iTraceRT-MVT-200/SLD

Accurate Real-Time Multi Vehicle Tracking
with integrated Dynamic Mesh Communication Features
for all automotive Localization & Control Applications

The latest applications in multi vehicle testing require INS/GNSS solutions with high performance, minimum latency and advanced timing features, combined with a robust local and global communication network support, to provide most reliable surveying and trajectory control capability.

iTraceRT-MVT, equipped with iMAR's LINUX[RT] based real-time signal processing, is the successor of the well-known traditional automotive motion reference system iTraceRT-M200.

- MEMS gyro based system.
- output of angular rate, acceleration, attitude, true heading, course over ground, velocity and position as well as all standard deviations via Ethernet, UART, CAN, USB.
- active mesh network communication support.
- accuracy: 2 cm position, 0.05° roll/pitch / 0.15° heading, < 1 mg acceleration (filtered) and 0.05 m/s velocity with RTK GNSS.
- latency < 2 ms plus jitter < 1 ms for tasks in advanced vehicle control & testing applications.
- all GNSS constellations supported simultaneously, with advanced interference rejection.
- odometer aiding for best performance even during longer GNSS outages.
- 32 GByte internal online data storage with "black-box" capability (option: 128 Gbyte).
- NTRIP caster capability to be operated as GNSS reference station (i.e. to supply other vehicles with RTK corrections).
- dual-antenna capability (allows determination of heading at standstill, without any initial motion)
- available also with gyro compassing capability with initial 0.5° heading (iTraceRT-MVT-510), e.g. for advanced parking garage use cases.
- robust, compact, lightweight, advanced EMI/EMC protection.

The iTraceRT-MVT incorporates both, more than iMAR's 25 years of experience in most accurate vehicle trajectory surveying and sensor technology, as well as the latest interface and GUI design rules

including related data exchange protocols to support both, the traditional highly skilled operators as well as the modern plug & play users.

Besides the iXCOM easy-to-use interface protocol on UART, USB and Ethernet, the powerful GUI allows to be configured according to the skills of the operator, from the professional engineer down to the briefly trained technician or safety driver. A dedicated operation wizard guides the operator step by step through less than a dozen of recommended configuration steps in the vehicle to assure a fast, easy, accurate and straight forward system setup.

The system provides all kinematic measurements and standard deviations of the target vehicle in real-time, with a data update rate of up to 500 Hz with an unbeatable low latency and jitter.

The iTraceRT-MVT/SLN, -MVT/SLC and-MVT/SLD series are fully interface compatible to iMAR's iNAT Navigation & Timing system series iNAT-M200/Sxx.
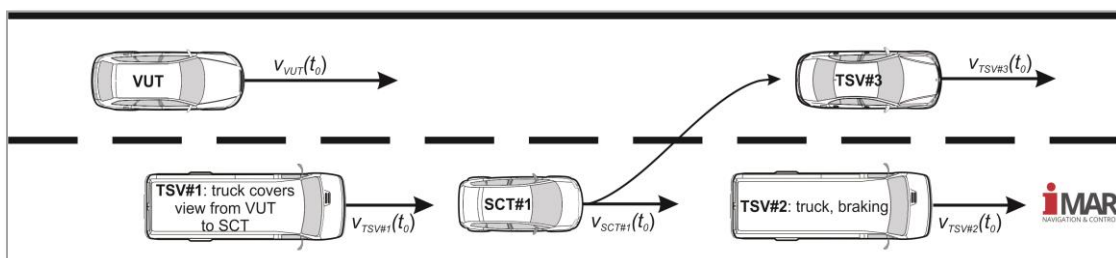
Technical Data: iTraceRT-MVT-200/SLD (rms)

	Rate	*Acceleration*	*Attit./Heading*	*Position*	*Velocity*	*Remarks*
Range:	± 500 °/s	± 8 g	unlimited	unlimited	515 m/s	> 515 ms on request
Bias day-to-day:	0.2 °/s	2 mg	pure INS, unaided, day-to-day, over temperature range			
Bias instability:	< 2.5 °/h	0.1 mg	AllanVariance values @ constant temperature			
Bias (filtered)	< 5 °/h	< 1 mg	after 5 minutes RTK-GNSS aiding under suffic. dynamics			
Angles:………………………………….			0.05° RP, 0.15° Y[1]			(INS/RTK-GNSS)
			0.07° RP, 0.17° Y			(after 10 sec RTK-GNSS loss)
			0.15° RP, 0.25° Y			(after 60 sec GNSS outage)
			0.15° Side slip angle			(v > 10 m/s, RTK)[2]
Position (horizontal / vertical): ……………………………				± 2 cm / 5 cm + 2 ppm[1]		(INS/RTK-GNSS) [1]
				± 0.1 m / 0.1 m		(INS, 5 s GNSS outage) [1]
				± 0.5 m / 0.4 m		(INS, 10 s GNSS outage) [1]
				0.2 % DT (CEP)		(INS/ODO during GNSS outages)
				± 1.8 m		(pure GNSS; CEP50)
				± 2 cm / 3 cm		(post-proc, INS/RTK) [1]
Velocity:			……………………………………..		0.05 m/s	(INS/GNSS) [1]
					0.02 m/s	(INS/RTK-GNSS) [1]
					0.1 m/s	(INS/ODO, 10 s GNSS outage) [1]

	Rate	*Acceleration*	*Attit./Heading*	*Position*	*Velocity*	
Noise:	< 0.15 °/√h	< 23 µg/√Hz	0.02 °	< 10 mm	< 0.01 m/s	
Resolution:	< 0.000'1 °/s	< 20 µg	0.001 °	< 1 mm	< 0.001 m/s	
Scale error (filt'd):	< 0.1 %	< 0.07 %	< 0.1 %			
Linearity error:	< 0.2 %	< 0.5 %	< 0.2 %			

Data fusion (INS/GNSS):	tightly coupled INS/GNSS Kalman filter based data fusion (INS/GNSS/ODO)
Data Rate / Latency / Jitter:	500 Hz / < 2 ms / < 1 ms
Output (max. Baud-rate):	USB Host, UART RS232/RS422 (921.6 kBd), CAN (1 MBd), TCP/IP/UDP (100 MBd)
	Option: iTraceRT-MVT can be operated also as NTRIP caster (like a GNSS reference station)
Inputs:	RTK-Base corrections (RS232 or NTRIP); odometer (A or A/B at RS422 level)
Synchronization:	PPS output (RS422 level), PPS timing accuracy better 25 ns; PTP / NTP Time Server (since HW rev. 4) with each PPS a time sync message can be sent via CAN bus.
Graphical User Interface:	MS Windows or LINUX based software iXCOM-CMD
	incl. supported features, like integration support wizard (I/F setup, mechanical setup calibration etc.)
Power Supply:	9...34 V DC, approx. 10 W
Temperature, Shock:	- 40...+71°C (outer case temperature); 60 g / 11 ms, 5 g rms (20-2'000 Hz) endurance
Mass, Size, Protection:	approx. 0.85 kg , approx. 102 x 65 x 122 mm (WxHxD) plus connector; IP67
Environmental Qualif.:	MIL-STD-810G, MIL-STD-461G, MIL-STD-704F (full military robustness proven)
Deliverables:	- MEMS based INS with integrated multi-frequency-RTK-GNSS
	- MS Windows based GUI software iXCOM-CMD, incl. integrated Configuration Wizard
Options:	- GNSS antenna(s) and GNSS reference station iREF-GNSS

- Dual-antenna configuration iTraceRT-MVT-M200/SLD-DAfor heading aiding at initial standstill (not required, if "stored heading" feature is used together with odometer or initial supervised motion is feasible) (0.2 deg initial accuracy at 1 m dual-antenna baseline, resp. 0.1 deg at 2 m baseline)

- odometer for aiding during longer GNSS outages (significant advantage for urban canyons)

- **interface to iMAR Dynamic Mesh Communication System** of up to 128 vehicles on a proving ground (car-2-base and car-2-car simultaneously with up to video data rate and latency < 50 ms (rms))

- GSM or GPRS based wireless modem iNetGo for internet based correction data
- compatibility to postproc software InertialExplorer
- interface to ABD driving robot (via Ethernet)
- fully compatible to the **Proving Ground Automation iSWACO-ARGUS**

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[1] assumes sufficient GNSS conditions and sufficient motion conditions for filtering state observability; values depend on trajectory
[2] The side slip angle is the angle between course over ground (CoG) and true heading. It is calculated based on the longitudinal and transversal velocity of the vehicle. It's accuracy therefore increases with increasing velocity. At standstill, the side slip angle cannot be defined.

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