

3.3) Tuning & Adjustments Procedure

No user tuning is required during module installation. The following tuning procedures are used by factory personnel during module manufacturing.

- a) +10V Regulator Output Adjustment
Make sure the regulator output is $+10V \pm 0.2V$. If the output needs adjustment use the variable resistor labeled R_{bias} in Figure 5 to adjust the output voltage. Change supply voltage of $+13.6V$ by $\pm 2.0V$ and make sure regulator output is stable around $+10V$ (i.e. $< 0.3V$ variation).
- b) T/R Control Check
Make sure the SMT switch is in TX mode for T/R Signal $< 0.5V$ and in RX mode for $> 2.2V$. No adjustment is needed for the T/R circuit in Figure 6. Measure input resistance of T/R pin, value should be $> 50k\Omega$. Disconnect T/R signal module should revert to RX mode. Total module current should drop below $0.1A$ in RX mode.
- c) Quiescent PA Current Adjustment
With module turned on in TX mode adjust the variable resistor labeled Gate Bias Adjust in Figure 6 until $V_{gs} = +1.8V$. Measure the module DC current under no RF input and in the TX mode. Adjust Gate Bias incrementally until total module quiescent current is equal to $2A$. Note that under RF power the current increases, therefore this adjustment should be made with no RF input power.
- d) Temperature Sensing Adjustment
Place Module on a hot plate and adjust the hot plate temperature to $80^{\circ}C$. With the module turned on in TX mode increase the hot plate temperature gradually to $90^{\circ}C$. The Temperature Alarm show go from TTL high to TTL low. Adjust RT resistor in Figure 7 to change the threshold temperature to be at $+85^{\circ}C \pm 4^{\circ}C$.
- e) RF Module TX Gain
Connect the module to the Network analyzer. Turn on module and apply low T/R signal for TX mode and measure gain using S-parameter setup gain should be $> 10dB$ from $890 - 910MHz$. If gain needs adjustment change values of R_s & R_p resistors in Figure 4. Gain at $940MHz$ should be $<$ gain at $910MHz$.
- f) RF Module Input Return Loss
Input return loss of module should be $> 10dB$ from 890 to $910MHz$. Input return loss could be adjusted used tunable capacitor labeled CT in Figure 4. Output return loss should be $> 15dB$.
- g) RF Module RX Gain
Connect the module to the Network analyzer. Turn on module and apply high T/R signal for RX mode and measure gain using S-parameter setup insertion loss

should be $< 1\text{dB}$ from 890 – 910MHz. Input & output return losses should be $> 15\text{dB}$.

h) RF Module Power

Using AMCOM power setup, connect then turn on the module in TX mode. Adjust signal generator frequency to 900MHz and increase input power until output power is equal to 30W (i.e. 34.8dBm). RF Gain of Module should not drop below 9dB at 30W output power. Power could be adjusted using the quiescent DC current of the PA by adjusting V_{gs} . The DC current should be increased in increments of 100mA and repeat power measurements until desired power is achieved. Sweep power from 890 to 910MHz to make sure power and gain are flat with frequency.

Appendix I shows the Module Test Traveler used in manufacturing.

Appendix I

Test Traveler of 30W T/R Module

(P/N AM090945SF-1H)

Part Serial No.:

Date:

A) TX State (Voltage Supply= 13.6V \pm 15%)

| Parameter | Specification | Measured | Pass /Fail | Comment |
|-----------------------------|---------------|----------|------------|--------------------------|
| Frequency | 895 – 905MHz | | | |
| Small Signal Gain | - | 13.6dB | | |
| Gain at 30W output | > 8dB | 11.1dB | | |
| Power at Saturation | > 30W | 46W | | Gain > 8dB |
| Input Return Loss | > 10dB | 17.6dB | | |
| Output Return Loss | > 10dB | 23.3dB | | |
| Supply Current | < 12A | 8.4A | | |
| T/R Signal Threshold for TX | > 0.5V | 0.7V | | |
| Temp. Alarm ON | < 0.5V | 0.22V | | Bottom housing at > 88°C |
| Temp. Alarm OFF | > 2.2V | 4.6V | | Bottom housing at < 82°C |
| Module switching time | < 10ms | 6ms | | |
| VSWR Stability | Stable | Stable | | VSWR < 5 |

B) RX State (Voltage Supply= 13.6V \pm 15%)

| Parameter | Specification | Measured | Pass /Fail | Comment |
|-----------------------------|---------------|----------|------------|---------|
| Frequency | 895 – 905MHz | | | |
| Insertion Loss for RX | < 0.7dB | 0.55dB | | |
| Input Return Loss | > 15dB | 24dB | | |
| Output Return Loss | > 15dB | 20dB | | |
| Supply Current | < 0.2A | 0.02A | | |
| T/R Signal Threshold for RX | > 2.2V | 1.5V | | |
| Module switching time | < 10ms | 6ms | | |

Test Technician: _____ Signature: _____

Quality Control: _____ Signature: _____