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ANTENNA ELEMENT FIELD TUNING

The JMPC antenna elements include provisions for fine tuning in the field, if necessary. First, it should be determined that indicated VSWR, if excessive, is not due to faulty installation or a defective transmission line. The line should be terminated in a high quality 50 ohm load with a return loss of 40dB or more. This requirement normally excludes standard transmitter dummy loads, which may have a VSWR of 1.1 to 1.5 themselves. The VSWR should then be checked using adequate test equipment, such as a sweeper with CRT display or a precision generator with meter indication. A high quality directional coupler with a directivity equal to or in excess of 40 dB should be used to properly sample the reflected power.

A properly operating transmitter-reflectometer arrangement may be used in lieu of the above to indicate relative antenna reflected power for tuning, but it will not be possible to read actual reflected power or VSWR of the antenna system due to residual error in the reflectometer system.

This residual error can be from three main sources. The first involves the placement of the reflectometer, which should be after the harmonic filter. If the reflectometer is located between the transmitter and harmonic filter, the reflectometer will indicate harmonic energy reflected back from the filter, which will cause a higher than actual reading. The second source can be spurious emissions, including harmonics, that are reflected back from the antenna system. The transmitter output should be clean of any parasitics. The third source is the inherent lack of high directivity of most transmitter reflectometers. Most reflectometers do not have better than 30 dB of directivity, which means that a "perfect" 50 ohm load (1.0 to 1 VSWR) would indicate a VSWR of 1.07 or so.

To properly tune the antenna using the transmitter reflectometer check and record the VSWR before any tuning is done, with the reflectometer calibrated to the forward reading. Next, expand this reflected reading by increasing the gain to the meter (maximum reading) in order to see small changes in reflected power during tuning, again recording the reading. Then shut off the transmitter and follow the tuning procedures below. Finally, recalibrate the meter for a final check.

To tune the elements, first loosen and slide all element tuning caps, which are clamped by an allen head screw, outward 1/8 of an inch. Be sure that the climber is out of (below) the antenna aperture, and check the VSWR. If the VSWR has decreased, the caps should be again moved outward 1/8 inch. If the VSWR has increased, the direction is wrong and the caps should be moved 1/4 inch inward. After the first improvement, the caps should be moved 1/8 inch each time and the results written down for comparison. A point will be reached when the VSWR will start to go up again. Go back to the minimum setting and securely clamp the caps. If the VSWR reading is not changing, or can not be read, stop the procedure at that point, recalibrate if using the transmitter reflectometer, and check the VSWR. Check the entire 400 kHz channel with sweep gear or generator, if possible.



During the tuning procedure all caps should be moved the same amount. The brass element arms have been scribed for the factory tuning setting so that if any confusion arises all arms can be set back to the original factory setting. Be sure that the rigger is out of the antenna array when checking the VSWR, especially with the transmitter. Be doubly sure that all caps are securely locked down when tuning is completed.

VSWR FINE MATCHER ADJUSTMENT

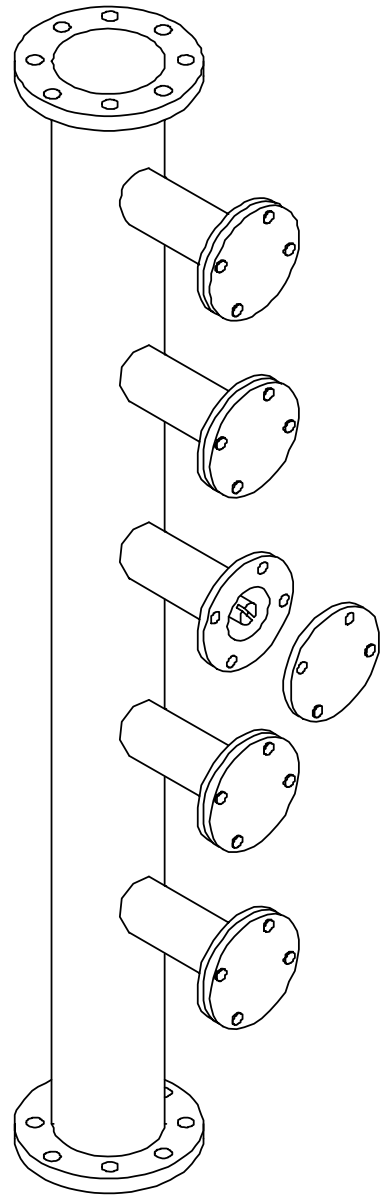
Note: Fine matching instructions apply to 1-5/8" and 3-1/8" designs

A VSWR fine matcher may have been ordered with the Jampro Antenna. The fine tuners provide a convenient way to match out any small reactances that the antenna may "see" in its final environment.

The fine tuners should be adjusted while using adequate test equipment. Refer to the field tuning portion of this manual for proper test equipment. Fine tuner adjustment is normally made "on-carrier" and verified across the operation channel.

The system VSWR should be checked first across the entire required channels of operation. If the VSWR of the antenna/transmission line combination is appreciably above 1.1 to 1 (reverse power 26.44 db down, or 0.23% reflected power, it should be determined whether the high VSWR is caused by the antenna system or the transmission line by attaching a precision 50 Ohm load (return loss 35 to 40 dB) to the top end of the transmission line.

It should be noted here that VSWR of individual components, such as transmission line, reducers, etc., is usually additive, so even a good line may have a 1.06:1 to 1.08:1 VSWR. The fine tuner should not be used to correct for transmission line VSWR, but to fine match the antenna to a properly operating line.





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To adjust the tuner, first shut off the pressurization system. Next, remove the brass tuner caps, which are secured with 4 each $\frac{1}{4}$ inch stainless steel bolts. Then back off the $\frac{1}{2}$ inch brass jamb nut. A special open back $\frac{3}{4}$ inch socket with bar handle is provided for this purpose.

Start with the tuning stub closest to the power dividers. Turn it clockwise (inward) while observing the VSWR indicator. Leave the stub in the position that gives the lowest overall VSWR. If no improvement is noted, back the stub out (counter-clockwise) to its original position. Repeat this same procedure with the next tuning stub down (opposite side of the outer conductor). Continue down the tuner, adjusting each stub, until all have been adjusted. The same procedure can be repeated to try for additional improvement. The person doing the tuning should not move around inside the tower during tuner movement.

When this procedure is completed, tighten the brass jam nuts while holding the tuning stub in place with a screwdriver. Next, replace the brass caps. The system may now be repressurized, and the transmitter reattached and turned on. Re-check for air leaks at the fine tuner probes.

Occasionally, the fine tuner may not provide enough tuning range to improve the VSWR adequately. In this case, be sure to check for the source of the high VSWR, which may be defective transmission line, defective installation, or final mounting considerably different from that used for factory tuning. In this last case, further adjustment can be made by disengaging all fine tuner stubs and following the tuning procedures in the body of this book.

WARNING

THIS ANTENNA, SUPPLIED BY JAMPRO ANTENNAS, HAS CERTAIN DEAD AND LIVE LOADS WHICH ARE INDICATED IN THE CATALOG. IT IS THE PURCHASER'S RESPONSIBILITY TO DETERMINE IF THE SUPPORTING STRUCTURE (TOWER, MAST, POLE, ETC.) CAN SAFELY HOLD THIS ANTENNA, TOGETHER WITH IT'S TRANSMISSION LINE, IN THE WINDS, SNOW, AND ICE CONDITIONS WHICH MAY PREVAIL. IT IS STRONGLY SUGGESTED BY JAMPRO ANTENNAS THAT A STRUCTURAL ENGINEER BE USED BY THE CUSTOMER TO DETERMINE THE OVERALL STRUCTURAL SAFETY OF THE INSTALLATION, WITH THE ADDITION OF THE ANTENNA SYSTEM.



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WARNING

THIS ANTENNA SYSTEM, WHEN ENERGIZED BY AN R.F. TRANSMITTER, CAN PRESENT POTENTIALLY LETHAL HIGH VOLTAGE AND A HIGH INTENSITY R.F. FIELD IN ITS VICINITY. CARE SHOULD BE TAKEN TO NOT TOUCH OR OTHERWISE CONTACT THE ANTENNA SYSTEM WHEN ENERGIZED. IT IS NOT ADVISABLE TO BE IN THE ANTENNA APERTURE WHILE THE ANTENNA SYSTEM IS ENERGIZED. ALL MAINTENANCE OR REPAIRS SHOULD BE DONE WITH THE PRIMARY VOLTAGE TO THE TRANSMITTER DISCONNECTED AND ALL TRANSMITTER REMOTE CONTROLS DISABLED.