

Product Review

Two Autotuners for the Icom IC-705: The Icom AH-705 and the MAT-TUNER mAT-705Plus

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While it is often convenient to have resonant, matched antennas at your home station, this is often not the case when operating portable. The IC-705 low-power portable transceiver (reviewed in the February 2021 issue of *QST*) doesn't have an internal

antenna tuner, but there are several compact manual and automatic tuners that can be used with this radio.

In this review, we will look at two autotuners that are made specifically to interface with the IC-705 via its tuner interface, which has connections for Start, Ground, and Key. The Icom AH-705 and the MAT-TUNER mAT-705Plus both cover 160 through 6 meters and are controlled directly from the IC-705.



Table 2
Icom AH-705 Automatic Antenna Tuner

Manufacturer's Specifications

Frequency range: 1.8 – 54 MHz (>98.4-foot antenna),
3.5 – 54 MHz (>23-foot antenna).
Maximum input power: 10 W.
Tuning power required: 5 – 10 W.
Tuning time: Average 2 – 3 seconds, maximum 15 seconds.
Power supply requirement: Two AA cells or 13.8 V dc $\pm$ 15%.
Current drain: Less than 300 mA (while tuning); less than 1 mA (standby).
Tuning accuracy: Less than 2:1 VSWR.
Number of tuned memories: 45.
Dimensions (height, width, depth): 1.6 $\times$ 4.1 $\times$ 7.5 inches.
Weight: 15.8 ounces without batteries.

AH-705 Resistive Load and Loss Testing

Untuned Load Power Loss (%) and Tuned SWR by Band (meters)

SWR	(Ω)	160	80	40	20	10	6
10:1	5.0	16% 1.3	16% 1.3	16% 1.2	<3% 1.3	<3% 1.3	<3% 1.3
8:1	6.25	12% 1.2	12% 1.2	12% 1.2	<3% 1.2	<3% 1.1	<3% 1.3
4:1	12.5	6% 1.1	6% 1.2	6% 1.2	6% 1.2	<3% 1.1	<3% 1.6
2:1	25	4% 1.1	<3% 1.3	<3% 1.3	<3% 1.1	<3% 1.1	<3% 1.6
1:1	50	<1% 1.0	<1% 1.0	<1% 1.0	1% 1.0	1% 1.0	<1% 1.0
2:1	100	<3% 1.2	<3% 1.2	<3% 1.2	<3% 1.1	<3% 1.0	<3% 1.3
4:1	200	8% 1.2	6% 1.3	5% 1.3	<3% 1.3	<3% 1.1	6% 1.5
8:1	400	8% 1.1	6% 1.3	5% 1.3	4% 1.2	<3% 1.1	NT —
10:1	500	11% 1.4	<3% 1.3	<3% 1.2	<3% 1.1	8% 1.3	NT —

NT = no tuning solution found



Figure 2 — One end of the Icom AH-705 has a BNC jack for RF from the transceiver, a jack for control signals from the transceiver, and an external dc power connector. The control and power jacks are protected by rubber covers when not in use.



Figure 3 — The other end of the AH-705 has an SO-239 jack for the antenna feed line and a binding post for ground.

Icom AH-705

The Icom AH-705 is housed in a weather-resistant case. It is powered by two internal AA batteries, or it can be powered from an external 13.8 V dc power supply. The AH-705 comes with a 6.6-foot BNC-to-BNC coaxial cable, a 6.6-foot control cable, a mounting bracket for attaching the tuner directly to an antenna or other structure, and a dc power plug. Table 2 lists the AH-705 specifications.

The AH-705 is fairly large, and the IC-705 could sit right on top of it. The input side of the AH-705 has a BNC connector, a 3.5-millimeter control cable connector, and a 2.1 $\times$ 5.5 millimeter coaxial connector for external dc power. The control and dc connectors are covered by water-resistant flaps. The output side of the AH-705 has an SO-239 connector and a ground lug with a wing nut (see Figures 2 and 3). The two AA batteries are easily accessible under a cover on the bottom side of the unit, and no special tools are required to change batteries. There are no indicators on the AH-705.

Basic Testing

Standard ARRL resistive load and loss testing was performed on the AH-705. The results are given in Table 2. Open/short testing was also performed. Ideally, a tuner should not be able to match an open or short circuit. However, many antenna tuners can tune into their own internal losses on some bands. As shown in Table 3, matches were found on some bands. See my article, “Antenna Tuner Loss Measurements,” in the March/April 2021 issue of *QEX* for more information.

Using the AH-705

Most operators will probably use the internal AA batteries for powering the tuner. This minimizes required equipment in the field, as the AH-705 cannot be powered from the IC-705. While the AH-705 draws up to 300 mA during tuning, latching relays are used so that when tuning completes, the AH-705 draws very little current. As noted in the manual, when the AH-705 will not be used for a while, the control cable should be disconnected from the tuner to prevent

Table 3
AH-705 Open/Short Test Results

Band (Meters)	Open Circuit	Short Circuit
40	1.52:1	1.8:1
20	1.2:1	2.17:1
15	1.3:1	—
10	1.65:1	—

depleting the batteries. The AH-705 draws a small amount of battery current (about 0.33 mA) whenever the control cable is plugged in, even if the IC-705 is powered off.

To enable tuning, on the IC-705 display select **FUNCTION**, and then press and hold **TUNER**. Except for extreme SWR conditions, tuning occurs within about 2 seconds, unless that particular frequency has been tuned before. In that case, tuning is almost instantaneous as the information is already stored in the AH-705 memory.

My primary antenna is a 43-foot vertical, which connects to my ham station with 60 feet of FSJ4-50B ½-inch Heliex. With the IC-705 and the AH-705 located in the station, the AH-705 tuned the antenna on 160 through 6 meters, typically in less than 2 seconds. Frankly, I was surprised that it tuned the antenna on 160 meters, as the 43-foot vertical is less than half the recommended length (greater than 98.4 feet) for this band. Once I'd tuned each band, returning to that same frequency from another band resulted in an instant tuning solution from memory as soon as I touched my CW key or pressed the PTT switch on the IC-705. Table 4 lists the tuned SWR on the different bands.

Manufacturer: Icom America, 2380 116th Ave. NE, Bellevue, WA 98004; www.icomamerica.com. Price: \$349.95.

MAT-TUNER mAT-705Plus

The mAT-705Plus is noticeably smaller than the AH-705. The mAT-705Plus is powered by internal lithium batteries, which are charged by a standard USB charger. The original mAT-705 used a 9 V battery, and replacement required disassembling the tuner and removing the PC board. The rechargeable batteries in the

Table 4
AH-705 Tuned SWR with 43-Foot Vertical

Band	160	80	40	30	20	17	15	12	10	6
SWR	1.2:1	1.1:1	1:1	1:1	1:1	1:1	1:1	1:1	1:1	1:1

Plus model are a big improvement, and they can be recharged anywhere with USB power.

The tuner comes with a control cable and a USB-C charging cable. A 39-inch BNC-to-BNC interface cable for connecting the IC-705 to the mAT-705Plus is a \$10 option.

Like the AH-705, the mAT-705 has no power switch. However, unlike the AH-705, the mAT-705 is turned on and off with the IC-705, so there is no need to disconnect the control cable to keep from drawing standby current when not in use.

The RF input and output ports are BNC connectors. Both of these connectors and the 3.5-millimeter control port are located on one side of the unit. The

Table 5
MAT-TUNER mAT-705Plus Automatic Antenna Tuner

Manufacturer's Specifications

Frequency range: 1.8 – 54 MHz.
Power handling: 30 W PEP, 10 W continuous.
Matching range: 5 to 1,500 Ω.
Tuning time: 5 seconds or less.
Power requirements: Internal rechargeable #10440 lithium batteries.
USB-C charging cable included (500 mA charging current).
Size (height, width, depth): 1.1 × 2.6 × 5.9 inches; weight 8 ounces.

mAT-705Plus Resistive Load and Loss Testing

Untuned Load Power Loss (%) and Tuned SWR by Band (meters)

SWR	(Ω)	160	80	40	20	10	6
10:1	5.0	27%	8%	<3%	<3%	<3%	<3%
		2.7	1.4	1.1	1.4	1.3	1.7
8:1	6.25	17%	6%	3%	<3%	<3%	<3%
		2.2	1.3	1.2	1.6	1.1	2.0
4:1	12.5	<3%	<3%	<3%	<3%	4%	4%
		1.2	1.2	1.1	1.3	1.5	1.6
2:1	25	<3%	<3%	<3%	<3%	4%	16%
		1.1	1.1	1.1	1.2	1.3	1.5
1:1	50	<1%	<1%	<1%	<1%	<1%	<1%
		1.0	1.1	1.1	1.1	1.4	1.5
2:1	100	<3%	<3%	<3%	<3%	<3%	4%
		1.2	1.1	1.2	1.2	1.4	1.5
4:1	200	5%	3%	<3%	<3%	<3%	4%
		1.2	1.1	1.0	1.1	1.2	1.8
8:1	400	6%	6%	4%	3%	6%	6%
		1.2	1.2	1.0	1.1	1.6	1.7
10:1	500	6%	6%	5%	3%	9%	36%
		1.5	1.2	1.3	1.3	1.5	2.2



Figure 4 (left) — The MAT-TUNER mAT-705 front panel has indicator LEDs and a USB jack for charging the internal batteries.



Figure 5 (right) — The mAT-705 rear panel has the jack for transceiver control and BNC connectors for transceiver and antenna.

Table 6
mAT-705Plus Open/Short Test Results

Band (Meters)	Open Circuit	Short Circuit
20	—	2.1:1
15	—	2.2:1
10	2.34:1	—

opposite side of the mAT-705 has the USB charging port, and **PWR/CHARGING** and **ONLINE/TUNING** LEDs (see Figures 4 and 5). Table 5 lists the mAT-705 specifications.

Basic Testing

Standard ARRL resistive load and loss testing and open/short testing was performed, and the results are shown in Table 5. While there were a few matches found in the open/short testing, no matches with less than a 2:1 SWR occurred, as shown in Table 6.

Using the mAT-705Plus

When you turn on the IC-705 with the mAT-705Plus connected via the control cable, the **PWR/CHARGE** LED on the tuner should light up solid green. If it flashes green, the tuner needs to be charged. While charging, the **PWR/CHARGE** indicator turns red. The tuning cycle is started by pressing **FUNCTION** on the IC-705 display, and then pressing and holding **TUNE**. The mAT-705Plus **ONLINE/TUNING** LED lights up red during the tuning cycle, and then turns green when tuning is complete. The mAT-705Plus uses latching relays, so minimal current is drawn after tuning is complete.

I ran tuning tests with my 43-foot vertical. The mAT-705Plus always seemed to take at least 5 seconds to tune the first time. After the initial tuning cycle, the tuner jumped to the prior tuning solution in a fraction of a second when I returned to a pre-tuned frequency. With 16,000 memory channels, you can

Table 7
mAT-705Plus Tuned SWR with 43-Foot Vertical

Band	160	80	40	30	20	17	15	12	10	6
SWR	NT	1.1:1	1.1:1	1.1:1	1.1:1	1.1:1	1.5:1	1.2:1	1.5:1	1.7:1

NT = no tuning solution found

expect quick re-tunes after initial tunes on many different frequencies, as long as you don't change antennas. As you can see in Table 7, the mAT-705Plus was unable to tune my 43-foot vertical on 160 meters but did find a solution on the other bands.

Manufacturer: Hengshui MAT-TUNER LLC, Hebei, China. Distributed in North America by Vibroplex, 1001 N. Broadway St., Knoxville, TN 37917; **www.vibroplex.com**. A 1-year parts and labor warranty is administered in the US and Canada by Vibroplex, and repair services are available. Price: \$229.95. Optional BNC-to-BNC interface cable, \$10.

Wrap Up

Autotuners provide simple and fast matching solutions when antennas aren't ideal. Both the Icom AH-705 and the MAT-TUNER mAT-705Plus simplify antenna tuning when used with the IC-705. There are some differences in matching ranges, tuning solutions, size, weight, and cost between these autotuners. As always, the end user needs to weigh the tradeoffs when making a purchase decision.

Bottom Line

Both the Icom AH-705 and the MAT-TUNER mAT-705Plus autotuners provide a seamless interface to the Icom IC-705 portable transceiver. They make antenna tuning with less-than-perfect antennas a simple operation.