No. IV-17017/13/2006-Prov-I
Government of India
Ministry of Home Affairs

26, Man Singh Road, Jaisalmer House,
New Delhi, 9.3.2010

To

The DGs: Assam Rifles/BSF/CISF/CRPF/ITBP/NSG/SSB/BPR&D

Subject:-Amendment in the existing QRs/specifications for the Direction Finder-regarding

In partial modification of this Ministry's letter of even number dated 15.11.2006, the following amendment/revision is made with the approval of the Competent Authority:-

QRs for Direction Finder		
under **S.No.7-Vehicle**	Existing Specifications	Amended specifications
	Tata Sumo/Tata 407	**TATA 715**

2. The remaining required specifications for the Direction Finder will remain un-changed.

9/3/10

(R.S.SHARMA)
Director(Prov)

Copy to:-DD(Procurement),MHA

जारी किया/ISSUED
दिनांक/Date.....
प्रो-I/Prov.-I
गृह मंत्रालय/MHA 10/3/10

No. IV-17017/13/06-Prov.I
Government of India
Ministry of Home Affairs

Jaisalmer House, Man Singh Road,
New Delhi, 15.11.2006

To
The DGs:Assam Rifles/BSF/CISF/CRPF/ITBP/NSG/SSB/BPR&D

Subject:- Finalization of QRs/specifications for Communication Equipments.

The QRs of the following Communication Equipments have been finalized and accepted by the MHA:-

(i) Integration of Voice and Data Communication over Wide Area Network
(ii) Direction Finder

2. Henceforth, all the CPMFs should procure the above items required by them strictly as per the laid down QRs/Specifications.

(Alok Mukhopadhyay)
Under Secretary(Prov-I)

Copy to:-

DD(Procurement),MHA

Copy for information to:-

1.PS to JS(PM),MHA
2. Dir(Prov), MHA

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QUALITATIVE REQUIREMENT FOR DIRECTIONAL FINDER

1.	Concept of Employment. The LVDFS will be employed to quickly move to the area of operation and get deployed within one hour. Three System units will form part of a Location Fixing (LF) cluster of LVDFS. The three System units should form a DF base of approximately 25-30 Kms and subsequently be able to provide location fix of hostile transmitters by functioning in integrated mode of operation. The system should be able to broadcast the DF results to Hand held terminals for display of DF locations on raster maps. Facility for retransmission of intercepted voice signal to the Hand held terminal in real time should also exist.
2.	Station Configuration. Planned configuration of the LVDFS is given at Appendix A. The proposed system should have following major components:-
	a) System Unit. The System Unit will consist of DF receiver, Scanning and Monitoring receiver, Control subsystem and intra-communication system based on secure VHF/UHF/Broad band radio. It should have the following features:
	(i) It should be light weight compact and so designed as to be able to fit easily inside a Station Wagon type of vehicle. The equipment should be provided well integrated in the vehicle. The vehicle is also to be supplied by the seller.
	(ii) It should be able to work efficiently in built up areas, hilly, jungle and desert terrain.
	(iii) It will form part of a Location Fixing (LF) system which would consist of upto three System Units.
	(iv) Each System Units should be capable of being configured as the Control Station. It should be possible to control the DF Receiver of the LVDFS configured as Slave in a cluster, from the Control Station and obtain DF readings for a specific task.
	(v) The integration with other System Units should be possible through secure VHF/UHF/Broad Band radio. The status of each System Unit in a cluster along with their location should be available to all the stations within the cluster.
	(vi) Each System Unit will have a state-of-the-art scanning and monitoring receiver to be controlled locally for obtaining the spectrum activity. There should be facility to record the voice transmission in hard disc of the control computer.
	(vii) Each System Unit should have standard RDBMS based database system to store the information obtained such as spectrum activity, DF/LF results, protected and target frequency/bands, recorded intercepts, etc. The system should cater for minimum 50000 records at any one time. Facility for storing recordings of minimum 1000 minutes of voice transmission should be available with the system.
	(viii) Facility for transferring the back up data and recorded transmission on the optical media should be available
	(ix) Each System Unit should have un interrupted Power Supply for providing back up for the entire system for 30 minutes of continuous functioning in order to switch over to external generator.
	(x) Each System Unit should integrate with hand held terminals through secure V/UHF radio communication. Facility for data and speech should be available on this link. **It should also be possible to communicate with MPDF, if held as part of the system over the same link, using digital secure communication technique/ commercial encryption of 32 bit or higher.**
	(b) Hand Held Terminals. Each System Unit should have three Hand held terminals. These terminals should have palm/laptop computer with color screen to

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	display the raster map and the DF results as available at the Control Station of the cluster. Following features should be available:-
	(i) The Hand held terminal should be light weight, man portable equipment. The entire weight of the terminal including the carrying harness and batteries should not exceed 10 Kgs.
	(ii) The terminal should be able to communicate with any system of the LF cluster through V/UHF communication **using digital secrecy communication technique/ commercial off the shelf encryption of 32 bits or higher**. A facility for integrating the Hand held terminals to the LVDFS cluster through alternate data communication media based on WLL/Cellular is desirable.
	(iii) These terminals should be self contained for 6 hours of continuous operation.
	(iv) It should have light weight color display console for displaying a raster map. The DF results as obtained at Control Station of the LF cluster should be available at the terminal display. The flow of DF results from the Control Station to the terminal should be automatic and transparent to the user. There should be facility to selectively control the flow of information to the terminal if so desired by the Control Station operator.
	(v) In case the communication between the Hand held terminal and the Control Station is not available due to screening, then the flow of results should take place through any system of the cluster which is in communication to both the Control Station and the Hand held terminal.
	(vi) A facility to send short message of 1000 characters from the terminal to the Control Station operator **is desirable**.
	(c) **Power Supply**. The power supply to the system should cater for 24 Hrs non stop functioning of the LVDFS. The power supply should be based on two noiseless 3/5 KVA Gen Sets of Indian Make or two generators as per power requirement of equipment for each System unit. These generator sets are to be accommodated in the same vehicle. Facility for automatic change over between the generators should be provided. These generators will be taken out from vehicle for operation of DF.
3.	**LF Capability.** Up to three LVDFS should be able to be employed in one cluster for LF. Following features should be available:-
	(a) **Automatic Mode.** It should be possible to originate LF request by any System Unit of the LVDFS in the integrated cluster. Based on the request the Control Station should get programmed for servicing the request and the results should be available to the requesting entity automatically. The time taken for the request for getting serviced should not exceed 2 seconds. There should be facility to grant/revoke such permission to specific entities in case so desired by the Control Station.
	(b) **Manual Mode.** In manual mode, the entire process of Location Fixing should be controlled by the operator at Control Station. The Operator should be able to task the local and remote DF units one by one and find the location off the map through triangulation software. There should be facility to transfer results to a Hand Held terminal as well.
Technical Parameters	
4.	The technical parameters are as given in **Appendix A.**
5.	**Posts.** Following posts will be available in each System Unit of LVDFS.
	(a) One LF/Search Post.
	(b) One Search/Monitoring Post.
6.	**Software.** The system software should have following features:
	(a) Standard System and Network Architecture using standard protocols.

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	(b) High speed operating system using High Level languages like C++ and Visual C++.
	(c) Use of 64 bit microprocessor having 5 MIPS (Million Instructions per Second) processing speed for faster computations.
	(d) Plot the enemy and own situation on the digitized map, using GIS based software tools. GIS should accept digitized maps in TIFF/DGN/DVD formats.
	(e) **GIS.** Digital map display software for DF and radio location fixing with following facilities
	(i) Fast online display of results on digitized map.
	(ii) Offline display of results from databases.
	(iii) Simple graphical display of tactical scenario.
	(iv) Calculation of position in IGRS.
	(v) Adding information to the map.
	(vi)Using maps from geographical information systems.
	(vii) Adapting maps to specific applications
	(viii) Zooming the shifting map sections.
	(ix) Distance measurements.
	(x) Selection of map objects and individual results.
	(f) **Database**. The system database should have following features
	i) Should be standard RDBMS based system.
	(ii) Should cater for minimum 50000 records at any one time.
	(iii) Should be able to store voice transmission recording for 1000 minutes at any one time.
	(iv) The database should be tightly integrated with the GIS package and should have analysis features as under
	aa) Plotting of desired DF results on the map.
	(ab) Display of known locations as stored in the database onto the map
	(ac) History plot of DF results along with analysis of their movement as per date and time parameters.
	(ad) Radio net analysis and display their location on the map to carry out the build-up analysis of the tactical scenario.
	(g) **System Control**. The integration software should be able to cater for two additional System Units in addition to the local DF unit. The System Control module should have following features:-
	(i) Should be able to task/control local scanning receiver, DF receiver (stand alone mode) and two remote DF receivers (integrated mode) when designated as Control Station.
	(ii) Should be able to initiate BITE sequence on the local equipment and report their status. Should also display the status of remote DF receivers in integrated mode. The status should also include the locations of the other DF stations as reported by their integrated GPS.
	(iii) Should have the facility of sending short messages of 1000 characters to Slave System Units LVDFS in the cluster and the Hand held terminals.
	(iv) Should be able to process LF requests both in automatic and **manual** modes.
	(v) Should be able to work with the database module for storage and retrieval of system status, results and mission parameters.
	(vi) Carry out the administrative control of the integrated functioning of the cluster including granting/revoking of certain permissions to the Slave System Unit of LVDFS or Hand held terminals of the cluster.
	(vii) Should be able to broadcast the LF results and other parameters to the slave System Units of LVDFS and Hand held terminals.

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	(h) **Search/Interception Sub-modules**. This sub-module will control the local scanning and monitoring receiver. It should have following features:-
	(i) Facility for defining minimum 10000 frequencies (100 groups of 100 frequencies) in the monitoring store and 2000 frequency bands (20 groups of 100 bands each) in the scanning store.
	(ii) Facility for defining up to 1000 frequencies in the protected frequency store and 100 sub-bands in the protected sub-band store.
	(iii) **Scanning.** Waterfall display (Activity Vs time) and spectrum activity plot (Amplitude Vs Frequency) should be available for both frequency and band scanning.
	(iv) **Monitoring.** Level 2 signal parameter detection algorithms should be built into the system. Detection of signals based on signal parameters such as modulation, etc should be available in addition to the squelch facility.
	(v) Facility for storing the activity in terms of screen shots of the display should be available
	(vi) Detection and de-interleaving of Burst and FH transmissions based on burst duration/hop rates should be available. Any additional method for de-interleaving of such transmissions should also be mentioned.
	(vii) The activity as detected by the sub-module should be stored in the database and facilitate analysis of the same.
	(viii) Audio recording facility on hard-disc should be available
	(i) **DF Sub-module.** This sub-module will control the local and remote DF receivers. It should have following features:-
	(i) Should have facility for frequency Vs Angle plot and Polar plot from the local DF receiver.
	(ii) Facility for Sector masking.
	(iii) Facilities for programming the remote DF receivers for desired frequency and obtain DF for triangulation in integrated mode.
	(iv) Allow storage of the LF results in the Database.
	(v) Facility for de-interleaving of FH and Burst signals based on Direction of arrival (DOA).
	(vi) Triangulation facility for finding the location of FH and Burst signals through correlation process.
7.	**Vehicle** Each system unit of LVDFS system should be well integrated in a 4 wheel driven and air- conditioned Tata sumo/Tata 407. Vehicle to be supplied by supplier. After installation of equipment, the vehicle should have sufficient space for atleast two operating staff.
Environmental Specifications	
8.	**Ruggedisation.** The system will be semi ruggedised and will meet environmental conditions as laid in Table L2A and Table L3 of JSS 55555, Revision No.2 for vehicle mounted sub system and for sub system installed in open outside the vehicle respectively
9.	**Certificate of Conformity.** If the equipment can not be subjected to the tests mentioned at Para above during the JRI, a certificate of conformity and the test results carried out at factory premises during production will be required to be furnished at the time of delivery.

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Appendix A

QUALITY REQUIREMENTS FOR DIRECTION FINDER

DF Equipment

DF Processor

Srl. No.	Nomenclature	Technical Parameters
1.	Frequency Range	20 MHz to 3000 MHz
2.	DF accuracy (Multi Path Propagation)	Better than 02 degree, RMS over entire Frequency range
3.	Bearing resolution	Better than or equal to 0.1 degree
4.	Display Parameters	(a) Modulation (b) Bandwidth (c) Signal Strength in dbm (d) Bearing and location fix (e) Bearing quality (f) Time of DF (g) Should have facility for working in darkness by lighting by the display.
5	Detection modes	AM,FM,SSB,CW,PSK,FSK, Frequency Hopping and Burst Signal
6.	Operating Modes	(a) Automatic (b) Manual
7.	FH DF Capability	Minimum 350 hops per second
8.	DF Receiver Channels	Minimum three channel DF Processor.
9.	Minimum required signal duration for DF	Less than or equal to 1 m second.
10.	Response time of LF system	Display of location fix within 2 seconds of initiating LF command. The entire procedure of requesting the bearings location calculation and plotting the same on the map must complete within 2 seconds.
11.	Receiver sensitivity	State-of-art, better than 2 micro volts per meter in entire frequency range for 10 db SNR and 6 KHZ Band width.
12.	Frequency history	Store history of minimum 1000 Frequency including time of DF, LF, and Modulation and bearing quality.
13.	Calibration	Should cater for auto calibration as well as site error calibration.
14.	Computer	Rugged laptop. GIS software should facilitate display of maps digitized in DVD/DGN/DEM(in DTED) formats
15.	External PC Port	All DF station should provide port for extending control station data base to a remotely connected PC.

DF ANTENNA SYSTEM

16.	DF Antenna	(a) Coverage of Azimuth 360 degree Elevation 60 degree.
		(b) Light weight, robust, telescopic type easy to raise (pneumatic/ electromechanical/hand crankable) masts.
		(c) Mast and antenna should be able to withstand high wind velocities of upto 150 Km/h.
		(d) Height of antenna mast should not be more than 10 meters from ground.
		(e) Mast should be mounted on top of vehicle and should permit erection on ground upto 50 meter away from vehicle.
		(f) All antenna accessories should be capable of being carried in suitable modification. To be made on top/ side of vehicle.
17	GPS Receiver	Should be available with each station of the system. Facility for manual entry of own location should also exist in the system.
18	GPS Integration	Each station of the system should have an additional port for integration of GPS results.

SEARCH AND INTERCEPTION RECEIVER

19.	Frequency Band	20 MHz – 3000 MHz
20.	Memory scan	1500 Channel per second
21.	Scan rate search	Minimum 10 GHz/second
22.	Protected Frequency	Minimum 200
23.	Pre-settable scanning frequency Band	(a) Edge Scan:-Facility to scan between specified lower and upper limits covering entire frequency band. (b) Should be able to cover entire frequency band for scanning. (C) Should be able to select a sub band for scanning. (d) Should be able to protect frequencies and sub band from scanning.
24	Antenna	Omani directional and directional with 6 db gain. The antenna should be software selectable from the scanning post.

INTRA SYSTEM COMMUNICATION

25	Intra system communication (between DF stations in a cluster)	(a) Tactical VHF/UHF FM radio.
		(b) Transmitting power minimum20 W.
		(c) For voice and data communication between post of DF Station.
		(d) Should incorporate FH technologies for ECCM for communication between DF Stations. **Intracommunication system should use only directional antenna.**
		(e) Small in size and light weight.
		(e) Minimum range 20 Km, with suitable antenna system mounted on the vehicle
26	Intra system communication (between DF stations and hand held terminal)	(a) Tactical VHF/UHF FM radio
		(b) Transmitter Power (i) LVDFS end. Minimum 20 W. (ii) Hand held. 5W.

		(c) For voice and data communication between LVDFS and Hand Held terminals.
		(d) Should incorporate digital secure communication technique/ **commercial encryption of 32 bit or higher.**
		(e) Small in size and light weight
		(f) Minimum range 10 Km, with suitable antenna system

POWER SUPPLY

27	Power supply	(a) System should be self contained for stabilized power requirement by providing rechargeable batteries and light weight noiseless generators.
		(b) Should also be capable of operating from single phase 220 V AC with built in facility to charge the battery. A stabilizer should cater for this purpose.
		(c) The battery pack should be capable of providing uninterrupted power supply for SIX Hours without charging.
		(d) Circuit breakers should be catered for protection of critical subsystem from power fluctuations.
		(e) Earthing protection should be catered in the system unit vehicle and in the power supply vehicle.
		(f) Noise level of the generator sets should be better than 86 dBA.

ENVIRONMENTAL

28	Temperature operating and storage	-10 degree Celsius to +50 degree Celsius.
29	EMI/EMC	To confirm to MIL Std. 461 C/D Specifications

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MAN PORTABLE DIRECTION FINDER (Optional)

A. GENERAL:

- Each system unit will have one Man Portable Direction Finder for homing to the location of clandestine/ hostile transmitter Location Fixing (LF) system of three System unit will have three Man Portable Direction Finders. Secure VHF/UHF radio communication should be provided with each MPDF for intercommunication with system units.
- The equipment should have capacity to DF all signals including fleeting emissions independently or in conjunction with main LVDF System.
- It should be able to DF burst & other short duration signals.
- It should be capable of scanning the entire band as also be able to carry out library based target frequencies search.
- It should have facility of voice/data communication with any LVDFs of the LF cluster and hand held terminals over VHF/UHF using digital secure communication technique/ commercial encryption of 32 bits or higher.
- It should have facility for automatic flow of DF results from control station to the MPDF. Also there should be facility to selectively control the flow of information to the MPDF if desired by the control station operator.
- In case communication between the MPDF and the control station is not available due to screening, then the flow of results should take place through any LVDFs of the cluster which is in communication to both the Control Station and the Hand Held Terminal.
- The system should be able to automatically search a given frequency band and store the active channels and subsequently scan the stored channels from it's internal memory channel bank (memory scan).
- The antenna system should have an electronics compass with an automatic north reference direction for bearing calibration.
- MPDF system should be self contained for 8 Hrs of continuous operation.
- The batteries provided with the system should be light-weight, state of art, rechargeable with 6-12 Hrs (or Better) operational life per charge.
- The equipment should be reasonably water proofed to enable successful field operation.
- The equipment should be compact and light weight, suitable for carriage by one man in field conditions.
- All possible details regarding each offered system(s) should be made available to enable credible evaluation and selection of the equipment for trials.

- It should be provided with Palm/ Laptop Computer with colour screen to display raster map and other results received from control station.
- All the audio outputs should be through ear phone (Loud Speaker –Optional)
- It should be having facility of panoramic display.

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B. TECHNICAL PARAMETERS:

1.	Frequency Range	2 MHz to 3000 MHz.
2.	Sensitivity (Overall noise figure including AF Section)	8 μV/Mtr or better.
3.	Operational Sensitivity	– 70dBm or better
4.	DF Accuracy in field conditions	2 degree RMS
5.	Dynamic Range	55 dB or better
6.	Probability of Intercept	Nearly 100%
7.	Image, IF & Spurious response	> 90 dB
8.	Noise Figure	< 20 dB
9.	Scan Characteristic	Auto memory scans upto 1000 definable locations.
10.	Frequency Scan	Start/ Stop/ Step definable.
11.	Power Supply	12/ 24 V DC Bty (Also provision for external battery feed be available)
12.	Antenna	Handy & highly broad band active directional antenna with frequency range 2 MHz to 3 GHz.
13.	Polarization	Vertical and Horizontal.
14.	Temperature: a) Operating : b) Storage	 a) -10° C to +55° C b) -30° C to +60° C
15.	Weight	Less than 18 Kgs (Including Bty, Antenna and Carrying Harness.

18/9/2006

(P.T.O.)

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