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GENERAL DESCRIPTION AND THEORY OF OPERATION
FOR RF OUTPUT ASSEMBLY AX-198 AS USED IN
TMC MODEL SBT-1K SERIES TRANSMITTERS

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1. **GENERAL DESCRIPTION:** The AX-198 assembly is contained within the TMC model RAK-9 and RAK-17 series cabinets for use with TMC model SBT-1K series transmitters. The primary functions of the AX-198 are to provide antenna switching and receiver disabling (muting). The AX-198 is mounted in the rear of the rack, directly behind the RFD-1A and MCU-2 or SWR-1K. Inter-connection of the AX-198 within the transmitter systems will be covered in section 2.

2. **THEORY OF OPERATION:** Before continuing further, the reader should obtain the following drawings for ready reference:

- a) Engineering Sketch, (8) E-1604.
- b) Schematic Diagram CK-422 (4 size).
- c) Schematic Diagram CK-501 (8 size).
- d) SBT-1K wiring diagram required. These diagram numbers and sizes are noted on drawing (8) E-1604.

It is assumed that the reader is familiar with the operation of the SBT-1K system and that the transmitter is functioning correctly. We will assume that the transmitter had been operating at full power and has just been returned to a non-transmitting or "RECEIVE" condition by setting S702 on the P.S.-4A from ON to the STANDBY position. Engineering sketch number E-1604 illustrates the control circuits involved for returning the transmitter to the "ON" position. All relays and switches shown on this drawing are in the proper position for the "RECEIVE" condition we wish. Because of the varied SBT-1K systems, not all of the units illustrated on drawing E-1604 will be used in every system. When an SWR-1K is used instead of the MCU-2, a jumper is placed between terminals 2 and 3, E603, on the AX-198. This jumper will maintain continuity in the interlock circuit. The reader should have no difficulty in deleting the SBE, CMO-1 and MCU-2 where required. It must be stressed that the reader must carefully note the conditions listed in Sect. 2.1.

2.1 **"RECEIVE":** The following conditions will exist if the system is functioning properly. Ref. DWg. #E-1604

- 2.1.1) +500 VDC at term 9, E701 on the P.S.-4A.
- 2.1.2) -200 VDC at the coil of K703, in the P.S.-4A.
- 2.1.3) PA bias voltage at pin C, J701 on the P.S.-4A applied to the PA in the RFD-1A through P614, J605 and P505.
- 2.1.4) No voltage between terminals 5 and 6, E701 on the P.S.-4A and thus none applied to the coil of K602 in the AX-198 through E604; P607; and J607 on the AX-198. K602 is therefore de-energized.
- 2.1.5) K601 in the AX-198 is also de-energized.

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- 2.1.5) Although +500VDC is applied to the coil through R601; J607; P607; the rack main cable; E604; and E701 on the P.S.-4A; the relay will not energize because its coil voltage circuit is NOT completed to ground through the normally closed contact of K602; pin E, J607; P607; the rack main cable; E604; and E701 on the P.S.-4A.
- 2.1.6) The receiver (if used) is connected to the TU-2 or the antenna through a normally closed contact of K601; J608; into the CU-2 "Transmitter" jack, through the CU-2 and out the "Tuner" jack; J610, W601; J609 and P606.
- 2.1.7) K703 in the P.S.-4A is de-energized. The -200V applied will not cause K703 to energize because the coil voltage circuit is NOT completed through the interlock circuit to ground. The interlock circuit is open at K601.
- 2.1.8) As a result of K703 being de-energized, there will be no B+ voltages applied to the RFD-1A.
- 2.2 "TRANSMIT": To change the system from the "Receive" to the "Transmit" condition, we may:
- a) Set S702 on the P.S.-4A to the "ON" position.
 - b) Set S104 on the SBE-2 or 3 to the "ON" position.
 - c) Jump terminals 1 and 2 on the APP-4.
 - d) Jump terminals 9 and 10 on the APP-4.
- By performing either of the above, we ground terminal 4, E701, on the P.S.-4A with the following results:
- 2.2.1) K601 in the AX-198 will energize as its coil circuit will be completed to ground through K602; J607; P607; E604; and terminal 4, E701 on the P.S.-4A.
- 2.2.2) The output connector (E203) of the RFD-1A is connected to the TU-2 or the antenna through K601; J608; into the "Transmitter" jack of the CU-2, through the CU-2 and out the "Tuner" jack; J610; W601; J609 and P606.
- 2.2.3) The interlock circuit is completed to ground through K601; a normally closed contact of K602; pin G, J607; P607; the rack main cable; E604 and terminal 8, E701 on the P.S.-4A. K703 in the P.S.-4A will now energize.
- 2.2.4) Primary voltage will be applied through K703 to the HV transformer in the P.S.-5 and plate voltage will be applied to the PA through J401; P615; J604 and P504. At the same time, B+ voltages will be applied to

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2.2.4) to the RFD-1A through pins d, e, and B on P505; J605; P614; and J701 on the P.S.-4A.

2.2.5) 115VAC will appear across terminals 5 and 6 on E701 in the P.S.-4A and hence across the coil of K602 through E604; the rack main cable; P607 and J607 on the AX-198.

2.2.6) K602 will energize, transferring the control of the interlock circuit (and hence K703) to any of the four circuits in sect. 2.2. via terminal 4, E701 in the P.S.-4A. Completion of the coil voltage circuit to K601 is transferred from pin 4, E701 directly to ground through pin G, J607.

2.2.7) Note that sequential switching was used to insure the antenna being connected to the RFD-1A output before high voltage was applied. This sequence will be more evident when returning to the "RECEIVE" condition. The transmitter is now switched to the "Transmit" condition and the receiver may be disabled by using pins 23, 24, and/or 25 on the APP-4.

2.3 RETURNING TO THE "RECEIVE" CONDITION: Opening the interlock circuit will cause the system to return to the "Receive" condition. This is done normally by setting S702 on the P.S.-4A to STANDBY; setting S104 on the SBE-2 or 3 to OFF; or opening terminals 1 and 2 or 9 and 10 on the APP-4; whichever method was used for turn on. Terminal 4, E701 on the P.S.-4A is now no longer at ground and the following will occur;

2.3.1) K703 in the P.S.-4A will de-energize as its coil voltage circuit is no longer completed to ground.

2.3.2) As a result of K703 being de-energized all B+ voltage will be removed from the RFD-1A and the coil voltage removed from K602 in the AX-198.

2.3.3) Note that K601 is still energized because its coil voltage circuit is completed directly to ground through pin G J607 (Ref. 2.2.6). The B+ voltages have therefore been removed from the RFD-1A but the output connector E203 is still connected to the antenna.

2.2.4) K602 will de-energize, returning control of K601 to terminal 4, E701 on the P.S.-4A.

2.2.5) Since terminal 4, E701 is no longer grounded, K601 will de-energize as its coil voltage circuit is no longer complete.

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- 2.2.6) The system will now be returned to the conditions described in section 2.1, "Receive".
3. THE "KEY LINE" CIRCUIT: This circuit does NOT control the functions of the AX-198 assembly but will be briefly described here to eliminate confusion with the "Push To Talk" and "Remote Transmitter Plate" circuits. The latter two circuits perform the function of grounding terminal 4, E701 on the P.S.-4A as noted in section 2.2. The "Key Line" circuit completes the DC cathode return for either V118 in the SBE-2 or 3 or V305 in the CMO-1; dependent upon which units are being used. For CW operation, a key would be connected between terminals 21 and 22 on the APP-4. With the transmitter set to the "Transmit" condition, no drive signal will be applied to the RFD-1A with the key up as V118 or V305 will not conduct. The key down position will cause V118 or V305 to conduct, driving the RFD-1A. It can be easily seen that the "Key Line" function is not related to the AX-198.