

FM vintage control panels

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Schematic diagram and frequency coding for the **ARC44, ARC-54 and ARC-131**.

These FM liaison sets were used in the fifties and sixties for air to ground communication, mainly fitted in helicopters. All had provisions for homing with appropriate antennas, and a pair of them could be used to retransmit communication.

ARC 44 : 24 -- 52 MHz, 8W RF 100kHz steps (280 channels)
ARC 54 : 30 - 69.95 MHz, 10W RF 50kHz steps (800 channels)
SEM-25 : 26 - 69.95 MHz, 15W RF 50kHz steps (880 channels)
ARC131 : 30 - 75.95 MHz 10W RF 50kHz steps (920 channels)

These FM sets had much in common.

Audio All need an external audio amplifier for microphone and headset, usually combined with the aircraft intercom system. For the ARC-44, this was the SB-329, with provision for two headsets and three ARC-44 sets. The audio interface is 1Vpp, 150 ohm, both for input and output, so the sets could be cross-connected for retransmission.

RETRAN The ARC-44 needed two external relays for this RETRANsmit, but the control panels of the ARC-54 and ARC-131 integrate these functions in the mode selector switch.

Homing All sets have provisions for homing. In the ARC-44, two vertical dipole antennas are fitted to the nose of the helicopter, and a motor driven, morse coded camwheel selects the left or right antenna. This produced either dah-dit-dit or dit-dit-dah in the headset, if the radio source was left or right in front of the helicopter.

In the ARC-54 or ARC-131 system, a horizontal bar antenna was used on the roof front of the helicopter, in the form of a towel rack. Either the left or right end is connected to the receiver in a 100Hz rhythm. The result is presented on a cross-needle indicator ID-48, the vertical needle gave direction, the horizontal needle the signal strength. Both needles have an "OFF" flag, which are operated in parallel from the squelch output of the ARC54 or ARC-131

This document gives the coding tables of each panel for those who want to control the set by a PC or other means. Note that the contacts should be rated for at least 1.2A / 30Vdc as they switch directly the electromagnetic clutches in the receiver-transmitter.

The ARC-44

The **RT-294 / ARC-44** had its control functions on 3 different panels.

- **SB-327** To set the frequency;
- **SA-474** Switch Assembly to select Homing mode, to disable the (carrier) squelch), and to select RETRANsmit if two sets and additional relays were fitted.
- **SB-329** INTERcom with the microphone and headset amplifiers.

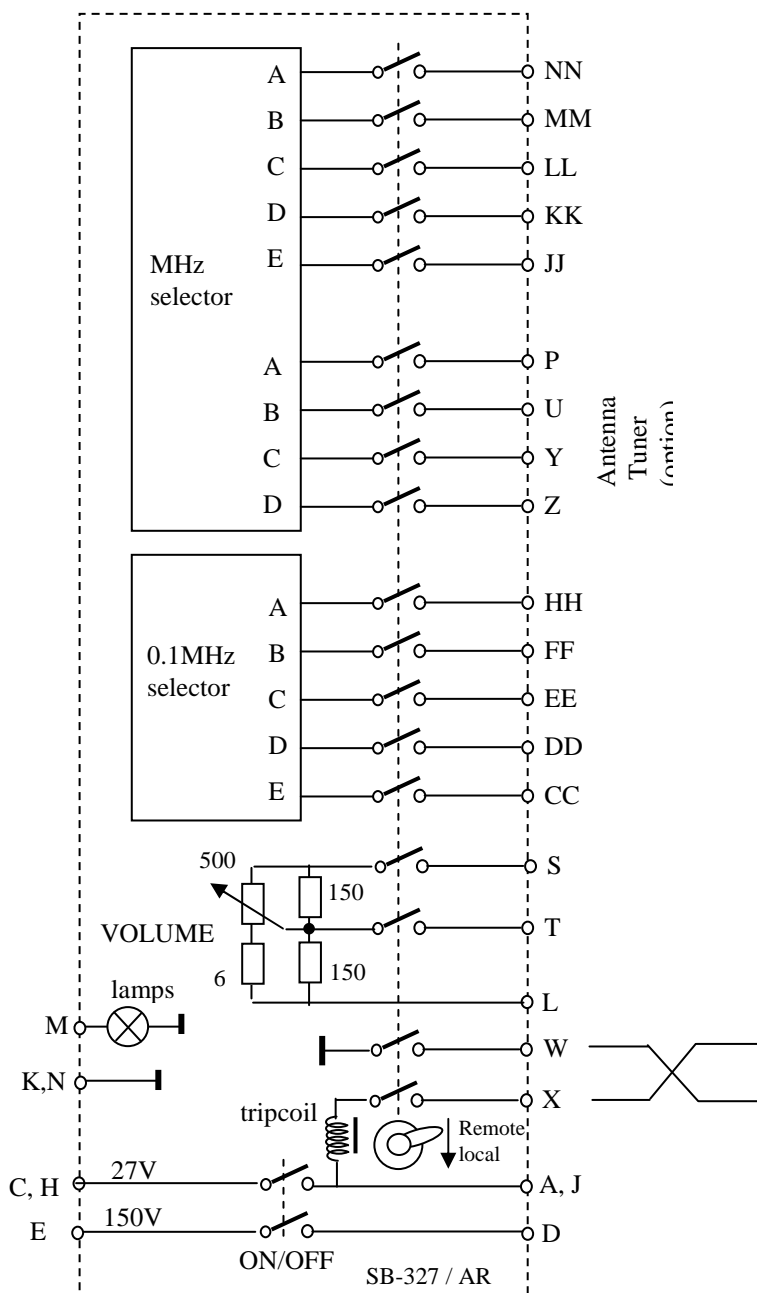
1. The ARC-44



The SB-327 / AR selects the frequency from 24.0-51.9 MHz in 100kHz steps is a total of 280 channels.

SA-474 panel

The RETRANsmiit and Homing modes were selected on another control panel, the SA-474 switch assembly. Here, also the squelch could be disabled and RETRAN could be selected.



The circuit diagram of the SB-327/AR is straightforward.

A co-axial selector selects the full MHz in 28 steps (outer knob) and the 0.1MHz (10 steps) with the inner knob.

The outer knob also sets the antenna tuner, although most ARC-44 systems had a wideband coupler that needed no tuning at all.

Multiple panels SB-327 can be connected in parallel. The one most recently set to "LOCAL" wins, and sets the others automatically to "remote" with a trip coil.

SB-327 / ARC-44 frequency coding

A. 0.1 MHz coding SB-327 / ARC-44

	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	Pin *)
A					X	X		X			HH
B				X	X		X			X	FF
C			X	X		X			X	X	EE
D		X	X		X			X	X	X	DD
E	X	X		X			X	X	X	X	CC

From 24-37 MHz, Positions marked "X" are connected to ground, the remaining lines are interconnected
 From 38-51 MHz, Positions NOT marked "X" are connected to ground, the "X" lines are interconnected
 *) Pins on 34-pin connectors, both on SB-327 and RT- 294/ ARC-44 (same pins)

B. MHz coding SB-327 / ARC-44

	24	25	26	27	28	29	30	31	32	33	34	35	36	37	Pin *)
A	X		X	X	X	X				X	X	X			NN
B	X	X	X	X				X	X	X		X			MM
C	X	X				X	X	X		X			X	X	LL
D				X	X	X		X			X	X	X		KK
E		X	X	X		X			X	X	X				JJ

	38	39	40	41	42	43	44	45	46	47	48	49	50	51	pin
A			X	X									X	X	NN
B	X	X	X								X	X	X		MM
C	X								X	X	X	X	X	X	LL
D							X	X	X	X	X	X	X	X	KK
E				X	X	X	X		X	X	X	X			JJ

Positions marked "X" are connected to ground, the remaining lines are interconnected

*) Pins on 34-pin connectors, both on SB-327 and RT- 294/ ARC-44

C. Antenna tuner coding

	24	26	28	30	32	34	36	38	40	42	44	46	48	50	pin
	25	27	29	31	33	35	37	39	41	43	45	47	49	51	
A	X	X	X			X				X	X		X		P
B		X	X	X			X				X	X		X	U
C	X		X	X	X			X				X	X		Y
D		X		X	X	X			X				X	X	Z

Positions marked "X" are connected to ground, the remaining lines are interconnected

2. The ARC-54

The ARC-54 and ARC-131 are similar, with the same mount, plugs and cable harness. Both systems have a 50-pole sub-D connector on the receiver-transmitter, and a single, round 61-pole



connector on the control panel. Signals and pinouts are identical, but the control panels can NOT be interchanged.

The RT-348 / ARC-54 has control panel C-3835 with squelch mode choice (none-carrier-tone), volume, operating mode (off-pushtotalk-retransfer-homing) and two knobs to set the frequency. The left one has 40 click positions for the MHz, the other 20 click stops for the 0.05MHz increments. Frequency is set from 30 - 69.95 MHz in 800 channels at 50kHz increments.

For the circuit diagram see page 6

0.05 MHz coding, both ARC-54 and ARC-131

	.00	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85	.90	.95
A	X					X	X			X	X	X		X	X	X	X			
B		X					X				X	X			X	X	X	X		
C			X					X				X	X	X	X	X	X	X	X	
D				X					X	X			X	X	X	X	X	X	X	X
E	X				X					X	X			X	X	X	X	X	X	X

An "X" indicates that the line connects to ground in the control panel

A blank indicates that : the line is left open in the C-7088 / ARC-131

: non - X lines are interconnected in the C-3835 / ARC-54

MHz coding, C-3835 / ARC-54

	30 50	31 51	32 52	33 53	34 54	35 55	36 56	37 57	38 58	39 59	40 60	41 61	42 62	43 64	44 64	45 65	46 66	47 67	48 68	49 69
A	X					X	X			X	X	X		X	X	X	X			
B		X					X				X	X	X		X	X	X	X		
C			X					X				X	X	X		X	X	X	X	
D				X					X	X			X	X	X		X	X	X	X
E	X				X					X	X			X	X	X	X	X	X	X

An "X" indicates that the line connects to ground in the control panel

The remaining lines are interconnected in the C-3835 / ARC-54

Pin J is grounded from 30 - 49 MHz

Pin G is grounded from 50 - 69 MHz

Pin K is grounded below 46 MHz (harmonics filter control)

Pin h is grounded every odd MHz

Pin i is grounded every even MHz

Antenna tuner coding

	30 50	31 51	32 52	33 53	34 54	35 55	36 56	37 57	38 58	39 59	40 60	41 61	42 62	43 63	44 64	45 65	46 66	47 67	48 68	49 69	pin
A	X					X	X			X	X	X		X	X	X	X				M
B		X					X	X			X	X		X	X	X	X	X			L
C			X					X	X			X	X	X		X	X	X	X		j
D				X					X	X			X	X	X		X	X	X	X	z
E	X				X					X	X			X	X	X	X	X	X	X	AA

Positions marked "X" are connected to ground, the remaining lines are interconnected

3. The ARC-131



C-7088 control panel for the RT-823/ARC131.

This panel has the same 61-pole connector and functions as the C-3835 except for the MHz selector. The code in this selector is different to handle the wider frequency range 30 - 75.95 MHz in 50kHz steps (920 channels)

The panel has 4 knobs for frequency setting, each with wafer switches. The MHz selection is a combined setting of two knobs, giving a lot of extra decks in the wafer switches. The MHz switch has 8 (double sided) decks ! The 10MHz and 1MHz knobs are mechanically interlocked. With the 10MHz dial set to 70, the 1MHz knob range is limited to 5. If the 1 MHz knob is above 5, the 10MHz knob range is limited to 60

a. The 0.05 MHz tuning of the C-7088 is identical to the C-3835/ARC-54

b. MHz coding C-7088

	30 53	31 54	32 55	33 56	34 57	35 58	36 59	37 60	38 61	39 62	40 63	41 64	42 65	43 66	44 67	45 68	46 69	47 70	48 71	49 72	50 73	51 74	52 75	
A	X			X	X		X	X	X				X			X	X		X	X	X	X		
B		X			X	X		X	X	X				X			X	X		X	X	X	X	
C			X			X	X		X	X	X				X			X	X		X	X	X	X
D				X			X	X		X	X	X				X			X	X			X	X
E	X	X	X	X	X	X	X	X	X	X	X	X												

Pin J is grounded from 53 – 75 MHz

Pin G is grounded from 30 - 52 MHz

There is no odd /even output, nor an output to control the harmonics filter (pins K,W, h, i, r are not connected)

c. Antenna tuner coding (identical to ARC54)

	30 50	31 51	32 52	33 53	34 54	35 55	36 56	37 57	38 58	39 59	40 60	41 61	42 62	43 63	44 64	45 65	46 66	47 67	48 68	49 69 *	pin
A	X					X	X			X	X	X		X	X	X	X				M
B		X					X	X			X	X	X		X	X	X	X			L
C			X					X	X			X	X	X		X	X	X	X		j
D				X					X	X			X	X	X		X	X	X	X	z
E	X				X					X	X			X	X	X		X	X	X	AA

Positions marked "X" are connected to ground, the remaining lines are interconnected

The ambiguity lines J and G are also used in the antenna tuner.

*) same code at 70,71,72,73 and 74 MHz settings.

