ABEM WalkTEM 2

TRANSIENT ELECTROMAGNETICS

SEARCH MAP MONITOR

Feature comparison between ABEM WalkTEM 1 & 2

Introduction to the ABEM WalkTEM product family

The first generation of the ABEM WalkTEM was a high-specification, robust, field-efficient TEM system with exceptional data quality and high bandwidth. It was well-suited to recording both the large, fast-changing, early (shallow) signals as well as weak, slow-varying, late (deep) responses. It was designed, primarily, with groundwater applications in mind.

The WalkTEM 2 has built upon this strong foundation to further improve the data quality, useability and specification options to help customers find a better "fit" for their requirements and budget. Some functionality has been added to improve the suitability of the system for mineral applications. In this document we will look at the main differences between the two generations of WalkTEM and what these changes mean for the end customer.

ABEM WalkTEM 2 receiver comparisons

Specifications/Functionality	WalkTEM1	WalkTEM 2 RX Standard	WalkTEM 2 RX Advanced
Weight (including internal batteries) [kg]	14 kg	8.3 kg	8.3 kg
Dimensions (length x width x height) [cm]	39 x 21 x 32	39 x 21 x 32	39 x 21 x 32
Automatic Dual Moment measurement sequence	Yes	Yes	Yes
Advanced front gate technology	Yes	Yes	Yes
Automatic sounding position via build-in GPS	Yes	Yes	Yes
Easy-to-use intuitive user interface	Yes	Yes	Yes
On-board PC	Yes	Yes	Yes
Instrument keypad	Yes	Yes	Yes
8.4", 6mm glass daylight visible screen	Yes	Yes	Yes
Military grade connectors	Yes	Yes	Yes
Rugged IP66 casing made for field use	Yes	Yes	Yes
Operating range (°C)	-20 to +55	-20 to +60	-20 to +60
Possible external power supply	Yes	Yes	Yes
Rx/Tx cable reference	Yes	Yes	Yes
Data transfer via USB, Wi-Fi or Ethernet	Yes	Yes	Yes
Rx input for Z, X and/or Y field components	No	Yes	Yes
Build-in advanced calibration parameters	No	Yes	Yes
Removable batteries	No	Yes	Yes
Bluetooth notification of measurement progress	No	Yes	Yes
On-board waveform analysis / measurement	No	Option	Yes
On-board data inversion capability	Yes	No	Yes
No of input channels (active KPT-19 for Rx antenna)	2	1	2
ABEM Receiver loops supported	RC5, RC200	RC5	RC5, RC200
ABEM Transmitter supported	Internal, TX60	TX8	TX8, TX20, TX60
Tx loops supported [m]	20x20, 40x40, 100x100, 200x200	20x20, 40x40	20x20, 40x40, 100x100, 200x200

ABEM WalkTEM 2 transmitter comparisons

Specifications/Functionality	WT1	WT2 TX-8	WT2 TX-20	WT TX60
Weight (including internal batteries) [kg]	14 kg	4.7 kg	4.7 kg	14 kg
Dimensions (length x width x height) [cm]	39 x 21 x 32	19 x 21 x 32	19 x 21 x 32	39 x 21 x 32
External power [V] DC	10-34 V	10-14 V	10-34 V	24-250 V
Cooling	Convection	Convection	Convection	Cooling fans
Automatic Dual Moment sequence	Yes	Yes	Yes	No
Military grade connectors	Yes	Yes	Yes	Yes
Rugged IP66 casing made for field use	Yes – alloy	Yes – ABS	Yes – ABS	Yes - alloy
Operating range (°C)	-20 to +55	-20 to +60	-20 to +60	-20 to +55
Receiver/Transmitter cable reference	Yes	Yes	Yes	Yes
Min/Max Tx current	1/15 A	1/8 A	1/20 A	7/60 A
Internal damping resistor array	No	Yes	Yes	No
Detailed transmitter waveform description	No	Yes	Yes	Yes

1 Separate transmitter (TX) and receiver (RX) units

WalkTEM 1: Transmitter and receiver circuitry were all inside the main unit**.**

WalkTEM 2: The main unit is now just the computer module and receiver circuits and all transmitter options are external units. The TX-60 is the same form factor as the receiver (as before) whereas the TX-8/TX-20 are half the size.

Description of improvement: Although Guideline Geo argued that the compact, single unit form of the original WalkTEM was a major useability benefit, the move to separate units has delivered more advantages than disadvantages. Increasing the output current by a third, from 15A to 20A, created a risk of increased noise due to having the transmitter so close to the receiver. Moving them out has voided this and further improved the excellent data quality of the original WalkTEM. It has also been easier to offer more configurations with separate units. The small form of the TX-8 / TX-20 is very convenient, the combined weight of the receiver and transmitter is less than the original WalkTEM, and we still have no need for an external PC.

Key improvement area: Data quality; ***Precise***.

2 Scalable architecture

WalkTEM 1: The only options with the original WalkTEM were the transmitter loop sizes and the option of using the external TX-60 high-power transmitter.

WalkTEM 2: Separating out the transmitter gave an opportunity to redesign the circuitry to allow for options on power. The TX options are now TX-8, TX-20 and TX-60 offering a maximum of 8, 20 and 60 Ampere, respectively. The RX also has more options with *Standard* and *Advanced* variants.

Description of improvement: Whilst the WalkTEM 1 was undoubtedly a good machine, it was 'too much technology' for some customers, making it sit above their budget. It also made it difficult to compete in tenders where the required specification was not so high. Now, with a choice of two receivers, 3 transmitters and all the different TX loop sizes, it is much easier to meet a customer's requirements. The fact that the Standard receiver can be upgraded remotely to an Advanced unit, and the TX-8 upgraded in a similar fashion to a TX-20, we can also allow new customers to grow their capability easily over time, spreading their investment. In summary, the instrument can be configured to compete at more levels in the marketplace.

Key improvement area: Better fit to customer needs; ***Flexible***.

3 Increased current in transmitter

WalkTEM 1: The WalkTEM 1 was limited to 15 Amps and the next step was to use the TX-60 external transmitter which took capacity up to 60 Amps.

WalkTEM 2: The TX-20 unit can deliver up to 20 Amps.

Description of improvement: It is now possible to run 20 Amps in the small-form transmitter before needing to make the jump up to investing in a TX-60. This represents a 33% improvement over the first generation WalkTEM and thus a significant increase in the signal strength (improving signal to noise ratios) and depth capability of the instrument at a given site.

Key improvement area: Data quality; ***Precise***
Depth; ***Flexible***.

4 Improved calibration parameters

WalkTEM 1: Calibration of the instrument comprised mapping the on and off ramps with just two points each (i.e. top and bottom of ramps) plus an offset and scalar value to shift readings against a known model.

WalkTEM 2: The WalkTEM 2 retains the scalar/offset values but has made them more specific to individual configurations. The instruments now define the on and off ramps with a larger number of digitized points to better represent the waveform.

Description of improvement: A better representation of the waveform will ultimately result in more accurate final models as the operation of the instrument and the subsequent electromagnetic field should be better understood. A calibration software tool will allow for easier calibrations.

Key improvement area: Data quality; ***Precise***

5 Removeable batteries

WalkTEM 1: The instrument receiver circuits were on a completely isolated circuit to avoid any noise from the TX and computing hardware. This meant that the unit contained separate batteries for the computer module and the receiver circuit but they were sealed inside the housing.

WalkTEM 2: The receiver unit contains two “hot-swappable” slide-in, rechargeable batteries.

Description of improvement: This allows charging of the batteries to be undertaken away from the instrument in a separate charging cradle and for the surveyors to carry a spare set of batteries which can be swapped for the aging units without switching the instrument off. The new batteries can also be charged inside the instrument without it being switched on.

Key improvement area: Ease of use; ***Easy***

6 Multi-component measurements

WalkTEM 1: The system was set-up on the assumption that all measurements would be made with a horizontal loop. Measurements with a vertically positioned receiver coil could be made but there was no way to embed information on the orientation of the antenna into the data.

WalkTEM 2: It is now possible to define whether the RX loop is measuring the Z component (as before) or the X / Y component, and updates to SPIA TEM inversion software means this will now recognize those flags in the data.

Description of improvement: For relatively simple geological settings and broad targets such as aquifers, measuring just the dominant vertical component of the ground response is sufficient. However, for more complex geological settings and confined targets such as mineral deposits, it is normally necessary to be able to compare different components of this response. The ability to record the data as X and/or Y components as well as the more normal Z component, opens up new application areas such as mineral exploration.

Key improvement area: Range of applications; ***Flexible***

7 RC-5 X-Z antenna stand

WalkTEM 1: There was no official solution for mounting an RC-5 vertically (which allows measurement of X-Y components).

WalkTEM 2: We now offer a lightweight antenna stand which will hold two RC-5 units perpendicular to each other.

Description of improvement: Enables a simple method of undertaking measurements of the X or Y component of the returned signal, useful for mineral exploration and complex geologies.

Key improvement area: Ease of use; ***Easy***

8 Onboard waveform analysis

WalkTEM 1: No way to measure or view the waveform generated by the transmitter.

WalkTEM 2: RX Advanced systems come with a Rogowski coil (which attaches to one of the input channels) for analyzing the transmitter pulse's off-ramp.

Description of improvement: Having better knowledge of the waveform will produce better results at the inversion stage and can also help troubleshoot problems more quickly. Knowing the character of the off-ramp allows for a more robust decision-making process when it comes to choosing the correct damping resistor for optimizing transmitter loop performance. Choosing the correct resistor value on the original WalkTEM was best done by an experienced operator and, even then, an 'educated guess' may have been required occasionally.

Key improvement area: Data quality; ***Precise***

9 Internal damping resistor array

WalkTEM 1: All damping of the transmitter loop had to be done with external resistor which were manually attached in parallel with the loop by the user.

WalkTEM 2: There is a rack of damping resistors installed within the TX-8/TX-20 and individual resistors can be selected from the user interface.

Description of improvement: Damping resistors are incredibly important to ensure the system generates a good clean transmitted signal. Having the damping resistors built into the TX unit has a number of advantages but primarily it stops them being mounted incorrectly onto the TX loop and also means there is no risk of losing or forgetting the damping resistors. There is still the option to use an external custom resistor if required. The Rogowski coil allows the rack of resistors and/or external resistor to be tested and the decay results plotted so that a more informed choice can be made about which to choose. Choosing the wrong resistor could mean the data are unusable in the worst case scenario, so this is an import capability.

Key improvement area: Ease of use; ***Easy***

10 Non-metallic housing

WalkTEM 1: Aluminium alloy casing

WalkTEM 2: ABS/PMMA

Description of improvement: The change from metal to impact-resistant plastic has been done to improve the data quality to even higher standards by removing the possibility of having currents induced in the chassis and bodywork of the instrument. The WalkTEM 2 still meets the IEC IP66 rating for ingress protection (sealed against dust and high pressure water jets).

Key improvement area: Data quality; ***Precise***

11 Bluetooth notifications

WalkTEM 1: No audio-visual notification of measurement status or errors

WalkTEM 2: Audio notification of measurement completion, audio for system messages and alerts

Description of improvement: For efficient fieldwork, especially when working in small crews, it is not desirable or practical to always watch the instrument. This function allows the operator to undertake other tasks once the instrument has started collecting data and the alert will sound once the measurement is complete, or whenever a system message appears.

Key improvement area: Ease of use; ***Easy***