

WRTC-2010 REGULATIONS ON POWER MONITORING

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GENERAL INFORMATION

1. The WRTC-2010 Organizing and Judging Committees state power output limit, principle of power monitoring and related topics in [1] (rules 16.2.1, 16.5, 16.6, 16.2.3, 16.15 and 16.16), [2] (paragraphs 4 and 5) and [3] (paragraphs 4.1-4.4 and 5.2). Teams are obliged to use peak power monitors and jumpers which are provided by Organizer. Power monitors and jumpers are the property of Organizer, so teams must return them to Organizer after the contest ends.

2. The power monitor (see fig. 1) consists of two identical and equivalent radio frequency coupling/detector heads (one head for Radio A and one head for Radio B). Each head is connected to referee's LED indicator module by 1.4 m long flexible screened cable (black wires in fig. 1), thus heads can be spaced up to 2.8 m from each other. Each head includes directional coupler and envelope detector. Directional coupler is based on one-half of Bruene coupler and acts on forward power only. LED indicator module includes peak detector and three bright LEDs: green, yellow and red (see details below). Low-frequency outputs of coupling/detector heads are combined in LED indicator module, so, assuming that there is the only one signal in the air, LEDs indicate power of that Radio which is transmitting at the moment. For connection, both coupling/detector heads have two SO-238 sockets which are labeled "TX" and "ANT" (fig. 1). Power monitor does not incorporate batteries and is powered by transmitting radio frequency signal only. LED indicator module and detector heads have protective seals which brake apart in case of device's disassembly. Judging Committee prohibits power monitor disassembly by teams. Teams must not break protective seals. Teams and referees must inform Judging Committee about broken seals. Judging Committee may test power monitors before, during or after the contest time.



Fig. 1 – WRTC-2010 peak power monitor:
LED indicator module (at left) and two coupling/detector heads.

3. Power monitor's parameters: impedance – 50 Ohm; operating frequency range – 1.8...30 MHz; accuracy, better than – $\pm 15\%$; accuracy, typical – $\pm 3\%$; SWR (50 Ohm-loaded head), better than – 1.1; insertion loss at 100 W, better than – 0.1 dB; maximum input power – 400 W. Judging Committee strictly prohibits teams to pass over 110 W through power monitor.

CONNECTION

4. Teams must connect Radio A, Radio B, the power monitor, PL-259 – PL-259 jumpers, auxiliary equipment and antennas' feed lines according to fig. 2. Remember that the only one antenna connector is allowed for each Radio (rule 16.2.1 in [1]). Each of two PL-259 – PL-259 jumpers is 1.5 m long piece of RG-8X coax with installed connectors. LED indicator module must be placed on a table, between Radio A and Radio B, so referee must be able to continuously observe the state of LED indicator.

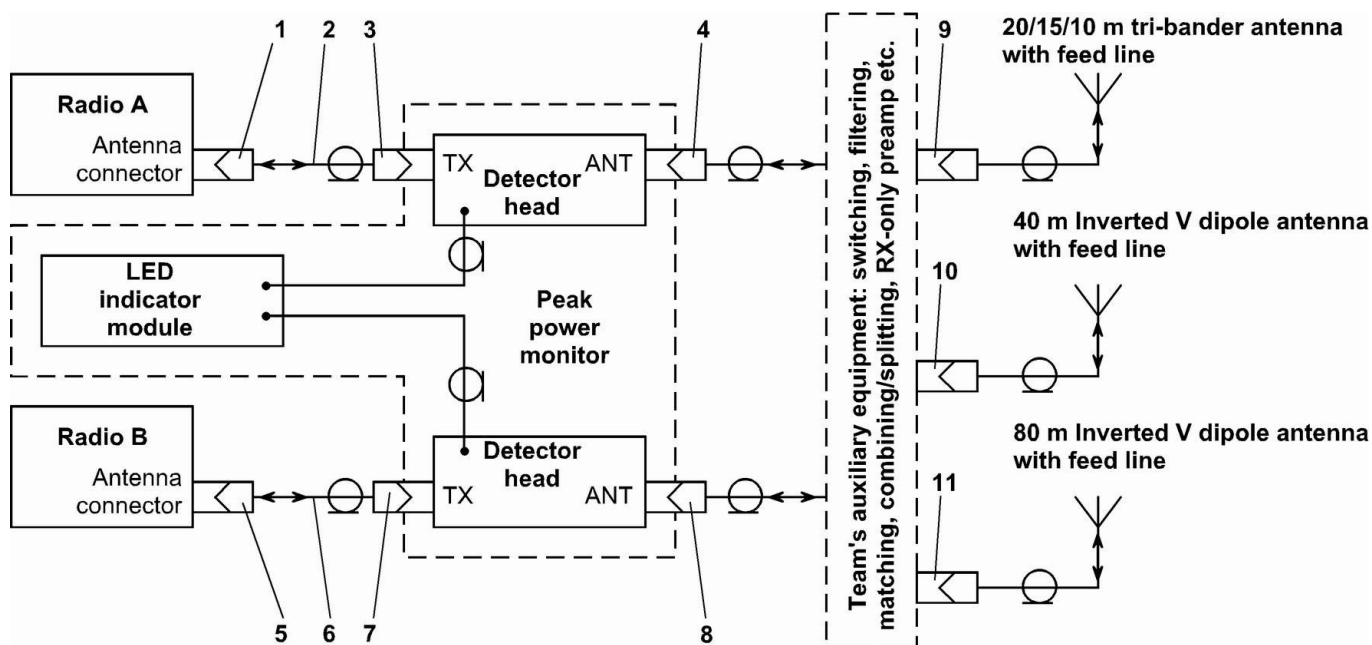


Fig. 2 – Connection of power monitor:
1, 3-5, 7-11 – SO-238/PL-259 connection; 2, 6 – PL-259 – PL-259 jumpers.

5. Each power monitor has been tested comprehensively. To prevent further issues, power monitor and two PL259 – PL-259 jumpers will be placed in sealed plastic bag. Power monitors will be arranged and delivered to every field location before team/location draw, so power monitors will be distributed among teams randomly by that draw. Team will receive plastic bag after arrival to field location. Team must open plastic bag in presence of referee and check integrity of seals. After that the team itself is allowed to connect power monitor to own equipment and further to play/test with power monitor until the contest commence. Team will return its power monitor to referee together with log file and audio record. Referee will pass power monitor to Judging Committee's representative.

6. For convenience of fine power adjustment, it is recommended for team to use own power meters for both Radio A and Radio B (e.g. Radio built-in output power indicator). Please note that the only Judging Committee's reference power meter will be used for possible issues' resolution.

LEDS' MEANINGS AND REFEREE'S ACTIONS

7. LED indicator module has three LEDs: green, yellow and red. Every LED lights in case of power value exceeds threshold as it is disclosed in table 1. In brief, the rule is: neither yellow LED ("over 100 W") nor red LED ("over 110 W") may light or even blink. See how it works in a movie at www.rk3awl.ru/ozchr09/pmeter-cw.mpg (34 Mbytes). Referee's obligatory actions depending on LED's state (ON/OFF) are listed in table 2.

Table 1 – LED's meaning




State:	All LEDs off	Green LED is ON	Yellow LED is ON	Red LED is ON
Power:	$P < 45 \text{ W}$	$P = 45...105 \text{ W}$	$P = 105...110 \text{ W}$	$P > 110 \text{ W}$
Image, WRTC-2010 LED indicator module is on top, reference power meter's scale is below:	no image			
Comments:	–	Green LED turns on if power exceeds 45 W $\pm 3 \text{ W}$	Yellow LED turns on if power exceeds 105 W $\pm 5 \text{ W}$	Red LED turns on if power exceeds 110 W $\pm 5 \text{ W}$

Table 2 – Referee's obligatory actions depending on LEDs' state

LEDs' state	Meaning	Referee's actions
1	2	3
1. All three LEDs are OFF	1.1. Both Radio A and Radio B are in receive mode	1.1. No referee's actions needed
	1.2. Output power of transmitting Radio does not reach 45 W level	1.2. No referee's actions needed
	1.3. Coupling/detector head does not connected properly (Radio must be directly connected to "TX" socket, antenna – to "ANT" socket) or not connected at all	1.3. Check connection of coupling/detector head against fig. 2 (see above)
	1.4. Peak power meter is broken	1.4. Immediately inform* Judging Committee. Until Judging Committee's representative will not arrive to team's location, use Radio A/B built-in power meters
2. Only green LED is ON or blinks	2.1. Output power of transmitting Radio is within permissible range (i.e. 45...105 W)	2.1. No referee's actions needed
3. Yellow LED (and, possibly, green LED) are ON or blinks	3.1. Output power of transmitting Radio exceeds 100 W, i.e. exceeds maximum allowed value which is stated by the rule 16.5 [1].	3.1. Softly touch that competitor's shoulder by a hand to attract his attention to peak power meter. Inform competitor about rule 16.5 [1] violation.
		3.1.1. If it happens for the first time or very seldom. Warn about possible sanctions up to DQ following rule 7.6 [1]. Require competitor to produce carrier ("key down" in CW or a loud sound or whistle in SSB) to reduce power accurately, below 100 W limit, so only green LED is ON. Make a record in referee's log about rules' casual violation (e.g. "Yellow LED is ON at ...UTC").
		3.1.2. In case of repeated violations which looks like deliberate actions. Stop both competitors' operation. Warn about possible sanctions up to DQ following rule 7.6 [1]. Require to reduce power so only green LED is ON. Make a record in referee's log about severe rules' violation. Inform* Judging Committee.
4. Red LED (and, possibly, yellow and green LEDs, i.e. all three LEDs) are ON or blinks	4.1. Output power of transmitting Radio exceeds 110 W, i.e. significantly exceeds maximum allowed value which is stated by the rule 16.5 [1].	4.1. Same as 3.1.
		4.1.1. Same as 3.1.1.
		4.1.2. Same as 3.1.2.

* See Judging Committee's contact information in participant's book

ISSUES WITH POWER MONITORING

8. In case of CW keying, peak power meter reading is very close (± 1 W) as in case of TX carrier mode ("key down"). In case of SSB operation, peak power meter reading is some lower (by 5...15 W) because of increased peak factor of human speech and simple schematics of power monitor (neither power supplies nor batteries for reliability). For qualitative peak power monitoring in SSB mode, referee may require and operator must produce a loud sound or a whistle.

9. Some radios can produce envelope's overshoot in SSB or in CW (e.g. at first dit's beginning) which will exceed 100 W level (so yellow LED blinks); after that Radio's output power decreases to steady-state level below 100 W (so then the only green LED is ON). Some radios produce different power in CW and SSB comparing to carrier mode. In any case the rule is the one: yellow and red LEDs must neither light nor even blink.

10. Acceptable accuracy of power monitor is $\pm 15\%$ or ± 0.6 dB (measured with 50 Ohm dummy load, compared to Judging Committee's reference power meter). A team or a referee, who suspects malfunction in peak power monitor, must inform Judging Committee about that. Judging Committee's representative may stop team's operation for a very short time to make necessary measurements and replace peak power monitor.

11. Peak power monitor can be influenced by strong radio frequency currents or strong electromagnetic field. This happens rarely. In most cases this shifts LEDs' thresholds lower, e.g. yellow LED ("over 100 W") turns on at some lower power (90...95 W). To prevent this, it is recommended to keep coupler/detector heads closely to each other, keep surplus connecting wire (black wire in fig. 1) compact (e.g. wind it in skein) or put ferrite clips on wires.

REFERENCES

1. WRTC-2010 Contest Rules. www.wrtc2010.ru/?id=20
2. WRTC-2010 Station description. www.wrtc2010.ru/?id=23
3. WRTC-2010 Frequently Asked Questions. www.wrtc2010.ru/?id=46