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TEST REPORT

Non-Transferable

Test Report No. : C T 0 G N 0 2 0 5

Date: 19.06.2018

1. **NAME AND ADDRESS OF THE CUSTOMER** — **M/s. Mark Electronic Corporation**
   U-1, Central Ground Floor Green Park Extn. New Delhi-110016,India

2. **DESCRIPTION OF DEVICE UNDER TEST (DUT)**

VTD (Vehicle Tracking Device)	Emergency Button
Model Name/No.: WETRACK 800	**Model No:** PB-L101
Part No: MECWT800105D	**Part No:** MECPBL1134L
Drawing No.: MECWT800106M	**Drawing No.:** PBL17/180158
GSM/GPRS Make/Module: MEDITEK MT 2503 A	
GNSS/GPS Make/Module: MEDITEK MT 2503 A	
Accelerometer & Gyroscope Make/Module: Concox 12AIA	
Voltage System: 12V & 24V	

3. **DATE OF RECEIPT OF SAMPLE (DUT)** — 12.04.2018
4. **CONDITION OF SAMPLE(s)** — OK
5. **TEST OBJECTIVE**
   To carry out the tests as mentioned in **Sr. No. 12 on the DUT mentioned in Sr. No. 2 above** as per AIS 140 as amended up to December 2017.
6. **TEST METHOD**
   As per AIS 140 as amended up to December 2017.
7. **FUNCTIONAL VERIFICATION**
   DUT was powered on with 12V & 24V as per each test requirement of AIS 140 as amended up to Dec' 2017. Performance was observed before, during and after each test as per the requirements mentioned in AIS 140 as amended up to Dec' 2017 through data output strings of the Vehicle Tracking System as per communication Protocol mentioned in AIS 140 as amended up to Dec' 2017.
8. **CONCLUSION**
   DUT as mentioned in Sr. No. 2 above ***meets*** all the Test requirements as per AIS 140 as amended up to December 2017.

Disclaimer

This test report pertains only to the test samples / components / parts/ assemblies/ gensets/ materials /fuels/chemicals/engines/vehicles/Agri. Tractors etc. actually tested /witnessed / verified by ICAT in the presented condition based on the documents / information produced / submitted by the customer. The issuance of this test report alone does not indicate any measure of approval, certification, supervision, COP, control of quality surveillance by ICAT of the test samples / items/ components. No extract, abridgment or abstraction from this test report may be published or used to advertise the product without the written consent of the Director, ICAT, who reserves the absolute right to agree or reject all or any of the details of any items of publicity for which consent may be sought. ICAT is in no way responsible for any misuse or copying of any design in connection with entire vehicle / components / systems and assemblies. Breach of any statutory provisions, of Indian laws or laws of other countries, will be sole responsibility of the customer. ICAT shall not be liable for any claims or damages made by the customer, whatsoever. The customer shall alone be liable for the same and undertakes to indemnify ICAT in this regard. Further, ICAT has the right to initiate cancellation / withdrawal of the certificate / report issued, in case of any fraud, misrepresentation, when it comes to the knowledge of ICAT. The appropriate local court at Gurgaon shall have the jurisdiction in respect of any dispute, claim or liability arising out of this report.

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INTERNATIONAL CENTRE FOR AUTOMOTIVE TECHNOLOGY ICAT Innovation • Service • Excellence MANESAR

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9. TEST DESCRIPTION AND DATE OF PERFORMANCE OF TEST:

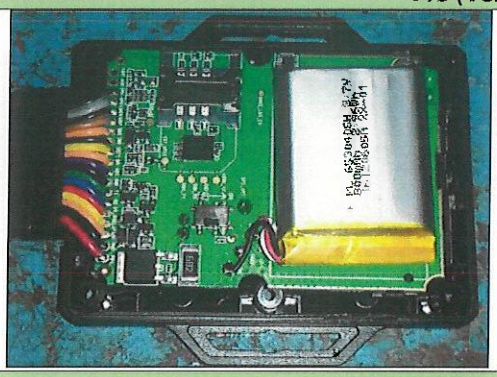
Test description is mentioned in Sr. No. 12 below. Tests were carried out from 12.04.2018 to 12.06.2018.

10. TEST RESULTS

Test observations, photographs are included in Annexure-I of this test report.

11. Vehicle tracking System , Emergency switch & System Details

VTS (Vehicle Tracking System)-PCB



VLT with Emergency Switch

System Details

1	Main GSM antenna	Internal antenna
2	GPS antenna	Patch antenna
3	WLAN antenna	N/A
4	System Software:	
4.1	Make	MARK
4.2	Version	WETRACK 800_11_A1A_D23_R0_V02_WM
4.3	Operating System Details with Version	N/A
5	Communication Protocol Used:	
5.1	Vehicle to center	TCP/IP(GPRS)
5.2	VLT to control center	TCP/IP(GPRS)
6	Command set for configurations	Available via GPRS/SMS as per AIS 140
7	Description of device	Vehicle Tracking Device with Emergency switch

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12 TEST DETAILS:

Sr. No.	Test Title	ICAT Sample I.D	Reference Standard	Observations/ Results
1.	Dry Heat / High Temperature Test	ICAT/AEEL/59329/02	As per AIS 140 Cl. No. 6.3.3 (Sr. No. 1) further referring IS: 9000 (Part 3/Sec 5)	*SATISFACTORY*
2.	Cold Test	ICAT/AEEL/59329/02	As per AIS 140 Cl. No. 6.3.3 (Sr. No. 2) further referring IS 9000 (Part 2/Sec 4 - 1977)	*SATISFACTORY*
3.	Temperature Shock Test	ICAT/AEEL/59329/02	As per AIS 140 Cl. No. 6.3.3 (Sr. No. 4)	*SATISFACTORY*
4.	Damp Heat Cycle Test	ICAT/AEEL/59329/03	As per AIS 140 Cl. No. 6.3.3 (Sr. No. 3) further referring IS 9000 (Part 5/Sec 2 - 1981)	*SATISFACTORY*
5.	Salt Spray Test	ICAT/AEEL/59329/03	As per AIS 140 Cl. No. 6.3.3 (Sr. No. 5) further referring Clause 4.8 of IS 10250	*SATISFACTORY*
6.	High Voltage Test	ICAT/AEEL/59329/04	As per AIS 140 Cl. No. 6.3.3 (Sr. No. 6) further referring ISO 16750-2:2010	*SATISFACTORY*
7.	Shock Test	ICAT/AEEL/59329/03	As per AIS 140 Cl. No. 6.3.2 (Sr. No. 1) further referring IS 9000-part 7 – 2006	*SATISFACTORY*
8.	Vibration Test	ICAT/AEEL/59329/03	As per AIS 140 Cl. No. 6.3.2 (Sr. No. 2) further referring IS 9000-part 8 – 1981	*SATISFACTORY*
9.	Dust & Water ingress protection test	ICAT/AEEL/59329/06 (Dust) & 04 (Water)	As per AIS 140 Cl. No. 6.3.2 (Sr. No. 3) further referring IS/ IEC 60529 - 2001	*SATISFACTORY*
10.	Battery backup Test	ICAT/AEEL/59329/06	As per AIS 140 Cl. No. 6.3.2 (Sr. No. 5)	*SATISFACTORY*
11.	Reverse Polarity Protection without fuse	ICAT/AEEL/59329/06	As per AIS 140 Cl. No. 6.3.2 (Sr. No. 6)	*SATISFACTORY*

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TEST DETAILS:

Sr. No.	Test Title	ICAT Sample I.D	Reference Standard	Observations/ Results
12.	Wiring Harness Test: a) Conductor Resistance Test b) Spark Test c) Immersion Test d) Flame Resistance Test	ICAT/AEEL/59329/W1/a-d	As per IS 2465 & AIS 028	***SATISFACTORY***
13.	Free Fall Test	ICAT/AEEL/59329/02	As per AIS 140 Cl. No. 6.3.2 (Sr. No. 9) further referring IS 9000 (Part VII/Sec 4)	***SATISFACTORY***
14.	Performance Parametric Test	ICAT/AEEL/59329/06	As per Cl. No. 6.3.2 of (Sr. No. 10) of AIS 140	***SATISFACTORY***
15.	Insulation Resistance Test	ICAT/AEEL/59329/03	As per ISO 16750-2:2010	***SATISFACTORY***
16.	Tracking Functionality Test	ICAT/AEEL/59329/01	As per Cl. No. 6.3.1 (Sr. No. 1) of AIS 140	***SATISFACTORY***
17.	Location Accuracy Test	ICAT/AEEL/59329/07	As per Cl. No. 6.3.1 (Sr. No. 2) of AIS 140	***SATISFACTORY***
18.	Acquisition Sensitivity Test	ICAT/AEEL/59329/07	As per Cl. No. 6.3.1 (Sr. No. 3) of AIS 140	***SATISFACTORY***
19.	Tracking Sensitivity Test	ICAT/AEEL/59329/07	As per Cl. No. 6.3.1 (Sr. No. 4) of AIS 140	***SATISFACTORY***
20.	Cold-Start Time to First Fix (TTFF) Test	ICAT/AEEL/59329/07	As per Cl. No. 6.3.1 (Sr. No. 5) of AIS 140	***SATISFACTORY***
21.	Warm-Start Time to First Fix Test	ICAT/AEEL/59329/07	As per Cl. No. 6.3.1 (Sr. No. 6) of AIS 140	***SATISFACTORY***
22.	Hot-Start Time to First Fix Test	ICAT/AEEL/59329/07	As per Cl. No. 6.3.1 (Sr. No. 7) of AIS 140	***SATISFACTORY***
23.	Embedded SIM/UICC Test	ICAT/AEEL/59329/02 & 07	As per Cl. No. 6.3.1 (Sr. No. 8) of AIS 140	***SATISFACTORY***
24.	Functional Endurance Test	ICAT/AEEL/59329/03	As per Cl. No. 6.3.1 of (Sr. No. 9) of AIS 140	***SATISFACTORY***

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TEST DETAILS:

Sr. No.	Test Title	ICAT Sample I.D	Reference Standard	Observations/ Results
25.	On Vehicle Dynamic Location Test	ICAT/AEEL/59329/08	As per Cl. No. 6.3.1 of (Sr. No. 10) of AIS 140	***SATISFACTORY***
26.	SMS Fall Back	ICAT/AEEL/59329/01	As per Cl. No. 3.1.5 of AIS 140	***SATISFACTORY***
27.	EMI/EMC Test	ICAT/EMC/59335/01	As per Cl. No. 6.3.2 of (Sr. No. 4) of AIS 140 further referring AIS 004-3	*Refer Report no CD0MN0194 Dated 19.06.2018* ***SATISFACTORY***
28.	Load Dump Test	ICAT/EMC/59335/02	As per Cl. No. 6.3.2 of (Sr. No. 12) of AIS 140 further referring ISO 7637-2:2004	*Refer Report no CD0MN0194 Dated 19.06.2018* ***SATISFACTORY***

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Annexure – I

(Functional Requirements as per AIS 140)

Sr. No./ Cl. No.	Test Requirement	Compliance (Yes/NO)	Observation/Remarks (If Any)
3.1.1	**Functional Requirements for VLT**		
3.1.1.1	Device shall be capable of obtaining position information using Global Navigation Satellite System (GNSS). GNSS receiver specifications are as follows:		
a	Device shall be capable for operating in L and/or S band and include support for NAVIC/IRNSS (Indian Regional Navigation Satellite System) for devices installed on or after 1st October, 2018. However VLT devices shall be compliant as per other GNSS constellation in interim period.	--	NAVIC would be applicable from 1st October, 2018
b	The Device shall support GAGAN, the Indian SBAS (Satellite Based Augmentation System)	YES	Tested & Verified
c	Device shall have a position accuracy of minimum 2.5 m CEP or 6 m 2DRMS	YES	Tested & Verified
d	Device shall have an acquisition sensitivity of minimum (-) 145 dBm with GNSS/ (-) 160 dBm with IRNSS (NAVIC as applicable).	YES	Tested & Verified
e	Device shall have an tracking sensitivity of minimum (-) 160 dBm with GNSS/ (-) 153 dBm with IRNSS (NAVIC as applicable).	YES	Tested & Verified
f	Device shall have an internal antenna; however if in case of Integrated systems with vehicle OEM approved kits if the fitment location prevents the internal antenna from functioning, then additional external antenna shall be provided.	YES	Internal Patch antenna was provided. Verified physically.
3.1.1.2	Device shall support standard minimum I/Os as mentioned: 4 Digital, 2 Analog Inputs and 1 Serial Communication (e.g. RS232) for interfacing external systems (E.g. Digital input for Emergency request button interfacing).	YES	Device was supporting 4 Digital inputs, 2Digital outputs, 2 Analog Inputs and 1 Serial Communication (RS232) for interfacing external systems. Verified the functioning of the each I/O & RS 232 Port.
3.1.1.3	Device shall be capable of transmitting data to Backend Control Server (Government authorized server) via Wide Area (Mobile) Communications network (Cellular) as per Communication Protocol in Section 4.	YES	Tested & Verified **Table 4A,4B &4C**
3.1.1.4	Device shall be capable of transmitting Position, Velocity and Time (PVT data) along with heading (direction of travel) to a Backend Control Server (Government authorized server) at configurable frequency as per Communication Protocol of Section 4. The fixed frequency shall be user configurable. Highest data transmission rate shall be 5 sec during vehicle operation and not less than 10 minutes in sleep/IGN OFF) as per the protocol defined in Communication Protocol of Section 4.	YES	Tested & Verified
3.1.1.5	Device shall be capable of transmitting data to minimum 2 different IP addresses (1 IP address for regulatory purpose (PVT data) and 1 IP address for Emergency response system other than the IP's required for Operational purpose.	YES	Data was verified on 2 IPs: 1 for regulatory purpose: 139.59.193.185:8000 1 for emergency: 139.59.46.143:3000 Table 4C was verified

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Sr. No./ Cl. No.	Test Requirement	Compliance (Yes/NO)	Observation/Remarks (If Any)
3.1.1.6	On pressing of Emergency button, the system implementing VLT function shall send emergency Alert (Alert ID 10 as mentioned in Sub-section 4.2.1 of Communication Protocol Section 4) to the configured IP address(s) as per the Communication Protocol mentioned in Section 4. In the absence of Cellular network, the emergency alert shall be sent as SMS message along with vehicle location data to configured control center number(s). The SMS shall consist parameters as given in Sub-section 4.2.2.	YES	Alert ID 10 was verified on pressing of the Emergency button as per Section 4. SMS as per sub-section 4.2.2 was verified in absence of Cellular network.
3.1.1.7	Device shall have an internal back-up battery to support 4 hours of normal operations (to be tested for positional record transmission at a frequency of 60 sec)	YES	Battery backup of 48 Hrs 55 Minutes was observed with transmission at a frequency of 60 sec
3.1.1.8	Device shall be capable of transmitting alerts to the Backend Control Server (Government authorized server) directly. The applicable list of alerts is given in Section 4.2 (Alert ID 3 to 12) of Section 4.	YES	All alerts ID's were verified as per section 4.2.
3.1.1.9	Device shall support over the air software and configuration update.	YES	Tested & Verified
3.1.1.10	Device shall support basic standard configuration (Mobile communications network settings, Backend Control Server (Government authorized server) details, data frequencies, alert thresholds etc.) as per configuration specification defined in Section 4.	YES	Tested & Verified
3.1.1.11	Device shall support store and forward mechanism for all type of data (periodic data and alerts) meant for backend transmission. The system shall store data in internal memory during communication network un-availability and transmit the data when the connection resumes in last in first out (LIFO) manner. The live data shall be given higher priority for transmission than back log (stored data) at any point in time.	YES	Tested & Verified
3.1.1.12	The Device shall have a unique identifier for identifying the VLT device and data. The unique ID shall be stored in a read only memory area so that it cannot be altered or overwritten by any person. The unique identifier is IMEI (International Mobile Station Equipment Identity) Number.	YES	Tested & Verified
3.1.1.13	Device shall store/write the registration number of the vehicle in the internal nonvolatile memory.	YES	Tested & Verified
3.1.1.14	Device shall have an Embedded SIM/UICC.	YES	Tested & Verified.
3.1.1.15	Device shall be designed to operate 12V DC and or 24 V DC.	YES	Tested & Verified at 12V &24V both.
3.1.1.16	Device shall have a sleep mode current ≤ 50 mA (If the function is implemented in a dedicated system/device).	YES	Tested & Verified (Average Sleep mode current is 3.99mA.)
3.1.1.17	Device shall support any operational GNSS system with 12 (minimum) acquisition channels.	YES	Tested & Verified

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Sr. No./ Cl. No.	Test Requirement	Compliance (Yes/NO)	Observation/Remarks (If Any)
3.1.1.18	The Device shall support: • Location on Cellular/SMS • Non-volatile memory to store min 40,000 positional log • Configurable backup SMS facility in case of Cellular failure • Capability to send serving and adjacent cell ID as well as network measurement report (NMR)	YES	Tested & Verified
3.1.1.19	The VLT Device shall have: • The capability of Hot start <10s • The capability of Warm start : < 60s • The capability of Cold start < 120 s	YES	Tested & Verified. **MEDITEK MT 2503 A** was used as GNSS/GPS Module
3.1.1.20	Device shall support data Outputs as per protocol covered in this standard.	YES	Tested & Verified.
3.1.1.21	The Device Cellular module shall have: • Multi slot Cellular with In - built Quad-band Cellular module/Modem • Cellular class 10 or above • Support Embedded SIM/UICC to cater to the operational requirement such as vibration, temperature and humidity and provide long life span with at least 10 years life and more than 1 million read/write cycles • Cellular module & SIM/UICC shall support o SMS, Data (Cellular, TCP/IP) and o Support multiple network OTA switching (on-demand/automatic) capabilities.	YES	Point no 1,2 & 3 was Verified in Data sheets of GSM/GPRS Module: **MEDITEK MT 2503 A & Shenzhen Concox: M2M MS1 (QFN5*6 chip package)** Point no 4 was Tested & Verified
3.1.1.22	Device shall be dust, temperature, vibration, water splash resistant, IP 65 rated or better, tamper proof as per Section 6.	YES	Tested & Verified.
3.1.1.23	Device shall be manufactured using processes as per quality management standard for automotive industries i.e. ISO/TS 16949 or ISO 9001 or any equivalent National or International Standard.	YES	ISO 9001:2015 Certificate was submitted.
3.1.1.24	Device shall support A-GPS (Assisted GPS)	YES	Verified in Data Sheets of **MEDITEK MT 2503 A**
3.1.1.25	Device shall have provision of secured data transmission to the Backend Control Centre from the devices through secured channel (e.g. secured dedicated APN).	YES	Tested & Verified
3.1.1.26	Device shall have 3 axis accelerometer and 3 axis gyroscope for getting the alerts on harsh breaking harsh acceleration, and rash turning.	YES	Tested & Verified with data sheets of **Concox 12AIA**
3.1.2	**Functional Requirement for Emergency System**		
3.1.2.1	Passengers or in-vehicle crew present in the vehicle shall be able to make an emergency request by pressing the emergency button provided	NA	Not Applicable (Vehicle level check)
3.1.2.2	The emergency request function shall not exist as standalone. The function shall be part of Vehicle Location Tracking (VLT) system. An alert shall be sent to the Backend Control Server (Government authorized server) when emergency request is raised. De-activation shall always be from authorized government server who receives alert message i.e. NERS system as mentioned in Sub-section 4.2.2.	YES	Tested & Verified.

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Sr. No./ Cl. No.	Test Requirement	Compliance (Yes/NO)	Observation/Remarks (If Any)
3.1.2.3	The Emergency Buttons will be such that or disconnection between switch and controller should be detected through controller logic or 'Normally Closed' (NC) Type Switch. For Emergency button, there shall be indication of its working status visible for passengers in Ignition ON Condition. The form factor of Emergency Buttons will be such that the button is easy to press in the case of an emergency, and simultaneously also minimizes the possibility of accidental or unintended press thereby causing a false alert.	YES	Tested & Verified
3.1.2.4	On pressing of Emergency button, the system implementing VLT function shall send emergency Alert (Alert ID 10 as mentioned in Sub-section 4.2.1 of Communication Protocol Section 4) to the Backend Control Server (Government authorized server) as per the Communication Protocol mentioned in Section 4. In the absence of Cellular network, the alert shall be sent as SMS message along with vehicle location data to configured control center number. The SMS shall consist of parameters as given in Sub-section 4.2.2.	YES	Tested & Verified
3.1.2.5	In absence of both Cellular and GSM networks and on pressing of Emergency Button, the system implementing VLT function shall store the emergency Alert (Alert ID 10 as mentioned in Sub-section 4.2.1 of Communication Protocol Section 4). Once the Cellular or GSM is available, this alert information shall be sent on high priority to the configured IP addresses as per the communication protocol mentioned in Section 4 or as SMS message along with vehicle location data to configured control center number. The SMS shall consist of parameters as given in Sub-section 4.2.2.	YES	Tested & Verified.
3.1.3	**Configuration of Device Parameters Over the Air (OTA):**		
The device shall support at least the below parameters to be configurable over the air (through SMS and Cellular). The updation/configuration shall be allowed only over an 'authenticated' channel:		YES	Tested & Verified
1	Setting/ Change of the Primary or Secondary IP and port number	YES	
2	Setting/ Change of the APN	YES	
3	Set configuration parameter like sleep time, overspeed limit, harsh braking, harsh acceleration, rash turning threshold limits etc.	YES	
4	Emergency control SMS Centre Number(s)	YES	
5	Configuring the vehicle registration number	YES	
6	Configuring the frequency of data transmission in normal / Ignition state / OFF state sleep mode/ Emergency state, etc.	YES	
7	Configuring the time duration for Emergency state	YES	
8	Capability to reset the device	YES	
9	Command to get the IMEI of the device	YES	
	Configurable commands must involve the following features: **9.1 SET:** For setting the parameters. **9.2 GET:** For enquiring regarding the parameters such as mobile number, GSM strength, vehicle number and other important parameters. **9.3 CLR:** For clearing certain commands, alarms, alerts etc. except emergency alert After each SET, GET, CLR command the device should send alert to Backend Control Centre, as mentioned in Section 4 Alert 12, giving the details of Mode, mobile no/ IP of control center sending commands.	YES	

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Sr. No./ Cl. No.	Test Requirement	Compliance (Yes/NO)	Observation/Remarks (If Any)
3.1.4	Tracking Device Health Monitoring Parameters		
The device shall send status of health parameters at configurable interval and this threshold value shall also be configurable over the air. It shall be possible for health parameters to be fetched on demand via command as set out below in Table 3B.		YES	Tested & Verified.
3.1.5	SMS Fall Back		
	In case of emergency state, (i.e. on pressing of Alert button), the device will shift to the SMS mode in case Cellular connectivity is not available. In such case, the device will send the Alert message and tracking data through SMS mode. Since SMS has the limitation of sending only 160 characters, so the tracking data to be sent in one SMS will have fields - IMEI, Latitude, Direction, Longitude, Direction, location fix, speed, Cell ID, LAC (Location Area Code), Date and Time as per emergency alert . The details is provided in Sub-section 4.2.2	YES	Tested & Verified.
4	COMMUNICATION PROTOCOL		
4.1	Data Frame Format		
	Table below (Table 4A) contains the listing of fields that the vehicle tracking devices would be required to send to the Backend Control Centre. The first 3 fields (Start character, Header for VLT with Emergency Buttons and Vendor ID, who has supplied the device) must be fixed in position as well as format (Header part of frame). Rest all other fields are required to be present in the location data sent by the devices to the backend, but can be in any sequence or with any separator between fields. The data value can be either in American Standard Code for Information Interchange (ASCII) or in HEX format. Device must transmit the Login message whenever it establishes (re-establishes after disconnection) its connectivity with Server with the specified fields. Login Message will carry following information:	YES	Tested & Verified
	$Device Name –Vehicle number on which the device is installed • $IMEI –15 Digit IMEI number • $Firmware – Version of the firmware used in the hardware • $Protocol -Version of the frame format protocol. • $Last Valid Location – Last location info saved at the device.	YES	Login Message is: $003,DL01AIS002,351510090277800,1.0.0,1.0.0,28.350000,76.916667*
Table 4A: Data Message Format		YES	Tested & Verified
4.2	Messages & Alerts from Devices		
4.2.1	Table below (Table 4B) contains the listing of alerts that need to come from the tracking devices. These alerts are applicable for both live packets as well as the history packets.	YES	Tested & Verified

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Sr. No./ Cl. No.	Test Requirement	Compliance (Yes/NO)	Observation/Remarks (If Any)
4.2.2	In case of emergency alert, the alert message shall be sent to 2 different IP addresses hence the device shall support minimum 2 IP addresses (1 IP address for regulatory purpose (PVT data) and 1 IP address for Emergency response system other than the IP's required for Operational purpose. The PVT data will send the emergency alert to the system. Primary alert will go to the emergency response Backend Control Centre (NERS/ MHA) as may be notified by the Government of India in the schema below:	YES	Tested & Verified
	Primary alert will go to the emergency response Backend Control Centre as notified by the Government of India in the indicative format in Table 4C	YES	
4.3	**Testing of Configuration of Device Parameters Over the Air (OTA)**	YES	Tested & Verified
5.0	**CONSTRUCTION AND INSTALLATION (To be verified on component level and target vehicle level approval)**		
5.2	**Requirement of Emergency System**		
	Emergency button shall be one time press type. Separate release action from authorized server shall be required to bring back the emergency button to normal mode or clear emergency flag.	YES	Tested & Verified
5.3	**Physical Mounting**	NA	Vehicle level check
5.4	**Power Supply**		
	The vehicle tracking device will be installed on vehicles in which the power supply voltage from vehicle battery is widely varying (12V, 24V etc.) and also the power supply is not as stable as that in case of fixed locations, especially during engine start-up and braking when the voltage can fall to as low as 9V. Typically electronic devices are very sensitive to power surges and spikes, and equipment may fail if they do not receive stable power supply. The devices will need to have a resilient power supply unit that can withstand such fluctuations and the devices also need to have power backup so that they continue to function for some duration when the vehicle battery is not functional or is disconnected from the devices. Vehicle power interface shall have: • One common ground linked to vehicle chassis • One permanent power Supply (12/24V) connected to the vehicle battery (+Vbat). • One non-permanent power line (12/24V) connects to the battery after ignition (IGN).	YES	Tested & Verified
5.3.1	**Electrical Wiring**		
	The wiring harness used in the device shall be tested for flammability as per IS 2465.	YES	Tested & Verified
6	**FUNCTIONAL, PERFORMANCE, DURABILITY, ENVIRONMENTAL AND PROTOCOL TEST**		
6.1	**Vehicle Level Functional Tests**	NA	Not Applicable (Vehicle level check)

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Sr. No./ Cl. No.	Test Requirement	Compliance (Yes/NO)	Observation/Remarks (If Any)
6.2	**Component Level Functional Test:**		
6.2.1	**Vehicle Location Tracking**		
6.2.1.1	Standard connector provided for power and other signals as per cl. No. 5.1	NA	Connectors would be as per agreement between device & vehicle manufacturer.
6.2.1.2	Configuration of the device as per standard format mentioned in Section 4 • Local configuration upload shall be verified • Configuration upload from control center shall be verified	YES	Tested & Verified
6.2.1.3	Vehicle Location data transmission to Backend Control Center.	YES	Tested & Verified
6.2.1.4	Backend Control Centre shall be able to check the version of firmware loaded on the system.	YES	Tested & Verified
6.2.1.5	Updating of the firmware of the system from Backend Control Centre only.	YES	Tested & Verified
6.3	**Device Level Functional, Performance & Durability Tests**		
6.3.1	**Table 6A**		
1	**Tracking Functionality Test:** The test shall be conducted on VTL to determine the proper functioning of VLT with Emergency Button by testing its connectivity to Backend Control Centre (Government authorized server). The VLT with Emergency Button shall be tested for the connectivity to server and its capability to send two location messages. **Acceptance Criteria:** The VLT with Emergency Button shall be connected to vehicle battery to switch it on. The VLT with Emergency Button shall be tested for the connectivity to server and its capability to send two location messages.	YES	The VLT with Emergency Button was connecting to server and was capable to send data to two locations.
2	**Location Accuracy test:** This test shall be conducted on VLT with Emergency Button. The receiver is placed into a cold start state usually by a command sent to the receiver through a test connection -- and then a fairly strong navigation signal simulating in L and / or S band is sent. The time it takes for the receiver to determine its first good location fix is recorded. Test is done many times (≥15 times) over many conditions and the results are averaged. **Acceptance Criteria:** 2.5 m CEP or 6 m 2DRMS	YES	Within 2.5 m CEP
3	**Acquisition Sensitivity Test:** Set the simulator to output navigation signal simulating L and/or S band to a particular location with a very level so that the tracking is not possible. Gradually increase the signal level that allows the receiver to successfully perform a cold start TTFF within a specified time frame. The minimum signal level that allows acquisition is referred as to the acquisition sensitivity. **Acceptance Criteria:** The acquisition sensitivity shall be minimum (-) 145 dBm with GNSS/(-) 140 dBm with IRNSS (NAVIC as applicable)	YES	The acquisition sensitivity was minimum (-) 146 dBm with GNSS

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6.3	Device Level Functional, Performance & Durability Tests		
6.3.1	Table 6A		
4	**Tracking Sensitivity Test:** The device under this test is locked on to the simulator's output frequency (navigation signal simulating L and/or S band) and the simulator power output is lowered until the lock is lost. Multiple repetition of the test with different satellite geometries ensures that an accurate average measure is recorded. **Acceptance Criteria:** The tracking sensitivity shall be equal to or better than (-) 160 dBm with GNSS/(-)153 dBm with iRNSS (NAVIC as applicable).	YES	The tracking sensitivity was (-) 160 dBm with GNSS
5	**Cold-Start Time to First Fix (TTFF) Test:** The device in this test is placed into a cold start state. The time it takes for the device to determine its first good location fix is recorded. The cold start test is performed several times and the results are averaged. **Acceptance Criteria:** The cold start TTFF shall be less than 120 seconds at Open Sky condition or (-) 130 dBm.	YES	The average cold start TTFF was 31.16 seconds at (-) 130 dBm.
6	**Warm-Start Time to First Fix Test:** In this test the device is started in warm start mode and time taken by device to determine the first valid location fix is recorded. This is done several times and results are averaged. **Acceptance Criteria:** The warm start TTFF shall be less than 60 seconds at Open Sky condition or (-) 130 dBm.	YES	The average warm start TTFF was 33.75 seconds at (-) 130 dBm.
7	**Hot-Start Time to First Fix Test:** In this test the device is started in Hot start mode and time taken by device to determine the first valid location fix is recorded. This test is performed several times and results are averaged. **Acceptance Criteria:** The hot start TTFF shall be less than 10s.	YES	The average hot start TTFF was 1 seconds at (-) 130 dBm.
8	**Embedded SIM/UICC Test:** This test is to check the suitability of the SIM/UICC and communication module. The test shall be conducted to determine the effectiveness and operation of the Cellular module with OTA network switching capabilities on demand as well as automatically in real-time. The test consist of two type of testing as below: 1. The device would be tested to perform as per the protocol using an embedded SIM/UICC. 2. The Cellular module & SIM/UICC, shall support: o SMS, Data (Cellular TCP/IP) and o Support multiple network OTA switching capabilities (On Demand as well as Automatic Switching on real-time basis) **Acceptance Criteria:** In the testing, vendors has to demonstrate the embedded SIM/UICC based tracking and multiple network OTA switching capabilities (On Demand as well as Automatic Switching on real-time basis) for effective network management and transmission.	YES	Tracking and multiple network OTA switching capabilities (On Demand as well as Automatic Switching on real-time basis) of Embedded SIM/UICC was satisfactory.

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6.3	Device Level Functional, Performance & Durability Tests		
Sr. No./ Cl. No.	Test Requirement	Compliance (Yes/NO)	Observation/Remarks (If Any)
6.3.1	Table 6A		
9	**Functional Endurance Test:** VLT device shall be operated for 96 Hours with external power supply and internal battery connected to device. PVT Data monitoring will be done for complete duration of test with data frequency defined after IGN switch ON mode. VLT device shall function successfully during & after test. **Acceptance Criteria:** VLT device shall function successfully during & after test.	YES	VLT device was functioning successfully during & after test.
10	**On Vehicle Dynamic Location Test:** VLT devices will be mounted on any target vehicle connected with vehicle battery. Target vehicle with VLT devices will be run for 10 Km on pre-defined track/route to verify dynamic location test. VLT device PVT data shall be within 12 meter for more than 90% of the fixed location data (as arrived using DGPS device on the same route). VLT device PVT data shall be super imposed on followed route map to check its correctness of followed route. **Acceptance Criteria:** PVT data of the Device shall be within 12 meter for more than 90% of the fixed location data (as arrived using DGPS device on the same route).	YES	PVT data of the Device was within 12 meter for more than 90% of the fixed location data (as arrived using DGPS device on the same route).
6.3.2	**Performance & Durability Test: Table 6B**		
1	**Shock Test:** Impact test carried out as per IS 9000 Part 7. Severity level=15g Impact duration =11 ms Impact type= Half sine Number of impact=9 (3 on each axis) **Acceptance Criteria:** After the shock test, the VLT with Emergency Button shall be tested for the connectivity to server and its capability to send two location messages.	YES	The VLT with Emergency Button was connecting to server and was capable to send data to two locations.
2	**Vibration Test:** **Frequency:** 10Hz – 55Hz – 10Hz **Displacement:** 1.5 mm **Duration:** 3 Hours (1 Hours on each axis) **Acceptance Criteria:** During and after the test the VLT with Emergency Button shall be tested for the connectivity to server and its capability to send two location messages.	YES	The VLT with Emergency Button was connecting to server and was capable to send data to two locations.
3	**Ingress Protection (IP):** Dust and water ingress protection as per IP 67 of IEC 60529: **Test conditions for Dust:** **Test Dust:** Talcum Powder **Depression value on Manometer:** Not more than 2kpa **Test Duration:** 2 Hrs **Acceptance Criteria:** No dust ingress inside the sample after the test. **Test conditions for water:** **Water Jet Hose Nozzle Diameter:** 6.3mm **Water Flow Rate:** 12.5 Ltr/minute ±5% Distance between Sample & Nozzle: 2.5m to 3m **Test Duration:** 1minute/m^2 at least 3 min **Acceptance Criteria:** No harmful effects should be observed after testing.	YES	No dust & water ingress was observed inside sample after test. No Harmful effects were observed after testing

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6.3.2	Performance & Durability Test: Table 6B		
Sr. No./ Cl. No.	Test Requirement	Compliance (Yes/NO)	Observation/Remarks (If Any)
4	EMI /EMC Test	YES	Tested & Verified (Refer Report No **CD0MN0194 Dated 19.06.2018** for details)
5	**Battery Backup Test:** Battery backup is the amount of time that the device battery can support sending the data without being connected to the power source. This test will be performed by disconnecting the input charging voltage to the device. On disconnecting the external supply, battery would use its charge capacity to send data through Cellular. Time duration between external power disconnect to the last data packet time denotes the battery backup time. **Acceptance Criteria:** Device shall be able to work in active mode for a period of 4 hours or more at the polling/ transmission rate of 60 sec.	YES	Device was able to work in active mode for a period of 4 Hrs 13 Minutes at the polling/ transmission rate of 60 sec.
6	**Reverse Polarity Protection without Fuse:** The device to be tested shall be connected to a reversed voltage of 14 V for 12 V systems and 27 V for 24 V systems for 2 min after connecting the system to the suitable circuit. **Acceptance Criteria:** After test, VLT with Emergency Button shall be tested for the connectivity to server and its capability to send two location messages.	YES	The VLT with Emergency Button was connecting to server and was capable to send data to two locations after the test.
7	**Wiring Harness - Flammability Test:** The wiring harness used in the device shall be tested for flammability as per IS 2465.	YES	Tested & Verified
8	**Wiring Harness - Electrical Properties:** As per AIS 028 or DIN72551 or ISO 6722 1. Conductor Resistance Test 2. Spark Test 3. Immersion Test 4. Flammability Test	YES	Tested & Verified
9	**Free Fall:** Device shall be released in Free Fall condition from a height of 500 mm on Steel plate. No. of Falls: 2 **Acceptance Criteria:** After test, VLT with Emergency Button shall be tested for the connectivity to server and its capability to send two location messages.	YES	The VLT with Emergency Button was connecting to server and was capable to send data to two locations after the test.

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6.3.2	Performance & Durability Test: Table 6B		
Sr. No./ Cl. No.	**Test Requirement**	**Compliance (Yes/NO)**	**Observation/Remarks (If Any)**
10	Performance Parametric Test: **Test Procedure:** During testing, VLT with Emergency button shall be kept inside test chamber in power ON condition. (System shall be stabilized for minimum 5 min at each condition as defined in below table. At each test point the system will be powered on and shut down 5 times with a duration of 1 min ON and 1 min OFF time) **Acceptance Criteria:** VLT with Emergency Button shall be tested for the connectivity to server and its capability to send two location messages for each value of the temperature and voltage.	YES	The VLT with Emergency Button was connecting to server and was capable to send data to two locations for each value of the temperature and voltage.
11	**Insulation Resistance Test:** Test shall be conducted as per ISO 16750-2:2010 after damp heat test mentioned in point 3 of the Section 6.4. System/components shall remain 0.5 h at RT after the damp heat test. Test shall be conducted with a voltage of 500 V DC. **Acceptance Criteria:** Insulation Resistance shall be > 1 MΩ. No arcing or puncturing of insulation allowed shall be observed.	YES	Insulation Resistance was > 550 MΩ. No arcing or puncturing of insulation was observed.
12	Load Dump Test Pulse 5a	YES	Tested & Verified (Refer Report No **CD0MN0194 Dated 19.06.2018** for details)
6.3.3	**Device Level Environmental Tests**		
1	**Dry Heat / High Temperature Test:** The test shall be carried out in accordance with Indian Standard IS: 9000 (Part 3/Sec 5) the device shall be subjected to temperature of 70 ± 2°C for 16 h in high temperature. Test with device in working condition. The recovery period shall be 2 h. **Acceptance Criteria:** Device during and after the cold test, the VLT with Emergency Button shall be tested for the connectivity to server and its capability to send two location messages.	YES	The VLT with Emergency Button was connecting to server and was capable to send data to two locations during and after the test.
2	**Cold Test:** The test shall be carried out in accordance with IS 9000 (Part 2/Sec 4 - 1977). The device under test shall be subjected to temperature of –10 ± 2°C for 2 h with device in working condition. The recovery period shall be 2 h. **Acceptance Criteria:** Device during and after the cold test, the VLT with Emergency Button shall be tested for the connectivity to server and its capability to send two location messages.	YES	The VLT with Emergency Button was connecting to server and was capable to send data to two locations during and after the test.

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6.3.3	Device Level Environmental Tests		
Sr. No./ Cl. No.	Test Requirement	Compliance (Yes/NO)	Observation/Remarks (If Any)
3	**Damp Heat Test:** The device under test shall be tested according to IS 9000 (Part 5/Sec 2 - 1981). The test is carried out at +25° to +55° C, Humidity 95%. Six cycles (each test cycle of 24 h) shall be run with device in off condition. Functional test shall be carried out with power in 'On condition' at start of 2nd, 4th and 6th cycle. **Acceptance Criteria:** Device during and after the test the VLT with Emergency Button shall be tested for the connectivity to server and its capability to send two location messages.	YES	The VLT with Emergency Button was connecting to server and was capable to send data to two locations during and after the test.
4	**Temperature Shock:** High Temperature: +70±2 °C Low Temperature: -10±2 °C Exposure time would be 3 hours/cycle (i.e. 1.5 hrs each temperature) Number of cycles:2 **Acceptance Criteria:** After the test the VLT with Emergency Button shall be tested for the connectivity to server and its capability to send two location messages.	YES	The VLT with Emergency Button was connecting to server and was capable to send data to two locations after the test.
5	**Salt Spray Test as per Clause 4.8 of IS 10250:** Solution: 5%NACL Temperature: 35±3°C Test Duration: 96 Hrs **Acceptance Criteria:** The VLT with Emergency Button shall be tested for the connectivity to server and its capability to send two location messages.	YES	The VLT with Emergency Button was connecting to server and was capable to send data to two locations after the test.
6	**High Voltage Test as per ISO 16750 - 2: 2010:** The test is conducted to ensure service life requirements & functionality. The device under test shall be operated for 60 minutes at 18 V for 12 V systems & 36 V for 24 V systems. **Acceptance Criteria:** The VLT with Emergency Button shall be tested during and after the test for the connectivity to server and its capability to send two location messages.	YES	The VLT with Emergency Button was connecting to server and was capable to send data to two locations during and after the test.
6.3.4	**Protocol Testing** This set of testing needs to be done for all cases namely vehicle level testing and component (Device) level testing. **Table 6D**	YES	Tested & Verified
a	**Memory Storage:** The device shall support 40000 or more positional logs/packets. This is a functional test and the device will be simulated to be in non – Cellular coverage area and the logs will be maintained. The capacity of logging will be checked by monitoring the logs on the device.	YES	Tested & Verified
b	**Messages & Alerts from Devices:** **TABLE 6E &6F**	YES	Tested & Verified

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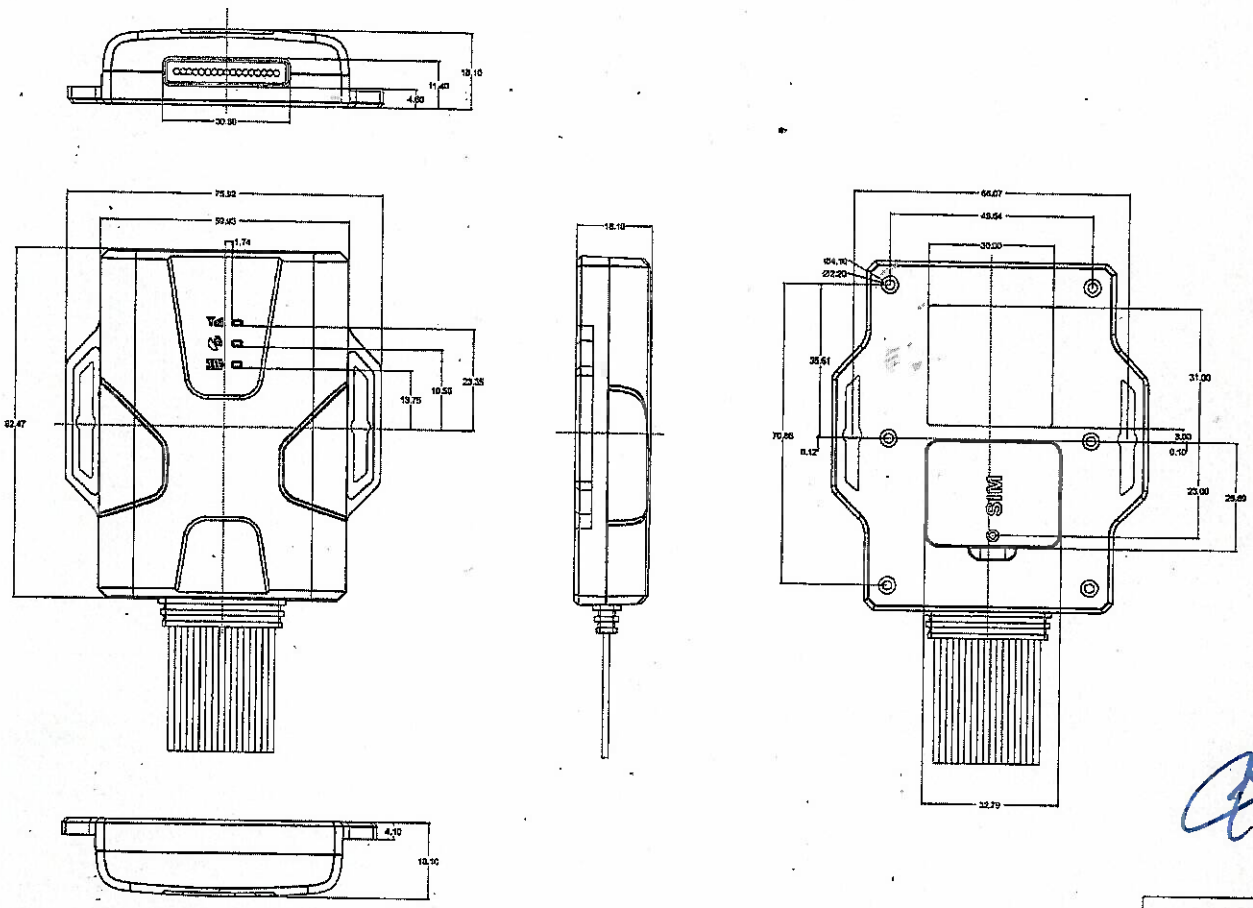
MODEL NO.: Wetrack 800



For MARK ELECTRONICS CORPORATION

Authorised Signatory

Mark electronics corporation

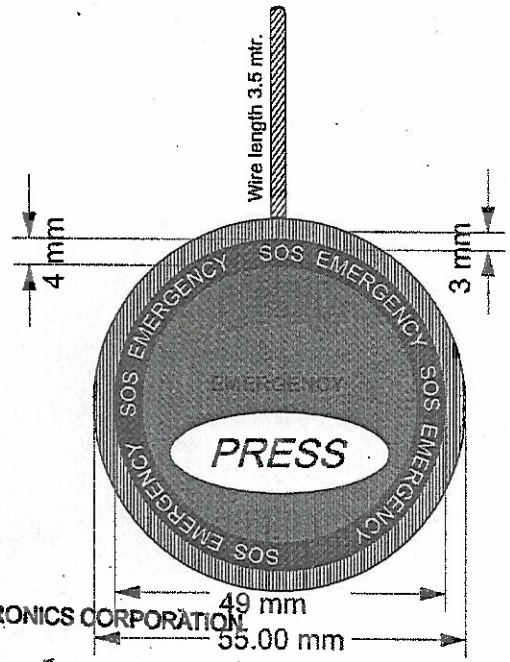
	REVISION RECORD	DATE
1	Drawing No. Mec	
2		
3		
4		
5		

TITLE:	wetrack				DN: MECWT800106M
PRODUCT MODEL:	wetrack800				PN: MECWT800105D
MATERIALS		DECIMALS			SCALE: 1:1
DRAWN BY	Zhou Haihua	DATE	16.04.28		UNIT: mm
CHECKED BY	Luo Xiong	DATE	16.04.30		PRO.(3):
APPROVED BY	Shao Bin	DATE	16.05.05		SIZE: A4

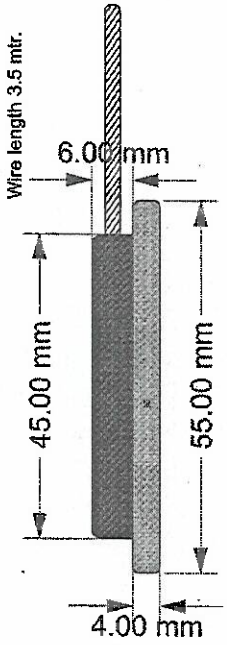
Panic Button With LED

MODEL NO. PB-L101

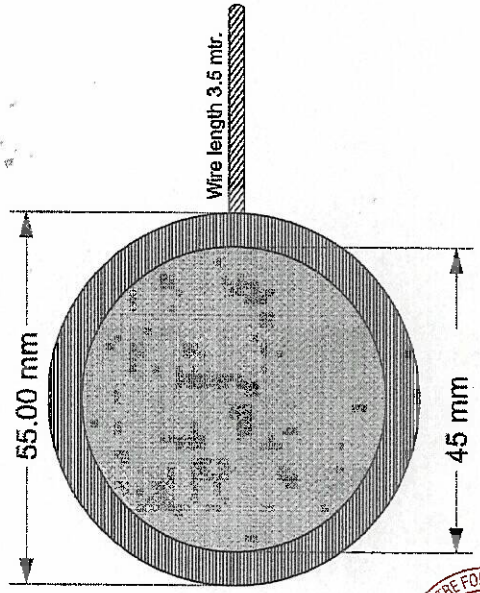
Front view



Side view



Back view



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	REVISION RECORD	DATE	TITLE: Panic Button				D/N: PBL17/180158
1	Drawing No. Mec		PRODUCT MODEL: PBL101				P/N : MECPBL1134L
2			MATERIALS		DECIMALS		SCALE : 1:1
3			DRAWN BY	Ram Kumar	DATE	17-03-05	UNIT : mm
4			CHECKED BY	Inder Kumar	DATE	17-03-10	PRO.(3):
5			APPROVED BY	Yatendra Sharma	DATE	17-03-17	SIZE : A4

Mark electronics corporation

Product Name :- Panic Button With LED

D/N -: PBL17/180158