

**OPERATOR'S MANUAL  
MODEL VM10A**

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**All requests for repairs should be directed to the factory.**

**This instrument is warranted against defective workmanship and materials for a period of  
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factory seal on the instrument is broken.**

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## Chapter 1 Introduction/Features

Micro Seven, Inc. ®'s model VM10a or VM10ac is a peripheral device that transmits measurement result to BLE controller like a smartphone. After an app is opened, VM10a connects to a BLE controller automatically when the device ID on the app matches with VM10a device ID. The device ID is a 4-digit code that is unique to each VM10a.

When the app is closed, BLE connection is turned off. When the app is opened again, “Restart” or “scanning” button is required to be pushed. VM10a and BLE controller or smartphone app provide remote measurement of DMM functions and oscilloscope via wireless BLE. Received data and/or trace information may be stored in the BLE controller by manually or automatically.

Various trigger methods, viewing of past test results and multi-colored traces, and isolated common signals help engineers and technicians for testing electronic circuits.

The stand-alone measurement mode includes voice-trigger mode for starting A/D with audio input through a built-in microphone, value-change mode for starting A/D automatically for input exceeding certain value and continuous mode. VM10's voiced measurement data output eliminates looking of display data on conventional display. The value-change mode provides automatic voiced data without looking at a display area. Each voice segment of numerical and legend voice segments is programmable through a built-in microphone. An audio speaker is built-in in VM10A. Lower cost VM10ac for no voice output nor stand-alone operation is available.

### Features

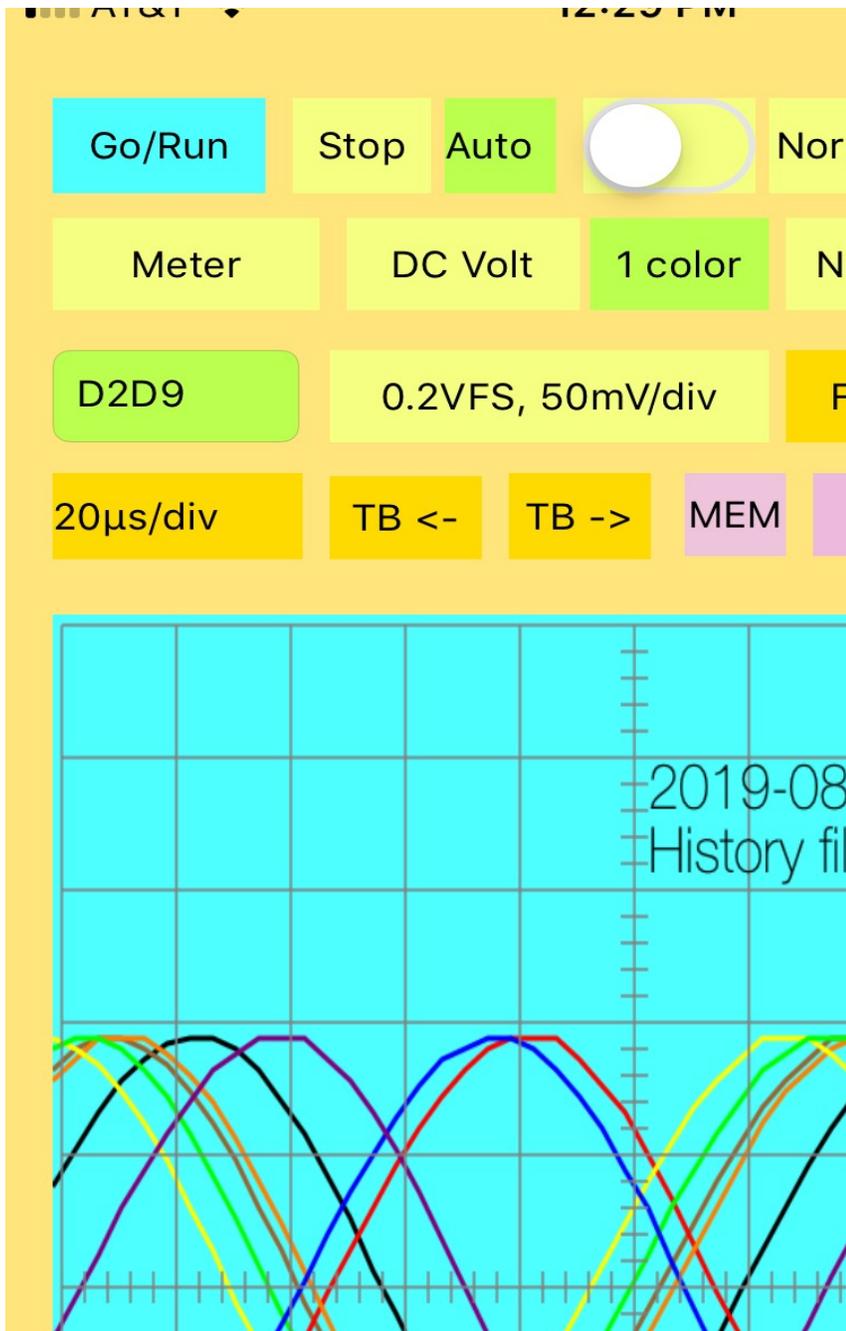
- Voiced measurement data output for DC Volt, AC Volt, and resistance
- Oscilloscope function with various trigger modes and time base change (App)
- Almost unlimited amount of measurement data output and oscilloscope data (App)
- Stand-alone or using smartphone App mode
- Measurement data output to smart phones wirelessly
- Programmable voice segments (App)
- Remote measurement of digital multi-meter and oscilloscope via BLE wireless and smart phone app
- Manual or automatic start/time interval mode and recording data/traces
- Voiced measurement data output for DC Volt, AC Volt, and resistance in your own voice
- Floated power supply measurement
- optional internal rechargeable battery



MICRO SEVEN-Model VM10a, Scope-Meter, oscilloscope/Talking Digital Multi-meter is shown in above picture. The rear view of VM10a is shown below.



Screenshot of eight traces of input voltage at different times applied at VM10a by smart-phone app is shown below. The time setup is  $50 \mu\text{s}/\text{div}$ . The vertical setup is  $0.5\text{V}/\text{div}$  with  $0\text{V}$  at its center. The triggering is set as "Free Run". The trigger level that may be changed by swiping up or down is shown as a red-dotted line. Number of color traces is changed among 1-8 colors.



## Chapter 2 Specifications

**Device ID:** 4-digit alphanumeric like “DD29”

Note: The BLE connection to BLE controller and data communication require matching of the programmed Device ID in the app and Device ID that is advertised by VM10a.

**Stand-alone mode (only for VM10a):**

- Value trigger mode to do automatic measurement with Microphone-triggered measurement
- No need to look measurement display anymore
- Continuous measurement

**Input amplifier bandwidth:** 125kHz

**Maximum sample rate for trace/oscilloscope measurement:** 250kHz

**Measurement ranges:**

DC volt and RMS: +/-200mV, +/-2.000V, +/- 20.00V, +/- 200.0V, +/- 500V, +/- 1 % (for DC volt), and +/- 3% for 50Hz to 5 kHz in RMS measurement

Oscilloscope input range: same as DC volt except +/-100mV, +/-1.000V, +/- 10.00V, +/- 100.0V, +/- 500V for battery option

Resistance: 2.000k ohm, 20.00k ohm, 200k ohm, 2.000meg ohm, +/- 5%

True-RMS measurement including DC+AC component

**Measurement inputs:**

VM10a: three banana jacks (Red, Black, and Blue)

J1 (Red ): + input terminal

J2 (Black): – input terminal

J3(Blue): AC coupled input terminal

VM10ac: two banana jacks (Red and Black)

J1(Red) + input terminal

J2(Black): – input terminal

Common input may be elevated up to +/- 120VRMS with respect to the earth ground with chassis-ground isolated AC/DC power adapter.

**Front-panel controls:**

Built-in microphone (only for VM10a)

SW 1 (left), Mode switch, short push for announcing current mode, longer push to change to next mode (only for VM10a):

SW 2 (center), Range switch, short push for announcing current range, longer push to change to next mode (only for VM10a)

Note: Pushing SW1 and SW2 simultaneously will place into mode-programming.

SW 3 (right) Start button for manual push button for starting voiced measurement (only for VM10a):

SW4: power on/off switch

**Power indicator**, steady when the power is on, or flashing when BLE connection is made.

### **Rear panel:**

12VDC input connector (from 117V AC/DC adapter)

**Time base:** 100ms/div, 50ms/div, 20ms/div, 10ms/div, 5ms/div, 2ms/div, 1ms/div, 0.5ms/div, 0.2ms/div, 0.1ms/div, 50  $\mu$ s/div, or 20  $\mu$ s/div where 'TB<' for slower time base (maximum 100ms) or 'TB>' for faster time base (minimum 20  $\mu$ s)

**Voice Generation/Recording in factory-default voice or in your own voice (only for VM10a)**

**Note: voice announcement of measurement is done by audio speaker in DM10a not by audio speaker in smartphones.**

Downloading factory default voice file is available in the app. Note: VM10a is also loaded with the factory default voice file.

Numerical voice data-0.5 seconds: 0,1,2,3,4,5,6,7,8,9, decimal point, over-range indicator, and minus sign

2 seconds voice data: Unit of measurement (DC volt, AC volt, kilo-ohm, and meg -ohm)

Audio output is output via built-in speaker.

**Wireless standard:** IEEE 802.15.1 transparent UART operation, BLE operation

**Optional battery operation with Ni-Cad battery pack:**

Power: 2.5 hours of battery operation

Recharging time: 24 hours

Charge/discharge cycles: 100 times minimum

**AC/DC Adapter and battery charger:** 12VDC unregulated, 800mA maximum with 117VAC input power

**Factory hardware reset: pushing power switch while pushing SW2 and release SW2**  
**Warning: the factory hardware reset requires the calibration procedure in Chapter 8.**

**Dimensions:** 19 cm (4") W x 4.5 cm (1.75") H x 10 cm (7.5") L

**Weight:** 500g (1.1 lbs.)

**Environmental: Operating temperature:** 0 to 35 degree C, Humidity: 85% RH at 35 degree C

**Warranty/Service:** one year limited warranty. No warranty if any factory seal is broken. Service is performed at the factory.

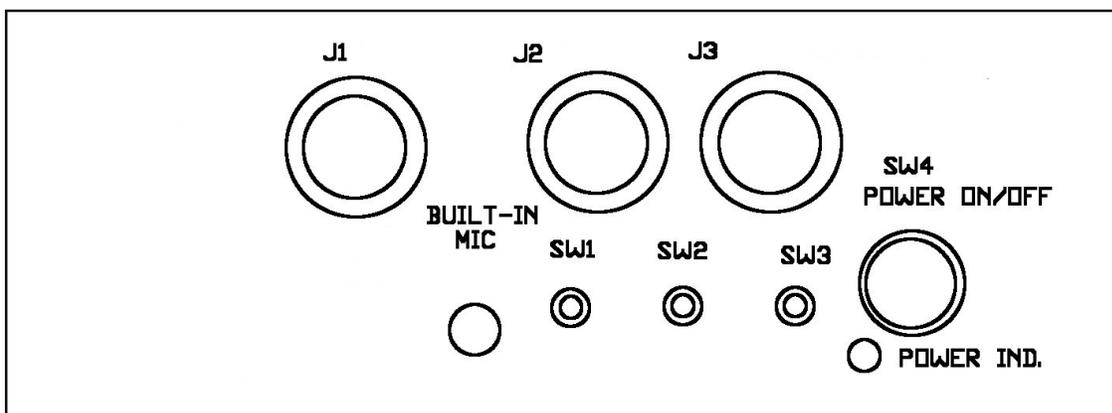
**Calibration procedure:** included in the app, description in Chapter 8 in this manual

**Models available:** VM10a, VM10ac, or VM10

VM10 is for stand-alone operation with RS232c interface instead of smartphone wireless operation.

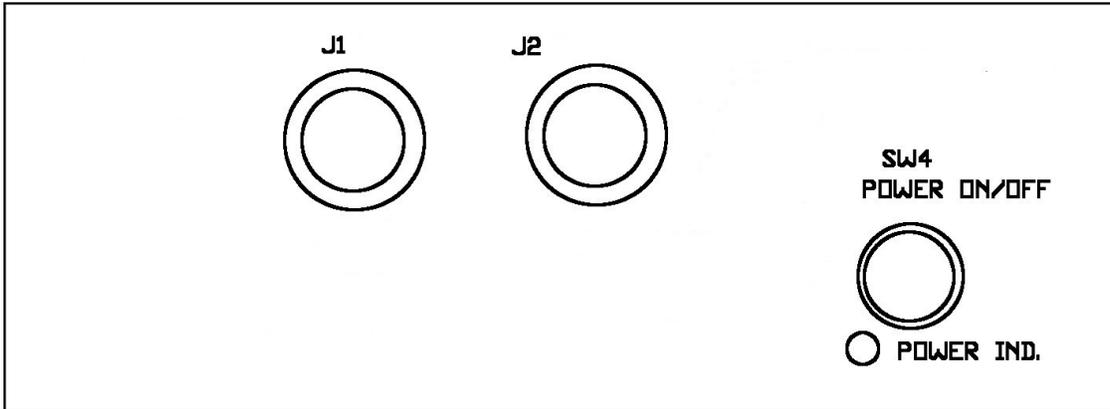
Optional features:

1. International AC/DC power adapter for 90-250VACRMS and 50/60Hz power input
2. Car battery adapter
3. Rechargeable battery
4. Order lower-priced [VM10ac](#), which is not for stand-alone operation and does not include voiced measurement nor speaker.



Front panel of VM10a is shown above.

The front panel of VM10ac is shown below:



## Chapter 3

### First-time Operation/Installation

***The smartphone setting on the Bluetooth must be on. If it is off, change to on. When it was off, see the troubleshooting in Chapter 11.***

Connect a provided AC/DC power adapter to proper AC power input and connect the input power connector to a power input jack of VM10a.

Turn on the power switch of VM10a confirm that green LED on the front panel of VM10a is on. Note that the LED continuously blinks when VM10a and smartphone are connected via the wireless standard.

Open VM10a app on the smartphone.

After few seconds, the screen will show very similar like the following:

Received: VM10\_D2D9

The device ID does not match with received device ID.

Enter the correct 4-digit Device ID after “\_” above

In the text field shown ‘D2D9’.

Close and reopen this app.

If you don't see the above display, see the Chapter 11 Troubleshooting.

Enter the same 4-digit code like D2D9 in the text field, and close the app, and enter the app.

When your entry matches with the 4-digit code programmed in the VM10a, you will see the following message:

Received: VM10\_D2D9

The device ID matches with received Device ID.

Few seconds later you will see Go/Run in the upper left corner.

## Chapter 4

### Basic Measurement with App

Wireless connection between a smartphone and VM10a is made automatically when the app is opened. When the app is closed, the wireless connection is closed. Displaying “Scanning” will be changed to “Go/Run” when VM10A is scanned, found and connected automatically to smart phones. Push “Go/run” button every time measurement is required unless “Auto” is enabled for continuous operations. The “Auto” mode may be stopped when either “Auto” mode is disabled, or “Stop” button is pushed.

#### 4.1 App Mode selection of Meter, Scope, or Scope Meter

Select **Meter** for digital measurement of DC volt, RMS, or resistance measurement (Ohm) without traces or waveforms. Select **input voltage range** such as 2VFS, 0.5V/div and push Go/Run. For continuous measurement, enable **Auto**. The result will be displayed in the upper section of the large screen. See Chapter 9 for recording measurement results. Set **Audio On** or **Audio Off** for turning on audio or turning off audio of measurement results.

A typical example of the Scope Meter mode is to show RMS value of AC input voltage and show AC waveform at the same time in the screen. See 4.2 App Mode Pre-trigger mode and App Mode Trigger point for trace display,

In the Scope Mode, select time base in the “TB <-“ for slowing time base or “TB -> “ for faster time base. The time base and input signal range is displayed in the text field and also in the result screen. . See 4.2 App Mode Pre-trigger mode and 4.3 App Mode Trigger point for triggering input signal.

#### 4.2 App Mode Pre-trigger mode:

When the pre-trigger mode is enabled, input signal before few divisions of the trigger signal is displayed.

#### 4.3 App Mode Trigger point:

Swipe the screen once and red-dotted trigger point is shown. If you swipe up or down, the trigger point is moved slowly. If you swipe continuously, the trigger point may be moved quickly. The trigger point is for “Trigger +” and “Trigger –“.

App Mode Trigger selection of “Free Run”, “Trigger +”, “Trigger –”, “P-P Auto”, “Peak”, “Valley”, “One Shot+”, or “One Shot-“.

Note: Trigger selection except “One Shot” requires repetitive input waveform.

##### 4.3.1 Trigger + mode:

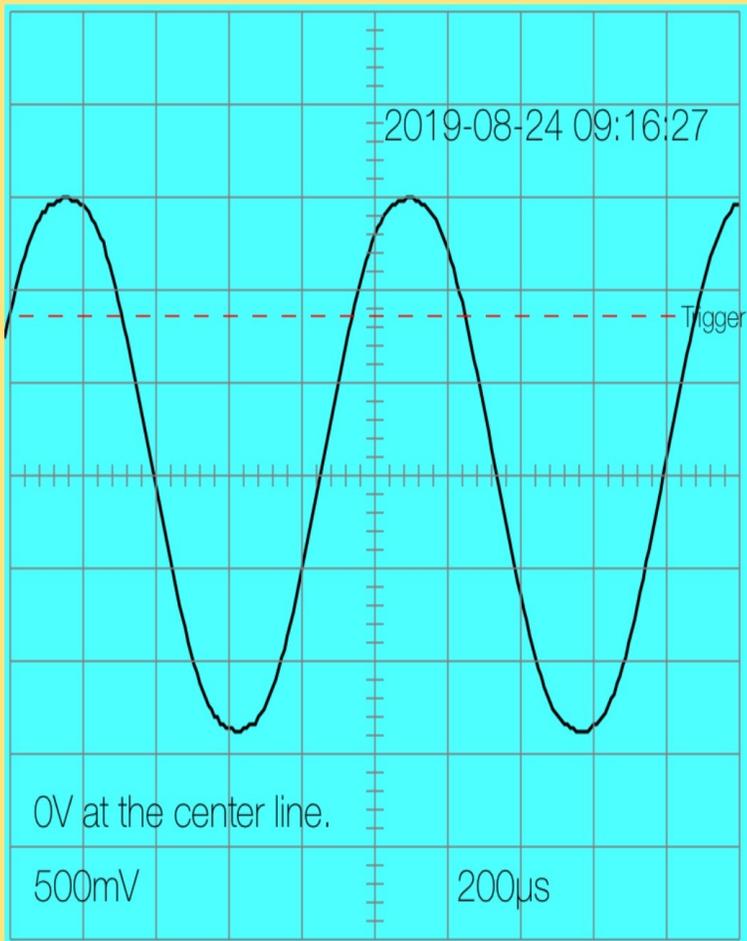
“ Trigger +” starts trace display when input voltage moves passing the trigger point upward. Also see the “Pre-trigger” mode below for displaying event before trigger point. In the shown picture below, trigger signal is generated when input voltage crosses the red-dotted trigger line upward.

Scanning Stop Auto  Normal Mode

Scope DC Volt 1 color No Pretrig.

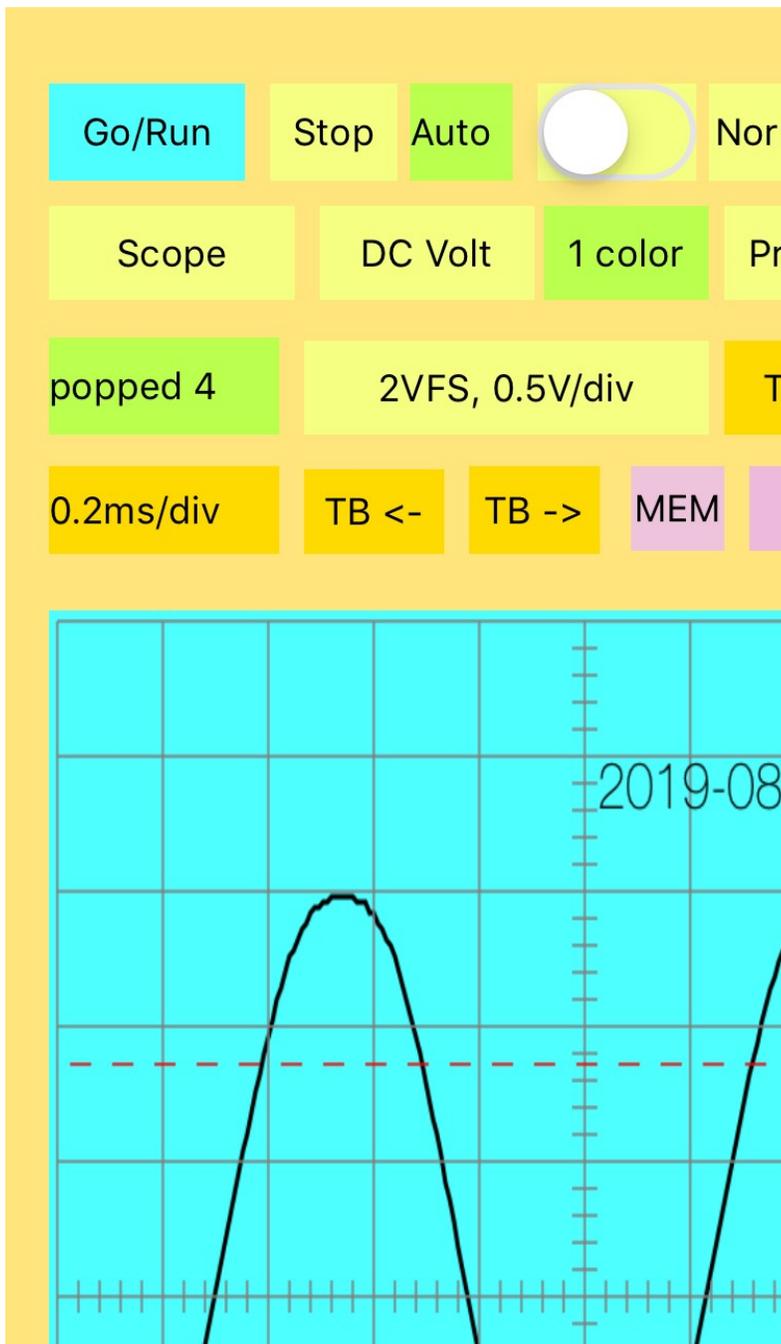
Scanning -found vm1... 2VFS, 0.5V/div Trigger +

0.2ms/div TB <- TB -> MEM 3 POP



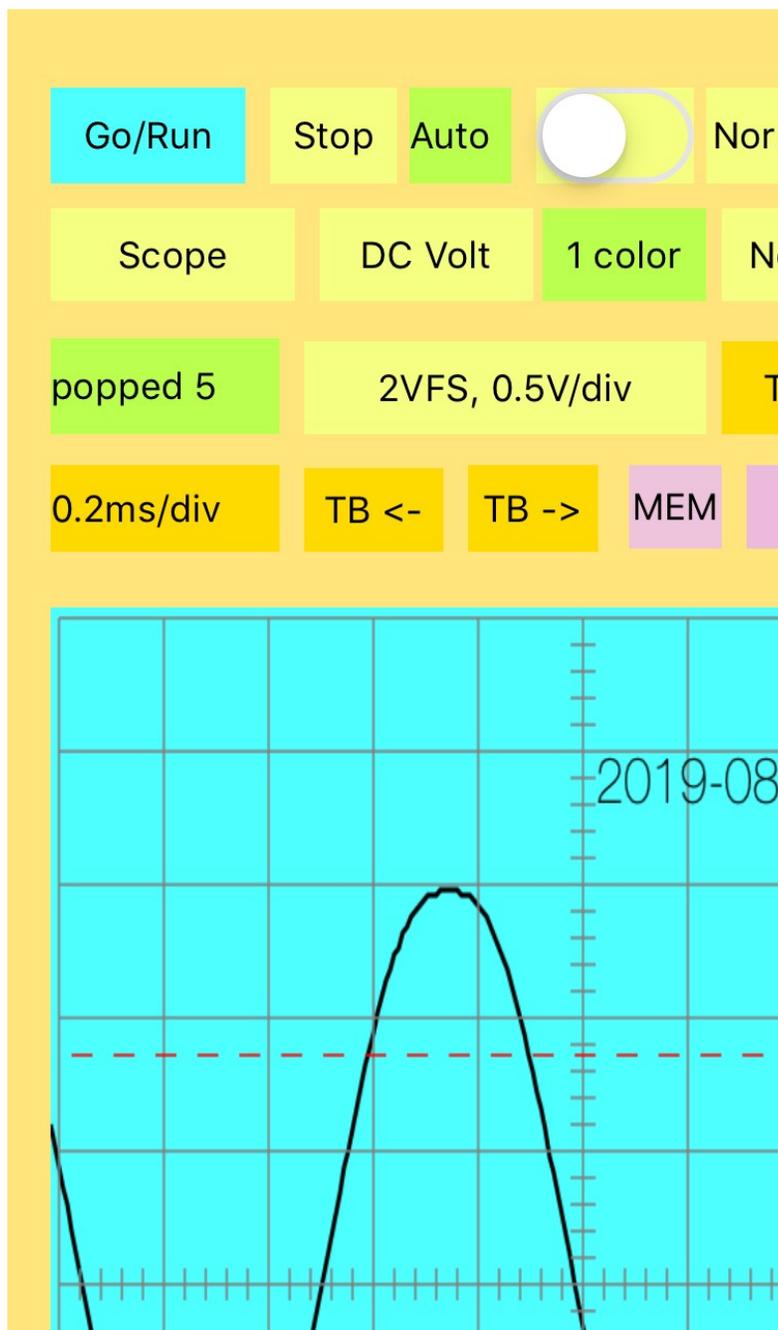
### 4.3.2 Trigger + mode with pre-trigger

The screenshot with pre-triggered event is shown with two horizontal divisions delaying for the same signal as the previous screen.



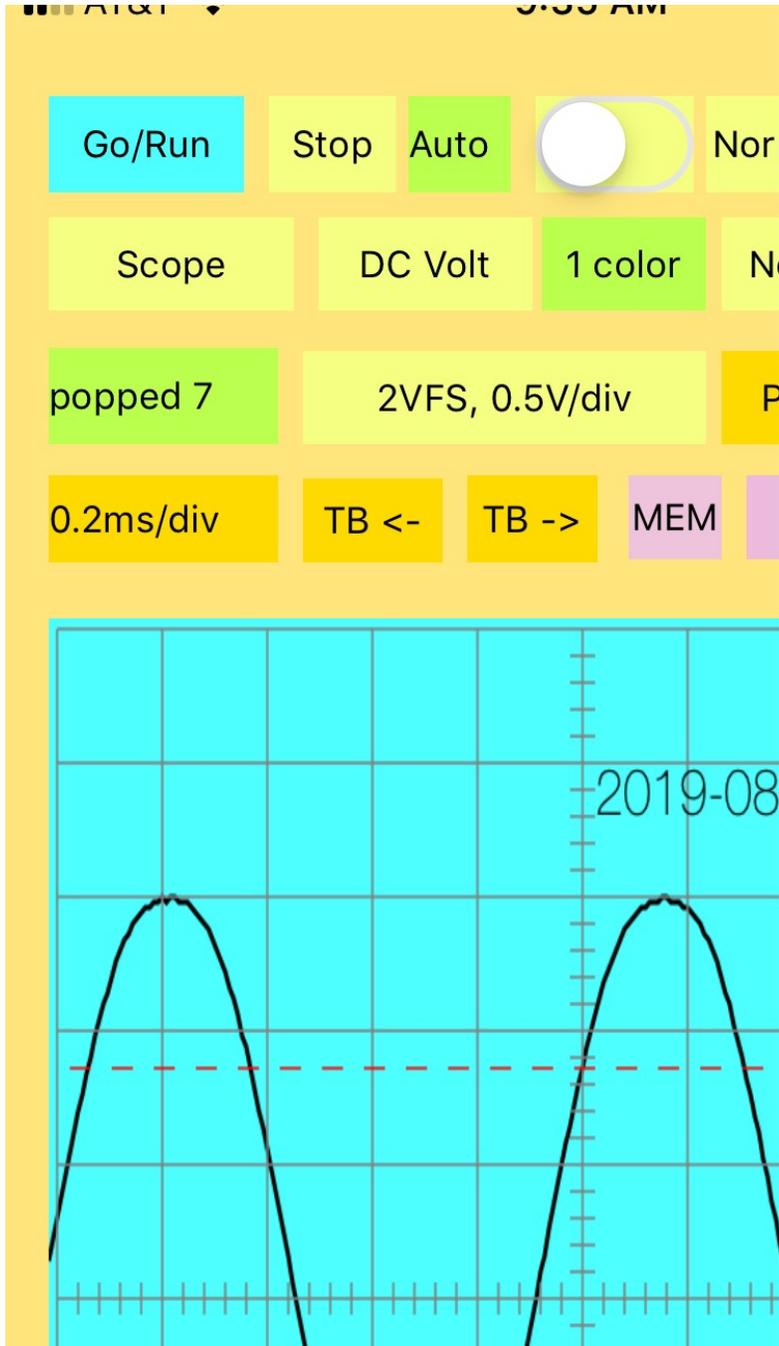
### 4.3.3 Trigger - mode:

“ Trigger -” starts trace display when input voltage moves passing the trigger point downward. No pre-trigger is enabled.



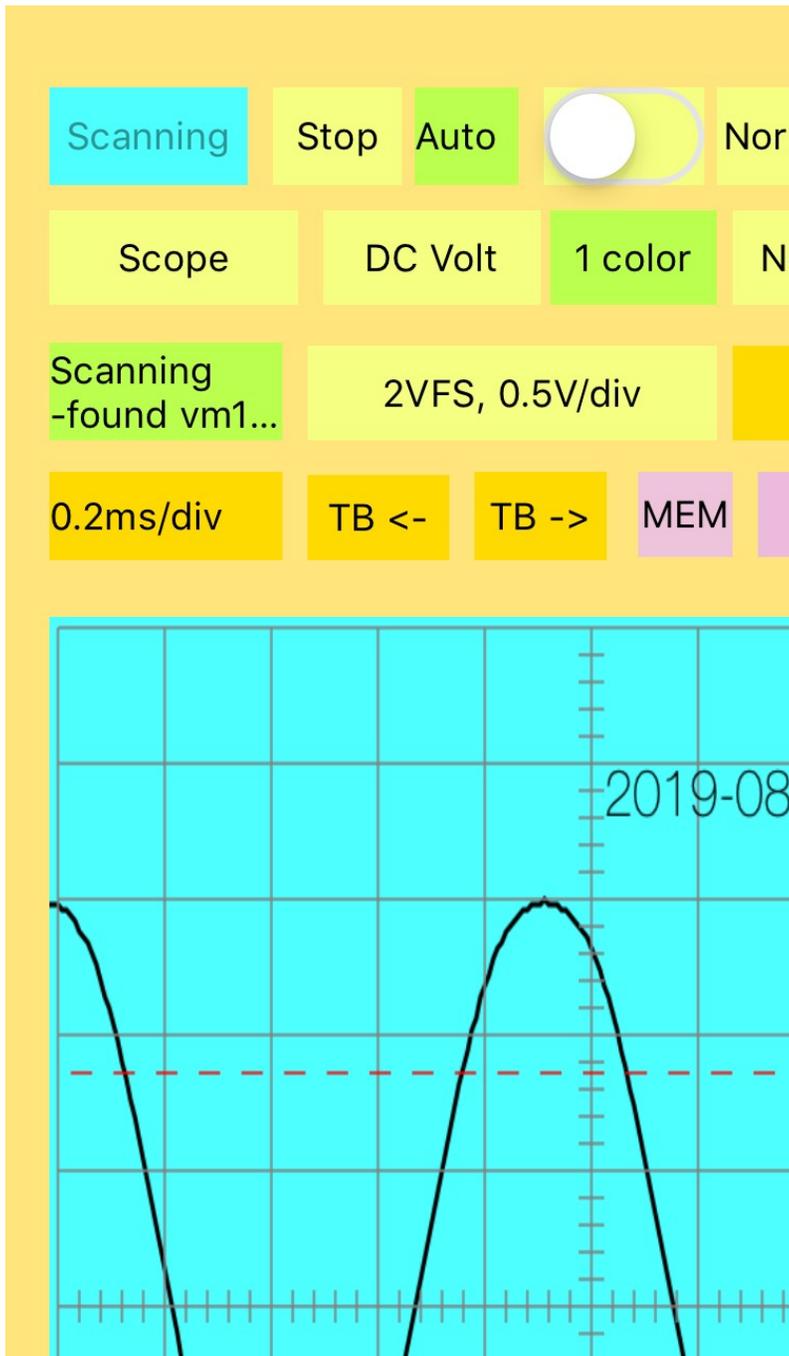
#### 4.3.4. P-P Auto Mode

The P-P Auto trigger starts trace display when the input voltage moves half point between peak and valley of input voltage at positive going direction in a screenshot below.



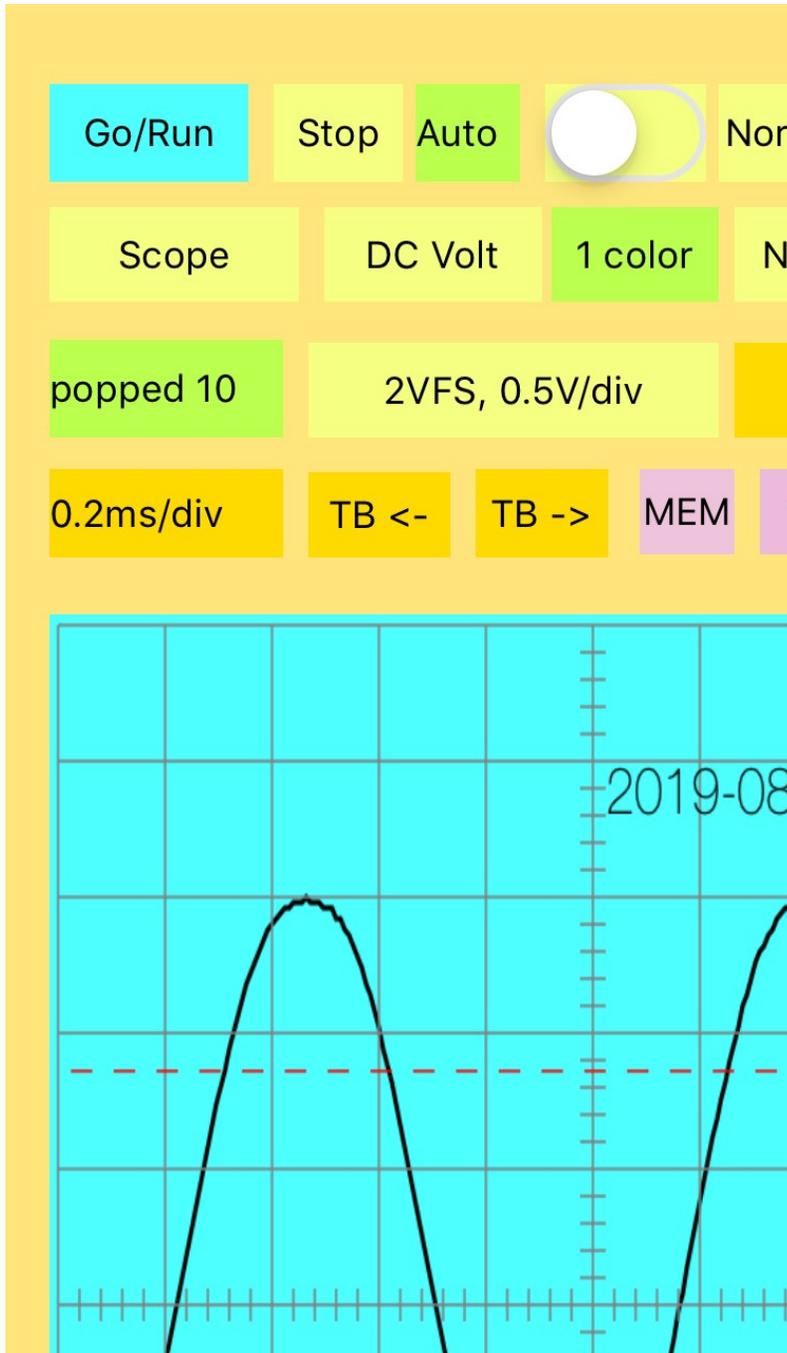
### 4.3.5. Peak Mode

The “Peak” mode starts trace display when the input voltage reaches its peak.



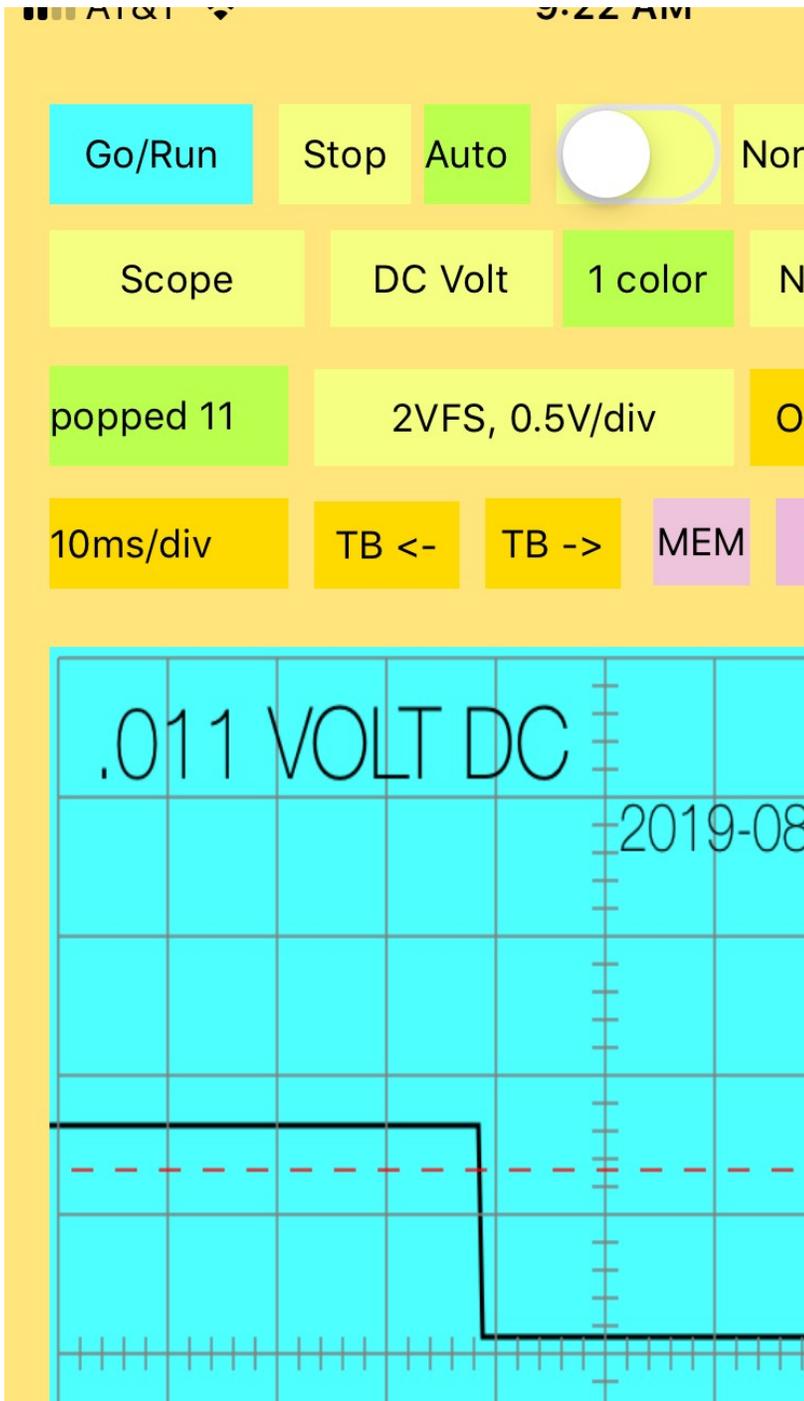
### 4.3.6. Valley Mode

The “Valley” mode starts trace display when the input voltage reaches its valley.

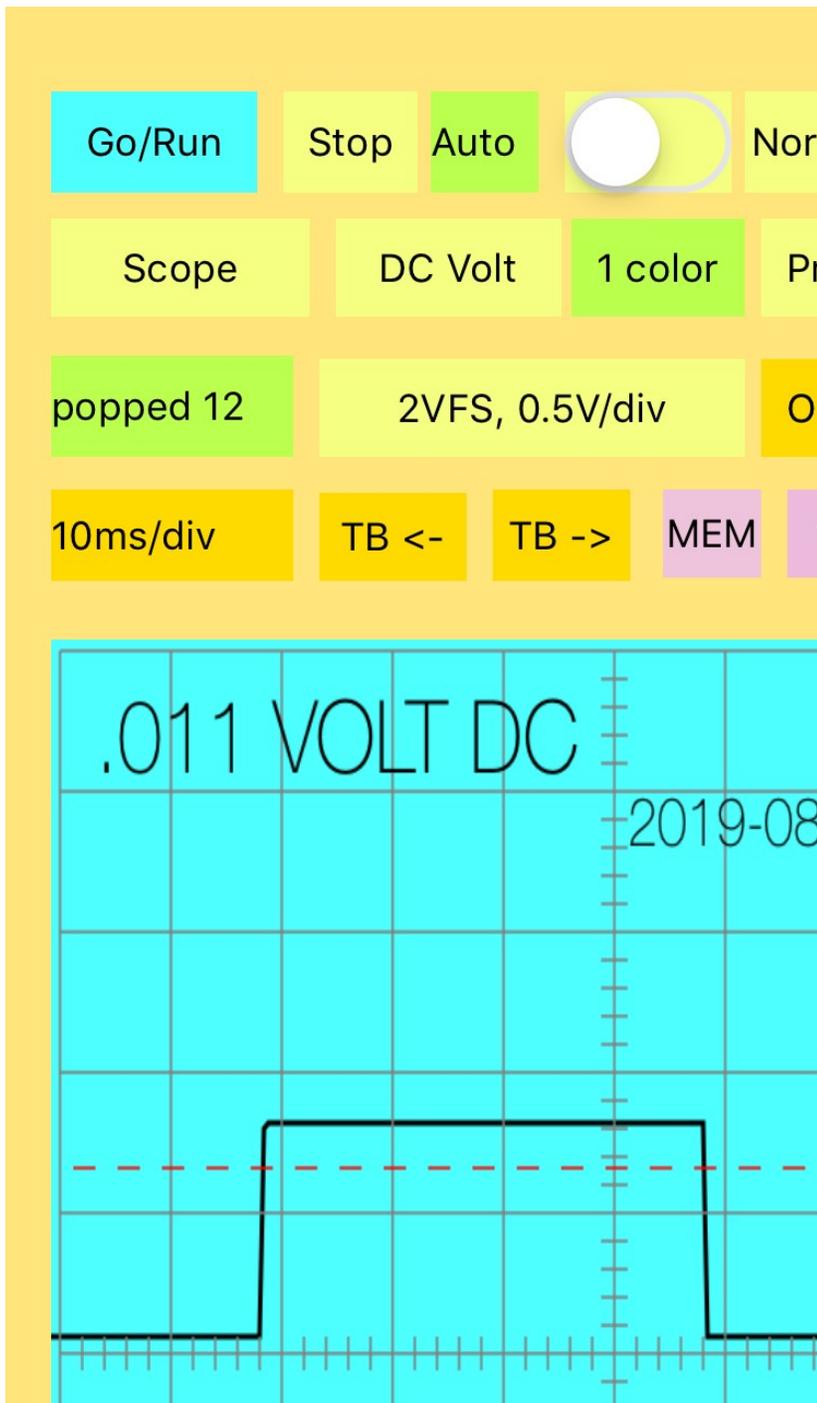


### 4.3.7 One Shot+ and One Shot-

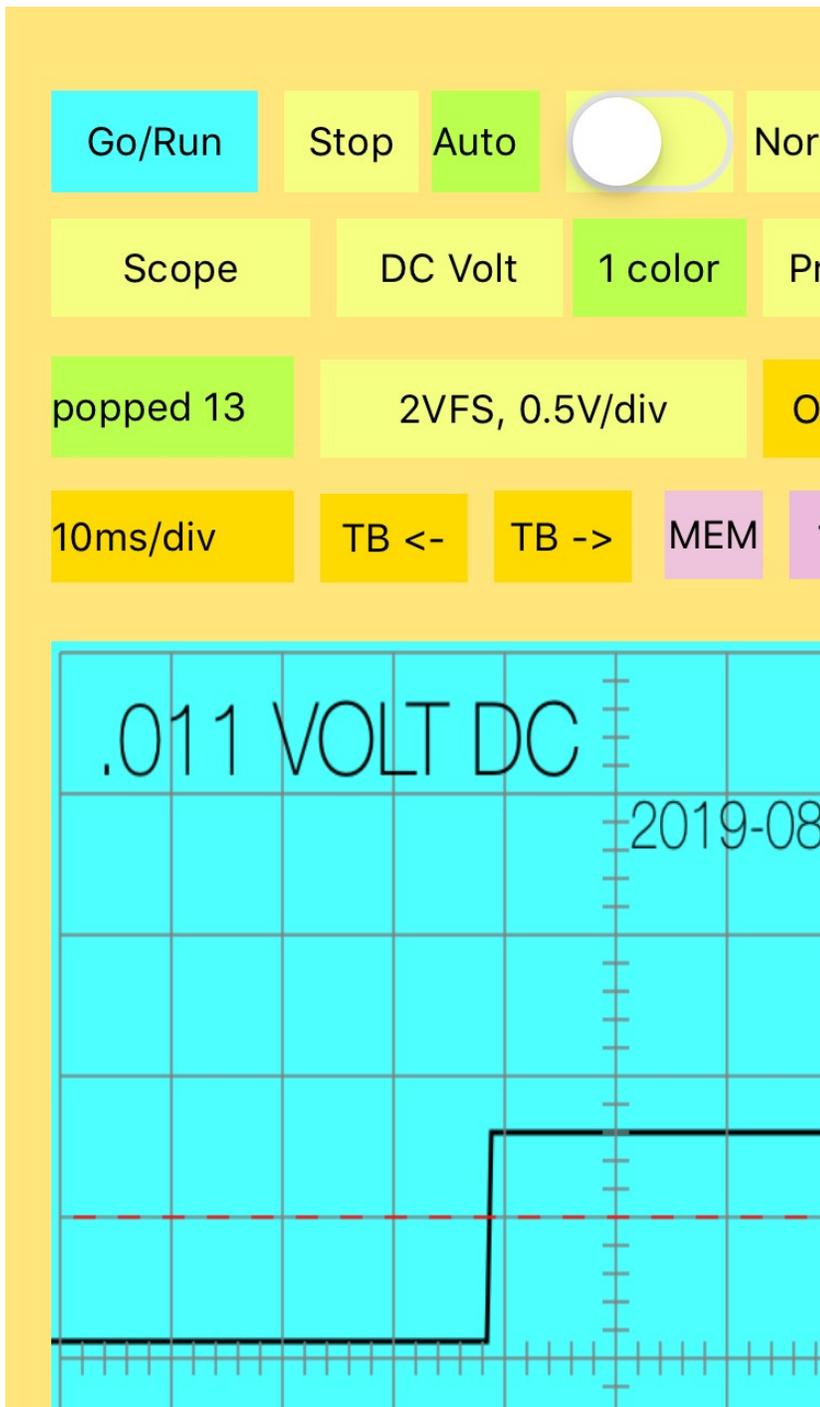
“One Shot+” trace display starts when input signal crosses trigger level upward. To abort trace measurement, push “Stop”. No pre-trigger is enabled.



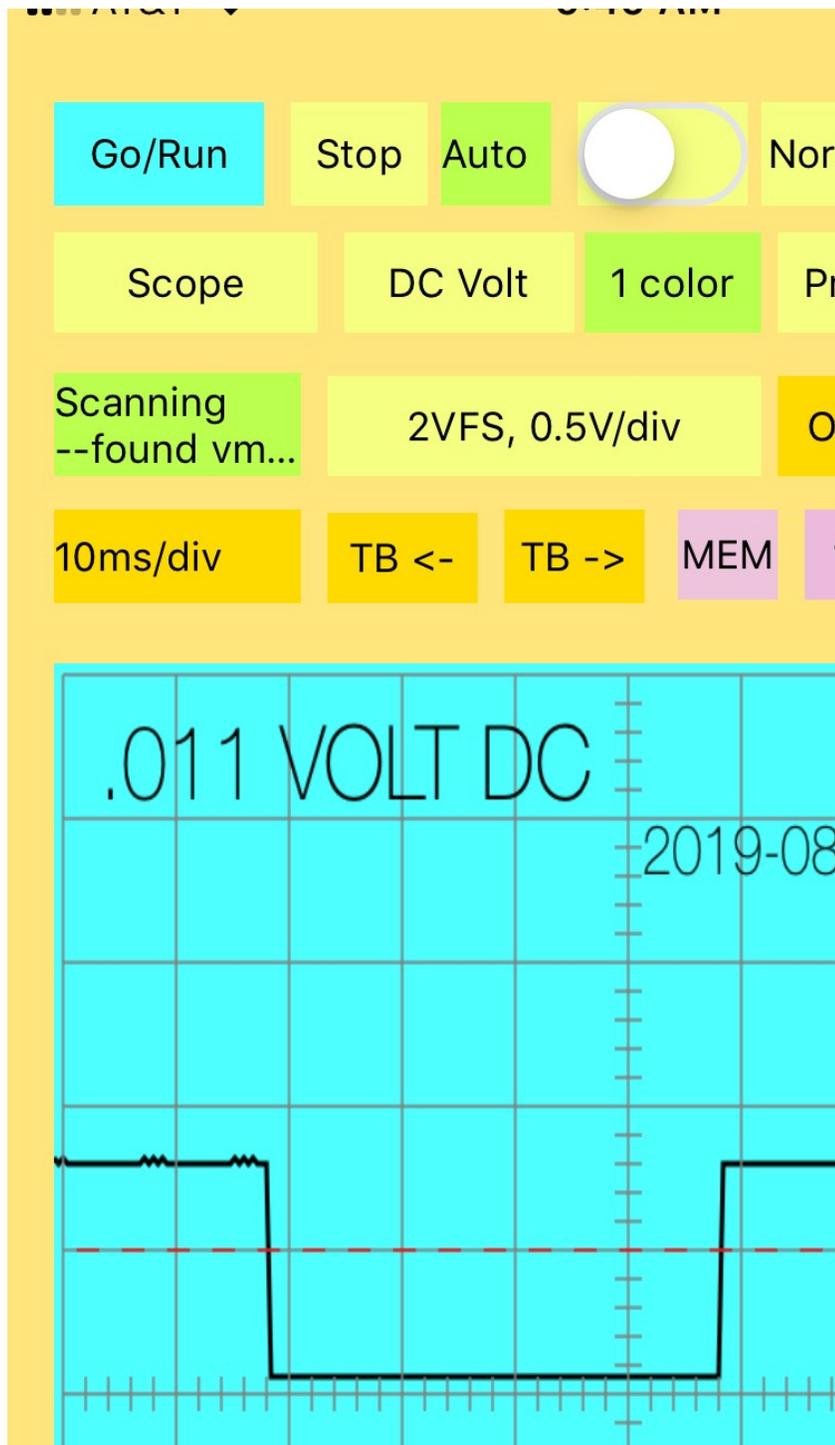
“One Shot+” trace display starts when input signal crosses trigger level upward. To abort trace measurement, push “Stop”. Pre-trigger is enabled.



“One Shot-” trace display starts when input signal crosses trigger level downward. To abort trace measurement, push “Stop”. Pre-trigger is disabled.



“One Shot-” trace display starts when input signal crosses trigger level downward. To abort trace measurement, push “Stop”. Pre-trigger is enabled.



Caution: “One Shot+” or “One Shot-“ with pre-trigger mode is intended for displaying signals that do not pass the trigger level initially. Erroneous displays of sine wave may result when “One Shot+” or “One Shot-“ with pre-trigger mode is selected.

4.4 App Mode Measurement storage: Smart phone screen showing measurement data and traces are stored. When you want to store the measurement data and/or trace display, enter file

number which is located between “MEM” and “POP” for file number 0-9999 and push “MEM”. If want to see any stored measurement data and/or trace display, push “POP” with corresponding file number. The date and time are also stored along with amplitude/screen division, time base data, and trigger point data. To change file numbers, click the number to be increased or double-click the number to be decreased. See Automatic File Storage for continuously recording measurement data and result.

#### 4.5 App Mode Color traces:

Different color traces may be shown on screen after incrementing colors to maximum eight colored traces.

4.5 App Mode Audio On/off: Voice generation at VM10A may be turned on or off by pushing the button for only Meter Mode.

#### 4.6 App Mode Operating Screen Changes:

The “Normal Mode” screen may be changed to “Short Voice” programming, “Long Voice”, “Auto Run”, “Calibration”, or “Downloading” voice file from smart phone to VM10A.

## Chapter 5

### Changing Voice Segment

Voice segments for announcing digital multi-meter result may be changed to your own voice by the following procedures:

For changing 0.5 seconds voice segments like 0-9, click the "Normal Mode" button. The sign "Short voice" is displayed. There are four buttons as follows:

"Audio On" must be on; otherwise, click the button.

Voice segment name as "zero", "one", etc. for clicking for next voice segment.

"Play voice" button to play the sound of the voice segment name.

"Record Voice" button to record your voice for the voice segment name.

If there is no recording sound detected after clicking the "Record Voice" button, there is no change in voice segment.

After finishing 0.5 seconds voice segment changes, click the two seconds voice segment change or click the "Short Voice" button to advance to "Long Voice".

In the "Long Voice", the voice segment becomes two seconds like "Volt DC", "Volt RMS", etc. and procedure for changing two-second voice segment is the same as 0.5 seconds voice segments.

After finishing the "Long Voice", click the "Long Voice" multiple time until "Normal Mode" is seen.

## Chapter 6

### Changing Auto Start Timer

The screen shows as follows after the screen button is changed to “Auto Run”.

*Automatic mode timing in second: 0*

*Data recording may be done when ‘Record’ is shown under ‘Auto Run’ switch. Click the ‘Record/No Record’ switch to change the recording mode. Recording during Auto run mode is stored in different files, which may be displayed during the ‘Auto Run’ mode by using ‘POP’ switch and the ‘file’ switch to display different files.*

The auto start timer is only effective when the “Auto” switch is on after the “Go/Run” is clicked.

To change the auto start timer, click either “SEC +” to increase or “SEC –” to decrease it.

There is no starting time delay in the continuous auto start mode, but there always is time delay between measurements.

Select ‘Record’ or ‘No Record’ for storing test result while the screen is showing “Auto Run. For each starting the Auto Start, new recording starts at file number = 0. To view recorded test result that were stored during auto start mode, the screen must show “Auto Run”. There is maximum of one thousand test results that may be stored. See also Chapter 9 DMM data and trace history files

## Chapter 7

### Downloading Factory Default Voice Segment

The screen shows as follows after the screen button is changed to “Downloading”:

*Click ‘Go/Run’ button to down load the factory default voice file. It takes twelve minutes to download it.*

**Caution: the entire voice-segments are replaced by the factory default voice segments. Your own voice segments that were recorded are destroyed by this action.**

## Chapter 8

### Calibration Procedure

The screen shows as follows after the screen button is changed to “Calibration Procedure”:

*Calibration procedure consists of zeroing input offset voltage of input amplifiers in VM10a and A/D gain adjustment.  
push Go/Run to start.*

After pushing Go/Run, the following screen shows:

*Apply 1.8VDC. Do not push Go/Run to obtain measurement data. Push CAL + to increase measurement value or push CAL – to decrease measurement value. Push CAL +2V button for next calibration.*

This procedure essentially increases or decreases measurement values to match 1.8VDC. After pushing CAL +2V button, the following screen shows:

*Apply –1.8VDC*

Here apply –1.8V DC at input and try to match the measurement value by pushing CAL + or CAL – button. Then push C-2V button to advance to next procedure. The following screen shows:

*Apply 180mVDC*

Here apply 180mV DC at input and try to match the measurement value by pushing CAL + or CAL – button. Then push C200mV button to advance to next procedure. The following screen shows:

*Apply -180mVDC*

Here apply -180mV DC at input and try to match the measurement value by pushing CAL + or CAL – button. Then push C-200mV button to advance to next procedure. The following screen shows:

*Connect 1.8K ohm resistor*

Connect 1.8K ohm resistor at input and try to match the measurement value by pushing CAL + or CAL – button. Then push C-2k button to advance to next procedure. The following screen shows:

*Connect 18K ohm resistor*

Connect 18K ohm resistor at input and try to match the measurement value by pushing CAL + or CAL – button. Then push C-20k button to advance to next procedure. The following screen shows:

*Connect 180K ohm resistor*

Connect 180K ohm resistor at input and try to match the measurement value by pushing CAL + or CAL – button. Then push C-200k button to advance to next procedure. The following screen shows:

*Connect 1.8 Meg ohm resistor*

Connect 1.8Meg ohm resistor at input and try to match the measurement value by pushing CAL + or CAL – button. Then push C-2meg button to advance to next procedure. The following screen shows:

*Apply 1.8VDC*

*To stop calibration, push Calibration button.*

This is the end of calibration. To restart a new calibration procedure, then follow the previous procedures.

## Chapter 9

### DMM data and trace history files

There are two methods for storing and reading test results:

1. Manual way

For storing test results, choose file number by incrementing the number between 'MEM' and 'POP'. Click 'MEM'. To see the stored test result, click 'POP'. There is limit of storing test result for one thousand.

2. Automatic way

Set up 'Auto' /continuous measurement with Changing Auto Start Timer in Chapter 6.

## Chapter 10

### Stand-alone operation

#### Voice/sound triggered measurement mode

Pushing MIC TRIG button switch displays setting for microphone triggered measurement. The first digit indicates whether voice/sound trigger is enabled when it is blank. It is disabled when it is "1". The next three digits indicates microphone sensitivity with 000 (most sensitive) and 255 (least sensitive). As a factory condition, you will see 1032 which shows the voice/sound trigger is disabled. While pushing MIC TRIG switch, push ON/OFF momentarily. The number is changed to 032 to enable voice/sound trigger. Release MIC TRIG switch. Shout some word in front of microphone area under banana jacks on VM10 front panel. You will hear voiced measurement value from the speaker.

To change the microphone sensitivity, push UP+ or DOWN- while MIC TRIG switch is pushed. For example, push DOWN- to obtain about 015 while pushing MIC TRIG switch to increase microphone sensitivity to trigger in less sound. Release MIC TRIG switch. Then shout any word away from VM10. You may hear voiced measurement.

Push MIC TRIG button switch and push ON/OFF switch to disable the voiced measurement by seeing 1 in the first displayed digit.

#### Value triggered measurement mode

Pushing VALUE TRIG switch displays whether value-change trigger mode is enabled when the first digit display is blanked or value-change trigger mode is disabled when the first digit display shows "1". While pushing this switch, push ON/OFF switch to change to enabled or disabled. The last three-digit displays value-change triggering level. Push UP+ or DOWN to change the trigger level while pushing this switch.

As a factory condition, the value trigger mode is disabled. Push the ON/OFF switch while pushing VALUE TRIG switch to enable this mode.

Set measurement mode to 2volt DC mode by pushing mode and range switches. The measurement indicates close to .000. Then apply 1VDC or similar value across VHI and VLO banana jacks. You will hear voiced measurement of data.

Input voltage needs to be returned to close to zero volt to reset value trigger mode.

Continuously applying same value across banana jacks will not produce voiced measurement.

In resistance measurement mode, the trigger value is less value to trigger voiced measurement. This is opposite from DC volt and AC volt modes. For example, if value triggered measurement is enabled in resistance mode, shorting VHI and VLO banana jacks produces voiced measurement.

There is no value triggered measurement mode in temperature mode.

Front-panel controls:

SW 1 (left), Mode switch, short push for announcing current mode, longer push to change to next mode

SW 2(middle), Range switch, short push for announcing current range, longer push to change to next mode

Note: Pushing SW1 and SW2 simultaneously will place VM10 into mode-programming.

SW 3(right) Start button for measurement

VALUE TRIG: pushing this switch displays whether value-change trigger mode is enabled when the first digit display is blanked or value-change trigger mode is disabled when the first digit display shows "1". While pushing this switch, push ON/OFF switch to change to enabled or disabled. The last three-digit displays value-change triggering level. Push UP+ or DOWN to change the trigger level while pushing this switch.

CONTINUOUS: pushing this switch displays whether continuous (or automatic) triggering mode is enabled when the first digit display is blanked or continuous (or automatic) triggering mode is disabled when the first digit display shows "1". While pushing this switch, push ON/OFF switch to change to enabled or disabled. The last three-digit displays trigger rate (two seconds each count). Push UP+ or DOWN to change the rate while pushing this switch.

MODE: short push for announcing current mode like DC volt or resistance, longer push to change the mode to next mode like DC volt, Volt RMS, Resistance, or Temperature.

## Chapter 11

### Troubleshooting

#### **1. VM10a does not make connection to the wireless controller running the app.**

VM10a disconnects the wireless connection to the wireless controller when the app is closed. When the app is reopened, VM10a tries to re-connect to the wireless controller. In case VM10a still does not show 'Go/Run' after ten seconds elapsed, close the app and re-open the app.

If the screen must show 'Normal Mode' when the app is opened.

If "Scanning" is shown instead of 'Go/Run', close the app and re-open the app.

#### **2. First-time operation with wrong device ID.**

If the screen shows the following, see Chapter 3 First time operation/Installation.

*Received: VM10\_D2D9*

*The device ID does not match with received device ID.*

*Enter the correct 4-digit Device ID after “\_” above*

*In the text field shown 'D2D9'.*

*Close and reopen this app.*

#### **3. VM10a is not detected or VM10a power is turned off or VM10a quits while working.**

When the sign "Scan Stop" is shown on the screen, push the same area as "Scan Stop". "Scanning" will be displayed. If there is still a problem of connecting VM10a, exit the app, and reentered.

4. If the Bluetooth on the smartphone was off in the setting and the app is opened, a warning sign whether the Bluetooth is required to be on, set to "yes". Close the app. Then go to the setting on the smartphone for turning the Bluetooth on. Then open the app. When "Go/Run" sign does not appear, click the "Scanning" button and/or closing the app and opening the app.