

AUDIO FILTER  
 MODEL HAFR-1

HAFR-1

GENERAL DESCRIPTION

TMC Model HAFR-1 Audio Frequency Filter is the same as Model HAF-1 with the addition of code-energized stepping switches coupled to the rear shafts of CHANNEL A and B HI- and LO-CUTOFF switches. The CHANNEL A switches receive the codes; CHANNEL B switches slave to CHANNEL A. The response of the switches to codes from a remote control center adapts the HAF-1 to function as a modular unit of TMC's TechniMatic\* receiver systems. The front panel switch knobs remain on and these controls may also be operated manually, if desired.

The primary function of the stepping switch is to move the control to a position in response to a parallel 4-bit code at its input from a remote control center. The secondary function is to present a 4-bit code output, in the same code, reflecting the switch position at any instance. This is used as a readback checkout to the remote operator. The 4-bit input code is contained in 4 wires; each wire containing a "1" or "0" bit. The "1" bit wire has a connection to an external 28 VDC source; the "0" bit contains no connection. The 4-bit readback output code is contained in 5 wires. The "1" bit wire contains a connection with the 5th (common) wire; the "0" bit contains no connection. The input code-to-position response is as follows:

<u>Code</u>	<u>Stepping Switch Position</u>	<u>LOW CUTOFF Sw. Position</u>	<u>HIGH CUTOFF Sw. Position</u>
1000	1	.1 KC	.1 KC
0100	2	.25 KC	.25 KC
0010	3	.5 KC	.5 KC
1001	4	1 KC	1 KC
1100	5	2.5 KC	2.5 KC
0110	6	5 KC	5 KC
1011	7	10 KC	10 KC
1101	8	—	OUT
1110	9	—	—
0111	10	—	—
0011	11	—	—
0001	12	OUT	—

The switch rotates the shaft in a clockwise direction as viewed from the HAFR-1 control panel. For the switch to go from position #3 to #1, it must first rotate through positions #4 through #12.

Each stepping switch is mounted to the rear apron of the chassis with its drive shaft coupled to a rear extension of the CUTOFF switch shaft. The wiring of the HAFR-1 is the same as that for the HAF-1 with the addition of the internal wiring of the stepping switch assemblies.

\* Trademark applied for

Figure A shows a plan view of the HAFR-1 with a typical stepping switch assembly installed. Figure B is the schematic wiring for the stepping switch assembly internal wiring.

The switch itself consists of a 2-wafer, 12-position rotary switch driven by a solenoid actuator on the end of its shaft (see figure A). The complete stepping switch assembly consists of the switch, an input receptacle and a readback receptacle mounted into a housing with internal wiring between the switch wafers and receptacles.

Figure C shows the necessary input connections for feeding the codes into CHANNEL A stepping switch; a simple readback connection from the CHANNEL B switch is also illustrated. Code generating equipment may have any form as long as the output (represented here by relays) makes and breaks the connections as shown to a 28 VDC source. A complete revolution of the switch (through its 12 positions) takes approximately 500 milliseconds.

#### PRINCIPLES OF OPERATION, STEPPING SWITCH

a. Input Wafer (see figure C). - Basically, every time the CHANNEL A solenoid coil becomes connected to the external 28 VDC source, it moves its rotary actuator enough degrees to advance the switch by one position. After the stroke, a spring returns the actuator to its original position and the switch remains in its advanced position. If the new switch position still connects the 28 VDC to the coil, the process is repeated. The switch continues to step around in this manner until the 28 VDC supply becomes cut off. The connections are made and broken by the combined positions of the 4 external relays and the far and near side rotors on the switch input wafer. Figure C shows the relays in the 0100 code (#2) position with the switch stabilized in the 0100 code position. The coil has become cut off from the 28 VDC source.

An interrupter (see figure B) built into the switch, is operated by a cam on the shaft. The interrupter momentarily disconnects the coil circuit at the end of each stroke in order to prevent a double stroke.

b. Readback Wafer. - Each position of the input wafer is followed by the readback wafer. In the HAFR-1, CHANNEL A readback wafer is used to send the code to the input wafer of CHANNEL B switch. For this purpose, the far side of the readback wafer is used. The common contact on the wafer receives 28 VDC via a connection on the input wafer and the code for CHANNEL B input is set up in the same manner as that shown for CHANNEL A. CHANNEL B switch responds by assuming the same position.

The readback wafer on CHANNEL B is used for the readback output. For this purpose, the

far side of the wafer is used. For each switch position, a 4-bit code appears at pins A, B, C and D of the output receptacle. A "1" bit is represented by a connection of that wire with the 5th wire (at pin E); a "0" bit is represented by a broken connection with the 5th wire.

CAUTION

Front panel knobs for automated controls may be rotated in clockwise direction only. Do not force knobs in counterclockwise direction.

PARTS LIST

The following parts list is for the additional automation components distinguishing the HAFR-1 from the HAF-1.

PARTS LIST, HAFR-1 AUTOMATION SECTION

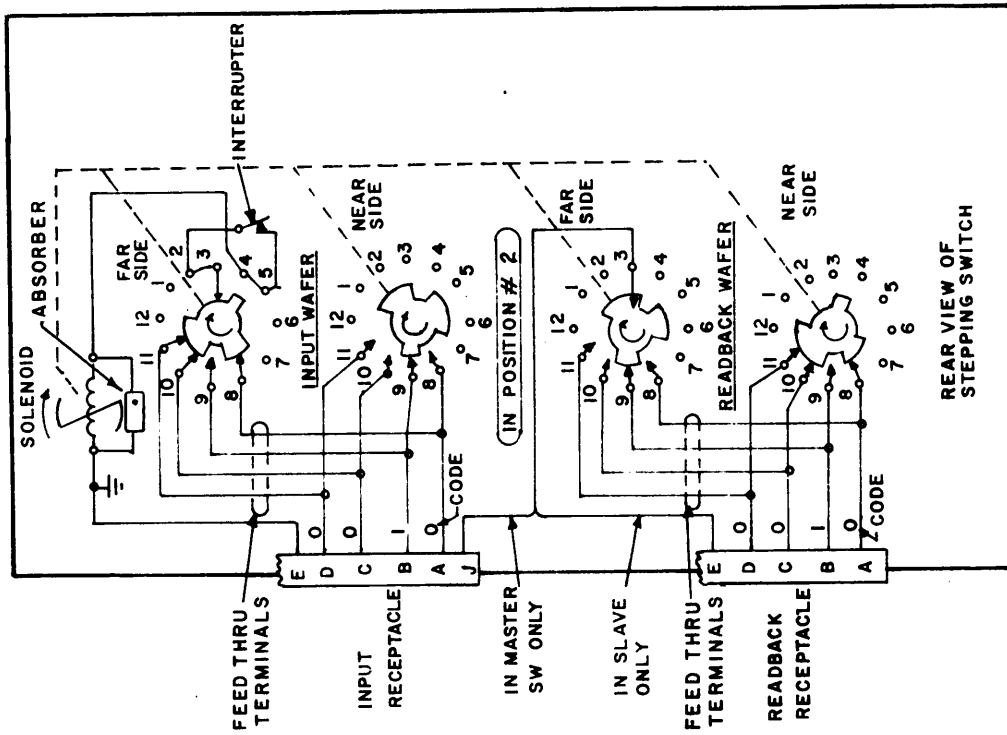
REF SYMBOL	DESCRIPTION	TMC PART NUMBER
CR7201,CR7202	ABSORBER, OVERVOLTAGE (NON-REPLACEABLE ITEM) (PART OF Z7201)	
CR7203,CR7204	ABSORBER, OVERVOLTAGE (NON-REPLACEABLE ITEM) (PART OF Z7202)	
J7204 thru J7207	CONNECTOR, RECEPTACLE, ELECTRICAL (NON-REPLACEABLE ITEM) (PART OF Z7202)	
J7208 thru J7211	CONNECTOR, RECEPTACLE, ELECTRICAL (NON-REPLACEABLE ITEM) (PART OF Z7201)	
S7204,S7205	SWITCH-SOLENOID, ROTARY (NON-REPLACEABLE ITEM) (PART OF Z7201)	
S7206,S7207	SWITCH-SOLENOID, ROTARY (NON-REPLACEABLE ITEM) (PART OF Z7202)	
Z7201	CONTROL ASSEMBLY: Consists of CR7201, CR7202, J7208 thru J7211, S7204 and S7205 (NON-REPAIRABLE ITEM)	AX581
Z7202	CONTROL ASSEMBLY: Consists of CR7203, CR7204, J7204 thru J7207, S7206 and S7207 (NON-REPAIRABLE ITEM)	AX582

NOTE

NON-REPAIRABLE items listed in the above PARTS LIST are assemblies that are repairable under some conditions; however, due to wiring intricacies it is more practical to replace them completely.

MATING PLUGS

When the HAFR-1 is shipped alone, TMC #PL-247-1 plugs are included in shipment to mate with J7204 thru J7211 receptacles.



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Figure B. Wiring Schematic of Stepping Switch

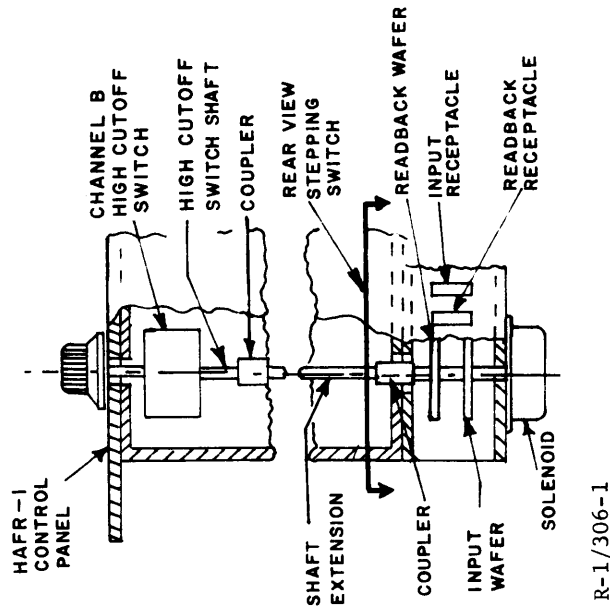


Figure A. Plan View of Stepping Switch  
 Installation on HAFR-1

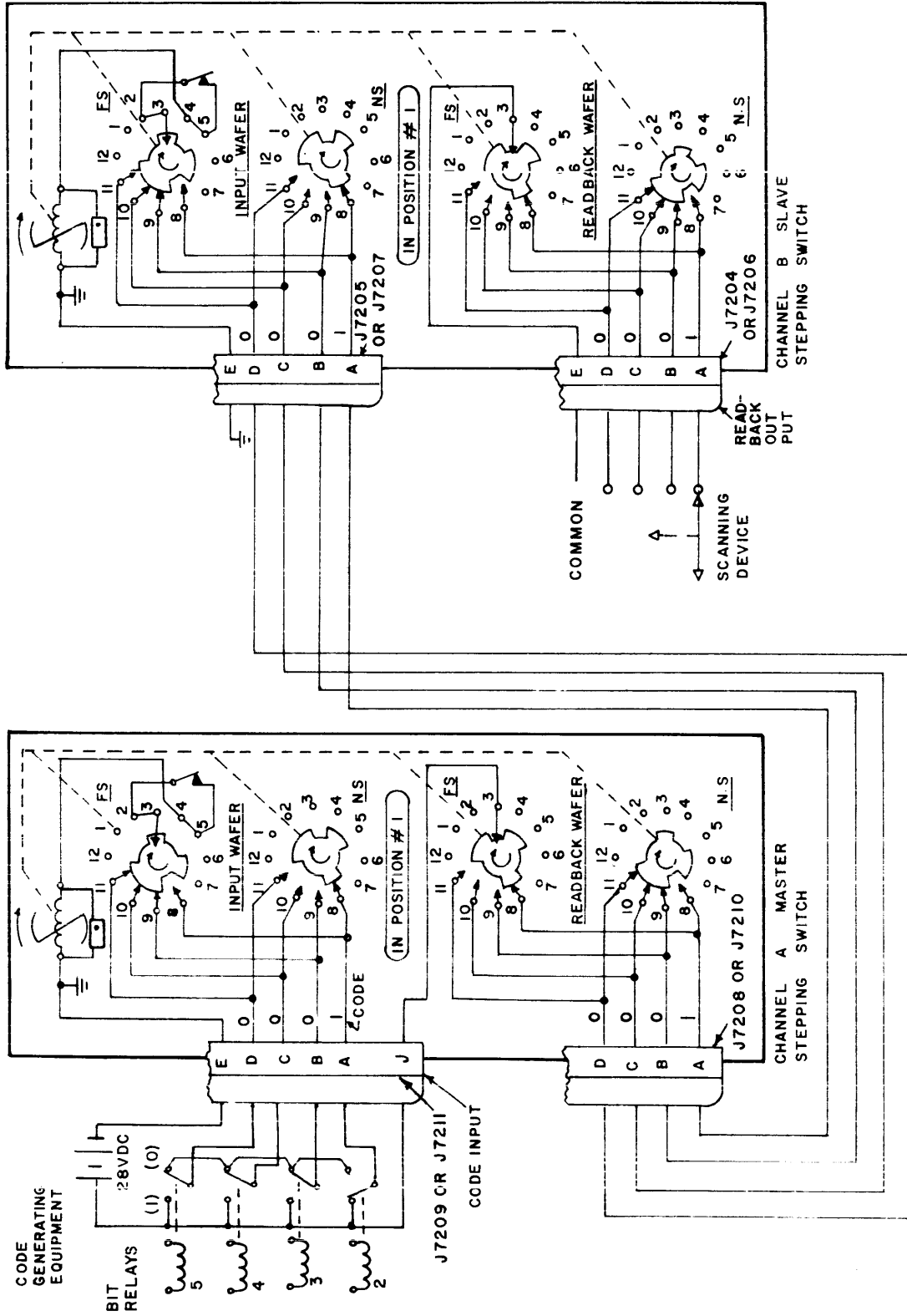


Figure C. Wiring Schematic, Typical Stepping Switch Operator