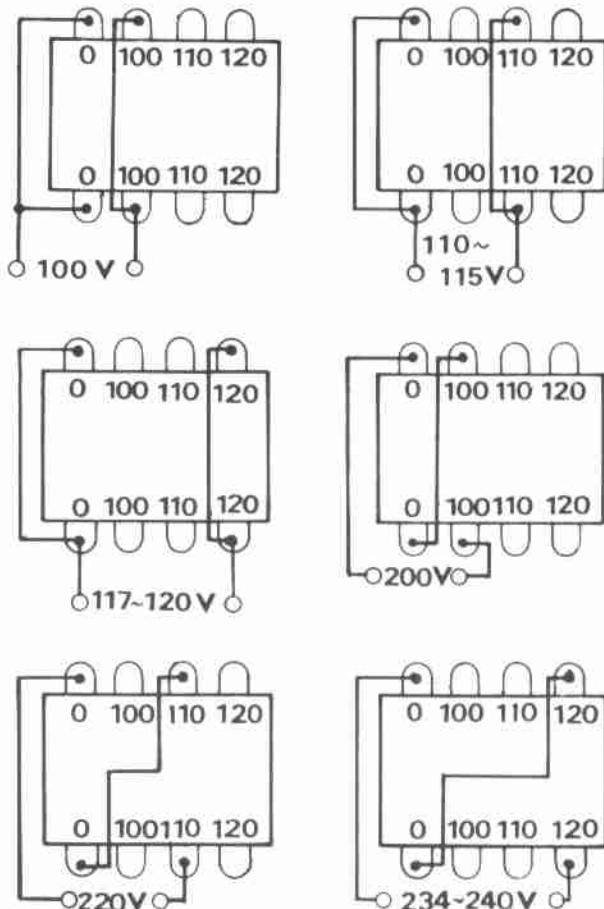
Connect the ground cable supplied with the FV-901DM to the GND terminals of the FV-901DM and the FT-901. Connect the interconnection cable from the EXT VFO jack on the FT-901 to the FV-901DM OUTPUT connector.

BEFORE CONNECTING THE POWER CORD TO THE REAR APRON POWER CONNECTOR, MAKE SURE THAT THE VOLTAGE SPECIFICATION MARKED ON THE REAR APRON MATCHES YOUR LOCAL SUPPLY VOLTAGE. REFER TO THE DRAWING FOR THE APPROPRIATE TRANSFORMER CONNECTIONS WHEN CHANGING SUPPLY VOLTAGES. WARRANTY DOES NOT COVER DAMAGE CAUSED BY IMPROPER APPLICATION OF SUPPLY VOLTAGE.

Connect the power cable to the rear apron POWER connector. Place the FV-901DM POWER switch in the ON position, and the VFO is now ready for operation.

### Note:

When using the optional DC cable, please note that the 2 amp fuse is located in the cable itself. Do not replace the AC fuse on the rear apron of the FV-901DM with a 2 amp fuse.



Transformer Primary Wiring

## OPERATION

FOR THE PURPOSES OF THIS AND FOLLOWING SECTIONS, THE READER IS ADVISED THAT THE TERM "FT-901" SHALL APPLY TO ANY AND ALL VERSIONS OF THE FT-901 SERIES: FT-901DM/DE/SD/D. THE MEMORY UNIT IS BUILT INTO THE FT-901DM, AND IS OPTIONAL ON THE OTHER MODELS. THE READER IS REFERRED TO THE FT-901 SERIES INSTRUCTION MANUAL FOR FURTHER CLARIFICATION OF THE DIFFERENCES BETWEEN THESE MODELS. SIMILARLY, THE FV-901DM SHALL HEREAFTER BE REFERRED TO AS "FV-901." THESE TERMS ARE ADOPTED IN THE INTEREST OF BREVITY.

The operation of the FV-901 in conjunction with the FT-901 adds several levels of operating flexibility never before possible with a transceiver/VFO combination. This added flexibility, however, contributes somewhat to the complexity of the operating procedure. Until familiarity is gained with the various operating modes possible with the FV-901, the operator is urged to refer to this manual for operating instructions. A quick reference card is furnished for your convenience.

### SCANNER OPERATION

The three MANUAL SCAN switches allow tuning of the FV-901 at one of three rates. In the SLOW mode, the tuning rate is 1 kHz per second. In the MED (medium) mode, the rate is 17 kHz per second, and in the FAST mode, the rate is 100 kHz per second.

With the FV-901 VFO or TX MR switch pressed, RX control is normally via the main tuning dial. Holding the manual scanning switches UP will cause the frequency to scan upwards until the switch is returned to the horizontal position. Likewise, holding the switches DOWN will cause the scanner to move the frequency lower.

The AUTO SCAN switch, when activated, will scan in the selected direction until a signal is heard, at which time it will stop and lock on that frequency. Another press of the AUTO SCAN button will cause the VFO to scan again, until

another signal is heard. The scan rate in the AUTO SCAN mode is the same as in the MED mode, that is, 17 kHz per second.

### CLARIFIER OPERATION

The clarifier in the FV-901 serves two useful purposes. First, it allows very fine tuning between the 100 Hz synthesizer steps. Secondly, it allows tracking of a memorized frequency, should the signal being received begin to drift.

To activate the receive clarifier, push the RX button. To activate the TX clarifier, push the TX button. For transceive clarifier operation, push both clarifier buttons.

When either of the clarifier buttons is pushed, the small light emitting diode will become illuminated to indicate that the clarifier is in operation.

### FV-901 OPERATION WITH THE FT-901

For the sake of clarity and brevity, the FV-901 SELECT buttons to be pressed will be circled, and the FT-901 SELECT buttons to be pushed will not be circled. Thus, when a sentence reads, "Press EXT, MR, and **TX MR**," the reader should press EXT and MR on the FT-901, and TX MR on the FV-901.

A useful method of confirming the transmit frequency while learning to use the FV-901 is as follows: place the FT-901 MIC GAIN and CARR controls fully counter-clockwise, and place the HEATER switch in the OFF position. Then, by placing the VOX GAIN control in the MOX position (or otherwise activating the PTT circuitry), the transmit frequency may be observed for reference. This is particularly valuable when observing operation in the split mode (TX and RX frequency control separate).

## I. REVIEW OF FT-901 MEMORY OPERATION

In order to explain the operation of the FV-901, a review of the operating procedure of the FT-901 memory feature is necessary.

Depressing the M button allows storage of a frequency in memory.

After storage of a frequency in memory, the pressing of the MR button will recall this frequency for control of the FT-901 transceive frequency.

In like fashion, pushing the TX MR button will recall the memorized frequency for control of the transmit frequency, with receive control being on the main dial.

Pushing the RX MR button will recall the memorized frequency for control of the receive frequency, with transmit control being on the main tuning dial.

Pushing the EXT button transfers frequency control to the FV-901 on transceive, receive, or transmit when the MR, RX MR, or TX MR buttons, respectively, are also pushed.

## II. TRANSCEIVE OPERATION USING THE FV-901 (Figs. 1 and 2)

Refer to the insert, "FV-901 Operation Decision Tree." Taking the "Transceive" branch, we can see that transceive operation may be controlled from either the FT-901 or the FV-901. From the previous section, in which we reviewed FT-901 operation, we further know that FT-901 transceive control may be via either the FT-901 VFO or memory. The appropriate positions of the SELECT switches are shown at the bottom of the decision tree.

In order to transfer control from the FT-901 to the FV-901, the EXT button is pressed. Then, the FT-901 SELECT switches dealing with memory, i.e. MR, TX MR, and RX MR, shift control from the FT-901 to the FV-901 on transceive, transmit, and receive, respectively. Pressing EXT and VFO does not transfer control from the FT-901 to the FV-901.

To transceive on the FV-901, press EXT and MR; control is now by the FV-901. Now the decision must be made as to whether the FV-901 VFO or memory bank will control the frequency. To start, press **VFO**. Now the main tuning dial on the FV-901 is controlling the transceive frequency. As well, the scanners are operable; refer to page 6 for instructions on scanner operation.

In order to store a frequency in memory, set the MEMORY CHANNEL switch to position 1, tune the dial to the desired frequency, and press **M**. To recall this frequency for transceive control, press **MR**. Other frequencies may be memorized by pushing **VFO**, tuning in the desired station, placing the MEMORY CHANNEL selector in positions 2-20, pressing **M**, and pressing **MR** for recall.

Before proceeding to the next case, the logical sequence should be reviewed. Having made the decision to operate transceive, we decided to operate with the FV-901 in control. Having decided that the FV-901 was to control the frequency, we decided between the VFO and the memory bank. The appropriate positions of the SELECT switches are shown at the bottom of the decision tree.

## III. SPLIT OPERATION USING THE FV-901 (Figs. 1 and 2)

Split operation, using the FT-901 VFO, FT-901 memory, or the FV-901 VFO or memory, makes a number of interesting combinations possible. Practical applications of split operation will be offered at the end of this discussion.

Split operation adds one more level of decision-making to the logical process, but the procedure is identical to that of the previous section. Fundamentally, the decision is made to receive on the FT-901 or the FV-901, and from there control is transferred according to the requirements of the situation.

Following the decision tree, let us decide to operate split, while receiving on the FV-901. Push EXT. Further, let us decide that we will listen on the FV-901 VFO, while transmitting on the FT-901 VFO. Push RX MR; this will transfer frequency control from the FT-901 to

the FV-901 on receive, with transmit control remaining with the FT-901. Now we must select the operating mode of the FV-901. Press **VFO** to provide VFO control of the FV-901. However, the **TX MR** button may also be pressed. The reason is as follows: the **TX MR** leaves the FV-901 in the VFO mode on receive, and transfers control to the memory bank on transmit. But we already decided that transmit control was to be by the FT-901 when we pressed RX MR. Therefore, the selection between **VFO** and **TX MR** is, in this case, trivial.

Another example follows: Let us decide to receive on the FT-901 VFO, and transmit on the FV-901 memory bank. Following the decision tree, press EXT and TX MR; this transfers frequency control to the FV-901 on transmit (activate the MOX control to confirm this). Now press **MR** and **TX MR**. Remember that control has been relinquished by the FT-901 only on transmit and thus the condition of the FV-901 on receive is irrelevant. As a result, we can press **MR** or **TX MR** with identical results.

#### IV. PRACTICAL OPERATING EXAMPLES

(a) You are operating on 40 meter phone, listening for DX between 7050 and 7100 kHz, while transmitting above 7150 kHz (operators outside the USA should reverse the preceding). Station DX1DX is heard on 7095 kHz, listening at 7205 kHz.

Proceed as follows:

If you are tuning on the FT-901 VFO, momentarily press EXT and MR, and set the FV-901 main dial to 7205 kHz. Next, push **VFO** or **RX MR**. Return the FT-901 to receive frequency control by pressing TX MR, leaving the EXT button depressed.

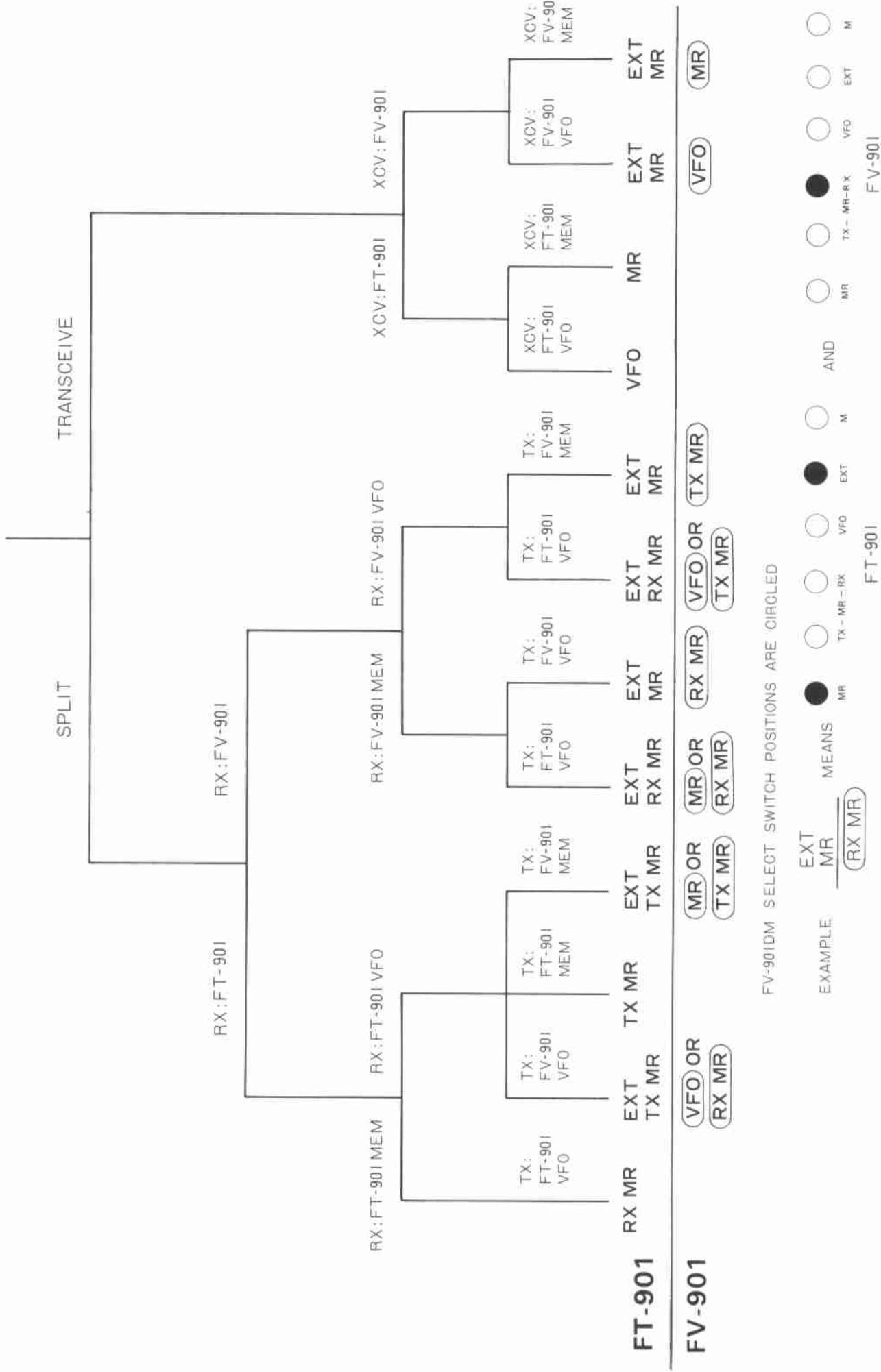
If you were tuning initially on the FV-901 VFO, store DX1DX's frequency in memory position 1 by pressing **M**. Now tune the FV-901 main dial to 7205 kHz (the FV-901 SELECT switch **VFO** should still be pressed), and then press **RX MR**. Receive control will be on the memory (7095 kHz) and transmit control will be on the dial (7205 kHz). To listen to the pile-up calling DX1DX on

7205 kHz, press **VFO**. Should DX1DX begin to drift in frequency, the RX clarifier may be activated to follow the unstable signal.

(b) You are net control station for a net meeting on 14315 kHz. Stations call into the net, then are moved off frequency. Prior to the start of the net, store typical QSY frequencies (14280, 14285, 14290, 14295, etc.) in the FV-901 memory bank. The net control station may then, quickly, determine whether or not a particular frequency is clear by pressing **RX MR** and setting the MEMORY CHANNEL switch appropriately. In this way, 41 frequencies could, potentially, be examined by one station (40 memory frequencies plus the VFO frequency).

(c) You are operating in a DX contest, where a number of desired stations are on the band at the same time. If some of them do not respond immediately to your call, or if they are not acknowledging your call area, store them in the FV-901 memory bank by pushing EXT and MR or RX MR for receive control on the FV-901, **VFO** for FV-901 main dial tuning, and **M** for frequency storage. Then, by pressing **MR** and setting the MEMORY CHANNEL switch appropriately, the various stations may be checked quickly. Total exposure on the band is, thus, increased. Note that, even though a band change is made in the meantime, the memorized frequencies remain valid upon return to the band on which they were stored!

FV-901 OPERATION DECISION TREE



## FT-901/FV-901 SELECT SWITCH POSITIONS FOR FREQUENCY CONTROL

FT-901						FV-901						FREQUENCY CONTROL		
MR	TX	RX	VFO	EXT	M	MR	TX	RX	VFO	LOCK	M	RX	TX	XCV
○	○	○	●	○	○	○	○	○	○	○	○			FT-901 VFO
●	○	○	○	○	○	○	○	○	○	○	○			FT-901 MEM
○	●	○	○	○	○	○	○	○	○	○	○	FT-901 VFO	FT-901 MEM	
○	○	●	○	○	○	○	○	○	○	○	○	FT-901 MEM	FT-901 VFO	
●	○	○	○	●	○	○	○	○	●	○	○			FV-901 VFO
●	○	○	○	●	○	●	○	○	○	○	○			FV-901 MEM
●	○	○	○	●	○	○	●	○	○	○	○	FV-901 VFO	FV-901 MEM	
●	○	○	○	●	○	○	○	●	○	○	○	FV-901 MEM	FV-901 VFO	
○	●	○	○	●	○	○	○	○	●	○	○	FT-901 VFO	FT-901 VFO	
○	●	○	○	●	○	○	○	●	○	○	○	FT-901 VFO	FT-901 MEM	
○	●	○	○	●	○	○	●	○	○	○	○	FT-901 VFO	FT-901 VFO	
○	●	○	○	●	○	○	●	○	○	○	○	FT-901 VFO	FT-901 VFO	
○	●	○	○	●	○	○	●	○	○	○	○	FV-901 VFO	FV-901 MEM	
○	●	○	○	●	○	○	●	○	○	○	○	FV-901 MEM	FV-901 VFO	
○	●	○	○	●	○	○	●	○	○	○	○	FT-901 VFO	FT-901 VFO	
○	●	○	○	●	○	○	●	○	○	○	○	FV-901 MEM	FV-901 VFO	
○	●	○	○	●	○	○	●	○	○	○	○	FV-901 VFO	FT-901 VFO	
○	●	○	○	●	○	○	●	○	○	○	○	FV-901 VFO	FT-901 VFO	
○	●	○	○	●	○	○	●	○	○	○	○	FV-901 MEM	FT-901 VFO	

