ZHC518D-300W Digital TV Transmitter

TECHNICAL MANUAL





Brand: ZHC
Model: ZHC518D-300W
Digital output power: 300WATTS TV DIGITAL
Range of frequencies: spans from 470 to 800 Mhz.
Range of channels: from 14 to 51 UHF band IV-V
Bandwidth: 6 Mhz. - 8 Mhz.
Transmission Standard: a) DVB-T/H, b) DVB -T2, c) ISDB-T, d) ISDB-Tb
Spectrum Polarity: Non-inverted and inverted.
Output Spectrum: Compliant to ETSI EN 300 744.
Harmonics & Spurious: ＜- 60 dBc relative to the total output power (Standard a,b,c).
type of emission: 5M70X7W

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Modulation type: OFDM, which makes it highly resistant to multipath interference and signal echoes. Subcarrier modulation schemes: Uses QPSK, DQPSK, 16-QAM, or 64-QAM, depending on the hierarchical layer and the required level of protection.

MER: ⩾ 36 dB

RF output connector: 7/16-DIN.
Power supply: single phase 220 VAC/ 110VAC 50/60 Hz.
Maximum power consumption: 1.5 Kw.
Control: Touchscreen interface

Panel Operating temperature:

-10℃~+50 ℃;
Maximum relative humidity: ≤ 95%
Weight: 35KG

1. Overview:

This product adopts a brand new design with full bandwidth and high efficiency, modular building block combination structure, dual excitation automatic switching, highly artificial intelligence control system, complete VSWR, over temperature, over voltage, over current, over excitation and other protection functions. The entire machine provides a one-line remote control and telemetry serial communication interface and TCP/IP interface.

This product has excellent performance indicators and extremely high reliability. The parallel redundancy design of power amplifiers has a large margin, and the hot-plugin power supply N+1 backup redundancy configuration has high reliability. The entire machine is composed of 4 AMPLEON high-power field-effect transistors (LDMOS) BLF989E, and the MAXIMUM OUTPUT POWER CAN REACH 350W. When a single

Doherty type power amplifier outputs 180W, the working efficiency can reach over 50%. Combined with a low loss high-power synthesizer, the overall efficiency is ≥ 35%, and the maximum efficiency can reach over 40%.

The power distributor of this product adopts microstrip technology, with small size, good consistency and stability. It is packaged in an aluminum alloy shielding cavity formed by precision milling for easy production testing and maintenance. The power synthesizer adopts the suspended copper strip line developed by our company to synthesize the full bandwidth power synthesizer. It has the characteristics of low loss, high isolation, small phase difference, and large power capacity, and is particularly suitable for use in all solid-state full

bandwidth digital TV transmitters.
The automatic gain control power output of this product control system is stable, automatically reducing power in case of failure, and adaptive shoulder correction. This product has comprehensive multiple detection and protection functions such as overcurrent, over temperature, and over power. The ten inch touch screen provides a friendly human-machine interface, displaying the working status of the entire machine and power amplifier components in real-time.

This product supports multi frequency network (MFN) or single frequency network (SFN) networking methods.

2. Features:

- All solid-state full bandwidth (470-700MHz or 470-800MHz) digital TV transmitter (without installing output filter)
- The entire machine is equipped with two main and backup actuators and one RF switch, with adaptive pre distortion correction and 1+1 actuator automatic switching. The exciter has no RF signal and can be switched between three modes: manual, automatic, and remote control
- High linear and efficient LDMOS multi body power amplifier, hot swappable 2+1 parallel 1500W switch power supply, high overall efficiency
- Computer remote telemetry and remote control, networked interface and software, the entire machine provides a one-line remote telemetry serial communication interface and TCP/IP interface.
- Good human-machine interface, with two independent normally open physical buttons for "power on" and "power off" on the panel of the entire machine, with one button fully automatic power on/off
- There is no intermediate amplifier between the exciter and the power amplifier unit, completely eliminating the dead center of shutdown faults. The connection between the power amplifier unit and the synthesizer adopts a hard connection method.
- The switching power supply adopts direct hot plug and has protection functions against surge, overvoltage, overcurrent, undervoltage, and phase loss.
- Adopting parallel redundant design of 300W power amplifiers in the same phase and direct hot swapping method, they can be backup to each other and can be replaced at will.
- The cooling method adopts a low noise and efficient PWM automatic speed regulation DC fan for forced air cooling.
- The output interface adopts an upward 40 direct feed output for easy connection.
- Equipped with multiple protection functions including overcurrent,

overvoltage, over temperature, over standing wave ratio, over excitation, phase loss, and three-level lightning protection measures, it can ensure the safe, stable, and reliable operation of the transmitter, and can work continuously for 24 hours

3. Technical Specifications:

1. General indicators

1) Environmental conditions ambient temperature
Normal operation: -5 ℃~+45 ℃;
Permissible working temperature: -10 ℃~+50 ℃

Relative humidity
Normal operation: ≤ 90% (20 ℃);

Permissible work: ≤ 95% (without condensation)

Altitude: ≤ 4500m.

2) Power supply
Three phase/single phase, 220V/110VAC, 50Hz/60Hz

2. Technical indicators

1) Main technical indicators
Performance indicators of 300W terrestrial digital television broadcasting transmitter (see Table 1).

Table 1. Performance indicators of terrestrial digital television broadcasting transmitters

No.	Item	Specifications
1	Working frequency	Comply with relevant regulations of GB/T 14433-1993.
2	Single frequency network mode frequency adjustment step size	1Hz
3	Frequency stability	+/− 1Hz
4	Type of emission	5M70X7W

5	Modulation type:	OFDM, which makes it highly resistant to multipath interference and signal echoes. Subcarrier modulation schemes: Uses QPSK, DQPSK, 16-QAM, or 64-QAM.
6	Frequency accuracy	1 For MFN mode, frequency accuracy ≤ ± 100Hz; 2 For SFN mode, frequency accuracy is ≤ ± 1Hz.
7	Local oscillator phase noise	Specific indicators can be found in 2) Local oscillator phase noise (Table 2 Transmitter Phase Noise Index)
8	RF output power stability	≤±0.5dB
9	Reflection loss of output load (within 8MHz band)	Normal operation: ≥ 26dB; Permissible working: ≥ 20dB.
10	Shoulder (measured before the filter at ± 4.2MHz off center frequency)	≤-36dB
11	In-band unevenness (fc ± 3.591MHz)	Within ± 0.5dB (non dual pilot mode)
12	Out of band spectral characteristics	Comply with the relevant regulations on out of band spectrum templates in GB20600-2006.
13	Modulation Error Rate (MER)	≥36 dB
14	Transmitting power within adjacent channels	The ratio of transmission power in adjacent channels to in band transmission power≤－45dB, satisfy the transmission power within adjacent channels≤13mW.

15	Transmission power outside adjacent frequency channels	The ratio of the transmission power outside the adjacent channel to the in band transmission power is ≤ -60dB, or the transmission power outside the adjacent channel is ≤ 13mW.
16	Overall efficiency	≥35%
17	Power Stability	＜ ±0.1 dB
18	Spectrum Polarity	Non-inverted and inverted
19	Output Spectrum	Compliant to ETSI EN 300 744

20	Harmonics and Spurious	＜ 60 dBc relative to the total output power .
21	MER	≥ 36 dB input level.
22	Overall energy consumption	＜1.5KW
Note: Items 10, 12, and 13 should be measured after the filter, while the rest should be measured before the filter.		

2) Local oscillator phase noise

Table 2 Transmitter Phase Noise Index

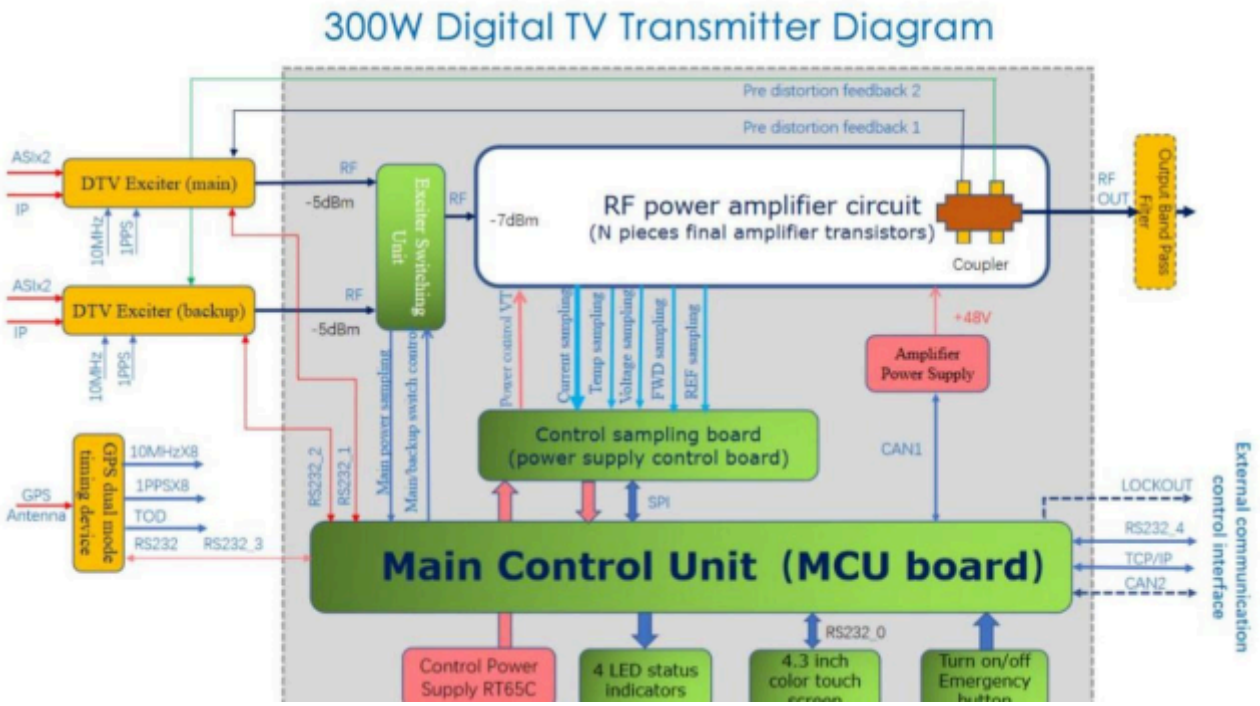
No.	Offset center frequency (Hz)	Local oscillator phase noise (dBc/Hz)
1	10	＜ -60
2	100	＜-75
3	1k	＜ -85
4	10k	＜ -95
5	100k	＜ -110
6	1M	＜ -115

1) Machine output interface: ϕ 40 direct feed 50 Ω.

2) Standard 19 inch cabinet, 3 U wide × 445 mm high × 133 mm Depth 572 mm.

4. Transmitter principle block diagram

1. Block diagram of the overall principle of 300W Digital TV transmitter



1. Introduction

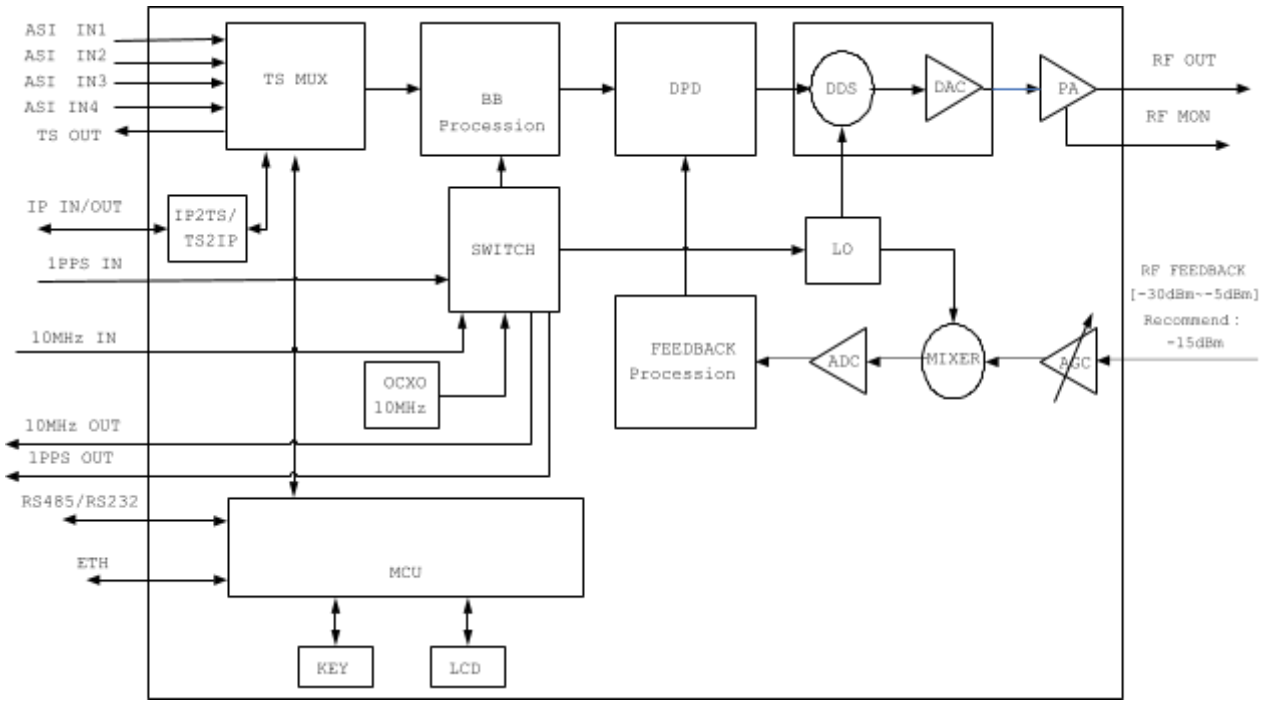
The ISDB-T exciter is composed of source procession, FEC, modulation, baseband procession, DAC, control system and display system. It is compliant with
ARIB_STD-B31_v1.6_E2. The following block diagram 1 shows the architecture of this production.

Advanced DPD technique is adopted in the exciter. High speed and high resolution data are captured from the feedback singal.Inverse properity of PA is got adaptively through DPD algorithum, which is used to compensate the baseband transmitting signal in the digital domain.

Direct Digital frequency Synthesis and Digital Up Convertion are used to obtain outstanding performance.

Remote management, operation and monitoring can be implemented via RS232 and RJ45. Exciter upgrading is easily implemented through RJ45.

Figure 1.Exciter Diagram



2. Product overview



2.1 Front panel view



Figure 2. Front panel

LCD: 40×2 LCD with backlight.

Function button: LEFT、RIGHT、UP、DOWN、OK、ESC.

TS: Green, light on indicates one of 4 ASI input is locked.

GPS: Green, light on indicates OCXO is locked to reference 10MHz clock.

IP: Green, light on indicates TS from TsoIP input is locked.

RFON: Green, light on indicates RF output is normal. TSErr: Red, light on indicates all paths of the TS input are unlocked. SYSErr: Red, light on indicates system fault.

2.2 Rear panel view



Figure3. Rear Panel

ASI IN1	ASI1 input，BNC-K female，input impedance 75 Ω

ASI IN2	ASI2 input，BNC-K female，input impedance 75 Ω
ASI IN3	ASI2 input，BNC-K female，input impedance 75 Ω
ASI IN4	ASI3 input，BNC-K female，input impedance 75 Ω
ASI OUT	ASI output，BNC-K female，output impedance 75 Ω
10M OUT	10MHz clock output，BNC-K female，output impedance 50 Ω
1PPS IN	1PPS input，BNC-K female，TTL
10M IN	10MHz input，BNC-K female，input impedance 50 Ω
RF OUT	RF output，N-K female，output impedance 50 Ω
RF TEST	RF monitor，BNC-K female，output impedance 50 Ω
RF INA	Feedback input, After the filter， BNC-K female， input impedance 50 Ω
RF INB	Feedback input, Before the filter， BNC-K female， input impedance 50 Ω
DIO/TOD IN	1PPS Information Out，RS232,DB9
RS232/RS485	Remote monitor interface， DB9 male
NMS	network management port,RJ45,support TCP/UDP
DATA	TSoIP net port, RJ45
Power switch	Rocker switch with light
power input	three prong socket with fuse

3. Character Description

3.1 Main Characteristics

1) Support ARIB_STD-B31_v1.6_E2.

2) Adopt advanced DPD technique, high performance and auto operation.
3) Directive Digital frequency Synthesis and Digital Up Convertion are used to obtain outstanding performance.
4) Total and effective TS rate display.
5) Real-time temperature monitor and display, temperature overhigh warning.
6) Remote management, operation and monitoring can be implemented via RS232 and RJ45.
   Exciter upgrading is easily implemented through RJ45.
7) Two user interface LCD and WEB.

3.2 Parameter Description

3.2.1 Physical Parameter

TABLE 1. ISDB-T exciter physical parameter

No.	item	parameter
1	ambient temperature	Operating Range ： 5 ºC ～ 45 ºC Maximum Range：-10 ºC ～ 50 ºC
	relative humidity	Operating Range：≤ 90%（20 oC）Maximum Range：≤ 95%
	atmospheric pressure	86 kPa ～ 106 kPa
2	Power voltage	100V～ 240V AC
	Power frequency	50 Hz ～ 60 Hz
3	Size	Normal 1U chassis
4	weight	Net : 3.5 kg，Gross : 5 kg

3.2.2 Technique Parameter

TABLE 2. ISDB-T exciter technique parameters

No.	Item	parameter	
1	TS input	4 paths ASI input with hot backup, auto/manual seitch	
		1 path TsoIP input,support TCP/UDP,support unicast/multicast, support IGMPV2	
2	MODE	BW	6MHz
		FFT size	2K, 4K, 8K
		Guard Interval	1/32, 1/16, 1/8, 1/4
		Code rate	1/2,2/3,3/4,5/6,7/8
		data Modulation	DQPSK,QPSK,16QAM or 64QAM
		Segments	A+B+C=13
3	RF output	Center frequency	50-866Mhz
		Single tone testing mode	continous wave(CW)
		Output level	-39.9 dBm ～ +9.9 dBm (9.77mW); (P<25 mW.); stepsize 0.1dBm
		RFMON level	RF monitor output,10dB less than RFOUT
		Power stable	< ±0.2 dB (24 hours)
		frequency stable	With internal OCXO：<2×10^{-8} With outer reference：<2×10^{-12}
		MER	⩾ 36 dB

		In-band flat	< ±0.5 dB
		shoulder	< -58 dBc @fc±4.2 MHz BW=8MHz
		Phase noise	< -80 dBc @10Hz
			< -100 dBc@100Hz
			< -110 dBc@1kHz
			< -115 dBc@10kHz
			< -120 dBc@100kHz
			< -130 dBc@1MHz
4	Internal clock	stable	< ±0.01 ppm（typical）
		aging rate	< ±0.3 ppm/year
	External 10M	Input level	AC couple,V_{P-P} ≥ 300 mV
	External 1PPS	Input level	TTL, positive trigger
5	DPD	Feedback level：-30 dBm ～ -5 dBm，typical：-15 dBm	
		High performance	improved amplitude ,phase and group delay at the same time
			MER improved 10dB(typical)
			Shoulder improved 15dB(typical)
			In-band flat falls in±0.5dB(typical) after pre-distortion.
6	Control	Local control	Keyboard on Front panel, LCD and LED indication
		Remote control	WEB,RS232/RS485,support remote upgrade