TransAM-100 Sync Guidelines

These instructions are intended for use by a radio technician. The TRANSAM-100 units are synchronized by a standard RS485 interface. The limit on length for the interface is about 2000 feet. First rotate the board with the components up, with the (2) 7 pin terminal blocks to the left and the (1) 3 pin terminal block to the right (See Figure 1).

INITIAL SETUP:
Place a shunt in J7 if the unit is the last slave in a daisy chain

SETTING UP MASTER:
Locate J9. Place a shunt in the "SEND" position (left). Be sure that there is no shunt in J7 or J8. All of these jumpers are located to the right of the bottom heatsink. The master has the crystal.

GPS: If you are syncing a system with a GPS then all transmitters are slaves. Be sure J9 on all slave units is set to "SLAVE"

SETTING UP SLAVE
Locate J9. Place a shunt in the (slave) position, pins 2&3 (right). Be sure there is no shunt in J8. If this is the last slave in the (Figure 2) daisy chain configuration you can place a shunt in J7. This will add a 220 ohm termination. All of these jumpers are located to the right of the bottom heatsink. The slaves do not need a crystal.

CABLING
There are 2 methods to cable the units. The first is to connect all the units together serially like a daisy chain (Figure 2), one after the other. The second is to use a central RD485 break out box (Figure 3).

CABLING (Figure 2) Daisy chain
The TRANSAM-100 has 2 terminal blocks to make cabling easier. The transmitters are connected together in a daisy chain. The power and audio coming from the studio go to either of the (2) 7 pin terminal blocks of the master. Then the remaining 7 pin terminal block is cabled to the first slave, matching all signals. The (power + and -) of the Master goes to the (power + and -) of the first slave. Important: make sure the "+" and "-"connections are correct, the same for the (audio + and -) and (S + and -) connections. The (power + and -) can only be hooked this way if the cable is not to long (approx. 50 ft for 24 Gauge wire). For longer runs you can use an individual local power supply for each transmitter. Be sure to use twisted pair cable, Category five 24 gauge cable works well. You can use standard telephone cable to synchronize the transmitters but that won't work as well as cable intended for RS485 use. Individually Shielded twisted pair cable is an even better choice. Connect the shield to the GND (ground) connection on the terminal block.

CABLING (Figure 3)
The power and 600ohm audio is cabled to the master unit as in (Figure 2). The master is then cabled, power, audio and "S" signal to an RS485 break out box. This box will receive the RS485 signal and then resend it to the slaves. The box will also connect the audio and power to the slaves. If the cable length is over approx. 50 feet for 24 gauge wire you may want to provide a local power supply for the slaves. In that case only the audio and "S" signals are necessary. Be sure to use twisted pair cable. Important: keep all of the wires from the RS485 breakout box to each slave exactly the same length. This will match all the slave phases to each other. The master signal phase will have to be adjusted to match the slaves.

FIRST TUNE MASTER
Turn all slaves off (locate on/off switch to left of board). Follow instructions in the main tuning instruction manual to tune master. Once the Master is operating disable the Master output by removing the coil tap select shunt J6. These jumpers are located near the large coil. This will disable the RF signal but still allow the sync signal to be sent to the Slave. Return this shunt to its original position after tuning slaves. Turn on each slave on and tune up each Slave as normal, one at a time.

PREPARE FOR FINAL TUNING
Final tuning needs to be done with some sort of field strength indication. It is important to note that hooking a voltmeter to the transmitter power amp voltage (red and black) tuning method will not work when more then one transmitter is on. It has to be a field strength indicator of some sort. The further away the indicator the better. A scope with a short length of wire on the input will suffice. Or simply use a voltmeter set to the lowest AC range. Spread the leads out. Of course a field strength meter or a selective frequency meter approx. 1000ft away is best. Use Walkie Talkie's or a cell phone to communicate.

FINAL TUNING
Turn all units on. The carriers are synced now and won't heterodyne, but to get maximum RF field strength you need to synchronize the phase. This step needs to be completed so that the RF signals from each transmitter will add to each other, increasing the overall radiation. If the phases are not properly synchronized it is possible that the slaves may actually cancel the masters' signal resulting in reduced RF radiation. To adjust the phase there are 2 jumpers on the board that delay the signal phase by a jumper selectable time period.

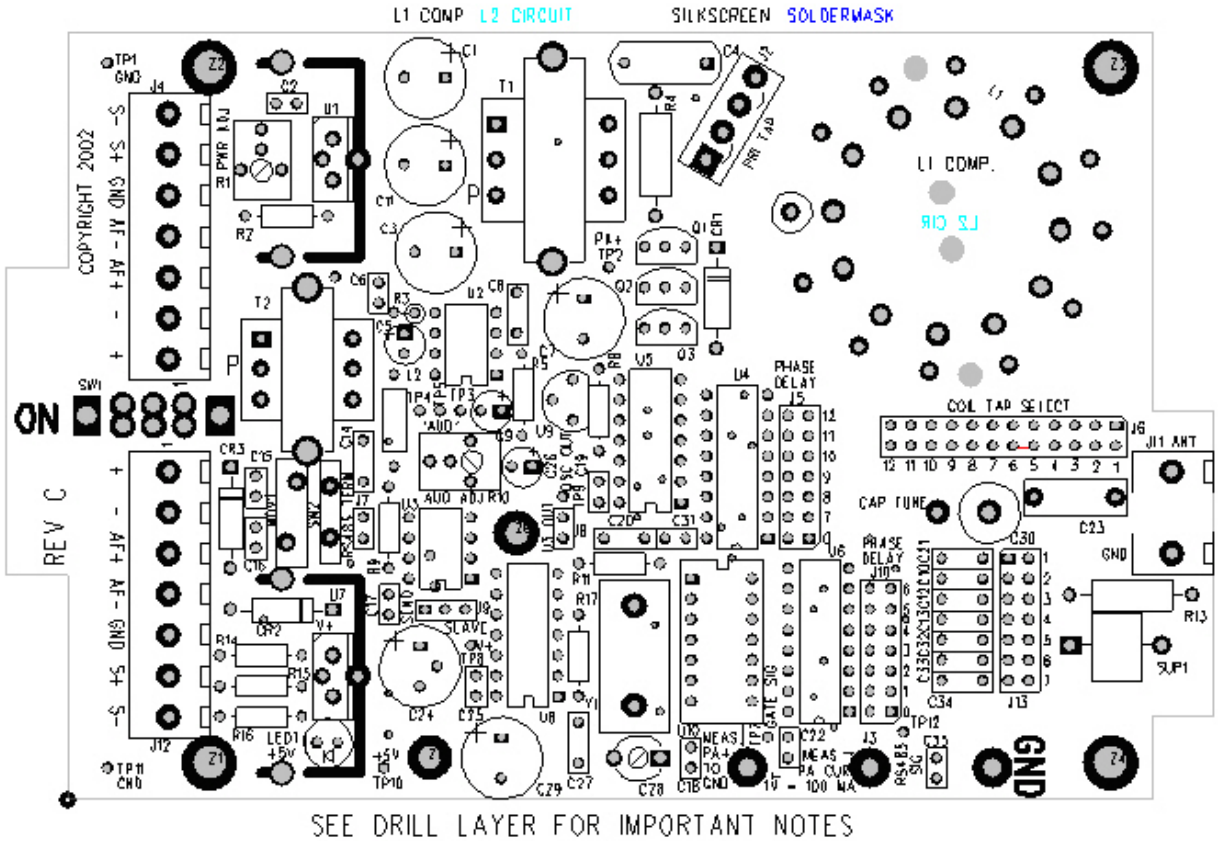
The job is to find the position of J10 and/or J5 (PHASE DELAY) (Positions 1-12 on the jumpers) on each slave that will synchronize the carrier. If you use J5 leave the J10 jumper in the number 6 position. If the U6 and U4 chips are not installed then moving J10 or J5 will stop the unit from working (there may be a permanent wire soldered in J10 and J5). If you can't seem to find a peak in the field strength try reversing the S+ and S- inputs to the slave. This will reverse the signal 180 degrees and you can start from there. You can also adjust the phase delay on the Master unit using J10 and J5. When the slave signal is fully delayed (J5 on Position 12 and J10 on Position 6) the delay is approximately 300 degrees. The step is about 15 degrees. Be sure your audio polarity is correct, + to + and – to -. Do a final tune on each transmitter watching your RF field strength indicator. If the transmitters are closely spaced they can interact and may need to be retuned more so then if the units are widely spaced. Experience has shown that on a typical rooftop 80-100 feet across with the configuration master>slave1>slave2>slave3>slave4 (transmitters equally spaced) that (leaving master on phase position "0") slave 1 will be best on position "0" or "1", slave 2 will be best on position "1", slave 2 will be best on position "1" slave 3 will be best on position "1" or "2", slave 4 will be best on position "2" assuming the wiring polarities are correct.

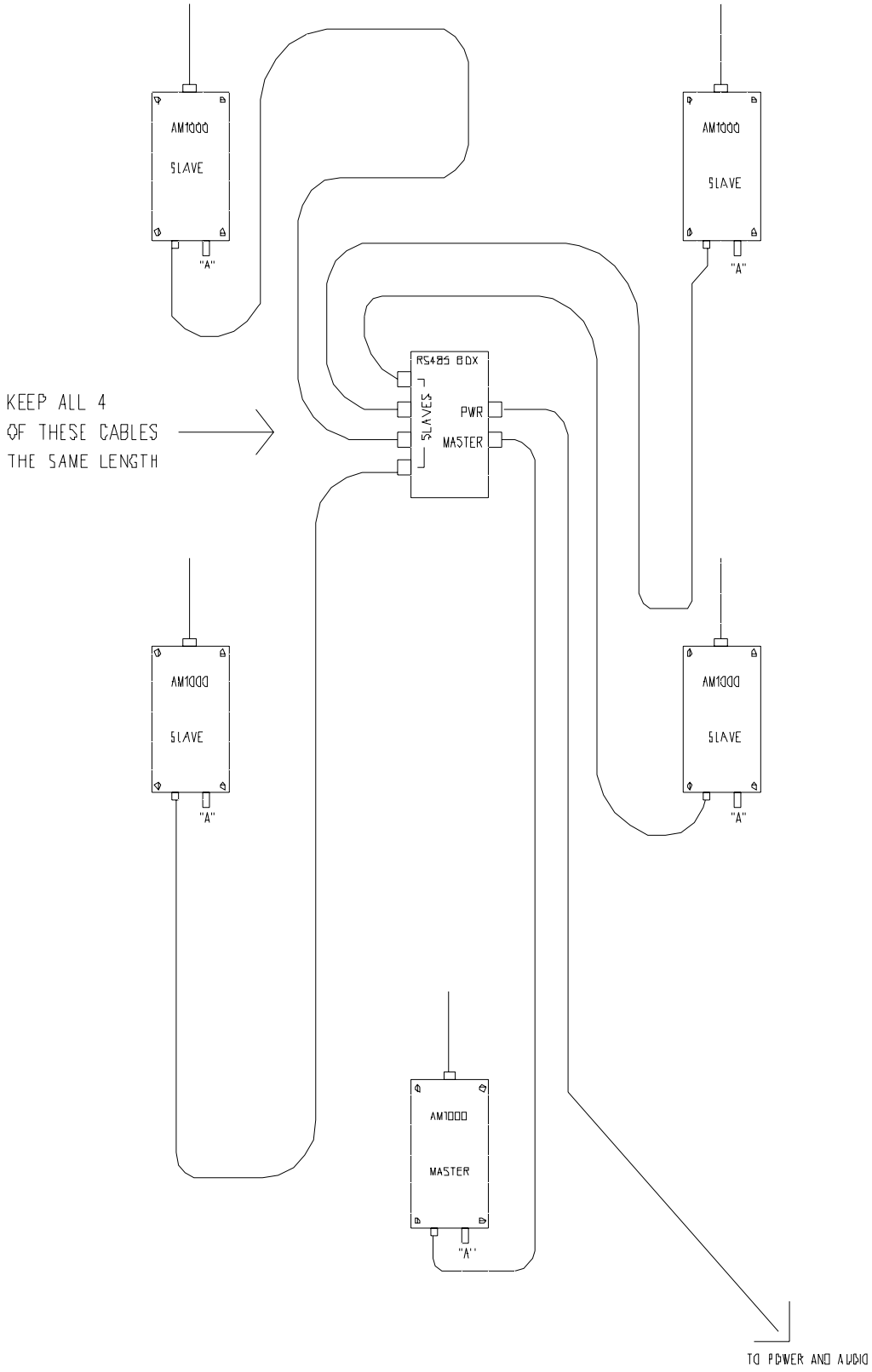
NOTES

Total maximum spacing from the Master to the final Slave is 2000 feet (standard RS485 rules apply). Each transmitter can have its own separate power supply. There is no limit on the audio line length since it is 600 ohm, (telephone line) Impedance. You will want to drive long audio lines with a 600 ohm transformer. For short runs you can drive the audio from an 8 ohm source using (2) approx. 200uf Capacitors in series with the minus pins together (making a 100uf non-polar capacitor). Connect the signal through the capacitors. If you are trying to get the RF signals to add by spacing the units closely it takes 4 – 5 units to double your range.

All the "A" terminals on Figures 2 & 3 go to a grounding rod in the earth for lightning protection. A crystal is not needed in the Slave.

Figure 1

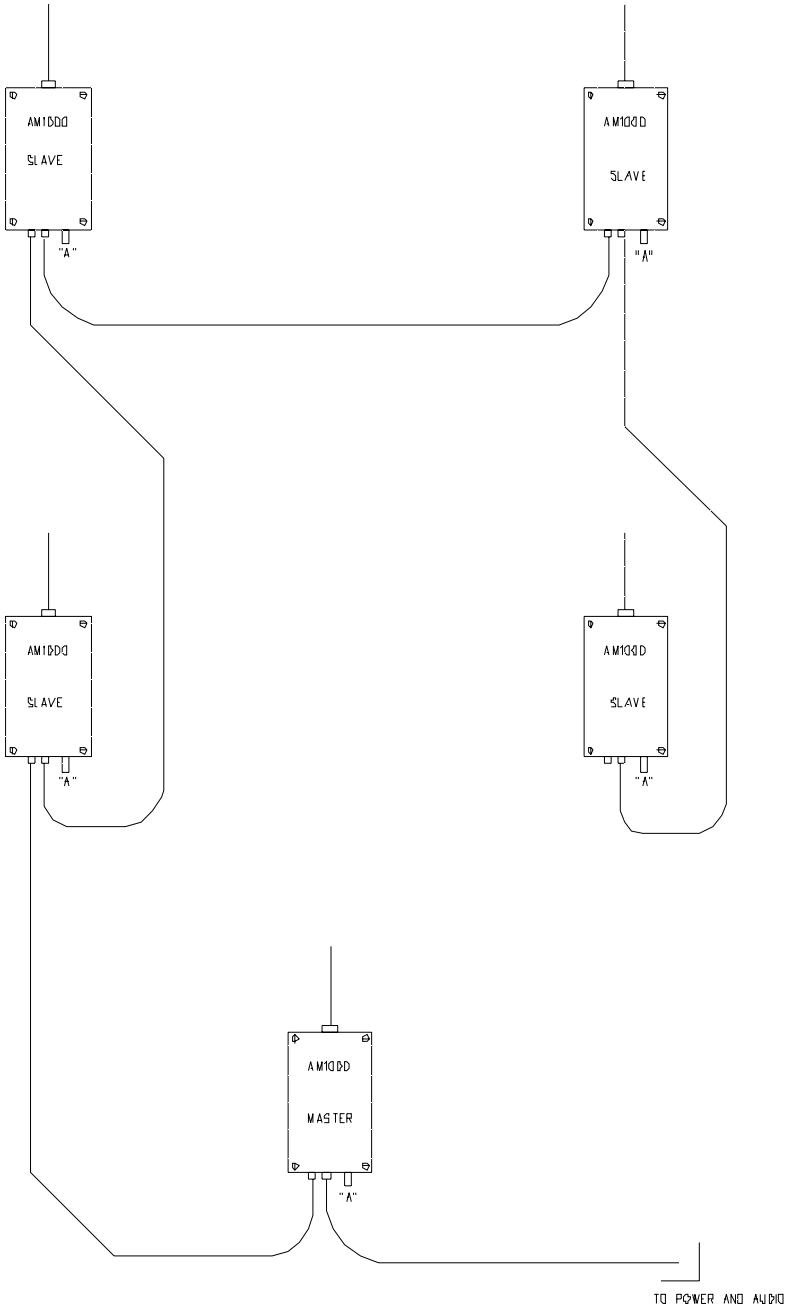




RS485 breakout box

Figure 3

Figure 2
Serial (daisy chain)



As of the writing of this document the FCC rules for clustering (multiple transmitters) are nonexistent, we know of no rules against clustering and have been told by FCC agents that they have no objections to it. We have been told by the FCC that multiple transmitters placed around a shopping mall for example would be legal. Systems using multiple transmitters (for example along a highway) have been around for many years. But until a cluster is addressed by FCC rules we can't guarantee that the FCC will not object to it.

Automated Advertising, Inc. sells its' transmitters to comply with FCC rules.

Here is a response from the FCC concerning the matter in 2006:

Response:
If the transmitter was certified under Section 15.219 of our Rules and is an unlicensed AM transmitter, there is no limit on the number of transmitters that may be installed and no minimum distance at which they may be spaced.