ULTIMATE™ UHF SOLID STATE TRANSMITTER
Introduction

• The Thomson ULTIMATE range of solid state UHF TV transmitters are specifically designed for:

  – Analog (NTSC) 500W to 60kW peak of sync

  – Digital (ATSC / DVB-T) 125 W to 20kW rms
ULTIMATE Features

Integrated Dual exciter configuration
- Analog or digital dual exciters
- Automatic switch over
- Internal redundancy
  (1 PS for each exciter)
  (1 synthesizer for each exciter)

Power supply
- 1 PS for every 2amps
- Hot-swappable modules
- Directly plugged in the PA
- Self-diagnostics
- Individually protected
- Power Factor Correction

Cooling
- Air or liquid

Amplification chain
- Broadband amplifier
- All PAs operate in parallel
- Hot swappable modules
- Directly plugged into output combiner
- Self-diagnostics
- Individually protected

Control Panel
- Color touchscreen display (digital)
- Easy to use control, maintenance & troubleshooting screens
- Memory for logging tx events
- Hardwired buttons for basic control

Compact size

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Additional ULTIMATE Features (Digital TXs only)

- VSWR fold back (maintains constant Reverse Power)
- Web based remote Graphic User Interface (GUI)
- Internal blower option
- System Characteristics OUTlook (SCOUT) option
- Easy upgrade path from low power to high power
The ULTIMATE Difference

- Intelligent Transmitter with Digital Adaptive Pre-correction (DAP) - best performance in the industry (digital standard only)
- Broadband LDMOS RF amplifier module covers all digital and analog UHF channels (NO Circulators)
- All PA’s operate in parallel for best redundancy (NO Driver Modules)
- Liquid or Air-cooled (ultra reliability with liquid cooled)
- Regulated and Power Factor Corrected switching power supplies eliminate the need for automatic voltage regulator and reduce harmonics
- Cable-less amplifier, PS, and combiner module interconnect reduces RF signal losses
- Compliant with international quality and safety recommendations (CE, IEC-215, ETS 300-385)
Reliability & Redundancy

On-Air availability is Increased

- UPS option for CPU
- Basic backup local control (On / Off / Reset)
- Ultra low device junction temperatures (120°C - liquid cooling)

- **Redundant configurations**
  - Parallel cabinets
  - Main / alternate transmitters with auto changeover
  - Main / alternate pumps (liquid cooling)
  - Main / alternate blowers (external only for air cooling)

- **Internal redundancies**
  - Main / alternate exciters
  - Amplifiers – all parallel configuration
  - Power supplies - one power supply per two amps
  - Synthesizers - 1 per exciter
  - CPU has own PS

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Easy Maintenance & Reduced Operating Costs

- Digital adaptive precorrection - less set up time needed because DAP performs pre-corrections automatically and maintains stable performance (digital Txs only)
- High efficiency broadband LDMOS amplifier - only one module design covering entire UHF range
  - reduces spare parts inventory
- Hot swappable modules – amplifier, power supply and exciter modules
- Color Man-Machine Interface (MMI) with easy to use control, monitoring & troubleshooting screens (digital Txs only)
- SCOUT low cost Tx performance measurement system option (digital standards only)
- Potential liquid cooling benefits – see next slide
Why Liquid Cooling?

- Less frequent cooling system maintenance – annually requires only one system flush vs. frequent, multiple air filter changes
- Ultra reliability due to reduced device junction temperatures
- Lower annual electricity costs due to reduced air conditioning requirements
- Significantly lower noise level
- Smaller footprint versus air cooling
- Sump tank / pump assembly can be mounted outside
- Capable of operation under more hostile environments (temperature, altitude, dust conditions)
Transmitter Assemblies

**TX Main assemblies:**

- System Control / Exciter / HPA
  (.125 - 6kW ATSC air, .125 - 7.5kW liq.)
- Slave HPA (1 or 2)
  (>6 - 20kW ATSC air, >7.5kW liq.)
- Unitized RF System
- Unitized Pump/Sump Tank Assy
  (liquid cooled only)

**Sub-assemblies:**

- Analog or Digital Exciter
- Power Amplifier Module
- Power Supply Module
- Patented PA Combiner
- Color Control Panel
- Load Bank Assy
Analog Exciters

- All vision and sound standards available
- High level of IF precorrection
- Fully microprocessor controlled
- Hot-pluggable modules
- Automatic switchover (dual drive)
- Internal redundancy for synthesizer, power supplies
Digital Exciters

- ATSC and COFDM standards
- Digital adaptive pre-correction (DAP)
- Fully microprocessor controlled
- Hot-pluggable modules
- Automatic switchover (dual drive)
- Internal redundancy for synthesizer, power supplies
- Separate PS for CPU
- High Quality CU DC for better Fwd to Rev signal isolation
- Integrated on line modulator (OLMC) & demodulator (OLDC) for precise performance measurements
Power Amplifier Unit

- LDMOS Technology
- Fully broadband with only one module
- No circulators
- Hot-swappable while on air
- Same module for digital and analog service (visual or aural)
- Individually protected (VSWR, Over-Drive, Temperature, Current, & Voltage)
- Self-diagnostics fault status LED

450 W rms or 1.8 kW peak of sync @ 32V

Gain = 60 dB

16 parallel final class AB devices
## Power Supply Unit 6.4 KW @ 32V

<table>
<thead>
<tr>
<th>Supply: Three phase mains</th>
<th>208V - 400V +/- 15%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>480V +10% / -15%</td>
</tr>
</tbody>
</table>

- Air or Liquid Cooled
- Hot-swappable while on air
- Individually protected (Over voltage, Over temperature, Over current)
- Power Factor Correction
- Self diagnostics fault status LED
- No transformer for mains supply
- CE Compliant for EMC compatibility
Power Amplifier Combiner & RF Filters

- Thomson patented UHF combiner
  - low loss < 0.3 dB
  - Isolation between RF Inputs > 25 dB

- Digital Output mask filter
  - High performance band pass filter per FCC requirements
  - Unitized design w/ patch panel & loads

- Analog Diplexer
  - Low loss coaxial cavity technology
Control Panel & Man Machine Interface

Simplicity is the key for the MMI operation:
- Discrete keys for: ON, OFF, & RESET commands
- LED indicators for: Alarms, Go Home, Unlock
- Bar graphs for metering:
  - Analog - Visual, Aural 1, Aural 2 Fwd Power
  - Digital - RF output
- Color touch screen for use of control, status, and password protected maintenance modes (digital Txs only)
Remote Control Capability

- Download all TX information to a PC or a Printer (500 events)
  - Event change order
  - Failures
  - Status change

Works with standard hard wired parallel interface

Also works with Thales web Based remote GUI via PC and RS232
ULTIMATE Analog Transmitter Configurations (air cooled)

- 0.5 KW, 1 KW & 2 KW
- 5 KW & 10 KW
- 15 KW
- 20 KW
- 40 KW
- 30 KW
- 60 KW
### ULTIMATE Analog TV transmitters Sub-systems

<table>
<thead>
<tr>
<th>Peak Power</th>
<th>RF Exciter</th>
<th>Amplifiers</th>
<th>PSU (V+S)</th>
<th>No. Cabs</th>
<th>Air Cooling</th>
<th>Diplexer</th>
</tr>
</thead>
<tbody>
<tr>
<td>.5 kW</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>internal</td>
<td>common mode</td>
</tr>
<tr>
<td>1 kW</td>
<td>1*</td>
<td>1**</td>
<td>1***</td>
<td>1</td>
<td>internal</td>
<td>common mode</td>
</tr>
<tr>
<td>2 kW</td>
<td>1*</td>
<td>2</td>
<td>1***</td>
<td>1</td>
<td>internal</td>
<td>common mode</td>
</tr>
<tr>
<td>5 kW</td>
<td>1*</td>
<td>4+2</td>
<td>3</td>
<td>1</td>
<td>external</td>
<td>1</td>
</tr>
<tr>
<td>10 kW</td>
<td>1*</td>
<td>8+2</td>
<td>5</td>
<td>1</td>
<td>external</td>
<td>1</td>
</tr>
<tr>
<td>15 kW</td>
<td>1*</td>
<td>12+2</td>
<td>7</td>
<td>1</td>
<td>external</td>
<td>1</td>
</tr>
<tr>
<td>20 kW</td>
<td>1*</td>
<td>16+2</td>
<td>9</td>
<td>2</td>
<td>external</td>
<td>1</td>
</tr>
<tr>
<td>30 kW</td>
<td>1*</td>
<td>24+4</td>
<td>14</td>
<td>2</td>
<td>external</td>
<td>1</td>
</tr>
<tr>
<td>40 kW</td>
<td>1*</td>
<td>32+4</td>
<td>18</td>
<td>4</td>
<td>external</td>
<td>1</td>
</tr>
<tr>
<td>60 kW</td>
<td>1*</td>
<td>48+8</td>
<td>28</td>
<td>6</td>
<td>external</td>
<td>1</td>
</tr>
</tbody>
</table>

* second exciter optional
** second RF amplifier optional
*** second PSU optional
ULTIMATE Digital Transmitter Configuration

0.125, 0.25, 0.5
1.25 & 1.5 KW

2.5 kW, 3 kW & 4 kW

5 kW & 6 kW

7 kW & 8 kW

(air cooled)

10 kW & 12 kW

15 kW
ULTIMATE Digital Transmitters Configurations

(liquid cooled)

0.125 kW, 0.25 kW, 0.5 kW, 1.25 kW, 1.5 kW, 2.5 kW, 3 kW

4 kW, 5 kW, 6 kW, 7 kW, & 8 kW

10 kW, 12 kW & 15 kW

20 kW
## ULTIMATE ATSC TV Transmitters Sub-systems

<table>
<thead>
<tr>
<th>RMS Power</th>
<th>Exciter</th>
<th>RF Amplifiers</th>
<th>PSU</th>
<th>No. Cabs</th>
<th>Air Cooled</th>
<th>Water Cooled</th>
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<tbody>
<tr>
<td>.125 kW</td>
<td>1*</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>internal</td>
<td>ext heat exchgr</td>
</tr>
<tr>
<td>.25 kW</td>
<td>1*</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>internal</td>
<td>ext heat exchgr</td>
</tr>
<tr>
<td>.5 kW</td>
<td>1*</td>
<td>2</td>
<td>1**</td>
<td>1</td>
<td>internal</td>
<td>ext heat exchgr</td>
</tr>
<tr>
<td>1.25 kW</td>
<td>1*</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>internal</td>
<td>ext heat exchgr</td>
</tr>
<tr>
<td>1.5 kW</td>
<td>1*</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>internal</td>
<td>ext heat exchgr</td>
</tr>
<tr>
<td>2.5 kW</td>
<td>1*</td>
<td>6</td>
<td>3</td>
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<td>external</td>
<td>ext heat exchgr</td>
</tr>
<tr>
<td>3 kW</td>
<td>1*</td>
<td>8</td>
<td>4</td>
<td>1</td>
<td>external</td>
<td>ext heat exchgr</td>
</tr>
<tr>
<td>4 kW</td>
<td>1*</td>
<td>10</td>
<td>5</td>
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<td>ext heat exchgr</td>
</tr>
<tr>
<td>5 kW</td>
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<td>1</td>
<td>int or ext</td>
<td>ext heat exchgr</td>
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<tr>
<td>6 kW</td>
<td>1*</td>
<td>16</td>
<td>8</td>
<td>1</td>
<td>int or ext</td>
<td>ext heat exchgr</td>
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<td>7 kW</td>
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<td>18</td>
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<td>1</td>
<td>int or ext</td>
<td>ext heat exchgr</td>
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<td>7.5 kW</td>
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<td>10</td>
<td>1</td>
<td>int or ext</td>
<td>ext heat exchgr</td>
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<tr>
<td>10 kW</td>
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<td>24</td>
<td>12</td>
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<td>int or ext</td>
<td>ext heat exchgr</td>
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<td>12 kW</td>
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<td>32</td>
<td>16</td>
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<td>int or ext</td>
<td>ext heat exchgr</td>
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<td>15 kW</td>
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<td>36</td>
<td>20</td>
<td>2</td>
<td>int or ext</td>
<td>ext heat exchgr</td>
</tr>
<tr>
<td>20 kW</td>
<td>1*</td>
<td>48</td>
<td>24</td>
<td>3</td>
<td>N/A</td>
<td>ext heat exchgr</td>
</tr>
</tbody>
</table>

* second exciter optional  ** second PSU optional
ULTIMATE Features Recap

- Intelligent ATSC transmitter with Digital Adaptive Pre-correction (DAP)
- Low maintenance and low operating expenses
- Multiple areas of redundancy
- Air or Liquid cooled (ultra low transistor junction temperatures with liquid cooling)
- Compact size
- Cable-less module interconnect to reduce RF signal losses
- Hot-swappable modules (amplifiers, power supplies, exciter modules)
- Broadband LDMOS amplifiers (no narrowband circulators)
- Power factor corrected PSs to reduce AC harmonics
- Easy to use color Man-Machine Interface (MMI)
- Remote control options: PC software via RS232, SNMP or standard hard wired interface
- Easy upgrade path to higher power