

WJ-8716/ WJ-8718 MCM and MCM-2 Manual Control Modules Differences *Some useful details about remote controlling the receivers*

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Many years ago, when I first read the Terry O's document concerning the WJ-8718 Option List [1] I was intrigued by his statement about the MCM-2 **Manual Control Module** ("*differences from MCM unknown*"), Figure 1, and I decided to further investigate in order to solve the mystery.

WJ-8716 and WJ-8718 Receiver Option

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Main web page <http://watkins-johnson.terryo.org>

232	RS-232 I/O remote control
232M	RS-232 I/O for MFP option
488-2	IEEE-488 I/O remote control
488M	IEEE-488 I/O for MFP option
B10	10 Hz BFO tuning
COM	command input module
COR	carrier operated relay
DDC	dual diversity combiner
EM	extended memory (100 channels)
FSK	frequency shift keying
GRN	green LED display
ISB	independent sideband
LLA	low level audio output
MCM	manual control module (standard front panel)
MCM-2	manual control module (difference from MCM unknown)
MFP	microprocessor front panel (extensive - radically alters appearance)
MFS	mainframe spares module
MON	status monitor module
NAV	Navy option (alters front panel)
PRE	preselector
RED	red LED display
SMO	spectrum monitor output
TK	tool kit
1HZ	one hertz tuning rate

Note: The differences between an 8716 and 8718 are minor. The 8716 is rumored to be the Tempest version (EMI hardened) but examination of several units has revealed only minor differences in shielding and filtering on four rear panel connectors.

Figure 1: The original document by Terry O'.

After some time and several observations on the documents in my possession and on various units I had at hand, I succeeded in understanding the differences between the MCM and the MCM-2 modules; then I wrote the results of my investigation in some notes which I later forgot and recently found in a drawer.

As my notes could be useful to some people, at last I resolved to write something on this topic..

First of all it must be observed that the stock WJ-8718s and WJ-8718As (including their WJ-8716 counterparts) were factory-provided with the A6A1 *Manual Tuning Up/Down Counter* card Type 791575 installed into the A6 slots XA1 (i.e. X7 and X8, look at Figure 2) and with the A6A2 *Front Panel Interconnect* card Type 791828 installed into the slot XA2 (i.e. X1, look at Figure 2 again).

The A6A2 *Front Panel Interconnect* card, apart from some revisions (an early type was provided with only one integrated circuit (U1), the later type makes use of two ICs (U1 and U2)) does not

show any important variant, while the A6A1 *Manual Tuning Up/Down Counter* board was produced in different versions, mainly the Types 791575-1, 791575-2 and 796014. The Type 791575-1 is the simplest version and does not allow any remote control of the radio, while both the Types 791575-2 and 796014 (the latter one specifically designed for use with a receiver including the 1-Hz resolution Option, look at Ref. [2]) are fitted with a ribbon cable going to a 37-pole female “*Remote Input*” connector that is installed in a slot on the receiver rear panel. The Figures 3, 4, 5 and 6 show the A6A2 card and the various versions of the A6A1 card respectively, in Figure 7 two possible rear panel configurations are represented.

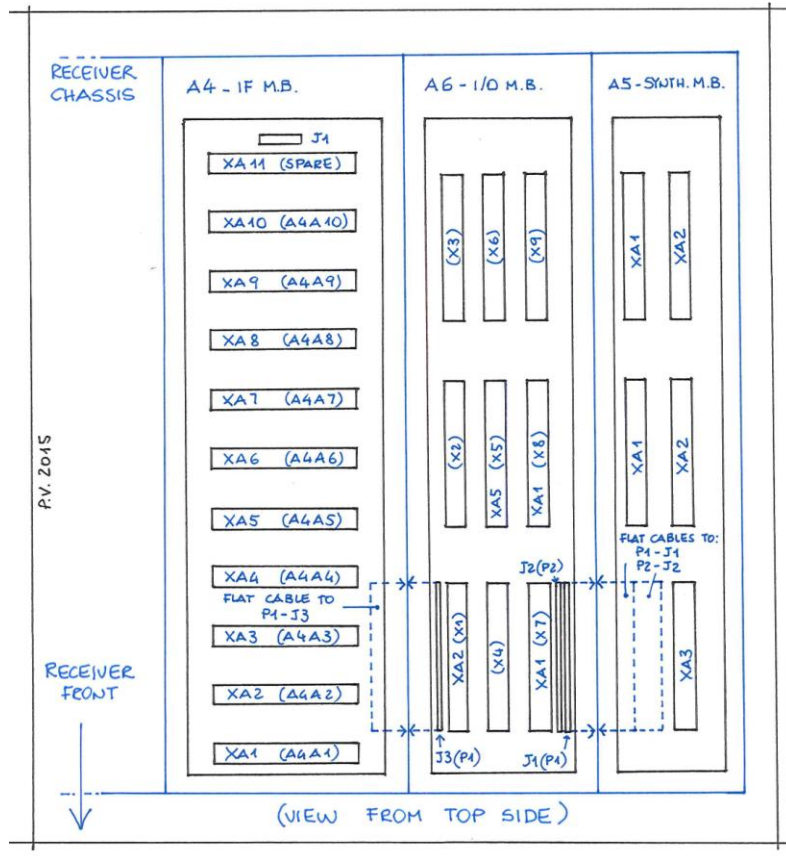


Figure 2: WJ-8716/WJ-8718 receiver chassis socket identification (view from top)

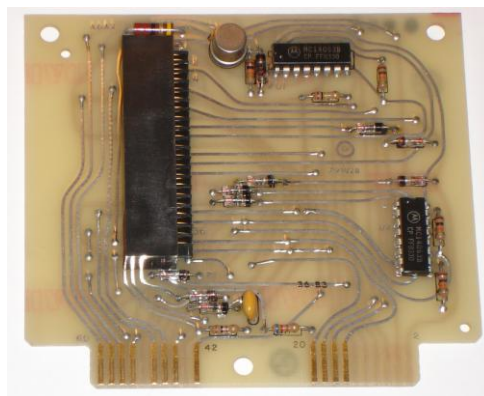


Figure 3: The A6A2 *Front Panel Interconnect* card Type 791828. The picture shows the later version that is provided with two ICs (U1 and U2).

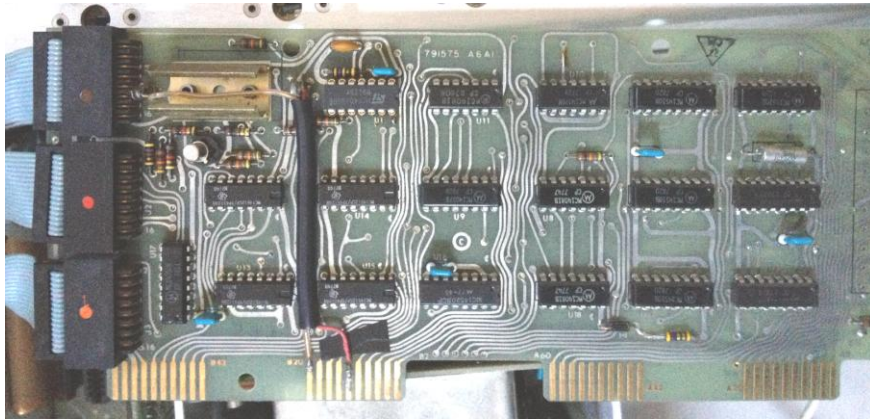


Figure 4: The A6A1 *Manual Tuning Up/Down Counter* card Type 791575-1, front view. Please notice that this card is not provided with any connector at its extreme right.

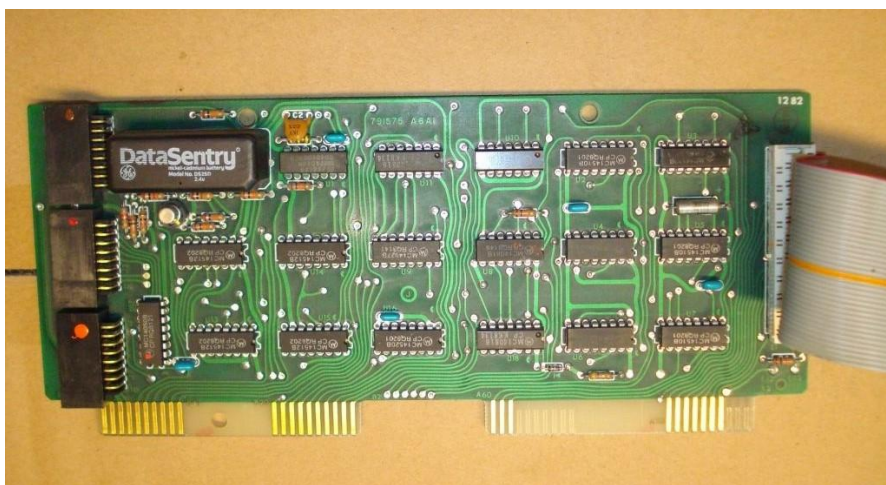


Figure 5: The A6A1 *Manual Tuning Up/Down Counter* card Type 791575-2, front view. Please notice that this card version is fitted with a ribbon cable (for Remote Control) at its extreme right.

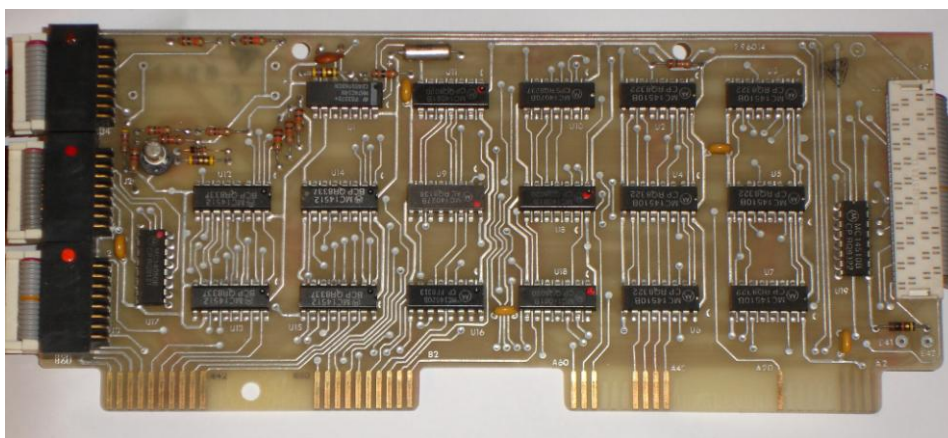


Figure 6: The A6A1 *Manual Tuning Up/Down Counter* card Type 796014, front view. This card is designed for use with receivers provided with the 1-Hz resolution option, it also has the ribbon cable for receiver Remote Control.

Two of the most frequent accommodations of the 37-pin “*Remote Input*” socket on the receiver rear panel are shown in Figure 7.

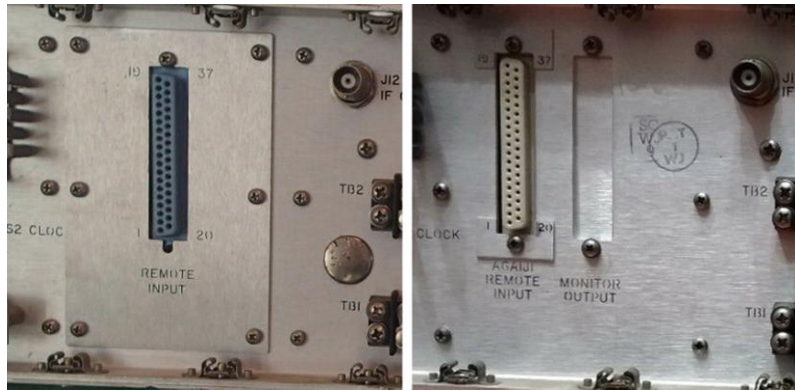


Figure 7: The 37-pole *Remote Input* socket on the receiver rear panel.

A further observation concerns the appearance of the *Manual Control Module* at the right of the receiver front panel: while some show the “*Tuning Disable*” writing on the upper key (Figure 8), other ones are provided with the writing “*DSBL/RMT*” (*Disable/Remote*), Figure 9.

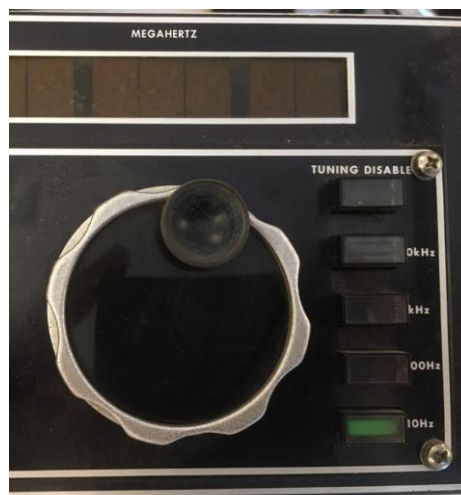


Figure 8: The “*Tuning Disable*” writing on a WJ-8718 MCM module.



Figure 9: The “*DSBL/RMT*” (*Disable/Remote*) writing on a WJ-8718 MCM module.

At first I thought that the *Tuning Disable* writing belonged to receivers that could not be controlled remotely, while the *DSBL/RMT* (*Disable/Remote*) writing belonged to remotely controllable units; hence the possible differences between the MCM and the MCM-2 modules.

This would have been perfectly logical (and perhaps so it was in the designer's mind), but I was wrong indeed: the differences between the two module types seem to be more subtle and most probably they are directly related to the possibility of using more sophisticated Remote Control systems, i.e. the RS-232 or the IEEE-488 GPIB Interfaces that once were available as options.

In practice the receivers provided with the MCM (sometimes also called MCM-1) modules and, obviously, with Types 791575-2 or 796014 A6A1 *Manual Tuning Up/Down Counter* cards, can be remotely controlled as specified in the WJ-8718 Manual (Ref. [3] and some details in Figures 10, 11, 12, 13 and 14).

The receivers fitted with the MCM-2 modules can still be remotely controlled as stated above (of course if they have the Types 791575-2 or 796014 A6A1 *Manual Tuning Up/Down Counter* cards too), but they also allow the installation of the RS-232 or of the IEEE-488 options alternatively.

Please notice that unfortunately the external appearance is not meaningful by itself, as often the front panel writings are not related with the installed MCM module type; I stumbled upon some receivers carrying the "*Tuning Disable*" writing on the front panel but with an MCM-2 module installed and vice-versa on some units showing the "*DSBL/RMT*" writing and provided with the MCM module instead.

INSTALLATION AND OPERATION

WJ-8718 HF RECEIVER

2.3.11 REMOTE INPUT OPTION (A6A1J1)

When this 37-pin input connector is provided, remote tuning is enabled by manually pressing the TUNING DISABLE pushbutton, or internally by connecting a jumper wire in Manual Tuning Up/Down Counter A6A1, as described in Note 4 of Figure 6-18. Frequency tuning and IF bandwidth can be remotely selected in AM, FM, or CW modes. Other modes automatically determine IF bandwidth. Identification of the Remote Input lines is shown in Table 2-1.

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INSTALLATION AND OPERATION

WJ-8718 HF RECEIVER

2.4.9 TUNED FREQUENCY READOUT

This seven-digit readout displays the tuned frequency of the receiver. Each digit is a seven-segment LED with intensity controlled by a single potentiometer located inside the receiver. The least-significant digit, at the far right, indicates 10's of Hz. Tuned frequency is displayed for both local and remote control of the receiver.

2.4.10 MANUAL TUNING MODULE (A7)

The tuned frequency of the receiver is controlled from the front panel. On versions of the receiver not including the Manual Tuning Module, remote inputs on the rear panel establish tuned frequency. For these remote control receivers, the IF bandwidths may also be selected from the remote location.

1. TUNING KNOB. Rotating the knob clockwise increases tuned frequency; counterclockwise rotation decreases tuned frequency. Continuing to tune past the end of the range causes the receiver to step to the opposite end of the band and to continue tuning in the same increasing or decreasing frequency direction. The receiver tunes from 00.00000 MHz to 29.99999 MHz, useable above 5 kHz.
2. TUNING DISABLE. Engaging this button locks the receiver to the frequency currently being displayed. Any other tuning-related button engaged will be released and the tuning knob disabled. Also, by engaging this button, the receiver may be tuned remotely, if this option is installed. Depressing any tuning button slightly releases all buttons and also disables tuning.

2-8

Figure 10: Some details on remote controlling can be found on the WJ-8718 Manual.

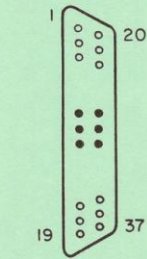
The illustration below clarifies the standard wiring to the I/O connector used in the WJ-8716 and WJ-8718 series HF Receivers.

The corrections listed in this addendum should be incorporated into the WJ-8718 HF RECEIVER Instruction Manual, Revision V, dated 01/80.

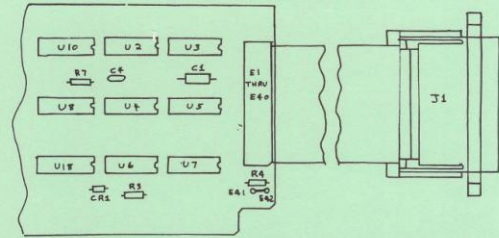
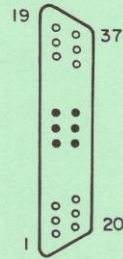
- Figure 5-30, Type 791575-2 Manual Tuning Up/ Down Counter (A6A1) should show a jumper wire from E41 to E42 and show J1 (rear panel REMOTE INPUT) connected through a ribbon cable to terminals E1 through E40, as illustrated below.

INDUSTRY STANDARD
WIRING TO PLUG

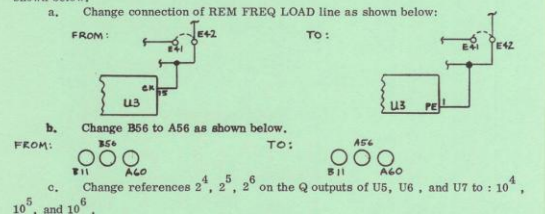
(Mfg Part No. 609-375)



RECEIVER STANDARD
WIRING TO PLUG



- Figure 6-19, Type 791575-2 (A6A1) schematic diagram, should be corrected to as shown below.



Used on : MCM-2, COM, and B-18 Options.

September 30, 1980
ADDENDUM VII
REVISION A

Figure 11: Further useful details on remote controlling from the WJ-8718 Manual.

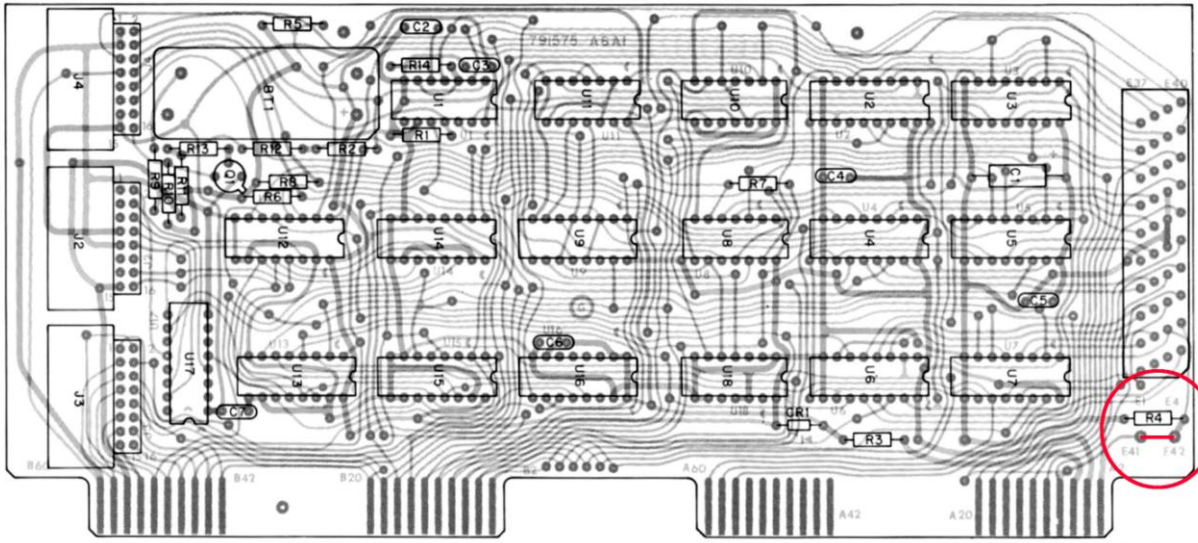
WJ-8718 HF RECEIVER

TABLE 2-1

Table 2-1. Remote Input Lines Identification

Up/Down Counter Board A6A1		Remote Input A6A1J1	
E20		Pin- 9	3.2 kHz
E12		Pin- 5	0.3 kHz
E32		Pin-15	1.0 kHz
E24		Pin-11	6.0 kHz
E28		Pin-13	16 kHz
E16		Pin-33	BW enable
E39	2^0	Pin- 37	10^1
E29	2^1	Pin- 32	
E30	2^2	Pin- 14	
E38	2^3	Pin- 18	10^2
E37	2^0	Pin- 36	
E34	2^1	Pin- 16	
E33	2^2	Pin- 34	10^3
E35	2^3	Pin- 35	
E26	2^0	Pin- 12	
E13	2^1	Pin- 24	10^4
E14	2^2	Pin- 6	
E25	2^3	Pin- 30	
E22	2^0	Pin- 10	10^5
E18	2^1	Pin- 8	
E17	2^2	Pin- 26	
E21	2^3	Pin- 28	10^6
E10	2^0	Pin- 4	
E08	2^1	Pin- 3	
E04	2^2	Pin- 1	10^7
E09	2^3	Pin- 22	
E06	2^0	Pin- 2	
E11	2^1	Pin- 23	Load
E15	2^2	Pin- 25	
E5	2^3	Pin- 20	
E36	2^0	Pin- 17	10^7
E40	2^1	Pin- 19	
E7		Pin- 21	Ground lines
E19		Pin- 27	
E23		Pin- 29	
E27		Pin- 31	

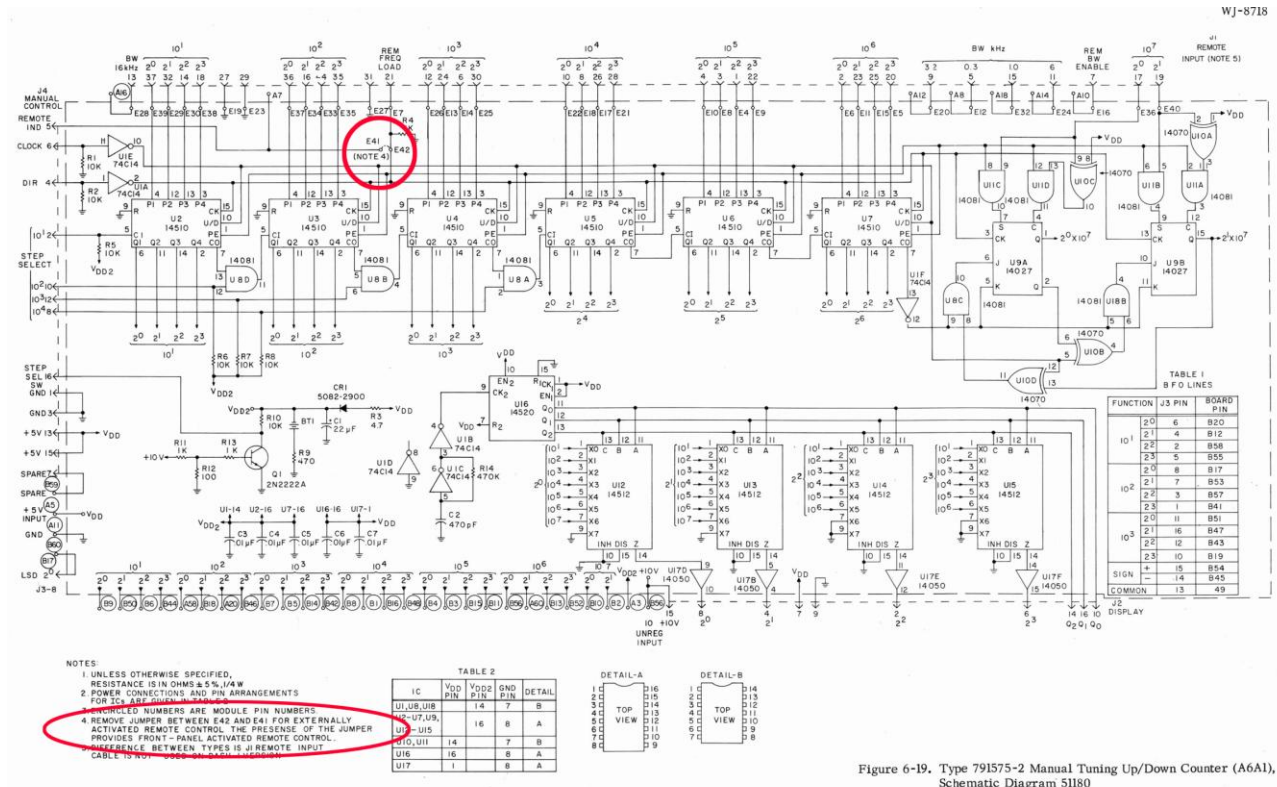
Figure 12: Identification of the lines of the 37-pole Remote Input connector.



Type 791575-2 Tuning Up/Down Counter (A6A1),
Location of Components

REMOTE CONTROL JUMPER

Figure 13: The Remote Control jumper on the A6A1 Tuning Up/Down Counter card 791575-2.



- NOTES:
- UNLESS OTHERWISE SPECIFIED, RESISTANCE IS IN OHMS & 5% TOLERANCE
 - POWER CONNECTIONS AND PIN ARRANGEMENTS FOR ICs ARE SHOWN
 - CIRCLED NUMBERS ARE MODULE PIN NUMBERS
 - REMOVE JUMPER BETWEEN E42 AND E41 FOR EXTERNALLY ACTIVATED REMOTE CONTROL. THE PRESENCE OF THE JUMPER PROVIDES FRONT-PANEL ACTIVATED REMOTE CONTROL.
 - REFERENCE BETWEEN TYPES 2 & 4 REMOTE INPUT CABLE IS NOT SPECIFIED

TABLE 2

IC	VDD PIN	VDD2 PIN	GND PIN	DETAIL
U1, U5, U18	14	7	B	
U2, U7, U9	16	B	A	
U3, U15	16	B	A	
U10, U11	14	7	B	
U16	16	B	A	
U17	1	B	A	

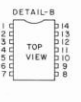
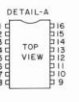


Figure 6-19. Type 791575-2 Manual Tuning Up/Down Counter (A6A1), Schematic Diagram 51180

Figure 14: Location of the Remote Control jumper on the A6A1 Tuning Up/Down Counter card Type 791575-2 schematic.

Electrical Differences

From an electrical point of view, the schematic of the MCM module is shown in Figure 15, while the schematic of the MCM-2 version is represented in Figure 16. Both of them involve the A7 Manual Tuning Module of the receiver.

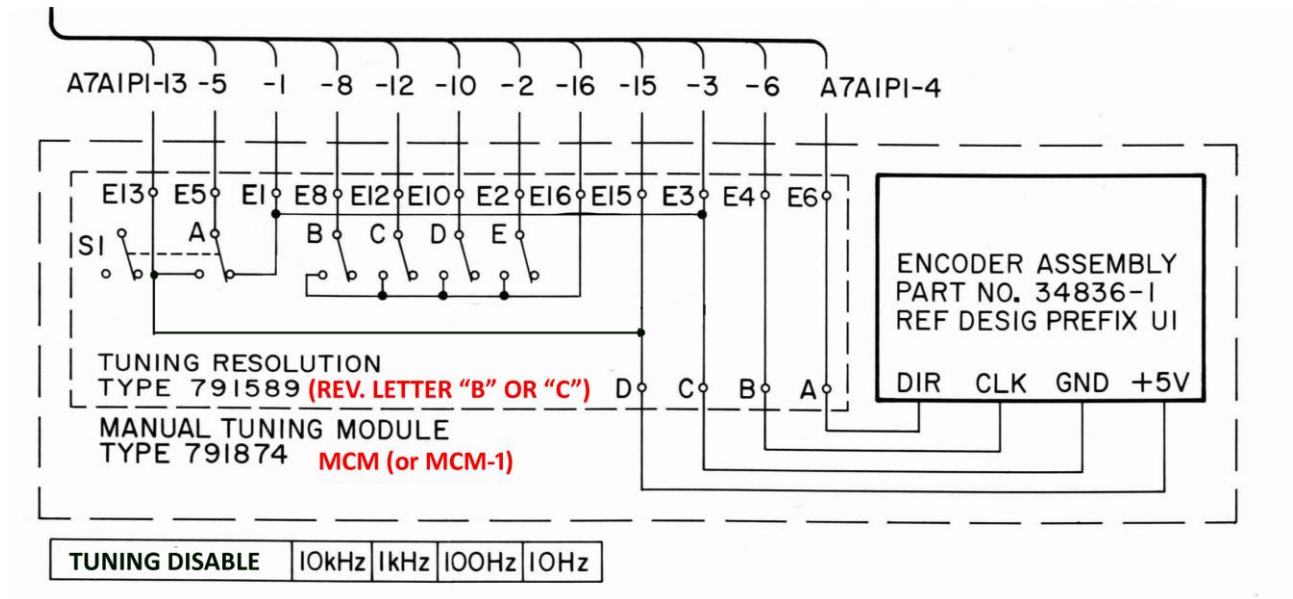


Figure 15: The MCM (MCM-1) A7 Manual Tuning Module schematic.

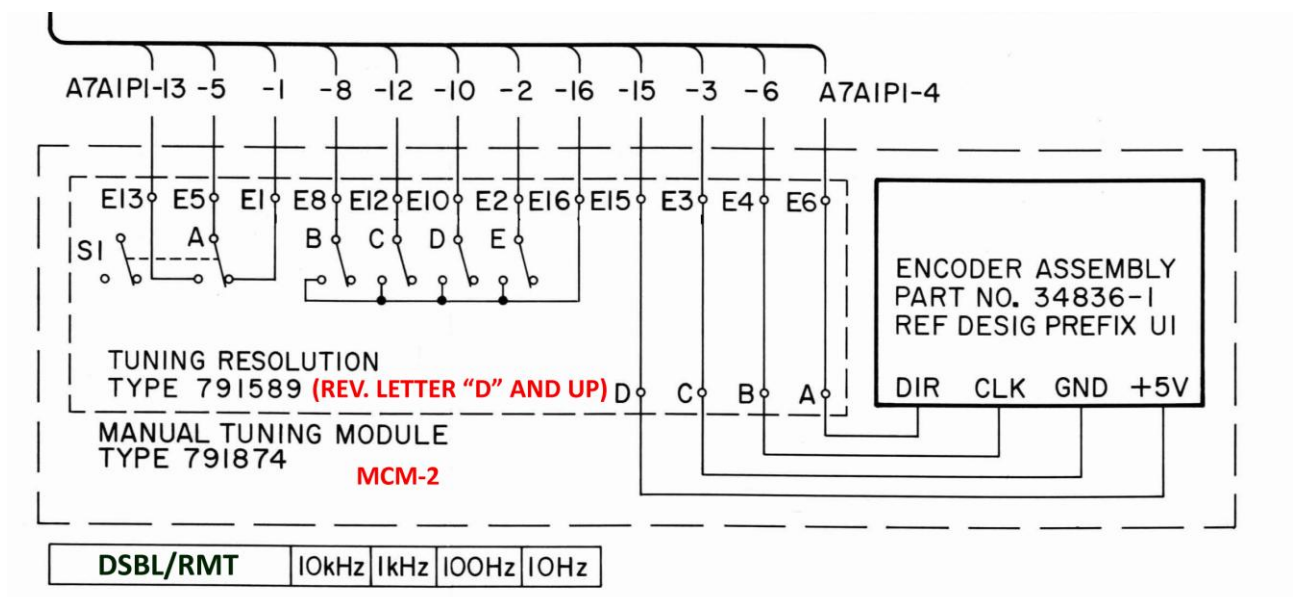


Figure 16: The MCM-2 A7 Manual Tuning Module schematic.

Please notice that the printed circuit board carries the same number (791589) both for the MCM and for the MCM-2 versions, but the later one can be identified by the Revision letter "D" (or up) stamped on the PCB.

In more details, the electrical connections between E13 and E15 and between E1 and E3 that are present on the MCM module are not present in the MCM-2 version.

If you wish to upgrade an MCM (MCM-1) A7 module to the MCM-2 version, a few steps are required: some PCB tracks have to be cut and two jumpers have to be installed as shown in Figure 17.

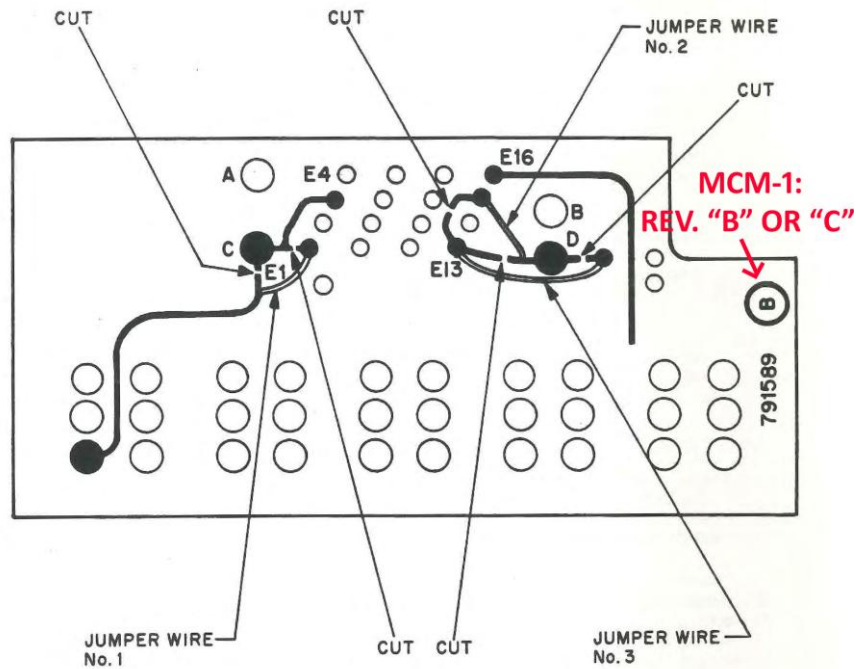


Figure 17: Conversion from MCM (MCM-1) to MCM-2 (view from A7 PCB track side).

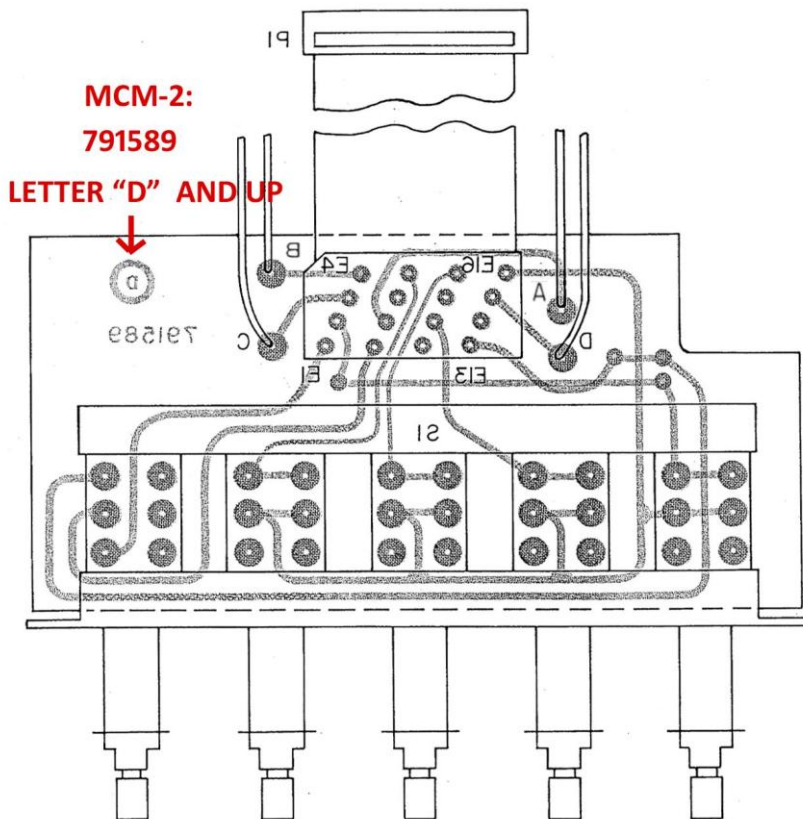


Figure 18: The MCM-2 A7 PCB (view from the track side).

In Figure 18 the Factory-built MCM-2 module PCB tracks are represented. Please notice that the PCB Revision of the MCM version carries the letters “B” or “C”, while the MCM-2 version is marked with the letter “D” or up.

The upgrade of the A7 module to the MCM-2 version is also needed whenever an RS-232 *Remote Control* card Type 796037 (Figure 19) or an IEEE-488 *GPIB* card Type 796075 (Figure 20) is to be used.

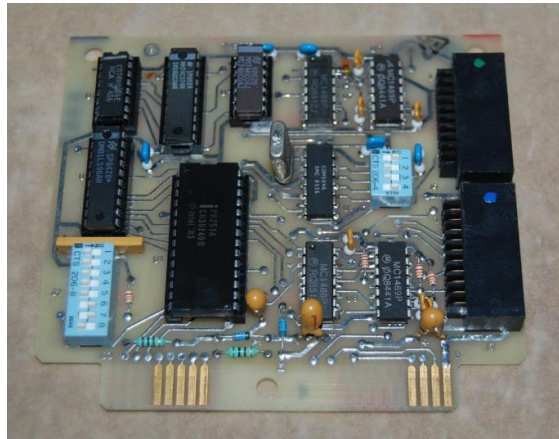


Figure 19: The RS-232 *Remote Control* card Type 796037.

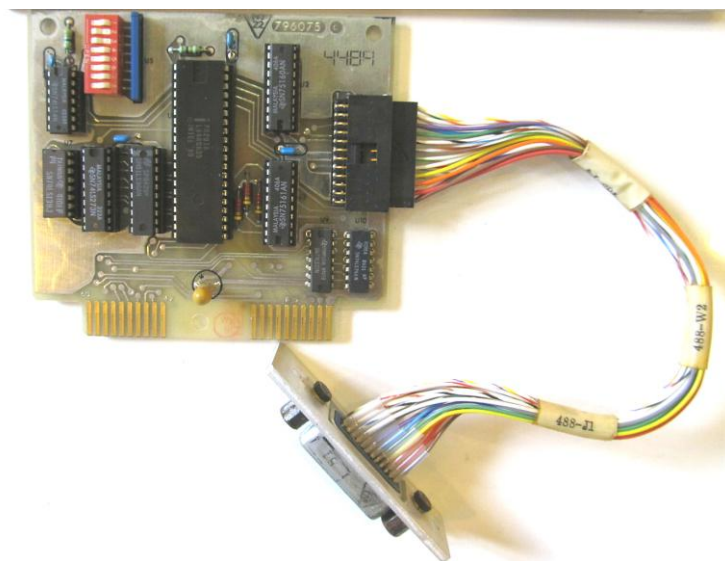


Figure 20: The IEEE-488 *GPIB* card Type 796075.

Both these cards allow full remote control of the receiver and have to be inserted into the XA5 (X5) slot of the A6 *I/O* Motherboard, but two more modifications in the radio are required:

1) A proper ribbon cable assembly (that may be built from scratch using proper connectors and a 64-pole flat cable) has to be installed among the slots 2, 5 and 8 of the A6 *I/O* Motherboard (Figures 21 and 22).

The needed 64 contacts - triple row (a + c) female connectors are currently available on the Internet (from Mouser, Farnell, etc.) and have to be installed from the bottom side of the receiver chassis.

Please take a great care in assembling the jumper cable also in order to preserve the correct pin assignment and to prevent row inversions between connectors.

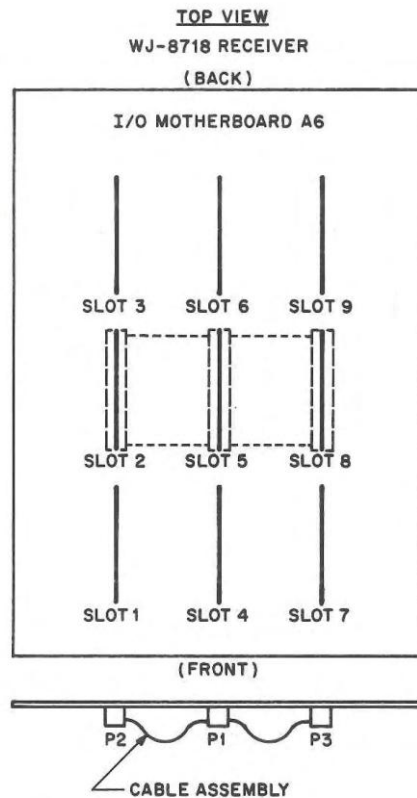


Figure 21: The ribbon cable assembly that is needed between the slots 2, 5 and 8 of the A6 I/O MB.

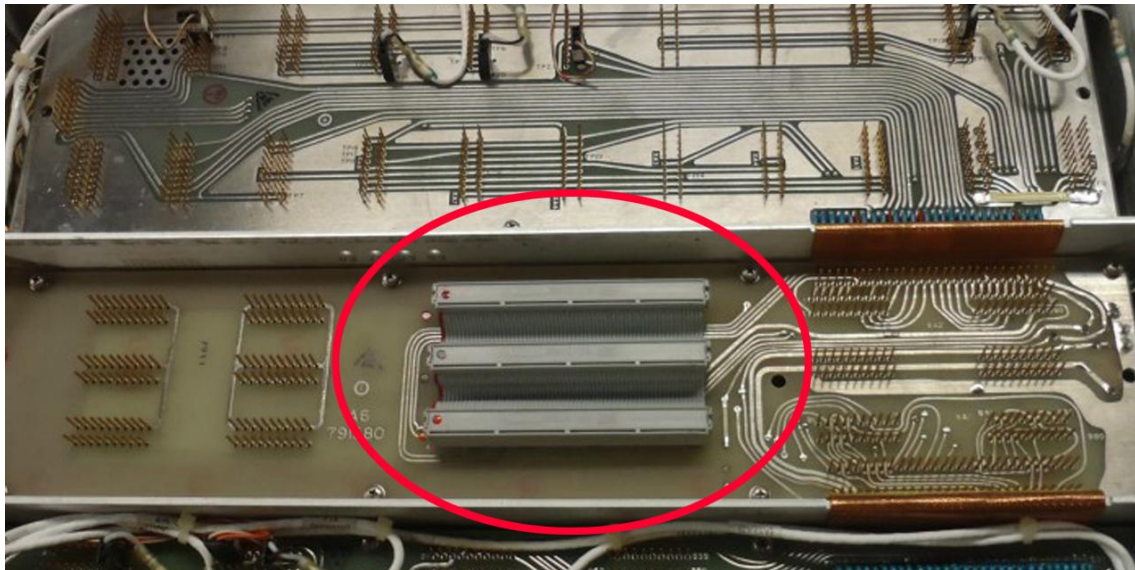


Figure 22: The ribbon cable assembly already installed on the bottom side of the A6 Motherboard.

2) The stock A6A1 *Manual Tuning Up/Down Counter* card Type 791575 that is installed into the slots XA1 (i.e. X7 and X8, look at Figure 2) and the A6A2 *Front Panel Interconnect* card Type 791828 that is installed into the slot XA2 (i.e. X1) have to be replaced by the Type 796029 *Synthesizer Interface* card (Figure 23) and by the Type 796032 *IF Interface* card (Figure 24) respectively.



Figure 23: The Type 796029 *Synthesizer Interface* card that has to be installed in the XA1 slots (X7 and X8).



Figure 24: The Type 796032 *IF Interface* card that has to be installed in the XA2 slots (X1 and X2).

Please be aware that for proper working of the RS-232 or IEEE-488 Remote Control cards a special software must be stored into one EPROM on the Type 796029 *Synthesizer Interface* card (in Figure 23 two EPROMs appear - the two ICs marked with a paper label - but the Remote Control software is stored only into U26, the lower one).

More info about the step 2 above can be found in References [4] and [5], but please pay attention to a few errors that are present in those Manuals.

It is also worth noting that from Nov. 18, 1983 (look at the Ref. [3], *Addendum IV* page 1) the Type 796029 *Synthesizer Interface* card was replaced by the newer Type 794275-X card (Figure 25) and that the Type 796032 *IF Interface* card was replaced by the later Type 794308-1 card (Figure 26).

Of course, in the case both the older cards have to be replaced simultaneously.

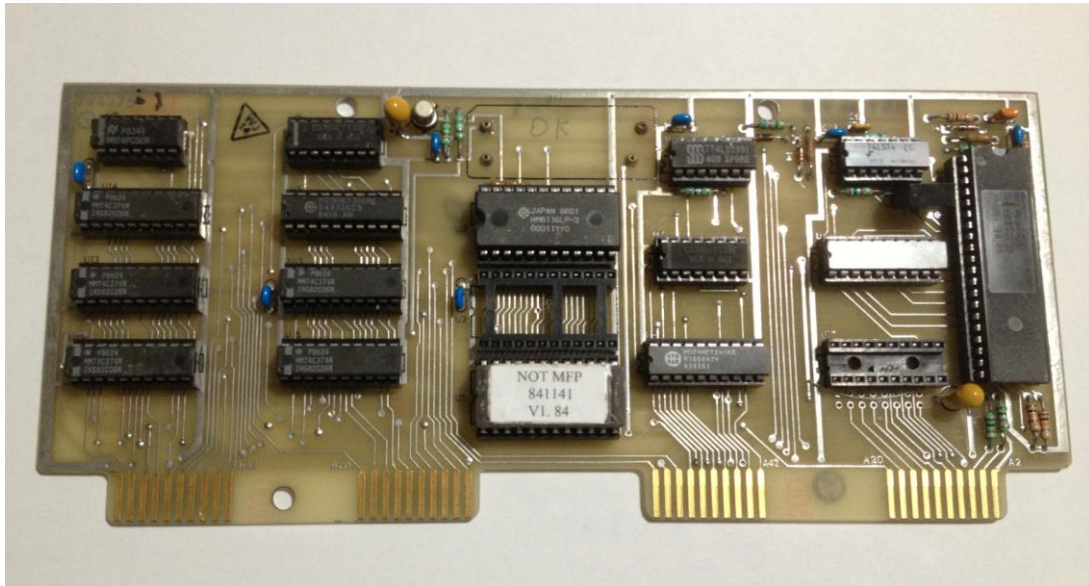


Figure 25: The later version (Type 794275-X) of the *Synthesizer Interface* card that has to be installed in the XA1 slots (X7 and X8). The Remote Control software is stored into the U1 EPROM (the labeled IC in the center of the card, below the empty socket).



Figure 26: The later version (Type 794308-1) of the *IF Interface* card that has to be installed in the XA2 slots (X1 and X2).

Both the early and the later versions of the *Synthesizer Interface* and of the *IF Interface* cards were also used in the /MFP series of the WJ-8718 and WJ-8718A receivers; in this case the *Synthesizer Interface* cards were fitted with two EPROMs (U25 and U26 or U1 and U2).

Please also notice that, when used in /MFP receivers, the *Synthesizer Interface* cards are also named “MFP-A4” and the *IF Interface* cards are often named “MFP-A3”; in addition the later units make use of a “simplified” version of the *IF Interface* card (Type 794308-2, shown in Figure 27).

But this is a different story...

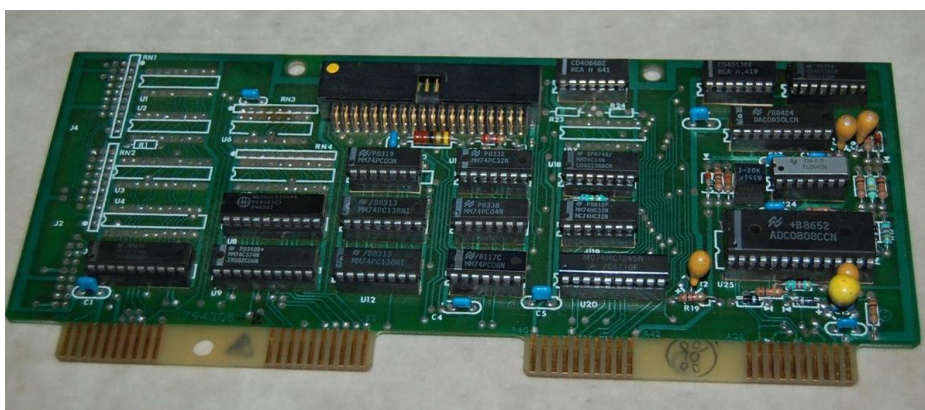


Figure 27: The “simplified” MFP-A3 *IF Interface* card Type 794308-2 that is missing of some ICs and of the unused connectors on its left side.

Conclusions

After having solved the “MCM Mystery” some final considerations seem to be appropriate.

First of all and in order to prevent any possible confusion it is worth to notice that *the stock radios, provided they are fitted with the Type 791575-2 (or Type 796014 eventually) A6A1 Manual Tuning Up/Down Counter cards, can always be remotely controlled (in a simple but effective way) as mentioned above and as specified on their Instruction Manuals.*

And this happens independently from which version of the Manual Control Module (MCM or MCM-2) is installed.

Of course, remote controlling a single radio requires using a proper PC interface or an home-built “Master Control” device capable to apply the proper logic signals to the 37-pole A6A1J1 *Remote Input* socket that is placed on the rear panel.

The use of the RS-232 or the IEEE-488 cards (more details in References [4] and [5]) for remote controlling the WJ-8718 Series receivers is intended mainly for special or professional use instead: both the options allow remote controlling many radios at the same time, and W-J recommends that in the case the MCM-2 version of the Manual Control Module is used in all the receivers.

The WJ-8718/232 option permits integration of the WJ-8718 receivers with a remote control equipment that is compatible with the EIA Standard RS-232C format; up to 32 receivers, all equipped with that option, can be connected together in a daisy-chain configuration and addressed to receive or transmit (*Listen/Talk*) by one controller via the RS-232C bus. The RS-232C Asynchronous I/O Boards handle communications between the receivers and the remote control device; their functions include data transfer, handshake protocol, receiver addressing and interrupt requests.

The WJ-8718/488-2 Option permits integration of the receivers with a remote control equipment that is compatible with the IEEE Standard 488-1975 format instead, and up to 14 WJ-8718 HF option-equipped receivers can be addressed to receive or transmit by one controller via the 488-1975 bus. The bus structure is designed around a three-line handshake circuit which permits asynchronous communication with devices that assimilate data at different rates. A bit-parallel, byte-serial, negative logic form is used for the bidirectional transfer of data between the remote control equipment and the receiver under control.

And that’s all for now, best 73!

Paolo Viappiani, Italy

References:

- [1]: Look at: <https://watkins-johnson.terryo.org/documents/option-lists/WJ-871x%20options.pdf>;
- [2]: Look at: [https://watkins-johnson.terryo.org/documents/manuals/WJ-8718A-MFP-1-Hz-Option-Manual-\(Paolo-Viappiani\).pdf](https://watkins-johnson.terryo.org/documents/manuals/WJ-8718A-MFP-1-Hz-Option-Manual-(Paolo-Viappiani).pdf);
- [3]: Look at: <https://watkins-johnson.terryo.org/documents/manuals/WJ-8718-17-receiver-manual.pdf>, in particular at the pages 33, 38, 52, 53, 56, 292 and 327.
- [4]: Look at: [https://watkins-johnson.terryo.org/documents/manuals/WJ-8718-232-Option-Manual-HD-\(Paolo%20Viappiani\).pdf](https://watkins-johnson.terryo.org/documents/manuals/WJ-8718-232-Option-Manual-HD-(Paolo%20Viappiani).pdf);
- [5]: Look at: [https://watkins-johnson.terryo.org/documents/manuals/WJ-8718-488-2-Option-Manual-\(Paolo-Viappiani\).pdf](https://watkins-johnson.terryo.org/documents/manuals/WJ-8718-488-2-Option-Manual-(Paolo-Viappiani).pdf).