Installation and Tune-up

Test Equipment Required

1. Calibrated 3 ½ Digit Voltmeter
2. Calibrated Dual Trace Oscilloscope
3. Calibrated Frequency Counter (accurate to± 1 Hz)
4. 250 Watt, 50 Ω Non-Inductive dummy load

Unpacking & Mounting

1. Remove the Transmitter cabinet from its shipping container, open the front panel, and remove any shipping material that may be included. Make a careful inspection looking for obvious shipping damage. Remove any foreign material that may have shaken loose.
2. Some PC boards are shipped in separate boxes. Individually unpack and inspect them for any obvious shipping damage. Check the connectors for any bent pins. Be sure to do this before attempting to plug any of the PCB's in.
3. Assuming the transmitter is not to be pre-tested in a lab facility, physically mount the Cabinet to its permanent structure. For mounting hole dimensions, see drawing SDE33075 on page 2-1 of the User Installation and Setup Manual for the SE Single, or SDE33052 on page 2-2 for the SE Dual.

Plug-Ins

1. Remove the front panel exposing the Master Control Panel, Transmitter Drawer(s), and Power Control Panel.
2. Open the Transmitter Drawer.
3. Unpack the Low Voltage Power supply module (SLP45400) and examine it closely for any damage.
4. Refer to Drawing SDE33200 in the User's Installation and Setup Manual, Page 1-23 and insert the LVPS PCB (SLP45400) into the left-most slot of the Transmitter Drawer.
5. Unpack the Transmitter 1 modules and examine them closely for any damage
6. Install the Switching Power Amplifier module (SLP45000) in slot #2 or right next to the already installed Filter /Bridge module (SLP45200). See drawing SDE33200.
7. Install the Power Control Modulator module (SLP45100) in slot # 3.
8. Replace the Transmitter Drawer.

User Wiring

1. See System Installation drawings starting on page 3-1 of the User Installation and Setup Manual for additional information
2. Remove the four (4) dresser screws holding the lower Transmitter Drawer in place. The drawer must be removed to allow full access to the system's terminal blocks.
3. Connect the bronze ground lug, located on the outside bottom of the enclosure, to a good Earth ground.
4. Install the short piece of flexible conduit, contained in the ship kit (SLK33001), in one of the open holes in the bottom of the transmitter's enclosure.
5. If using a battery backup, trim all wires to proper length for neat routing. Terminate the AC power wiring with insulated 14AWG, #8 crimp spade terminals (supplied in the installation/ship kit). Terminate the optional DC power wiring with the insulated 12AWG, #8 crimp spade terminals.
6. Connect AC Power line 1 ("hot" wire Line1 in 115V and 230V systems) to position 1 of TB6.
7. Connect AC power line 2 ("neutral" wire in 115V or 230V single phase systems; "hot" wire Line 2 in 220V two phase systems) to position 2 of TB6.
8. Connect AC Input ground to position 3 of Tb6.
9. Connect the battery charger negative (BATCHG-) lead to position 4 of TB5.
10. Connect DC Power BTRY+ (Battery "+"/positive wire of 48VDC battery stack) and the battery charger "+" (BATCHG+) lead to position 2 and 1 of TB5 respectively.
11. Connect DC Power BTRY- (Battery "-"/negative wire of 48VDC battery stack to position 3of TB5.
12. Remove/open the Coupler enclosure's front panel.
13. Remove the Coupler's coil access panel located above the tuning controls panel.
14. If the transmitter is mounted outdoors adjacent to the coupler install one end of the long flexible conduit, contained in the installation kit, in the remaining open hole in the bottom of the transmitter's enclosure. Install the other end in the hole in the bottom of the coupler's enclosure.
15. If the transmitter is mounted in a shelter, install the remaining short flexible conduit, contained in the installation kit in the remaining open hole in the bottom of the transmitter's enclosure. The user must provide a conduit to route the wires/cables from the transmitter to the coupler.
16. Route the Coupler DC power cable and the Antenna Current/Coupler Switch cable, both supplied with the installation kit, from inside the coupler's enclosure, down through the conduit and up into the bottom of the transmitter's enclosure. Southern Avionics Company recommends a maximum distance of 328ft (100m) for these two cables.
17. Connect the red wire (+12VDC) to position 1 of TB4 and position 1 of TB1
18. Connect the black wire (TX On/Off) to position 2 of TB4 and position 2 of TB1
19. Connect the white wire (ANT I) to position 3 of TB4 and position 5 of TB1
20. Connect the cable's shield to position 4 of TB4 and position 6 of TB1
21. If the user wishes to supply the system with an external RF signal, connect the MSK signal cable to J1 of the Master Controller PCB 5A1A1.

22. If a 50 ohm Dummy load is available, connect it to the N-type RF output connector on the bottom of the cabinet for initial testing and operational verification.

Operational Checks

1. **Power up Verification**
    1. Connect a 250 Watt, 50 Ohm non-reactive dummy load to the RF output jack (J50), and N-type RF connector, on the bottom of the enclosure.
    2. Switch the AC switch (S2) to the ON position.
    3. Observe the Front Panel LCD display sequence. Refer to page 7-1 of the User's Installation and Setup Manual for more information.
2. **Transmitter #1 RF Power Level Checks**
    4. Connect an oscilloscope or a calibrated power meter to the system's RF output at the dummy load.
    5. Use the MAIN TX key to select TX1 as primary transmitter. Green LED's will illuminate indicating which TX is primary.
    6. Use the LCD DATA key to select TX1 as the display/control transmitter data.
    7. In the Monitor section press the ENABLE key until "Disabled" is displayed on the LCD. Press ENTER to store this condition. This action will be necessary until shutdown testing is performed later in this section.
    8. Press the FREQ key to open the RF FREQUENCY ENTRY menu, as shown below.
    9. Enter the desired frequency of operation using the numeric keypads then press ENTER to store this selection. (If necessary press the FREQ key repeatedly to clear the RF frequency field).
    10. Press the TONE key to toggle between 400 Hz and 1020 Hz modulation frequency.
    11. Key in the desired power level for the site and press ENTER to store and activate that level. In a few seconds, the power output level selected should register on the meter and voltage on the PA meter should be indicated.
    12. Verify the output RF power level measured at the dummy load agrees (within 5%) with the value displayed on the LCD in the Transmitter 1 section.
3. **Transmitter #1 Modulation Level Check**
    13. Press the MOD LEVEL key to open the MODULATION SETTING menu. You may have to press the MOD LEVEL repeatedly to clear the modulation level box.
    14. Enter 95% modulation and press ENTER to store that level.
    15. Scope the modulation waveform and record the max/min envelope values to calculate the modulation percentage. (Vmax-Vmin)/(Vmax+Vmin)=MOD%
    16. Verify the set modulation percentage (displayed on the LCD) and the calculated modulation percentage agrees to within 5%.

4. Transmitter #1 Frequency Checks

17. Connect a calibrated frequency counter to the dummy load to measure the RF output frequency.
18. Verify the measured frequency equals the site frequency +/- 100 ppm Hz.

5. Transmitter #1 Morse Code Intensification Check

19. Attach the oscilloscope to the dummy load and verify the output RF modulation envelope is being keyed with the site's required Morse code identifier. Refer to page 7-6 of the User's Installation and Setup Manual for more information.
20. For dual transmitters, use the MAIN TX key to select TX2 as the primary transmitter, and repeat steps 4 through 19.

6. Shutdown Tests Setup

21. Note: Fault indications will appear on the LCD for the transmitter selected to display. After a shutdown transfer occurs, the LCD DATA key must be pressed to display fault information for the TX that caused the transfer.
22. Set up both TX1 and TX2 with the same parameters. Set both transmitters in the normal IDENT mode by pressing the MODE key.
23. Using the LCD DATA key to select either TX1 or TX2, turn both transmitter monitors on by pressing ENABLE in the monitor section until the LCD reads enable and press ENTER to store this condition.

7. No Tone Shutdown Test – Loss of Modulation

24. Set TX1 as the PRIMARY transmitter by pressing the MAIN TX key.
25. Set TX1 mode to CARR by pressing the MODE key. The transmitter should shutdown within 60 seconds and transfer to TX2 with the SECONDARY lamp illuminated.
26. Very TX2 operation is stable for 2 or more minutes.
27. Set TX2 mode to CARR by pressing the MODE key. The transmitter should shut down within 60 seconds and the system should illuminate the red FAIL indicator.
28. Set both transmitters back to the IDENT mode by pressing the MODE key.
29. Press RESET and the system should return to normal stable operation.
30. Repeat the above test with TX2 as PRIMARY and verify the same results.
31. Return to TX1 as PRIMARY for the next test by pressing the MAIN TX key.

8. Low Modulation Shutdown Test

32. Press the MOD LEVEL key and set the modulation level to less than 70%.
33. Verify that TX1 shuts down within 60 seconds, thus indicating a low modulation fault condition and transfers to TX2 with the SECONDARY lamp illuminated.
34. Verify TX2 operation is stable for 2 or more minutes.
35. Press the MOD LEVEL key and set the modulation level to less than 70%.
36. Verify TX2 shutdown within 60 seconds, indicating a low modulation fault condition. The system enters the failed state with the FAIL lamp illuminated.
37. Repeat the above test with TX2 as PRIMARY, using the MAIN TX key, and verify the same results.

38. Reset both modulation levels to 95% and return to TX1 as PRIMARY for the next test by pressing the MAIN TX key.

9. Continuous Tone Shutdown Test

39. Press the MODE button setting TX1 to CONT (Continuous Tone).
40. Verify TX1 shutdown within 60 seconds, thus indicating a continuous tone modulation fault condition, and transfers to TX2 with the SECONDARY lamp illuminated.
41. Press the MODE button setting TX2 to CONT.
42. Verify TX2 shutdown within 60 seconds, indicating a continuous tone fault condition, and enters the failed state with the FAIL lamp illuminated.
43. Repeat the above test with TX2 as PRIMARY, using the MAIN TX key, and verify the same results.
44. Reset both transmitter modes to IDENT and return to TX1 as PRIMARY for the next test by pressing the MAIN TX key.

10. Power Shutdown Test – Low Power

45. Press the special function key SPCL FCTN, then press menu number 7. This is a special test mode. In this mode, the Master Controller will test for under power shutdown. The Master Controller commands the Transmitter Control to decrease the output power by 5 Watt intervals in 5 second intervals. As the transmitter changes power level, it is still sending back data on all of the parameters associated with that transmitter. Once the power level drops below an acceptable level, the Master Controller will institute a transmitter changeover and shutdown of the offending transmitter.
46. Verify TX1 shutdown within 60 seconds, indicating a Low Power shutdown condition, and transfers to TX2 with the SECONDARY lamp illuminated.
47. Again, assert the SPCL FCTN+1 keys.
48. Verify TX2 shutdown within 60 seconds, indicating a Low Power shutdown condition, and illuminates the FAIL indicator.
49. Repeat the above test with TX2 as PRIMARY, using the MAIN TX key, and verify the same results.
50. Press the RESET button setting TX1 as PRIMARY using the MAIN TX key.

11. VSWR Shutdown Test

51. Reduce the power output to less than 50 Watts on the PRIMARY transmitter.
52. Disconnect the RF connector from the dummy load.
53. TX1 “V” LED should illuminate and the system will transfer to TX2.
54. If the open condition is rectified before TX2 comes up to power, it will stay on the air; otherwise TX2 will also shutdown with a VSWR “V” fault, and the system will enter the FAIL state.
55. Repeat the above test with TX2 as PRIMARY, using the MAIN TX key, and verify the same results.
56. Press the RESET button setting TX1 as the PRIMARY using the MAIN TX key.

12. ID CODE Test

57. Press SPCL FCTN +6. This is a special test mode. In this mode the Master Controller will test for improper identification. The Master Controller commands the Transmitter Controller to reverse the

identification. After the transmitter changes identification, it still sends data to the Master Control of parameters associated with that transmitter including identification. Once the identification changes, the Master Controller will institute a transmitter changeover and shutdown of the offending transmitter.

58. Verify TX1 shutdown and transfer to TX2 within 60 seconds. Press LCD DATA to display TX1, revealing TX1 has shutdown due to an IDENT fault.
59. Press LCD DATA again to display TX2.
60. Press SPCL FCTN +6 again to test the TX2 IDENT.
61. Verify TX2 shutdown within 60 seconds and the FAIL LED illuminates. The LCd should indicate TX2 has shutdown due to an IDENT fault.
62. Press RESET to return to normal operation.
63. This concludes SE Series Transmitter Operation Checks using Front Panel Controls.

Antenna Tuning

1. Refer to page 10-1 of the User's Installation and Setup Manual for more information
2. Turn the system on, and verify that TX1 is set as the primary transmitter
3. Set the MODE to CARR, and confirm that the OUTPUT POWER is set to Zero watts into a DUMMY LOAD.
4. Set MONITOR to disabled.
5. Connect the Transmitter RF output coax to the Coupler's input RF connector.
6. On the coupler front panel, set the Sense and Speed controls fully clockwise.
7. Set the RF Power Level to approximately 20 Watts, making sure the Coupler TX ON/OFF switch is ON.
8. Check the Reflected Power reading to determine the antenna's state of tune. A value of 0, or nearly 0, indicated the antenna is tuned. If it is tuned, skip to step 11.
9. Rotate the coupler's INDUCTANCE from one limit to the other by using the CCW/CW switch while in manual mode. Monitor the coupler meter tune reading during this process for a change in reflected power. If a change is seen, place the switch in auto to allow the Autotune to make adjustments freely.
10. Turn the Coupler TX ON/OFF Switch to OFF, and change the FINE TAPS selector wire to the next lower setting and repeat steps 7 through 9. If the antenna does not tune, change the FINE TAPS selector to the next higher setting and repeat steps 7 through 9 again. Continue this procedure until the Autotune motor starts to tune the antenna.

    Note: If the FINE TAPS selector is at the lowest setting, and it is necessary to decrease the inductance, change the coarse Tap to the next lower tap and change the FINE TAPS selector to the highest setting. If the FINE TAPS selector is on the highest setting and it is necessary to increase the inductance, change the Coarse Tap to the next higher tap and change the FINE TAPS selector to the lowest setting.

11. Set the RF Power level to the transmitter's maximum rated level. Verify the measured Forward Power level agrees with this setting. Adjust the Coupler's front panel Sense control counterclockwise for Autotune stability as necessary. It will be fine set later in this procedure.
12. Record the measured Reflected Power level and then turn the Coupler TX ON/OFF Switch OFF.
13. Increase the coupler's IMPEDANCE selector wire setting by one position, then turn the Coupler TX ON/OFF Switch ON. Set the RF Power Level to the transmitter's maximum rated level, and verify the measured Forward Power level agrees with this setting.
14. Record the current measured Reflected Power level and compare it with the previous recorded reflected power in step 12. If the current level is greater than the recorded level, turn the Coupler TX ON/OFF Switch OFF and decrease IMPEDANCE selector wire setting by two positions then turn the Coupler TX ON/OFF Switch ON. If the current level is less than the recorded level, turn the Coupler TX ON/OFF Switch OFF and increase the IMPEDANCE selector wire setting by one position.
15. Repeat steps 12 through 14 until the IMPEDANCE selector setting is found that gives the lowest Reflected Power level.
16. Set the transmitter to operate in Morse Code Identifier (INDENT) Mode.
17. Adjust the sense adjustment potentiometer on the coupler Autotune PCB counter clockwise (CCW) until the Autotune motor beings to chatter, then adjust it back clockwise until all chattering stops.
18. Reduce the Output Power to 0 Watts.
19. Turn the transmitter OFF (Switch the AC and DC switch to the OFF position.)
20. Remove the coupler's RF output lead where it is attached to the coil.
21. Remove the clip from the lead end and trim the wire to the proper length. Ensure at least 3in (7.6cm) separates the wire from both the coil and the coupler enclosure.
22. Dress the wire to avoid sharp bends that may lead to high voltage corona discharge, and solder the lead to the selected coarse tap on the coil.
23. Replace the Coupler's front cover panel. The system may now be turned ON and placed into service at the desired power.