June 14, 2007

1 PARTS LIST/TUNE UP INFO

1.1 Parts List (active components only)

The RF chain within the transmitter system can be broken down into several smaller sub-systems including: Exciter, Synthesizer, Pre-Amplifier, Detector, and Power Amplifier. The following table lists the active components within these sub-systems that ultimately define the frequency stability, RF power regulation, power limiter, and spectral purity of the Thomson MediaFlo digital transmitter system. This table should be used along with the block diagrams and/or schematics enclosed to identify location and function of each.

45321627.11 EXITER,SIRIUS,FLO,UHF

PART NUMBER / REVISION		DESCRIPTION	REF.
45323350 A		PRE-WIRED RACK	
45323251	M	ASSEMBLED RACK	A1
91793968	A	LASSEN SK II GPS (IF EQUIPPED)	A2
45324498	D	LED BOARD	A3
61391711	A	POWER SUPPLY, EQUIPED	A4
91832443		POWER SUPPLY	PS1
45335427.01	A	FPGA BOARD 6M GATES EQUIPPED	
45324527.01	A	FPGA 6M GATES MODULATOR BOARD	A1
45324535	B	SYNTHESIZER/FILTERING 10MHZ	
91819220	A	SYNTHSIZER, DDAS 1013 OPT08 OPT30	Y
45323352.01	A	MODUL, TS TV UHF	1.00
45324480.01	A	TS / TV BOARD	A1
45324492.01	A	TX BOARD	A2
45324501	B	IF FILTER BOARD DVBT	A3
45324591	A	SWITCH/ALE BOARD	A6
45323321	A	FILTER PREAMPLI UHF/VHF 19DBM	
45324529	B	SIRIUS PREAMLI/FILTER BOARD	N/A

47267453	PRE-AMPLIFIER		
47267457	PRE-AMPLIFIER MODULE		REF
47267522	PCB ASSY, PRE-AMPLIFIER		
750259-01	IC, AMP LOG .1-2.2GHZ 70dB DR		U8
750071-01	IC TEMPERATURE SENSOR		U10
607784-01	IC ACTIVE DETECTOR		U201
751395-01	AMPLIFIER, +36dBm IP3 SOT-89		U4, U5
750439-01	IC OPERATIONAL AMPLIFIER		U19, U22
750016-01	PIN DIODE		D2, D4
750015-01	SCHOTTKY DIODE		D6, D7
750327-01	VOLTAGE REGULATOR +8V		U21
750110-01	IC MUX/DEMUX		U17, U18
750293-01	NPN TRANSISTOR		Q2
754686-01	LDMOS RF TRANSISTOR		Q201 – Q204
754186-01	HIGH SPEED OP. AMPLIFIER		U202, U203
754184-01	TEMP CONTROLLED VOLT. REFER.		U204, U205
750005-01	IC, V-REG +5V .1AMP SOT-89		U7, U16

47267102	MODULE, ENV DETECTOR TRUE-RMS		
47267101	PCB ASSY, TRUE-RMS DETECTOR		REF
750409-01	REGULATOR, VOLTAGE +5 .5A		U1
750964-01	IC, QUAD OP AMP		U2,U3
607784-01	IC, ACTIVE DETECTOR		U6,U7,U8

47266731.02	AMPLIFIER ASSY, UHF		
47266872	POWER AMP SUB-ASSY, L-BAND		REF
47266706	PCB ASSY, PWR AMP L-BAND		
750071-01	SENSOR, VOLT OUTPUT TEMP W/SIG		U2
750015-01	DIODE, RF SCHOTTKY BARRIER SMT		D3
750658-01	DIODE,COMMON,CATHODE,SMT		D1
750016-01	DIODE, PIN DUAL CATHODE SOT-23		D2
754192-01	TRANSISTOR, LDMOS BLF2043F		Q4,Q5
754191-01	TRANSISTOR, LDMOS BLF861A		Q1, Q2, Q3

1.2 Tune-up Information

Each Thomson transmitter is factory calibrated, and requires only a minimum start-up procedure to ensure proper operation. The normal start up procedure for installation and operation of the Thomson transmitter can be found in the equipment manual. The guidelines below offer additional setups beyond those required to normally operate the transmitter and are viewed as maintenance routines. In most cases the calibration process involves a software tool running on a laptop computer. The user should be familiar with this software prior to attempting calibrations.

1.2.1 Turn on the System in a Safe mode

- Start with amplifiers switched off via their front panel key switches

1.2.2 Activate System's First Exciter

- Via Dual Driver Controller Front Panel, Navigate to Exciter selection page
- Press F3 key under the LCD display until referred page is presented
- Highlight Active Exciter option with the by using the arrow keys
- Press OK key to allow for selection change
- With the arrow keys, scroll up or down until exciter A is displayed
- Press the OK key to effectively set exciter A as the active exciter

1.2.3 Power Limiter & Manual Gain Calibration

- Connect laptop (or computer), featuring software GUI, to the Pre-Amplifier plug-in within the main exciter block
- Set ALC MODE SELECT = 0
- Set ALC AUTO REF to 0
- Set ALC manual REF to 0
- Connect a cable between the preamplifier's front panel RF Sample Output SMA connector to an test instrument capable of measuring power level in the magnitude of -20dBm (a Spectrum Analyzer with Channel Power feature would be an example)
- Set POWER LIMITER value to zero (at this point, maximum output power should be +14dBm from preamplifier direct output; Measured at front panel sample would be -16dBm max.)
- Set ALC MODE SELECT = 1
- Set ALC AUTO REF to 4095
- Switch on power amplifiers via their front panel key switches.
- Raise the POWER LIMITER value until power is 1db above the nominal power
- Set ALC MODE SELECT back to 0:
- Raise ALC MANUAL REF from parameter value of zero until nominal power achieved. Confirm nominal power with external calibrated power meter.
- Set HEALTH SNAPSHOT 65535 to clear any faults

1.2.4 Forward Power Calibration

- Using the software GUI, set Normal Debug Mode field to 1
- Using the software GUI, Refresh the monitored variables under Normal Debug Mode 1
- Under monitored variables frame; Read values displayed in the second row. The value in the cell titled LOW is first multiplied by 256 then that result is added to the value in the cell titled HIGH. The value determine from this operation is now entered into SYSTEM FORWARD POWER REFERENCE parameter.
- Using the software GUI, again set ALC AUTO REF until the transmitter output power is 6dB +/- 0.1 dB lower than nominal output power. This -6dB setting is critical for the front panel display accuracy.
- Using NORM DEBUG MODE 1 again read values displayed in the second row. The value in the cell titled LOW is first multiplied by 256 then that result is added to the value in the cell titled HIGH. Record this value.

- See figure 13 below, locate the write setting partition, you should see two fields one named address, the other named Data. Enter 65 into the address field
- Now enter the recorded value from the step above into data, and then click send. At this point the scale factor will be incorporated into the meter system.
- Confirm that 25% is displayed on the front panel meter under SYSTEM FORWARD POWER.
- Raise ALC AUTO REF until system reaches nominal power and 100% on the front panel meter.
- This completes the forward power meter calibration.
- Set HEALTH SNAPSHOT 65535 to clear any faults

1.2.5 Reverse Power Calibration

- Verify the level arriving to the TRU-RMS Detector is +5dBm +/- 2dbm, if not troubleshoot (the level is determined by a fixed coupling factor and fixed attenuation values based on transmitter output power rating; if the level is out of tolerance one should expect something wrong in the RF chain.)
- In order to calibrate the reflected meter; Swap the forward sample and reflected sample cables on detector module. **Important Note**: in order to do cables swapping, mode of operation of the system must be MANUAL (with the 0 value entered in the ALC MODE SELECTION field)
- Set NORMAL DEBUG MODE = 1(For a complete explanation of debug modes see 25-0021) screen will auto refresh. Note that the variable names no longer represent actual parameter DOC# 25-0021 explains the function of each parameter under the various debug modes. (Normal debug mode = 1 is used for meter calibration)
- Under monitored variables frame; Read values displayed in the third row The value in the cell titled LOW is first multiplied by 256 then that result is added to the value in the cell titled HIGH. The value determine from this operation is now entered into SYSTEM REFLECTED POWER REFERENCE parameter. This completes the reflect meter calibration.
- Return cables to normal position.
- Set HEALTH SNAPSHOT 65535 to clear any faults

1.2.6 Automatic Level Control

- Using the software GUI, Place system back to auto ALC mode by setting ALC MODE SELECT = 1
- Lower ALC AUTO REF until system reaches nominal power
- Perform linear and non-linear pre-correction of transmitter using the front panel menu via the Exciter (see below). After correction the exciter's output should be still at -13dBm output level, if not readjust output back to this nominal level.
- With the exciter now at -13dBm, If necessary go back to refine ALC AUTO REFERENCE to nominal power after correction.
- Set HEALTH SNAPSHOT 65535 to clear any faults

1.2.7 Upconverter Power Meter Calibration

- Refresh the monitored variables under normal debug mode 1

- Under monitored variables frame; Read values displayed in the eighth row The value in the cell titled LOW is first multiplied by 256 then that result is added to the value in the cell titled HIGH. The value determine from this operation is now entered into UPCONVERTER FORWARD POWER REFERENCE parameter. This completes the preamplifier meter calibration.
- Set HEALTH SNAPSHOT 65535 to clear any faults

1.2.8 Calibrate Fast Reflected Shut Down

- Sample TX output, use an inline variable attenuator. Set level to -10 dBm, connect this signal to the reflected port of TRU RMS detector module.
- Raise level slowly until the preamplifier's LCD display of reflected power reads 15%
- Lower the FAST REFLECTED THRESHOLD until the power is reduced by approx. 6dB (this power reduction is pre determined) A typical value of fast reflected threshold = 1000 This threshold must be precise use smaller calibrations steps when reaching near the value of 1000
- Once tripped it will stay at reduced power to verify or to recalibrate lower the sample and reset the module, use the reset button on the SOFTWARE GUI window for this purpose.
- Verify that you can raise the reflected power percentage to at least 10% without the transmitter tripping into it's 6dB protection mode. Also exceed the 15% mark to active the protection system. Again reset the module back into normal operation when this test is completed.
- Now set system reflected power percent limit to = 25
- Return all cables to normal
- Set HEALTH SNAPSHOT 65535 to clear any faults

1.2.9 Activate System's Second Exciter

- Via Dual Driver Controller Front Panel, Navigate to Exciter selection page
- Press F3 key under the LCD display until referred page is presented
- Highlight Active Exciter option with the by using the arrow keys
- Press OK key to allow for selection change
- With the arrow keys, scroll up or down until exciter B is displayed
- Press the OK key to effectively set exciter A as the active exciter
- Repeat steps 1.2.3 through 1.2.8 to completely calibrate reserve exciter side

1.2.10 Non-linear precorrection

- Navigate to the menu for non-linear calibration on the Dual Driver Controller's front panel; this is located under the F4 button on the keypad located below the display window.
- The feedback sample should be connected prior to the channel filter (default location)
- Observe the feedback level is Normal; see feedback level indicator.(Typical level is –10dBm)
- Apply a one shot or place the correction in adaptive mode; allow few seconds for automatic correction.
- Observe the shoulder level; ensure it is within tolerable limits. (i.e. ≥36dB)

1.2.11 Linear Precorrection

- Navigate to the menu for linear calibration on the Dual Driver Controller's front panel; this is located under the F4 button on the keypad located below the display window.
- The feedback sample should be connected after the channel filter
- Observe the feedback level is Normal; see feedback level indicator.
- Apply a one shot or place the correction in adaptive mode; allow approximate 10 minutes for automatic correction.
- Observe the frequency response and group delay; ensure they are within tolerable limits.

1.2.12 Raise & lower power

- Navigate to the menu for POWER & CONTROL on the exciter's front panel; this is located under the F3 button on the keypad located below the display window.
- Change power by selecting the appropriate output power in a percent value. An increase or decrease can be achieved, so long as the maximum rating of the transmitter is not exceeded. Example to reduce the transmitter to 90% output select 90% in menu control.
- Observe the power adjustment. Note this step requires that transmitter's meter calibration has been conducted or default factory cal has not been changed.