



MTS-5100 SPECIFICATIONS



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CAPABILITIES

Arbitrary Adjustment

- Independent adjustment and display of all output amplitudes and phase angles
- All output parameters can be set "off-line"
- Adjustment via continuous dial or numeric keypad

Multi-Phase Adjustment

- AC output amplitudes, angles and frequencies controllable in a multi-phase fashion
- Control phase-phase and 3-phase voltage, current and phase angle via single parameter adjustment
- Rotation of fault quantities to improve 3-phase testing productivity
- Currents: 6ph, 3ph, 1ph paralleled

Parameter Display

- All amplitude/angle/frequency parameters displayed numerically
- All AC outputs displayed in phasor graph form
- Parameter display active and updated while under computer control

State Sequencing

States	Off, Prefault, Fault 1-8, Postfault
State duration	Infinite or 0-9999.9999 seconds
State change control	Infinite, fixed duration, or dynamic based on contact/voltage input
Point-on-wave	Programmable from 0-359 deg for Prefault to Fault1 transition
DC offset	Exponentially decaying, user controllable

Waveform Playback

- Accepts IEEE C37.111 COMTRADE format files
- Reproduces analog and digital waveforms
- Channel assignment and scaling performed on front panel user interface
- Plays back from internal waveform memory

Max duration	1 minute
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Time Measurement

No. of timers	5	
Range	0 - 99999 seconds 0 - 99999 cycles	
Significant digits	6	
Accuracy	±0.5ppm of reading ±50µs	
Resolution	for times <1 sec	0.1 ms
	for times ≥1 sec	1 ms

Sequence of Events Recording

- Records state changes on all contact/voltage inputs, contact outputs and output state changes

Resolution	0.1ms
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Waveform Capture

- Functions as a 12ch oscilloscope on inputs 1-12

Resolution	±0.2 Vdc for signal levels ±300 Vdc
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Display of Relaying Quantities

- V0, V1, V2
- I0, I1, I2
- Impedance (positive sequence 3-phase, phase-phase or phase-ground)
- V/Hz, % unbalance, power, impedance ratios

Time/Phase/Frequency Synchronization

- Synchronizes phase, frequency and time of multiple instruments

Synchronization Sources	<ul style="list-style-type: none"> • Internal clock • Internal GPS receiver • External IRIG-B
Time	<ul style="list-style-type: none"> • Synchronize start of prefault and Fault1 in non-waveform playback mode • Synchronize start of record in waveform playback mode
Internal GPS 1pps accuracy	± 1 microsecond (subject to selective availability)
Frequency sources	2 (for testing synchronizing devices, and islanding conditions)

Ramping

- Independent linear ramps settable for each state

AC current	(each output)	0 - ± 100000 A/s
AC voltage	(each output)	0 - ± 100000 V/s
Phase angle	(each output)	0 - ± 9000.0 °/s
Frequency	(each frequency source)	0 - ± 20.00 Hz/s

Relay Test Modes

- Synchronizing for testing synchrocheck elements
- Synchronizing / Synchrocheck
- Differential
- Overcurrent
- Reclosing
- Distance
- Meter and Transducer

Automatic Control

- All instrument capabilities controllable via RS-232 and Ethernet communication interfaces

Preferences & Defaults

- User programmable, non-volatile defaults for system frequency, line-to-line voltage, phase sequence, phase naming and display colors, DC voltage, and communication settings

Note: Due to technical progress, all specifications are subject to change without notice.

OUTPUTS

AC/DC Current Outputs

Range	6-phase AC	0-30 Arms
	3-phase AC	0-60 Arms
	1-phase AC	0-180 Arms ¹
	DC	0-5 A
Maximum power	6-phase AC	each 450 VA
	3-phase AC	3 x 900 VA ¹
	1-phase AC	1 x 2400 VA ¹
	DC	60 W
Accuracy²	for > 5% of range	Greater of 0.25% setting or 10mArms (15mAdc)
Resolution		0.001 Arms
Superimposed harmonic	2 nd to 50 th harmonic	0 - 50%
Bandwidth	(-3dB)	3 kHz
Noise & distortion	at maximum power	<1% (for >3% range)
Protection	Overload, overtemperature, transient overvoltage, open circuit	
Paralleling	<ul style="list-style-type: none"> 2, 3, or 6 channels >6 channels when using multiple MTS-5100's 	

AC Outputs – Frequency/Phase

Freq. range		10 – 3000 Hz
Freq. resolution		0.001 Hz
Freq. accuracy	Without GPS With GPS	< ±1ppm typ. ^{2,3} < ±1µs
Phase Angle	Range	0 - 359.99°
Phase Resolution		0.01°
Phase Angle	Accuracy ²	< ±0.25° guar. < ±0.10° typ.

IRIG-B Output

Type	5V TTL, isolated
Connector	BNC

¹ Transient, dependant on line and channel configuration.

² For frequencies 47-63Hz

AC/DC Voltage Outputs

Range	3-phase AC	0-250 Vrms
	1-phase AC	0-750 Vrms
	DC	0-350 V
Maximum Power	3-phase AC	3 x 85 VA
	1-phase AC	1 x 250 VA
	DC	100 W each phase
Accuracy²	for >5% of range	Greater of 0.15% setting or 10 mVrms
Resolution		0.01 Vrms
Superimposed harmonic⁴	2 nd to 50 th harmonic	0 – 50%
Bandwidth	(-3dB)	3 kHz
Noise & distortion	at maximum power	<0.5% guaranteed <0.2% typical (for >3% range)
Protection	Overload, short circuit, overtemperature, transient overvoltage	

4th Voltage Output

Range	10 - 350 Vdc, 0-250 Vrms
Max. power	150 W, 200 VA
Current	0.5 Arms cont. max, 1.5 Apk surge
Accuracy	Greater of 0.15% setting or 10 mVrms (for >1% range)
Resolution	0.01 V
Noise & distortion	<0.5% guaranteed (at max power) <0.2% typical (for >3% range)

Contact Outputs

Type	4 x form A
Rating	5 A / 240 VAC
	0.4 A / 300 VDC
Isolation	each output independently isolated
Functions	52A, 52B, unblock, permissive
Transition delay	programmable 6.0 - 9999.9 ms

³ Less than 10ppm guaranteed

⁴ Maximum 353.55Vpk (fundamental + harmonic)

INPUTS

Analog Transducer Measurement

Input range	0 to ±10 VDC or 0 to ± 20 mADC
Accuracy	0.1% of reading or 0.05% of range
Connector	4mm banana

Contact/Voltage Inputs

Type	12ch dry contact or AC/DC voltage	
Voltage range	±300 VDC, 0 - 225 VAC	
Accuracy	±1.5% of reading ±0.5% of range	
Threshold range	Channels 1-12	0.1V - 250 V
	Channels 1-12	0.1V
Threshold resolution	0.1V	
Debouncing/ Deglitching	0.0 - 999.9 ms programmable	
Isolation	each input independently isolated	

Antenna

Type	Active, low gain
Connector	BNC

IRIG-B

Type	AM or TTL, isolated
Connector	BNC

Power Input

Rated range	100-240 VAC
Frequency	47 - 63 Hz
Consumption	1800 VA typical maximum

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OTHER

Communication Interfaces

- 2x USB 2.0 type "A" receptacle – Host Port
- 1x USB 2.0 type "B" receptacle – Slave Port (opt.)
- 10/100/1000 Base-TX Ethernet (RJ45)
(IEC - 61850 Capable)
- RS-232 (9600 to 115200 baud, DB-9)

Communication Protocols

- USB 2.0
- IEC-61850 / GOOSE
- HTTP, FTP
- ASCII commands

Physical

Weight	49 lbs (22.2 kg)
Width	18.9 in. (48.0 cm)
Height	14.5 in. (36.8 cm)
Depth	11.7 in. (29.7 cm)
Operating Temperature	14° to 122°F (-10 to 50°C)
Relative Humidity	5% to 90%, non-condensing
Storage Temperature	-22° to 158°F (-30 to 70°C)

Accessories Included

- Front panel cover
- Rugged, watertight HPX shipping/transport case with wheels & extension handle
- Manual
- GPS antenna with 100' extension cable
- AC power cord

Application Software

- RapidReporter®
- Remote Console

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