

No. B.V-7/2014-15-C(QRs)-(29)

भारत सरकार/Government of India

गृह मंत्रालय/Ministry of Home Affairs

पुलिस आधुनिकीकरण प्रभाग /Police Modernization Division

संभरण-I डेस्क /Prov.I Desk

26, Man Singh Road, Jaisalmer House,
New Delhi, the 30 December, 2014

To,

The DsG: AR, BSF, CISF, CRPF, ITBP, SSB, NSG & BPR&D.

Subject: QRs and Trial Directives of Radio Communication Test Set (Analog/Digital).

The undersigned is directed to refer to the subject mentioned above and to say that the QRs and Trial Directive in respect of Radio Communication Test Set (Analog/Digital) as per Annex-I and Annex-II respectively have been approved by the competent authority in MHA.

2. Henceforth, all the CAPFs should procure the above item required by them strictly as per the laid down QRs and Trial Directives.
3. Concerned CAPF will be accountable for correctness of the QRs and Trial Directives.

Yours faithfully,



(P. K. Srivastava)

Under Secretary to the Govt. of India

Encl: As above.

Copy forwarded for necessary action to:

SO (IT), MHA - with the request to host the QRs and Trial Directives of Radio Communication Test Set (Analog/Digital) on official website of MHA (under the page of Organizational Set up, Police Modernization Division-Communication Equipments). Soft copy is being sent through email also.



(R. K. Soni)

Section officer (Prov-I)


Copy to: DDG, (Procurement), MHA

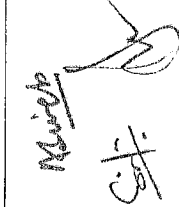
QRS/ SPECIFICATIONS OF RADIO COMM TEST SET (ANALOG/DIGITAL)


CONSISTING OF -

1. RF SIGNAL GENERATOR
2. RF POWER METER
3. AUDIO FREQUENCY COUNTER
4. SINAD METER
5. DISTORTION METER
6. HUM & NOISE METER
7. SIGNAL to NOISE RATIO METER
8. AUDIO FUNCTION GENERATOR
9. OSCILLOSCOPE
10. DIGITAL MULTIMETER
11. RF SPECTRUM ANALYZER
12. AUDIO SPECTRUM ANALYZER
13. HARMONICS & SPURIOUS METER
14. TRACKING GENERATOR
15. DIGITAL TEST (OPTIONS) FOR P25-I&II, TETRA, NXDN, DPMP & DMR

Sl No.	Parameters	Specifications
1	General Characteristics	
	a) Operating Voltage :	AC 220V ± 10% @ 50 Hz
	b) Internal storage capacity	20 GB or more
	c) Display size	6" or more (diagonal)
	d) USB port	Should be available
	e) Ethernet	RJ-45, 100/10 Mbit/s, Minimum 1 port.
	f) GPIB Connector Type	24 pin IEEE
	g) RS-232 Connector Type	9-pin, D-sub, Male
	h) IF output connector type	BNC
	i) Function	10.7 MHz Receiver IF
	j) Automated signal measurement and analysis software (optional)	The software should have interface with digital radio test set. The software is capable to test and align the transmitter/receiver of a radio set automatically and analysis in the field.
k) Calibration support	Calibration facilities should be available in India free of cost during the guarantee/warranty period.	
l) Field upgradations	a) The product should field upgradable to other Digital Technologies such as: P 25 Phase I & II testing, DMR Radio with Repeater, NXDN, dPMR & Tetra Mobile and Base station and DMO mode testing: b) The equipment should be capable of performing tests-of digital/analog radio set and contain all functionalities in one stand-alone unit	
2.	SIGNAL GENERATOR FOR RECEIVER TEST	
a) Frequency Range	250KHz to 2.5 GHz or better	
b) Frequency Resolution	1Hz or better	
c) Output level range	T/R Port: -120.0 to -30.0 dBm or better Gen Port : -120.0 to 5.0 dBm or better	
d) Resolution	0.1 dB or better	
e) Port Protection limit	(a) T/R Port: 200 W with warning above 135 W. Max of 30s ON and minimum of 2 min. OFF for power levels above 50W. (b) Antenna Port: 10 W with warning above +17 dBm. (c) Generator Port: 10 W with warning above +23 dBm (Remove power immediately when alarm sounds)	
f) Harmonics	<-25 dBc (RF level set at+10 dBm)	
g) Non-Harmonics	<-55 dBc (all freq. except Crossovers) or better.	
	Modulation	
2.1	a) Selection Mode	OFF, AM, FM, AM USB, AM LSB.
	b) Waveforms	Sine, Square, Triangle, Ramp, DCS, DTMF
2.2	FM Modulation	
	a) Deviation Range	0 to ±125 KHz or better. Off
	b) Deviation Accuracy	3% of setting
	c) Resolution	10 Hz or better
	d) Modulation Range	20 Hz to 20 KHz or better



 554
 H.P. Mehta
 Sd/-




QRS/ SPECIFICATIONS OF RADIO COMM TEST SET (ANALOG/DIGITAL)	
Sl No.	Parameters Specifications
2.3	AM Modulation
	a) AM depth range
	b) Accuracy
	c) Modulation Bandwidth
2.4	d) Resolution
	SSB Modulation
	a) Modulation selection
	b) SSB depth range
3.	c) Modulation bandwidth
	Receiver(Transmitter test)
	a) Frequency Range
3.1	b) Demodulation selection
	c) Signal Code
	d) Sensitivity
	Demodulation Measurements
	a) FM Deviation
	b) Accuracy
4.	c) Range
	d) AM Deviation
	e) Accuracy
	f) AM rate
	RF Power Meter
	a) Range :- 0.10 To 125 Watt, Resolution 0.01W
5.	b) VSWR (with Attenuation ≤ 10 dB): Better than 1.20 : 1
	Audio Frequency counter
	Range
	Wave shape
6.	AF level meter
	SINAD Meter
	a) Frequency Range
	b) Accuracy
7.	c) Range
	d) Level
	Distortion Meter
	a) Distortion Range
8.	c) Freq Range
	d) Input level (Audio)
	e) Resolution
	Hum and Noise Meter
9.	a) Range
	b) Signal Frequency
	c) Resolution
	Signal to Noise Ratio Meter
10.	a) Frequency range
	b) Range
	c) Accuracy
	AUDIO FUNCTION GENERATOR
a) Wave Shape	
b) Frequency Range	
c) Level range	
d) Frequency resolution	
e) Level accuracy	

W. S. S.

714

11/11/2007

M. S. S.

Soft

11/11/2007

11/11/2007

± 1 % of setting across 10 k Ω load or better

Sine, Square, Triangle, Ramp, Digital Coded Squeich, DTMF

Sine: 20 Hz to 20 KHz or better

Square, Triangle and Ramp: 20 Hz to 4 KHz or better

1mV to 5V RMS across a 10 k Ω load or better

0.1Hz

46





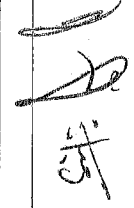
QRS/ SPECIFICATIONS OF RADIO COMN TEST SET (ANALOG/DIGITAL)			
SI No	Parameters Specifications		
11.	OSCILLOSCOPE		
	a) Nos of channel	Two channel or more	
	b) Frequency range (vertical)	DC TO 2 Mhz or better	
	c) Input range (vertical)	0 to 100 Vpeak Max, Cat- II	
	d) Accuracy(vertical)	10% of full scale (DC to 2 MHz)	
	e) Sweep Factor(Horizontal)	1 μ Sec to 1 Sec/division in a 1, 2, 5 sequence	
	f) Accuracy(Horizontal)	>1.5% of full scale	
	g) Trigger Selection	Auto, normal Continuous, single shot	
	h) Marker functions	Time with amplitude, deviation or % depth.	
	12.	Digital MultiMeter	
		a) Voltage Range	200 mV to 1000V, or more(150 VAC RMS, or VDC MAX input)
b) AC Voltage Freq range		50 Hz to 20 KHz	
c) Accuracy		AC \pm 5% fullscale \pm 1 LSB	
		DC \pm 1% fullscale \pm 1 LSB	
d) AC/DC ampere meter		200 mA to 20 A, or better Auto(20 A range uses optional shunt connected to Voltmeter)	
e) Resolution		3 Digits or more (up to 2000 counts)	
f) Ohmmeter		Full Scale Range: 200 ohms to 20Mohms, Auto.	
13.		RF Spectrum Analyzer	
		a) Frequency Range	250KHz to 2.5 GHz
		b) Frequency Resolution	1 Hz
	c) Frequency Accuracy	Same as freuency standard	
	d) Span Accuracy	\pm 5% of span width or better	
	e) Span Mode	Start/Stop, Center/Span and Zero Span	
	f)Resolution bandwidth (RBW) filters	Slectable from 300 Hz, 3 kHz, 30 KHz, 60 KHz, 300 KHz, 3 MHz or more	
	g) Video Bandwidth (VBW)	Selectable from 10 Hz to 1 MHz.	
	14.	Audio Spectrum Analyzer	
		a) Freq Range	Start and Stop Frequency - 0 Hz to 20 KHz
		b) Freq Span	2 Khz (Min) to 20 Khz (Max)
15.	c) Freq accuracy	\pm 50ppm, (\pm 10 ppm typical)	
	Automatic Harmonics and Spurious Measurement for Radio		
	a) Harmonic / spurious level range	0 to -50 dBc or better	
16.	b) Accuracy	Same as RF spectrum analyser	
	Tracking Generator		
	a) Tracking generator Output	Refer to RF SIGNAL GENERATOR section for: - Frequency range and accuracy - Output level range, resolution and accuracy	
	b) Tracking Generator controls	Output port selection, RF level,Reference cal	
	c) Waveform Generaotor	PC based software utility that gives the user the ability to develop their own waveforms to use as the modulation source.	
	17.	Environment and Safety Standard	
a) Operating temperature		0 to 45 degree celsius (in accrodance with MIL PRF-2880F class-3)	
b) Storage Temperature		-20 to 60 degree celsius	
c) Relative humidity		75% up to 30 degree celsius	
d) Safety standard	UL61010B-1, EN61010-1, CSA C22.2 No- 61010-1 or equivalent.		

M

 589

 Mixer

SI No	Parameters	Specifications
18.	PROJECT- 25 (P-25) or Association of Public Safety Communication Official International (APCO-25) Technology (Optional)	
18.1.	RF Signal Generator	
	a) Frequency Range	250KHz to 2.5 GHz or better
	b) Output level range	T/R Port: -120.0 to -30.0 dBm or better
	c) Resolution	1Hz
	d) Modulation	C4fm, CQPSK,LSM
	e) Test pattern	STD1011,STD CAL,STD SILENCE, STS IDLE, STD 511(0.153), STORED SPCH, Voice , 1011, SILENCE
	f) Duplex Radio	Should have facility test in duplex mode/Repeater set test
	g) P 25 Encryption Test	Facilities to test the AES/DES should be available.
	h) Vocoder Test	IMBE/AMBE Vocoder testing facility should be available.
18.2	P-25 Measurement	
18.3	Modulation Fidelity	
	a) Range	0 to 20%
	b) Resolution	0.01%
	c) Accuracy	<5.0% of reading (2.5 to 5%)
18.4	Symbol Deviation	
	a) Range	1500 Hz to 2100 Hz
	b) Resolution	0.1 Hz
	c) Accuracy	±10 Hz (1620 to 1980 Hz)
18.5	Freq Error	
	a) Range	±4 KHz
	b) Resolution	0.01Hz
	c) Accuracy	Frequency Standard ±1 Count
18.6	UUT TX/RX Bit Error Rate	
	a) Range	0 to 20%
	b) Resolution	0.10%
18.7	Error Vector Magnitude	
	a) Range	0 to 20%
	b) Resolution	0.01%
	c) Modulation Fidelity Display	Should have Constellation, Distribution, Eye Diagram and Trajectory type display graphics
18.8	Protocol	
	a) Data Link: Should have Header and Voice Frame.	
	b) Conventional Mode Simulation	
	c) Phase -1 Trunking Simulation	
	d) Trunking Control	
	e) Simulator	
	f) Supports DES Encryption	
18.9	a) P 25 Phase II - HCPM TX/RX Test :- Upgradation facilities should be available	
	b) P25 Trunking Operation VHF/UHF/700/800 MHz LSM Generate and Receive/Analysis :- Facilities should be available	
19.	Digital Mobile Radio (DMR) Technology (Optional)	
	a) RF Signal Generator	Same as in P-25 except following
	b) Output level	-do-
	c) Modulation	4FSK
	d) Test pattern	STD1B1031, STDIB CAL, STDIB511(.153), STD OB TSYNC (Repeater IDLE pattern)
	e) Duplex Radio/ Repeater	Should have facility to test in duplex mode/Repeater set test
	f) Vocoder Test	IMBE/AMBE Vocoder testing facility should be available.
19.1	DMR Measurement	
	a) FSK -Error	0 to 20%
	b) Range	0.01%
	c) Accuracy	<5.0% of reading (2.5 to 10%)
19.2	Protocol	
	a) Decode	Color code, call ID, Unit ID
	b) Simulation	Color code , call ID

SI No	Parameters	Specifications
19.3	Magnitude Error	
	a) Range	0 to 5%
	b) Resolution	0.01%
19.4	c) Accuracy	<10 of reading (0 to 2%)
	Frequency Error	
	a) Range	±4 KHz
19.5	b) Resolution	0.01 Hz or better
	c) Accuracy	Frequency Standard ±1 Count
	UUT/Tx/Rx Bit Error Rate	
20	a) Range	0 to 20%
	b) Resolution	0.1 %
	DPMR (Optional)	
	a) RF Signal Generator	Same as in P-25 except following
	b) Output level	-do-
	c) Modulation	4FSK
	d) Test Pattern	STD 511.(153)
	e) Duplex Radio/Repeater	Should have facility to test in duplex mode/Repeater set test.
20.1	DPMR Measurement	
	FSK-Error Meter	
	a) Range	0 to 20%
20.2	b) Resolution	0.01%
	c) Accuracy	<5.0% of reading (2.5 to 10%)
	Frequency Error	
	a) Range	±4 KHz
	b) Resolution	0.01 HZ or better
	c) Accuracy	Frequency Standard ±1 Count
20.3	UUT/Tx/Rx Bit Error Rate	
	a) Range	0 to 20%
	b) Resolution	0.1 %
21	Accessories	All require accessories for testing the all parameters of Equipment and User/ Maintenance Manual.

Charan Singh
(SI/RO, CISF)

Neeharj Pragaat
Dy. Comdnt(TC), NSG

S.K. Prakash
(DC, Assam Rifle)

Sumit Gupta
{PSO(E), BPR&D}

Jai Singh Yadav
{AC(Tel), ITBP}

D. Pragaat
{DC(Com), SSB}

Hem Prakash Sharma
(DC, CRPF)

Jasbir Singh Sandhu
{DIG(Eqpt.) CRPF}

Rajeev Kumar
(Major, NSG)

Rajesh Kumar
{DC (Com), BSF}

Amarjeet Singh
(E. Asst. Dir, DCPW)

Shailendra Kumar
(IG (Com), CRPF)

Approved/ ~~Net Approved~~

(Dilip Trivedi, IPS) (M)
DG CRPF

1

43

TRIAL DIRECTIVE FOR RADIO COMN TEST SET (ANALOG/DIGITAL)

Trial/ technical evaluation of radio communication test set will be conducted by a Board of Officers (B.O.O.) in the presence of Vendor or representative of Firm to assess actual performance of the instrument.

2. All specifications / parameter of radio communication test set mentioned in the QRs will be checked by B.O.O. during Trial by ascertaining/verifying following ways:-

- i) **Physical Check:-** In this category specifications of the equipment will be checked by B.O.O. Physically as per QRs.
- ii) **Functional Check:-** In this category Vendor/Supplier will show practically all features/ configuration shown against to the board of officers during trial.
- iii) **Submission of Certificate:-** Specification which cannot be checked due to lack of testing facilities/expertise, certificate of Government Authorized Laboratory of test shown against provided by the vendor will be acceptable by B.O.O.

CONSISTING OF -

- | | | | |
|-----------------------------|--|--------------------------------|----------------|
| 1. RF SIGNAL GENERATOR | 2. RF POWER METER | 3. AUDIO FREQUENCY COUNTER | 4. SINAD METER |
| 5. DISTORTION METER | 6. HUM & NOISE METER | 7. SIGNAL to NOISE RATIO METER | |
| 8. AUDIO FUNCTION GENERATOR | 9. OSCILLOSCOPE | 10. DIGITAL MULTIMETER | |
| 11. RF SPECTRUM ANALYZER | 12. AUDIO SPECTRUM ANALYZER | 13. HARMONICS & SPURIOUS METER | |
| 14. TRACKING GENERATOR | 15. DIGITAL TEST (OPTIONS) FOR P25-I&II, TETRA, NXDN, DPMR & DMR | | |

Sl No.	Parameters	Specifications	Trial/Testing Procedure
1	General Characteristics		
	a) Operating Voltage :	AC 220V ± 10% @ 50 Hz	B.O.O will practically "ON" instrument on AC voltages and ensure its functionality.
	b) Internal storage capacity	20 GB or more	B.O.O will check practically.
	c) Display size	6" or more (diagonal)	B.O.O will check size diagonally by standard scale.
	d) USB port	Should be available	
	e) Ethernet	RJ-45, 100/10 Mbit/s, Minimum 1 port.	
	f) GPIB Connector Type	24 pin IEEE	
	g) RS-232 Connector Type	9-pin, D-sub, Male	
	h) IF output connector type	BNC	B.O.O will check it physically.

W, [Signature], JSC, [Signature], [Signature], [Signature], [Signature], [Signature]

2

42

TRIAL DIRECTIVE FOR RADIO COMN TEST SET (ANALOG/DIGITAL)		
i) Function	10.7 MHz Receiver IF	B.O.O will check it practically.
j) Automated signal measurement and analysis software (optional)	The software should have interface with digital radio test set. The software is capable to test and align the transmitter/receiver of a radio set automatically and analysis in the field.	Firm will demonstrate it practically to the board and board will ensure.
k) Calibration support	Calibration facilities should be available in India free of cost during the guarantee/warranty period.	Vendor will produce the certificates in this regards. Board will check it.
l) Field upgradations	<p>a) The product should field upgradable to other Digital Technologies such as: P 25 Phase I & II testing, DMR Radio with Repeater, NXDN, dPMR & Tetra Mobile and Base station and DMO mode testing.</p> <p>b) The equipment should be capable of performing tests of digital/analog radio set and contain all functionalities in one stand-alone unit</p>	<p>a) Firm will demonstrate it practically to the board and board will ensure.</p> <p>b) Board will carry out testing of Digital/ Analog radios set practically and ensure its workability and compatibility.</p>
2. SIGNAL GENERATOR FOR RECEIVER TEST		
a) Frequency Range	250KHz to 2.5 GHz or better	B.O.O will check practically by set the various frequencies within the specified range and ensure its availability.
b) Frequency Resolution	1Hz or better	B.O.O will check practically and ensure it availability.
c) Output level range	T/R Port: -120.0 to -30.0 dBm or better Gen Port : -120.0 to 5.0 dBm or better	B.O.O will check practically to measure the power in the all port and ensure their workability and availability.
d) Resolution	0.1 dB or better	B.O.O will check resolution level practically.
e) Port Protection limit	<p>(a) T/R Port: 200 W with warning above 135 W. Max of 30s ON and minimum of 2 min. OFF for power levels above 50W.</p> <p>(b) Antenna Port: 10 W with warning above +17 dBm.</p> <p>(c) Generator Port: 10 W with warning above +23 dBm (Remove power immediately when alarm sounds)</p>	B.O.O will check practically by give the power level as specified to the instrument and ensure availability of protection feature.
f) Harmonics	<-25 dBc (RF level set at+10 dBm)	B.O.O will check practically by setting the harmonics/non harmonics level and ensure its functionality.
g) Non-Harmonics	<-55 dBc (all freq. except Crossovers) or better.	-do-

✓

[Signature]

[Signature]

[Signature] *[Signature]* *[Signature]*

[Signature] *[Signature]*

[Signature] *[Signature]*

41

TRIAL DIRECTIVE FOR RADIO COMN TEST SET (ANALOG/DIGITAL)			
2.1	Modulation		
	a) Selection Mode	OFF, AM, FM, AM USB, AM LSB.	B.O.O will check practically by selecting the all modes/ waveforms in the test set and ensure its availability and workability.
	b) Waveforms	Sine, Square, Triangle, Ramp, DCS, DTMF	-do-
2.2	FM Modulation		
	a) Deviation Range	0 to ±125 KHz or better, Off	B.O.O will check practically by selecting one/ two frequencies of specified range and ensure availability.
	b) Deviation Accuracy	3% of setting	B.O.O will check practically by setting the accuracy and resolution as specified and ensure its availability.
	c) Resolution	10 Hz or better	
d) Modulation Range	20 Hz to 20 KHz or better	B.O.O will check by setting the desire range practically.	
2.3	AM Modulation		
	a) AM depth range	0 to 90% or better	B.O.O will check practically by set percentage of modulation in the specified range and ensure availability.
	b) Accuracy	Up to 3% .	B.O.O will check practically by set the accuracy in the specified range and ensure its availability.
	c) Modulation Bandwidth	100 Hz to 15 KHz or better	B.O.O will check practically by set the frequency within the specified range and ensure workability.
	d) Resolution	1% .	B.O.O will check practically.
2.4	SSB Modulation		
	a) Modulation selection	Upper Side Band (USB) or Lower SideBand(LSB)	B.O.O will check practically by set modulation mode /range /bandwidth in the specified range and ensure availability and workability
	b) SSB depth range	0 to 100% (LSB or USB)	
c) Modulation bandwidth	300 Hz to 20 KHz		
3.	Receiver(Transmeter test)		
	a) Frequency Range	250 KHz to 2.5 GHz or better	B.O.O will check practically by set the different frequencies within the specified range and ensure their availability.
	b) Demodulation selection	OFF, AM, FM, AM USB, AM LSB	B.O.O will check practically be set the all modes and ensure their availability and workability.
	c) Signal Code	1 KHz tone, Private line, Digital Private line, single tone, two -tone paging, 3/6 tone paging, POCSAG, external input from both suplied microphone and BNC input.	B.O.O will check practically after set the different signal code in the test set and ensure their availability.
	d) Sensitivity	Less than -100 dBm (10 dB SINAD) or better	B.O.O will check the sensitivity level practically.

A series of handwritten signatures and initials are present at the bottom of the page, including names like 'Nees', 'Full', 'w/h', 'G.B.', 'D.P.', 'L.P.', 'S.P.', 'Smit', 'H.H.', 'Munick', and 'Sury'.

4

40

TRIAL DIRECTIVE FOR RADIO COMN TEST SET (ANALOG/DIGITAL)			
3.1	Demodulation Measurements'		
	a) FM Deviation	Range : ± 7.5 to ± 125 KHz or better	B.O.O will check practically by selecting the specified range and ensure its availability and workability.
	b) Accuracy	$\pm 3\%$ plus source residual(IF BW set approximately for received modulation BW)	B.O.O will check it practically and ensure availability.
	c) Range	20 Hz to 20 KHz	B.O.O will check by setting the desire range practically.
	d) AM Deviation	Range : 0 to 100%	B.O.O will check by setting the desire range practically
	e) Accuracy	$\pm 3\%$ plus source residual (30 to 80% AM, IF BW set appropriately for the received modulation BW)	B.O.O will check it practically and ensure availability.
4.	RF Power Meter	a) Range :- 0.10 To 125 Watt, Resolution 0.01W	B.O.O will check the specified range practically.
		b) VSWR (with Attenuation ≤ 10 dB):Better than 1.20 : 1	B.O.O will check practically.
5.	Audio Frequency counter		
	Range	20 Hz to 20 KHz.	B.O.O will check the specified range practically.
	Wave shape	Sine or square.	B.O.O will check both wave shapes practically.
6.	SINAD Meter		
	a) Frequency Range	300Hz to 3 KHz or better	B.O.O will check the specified range practically.
	b) Accuracy	± 1 dB, ± 1 count	B.O.O will check the specified accuracy practically.
	c) Range	0 to 50 dB or better	B.O.O will check the specified range practically.
7.	Distortion Meter		
	a) Distortion Range	1% to 50% or better	B.O.O will check the specified range practically.
	c) Freq Range	300 Hz to 3 KHz	B.O.O will check the specified range practically.
	d) Input level (Audio)	0.1V rms minimum to 20 Vrms or better	B.O.O will check the specified level practically.
	e) Resolution	1 % or better	B.O.O will check the specified resolution practically.
8.	Hum and Noise Meter		
	a) Range	-80dB to 0 dB or better	B.O.O will check the specified range practically.
	b) Signal Frequency	300 Hz to 3 KHz or better	B.O.O will check the specified range practically.
9.	Signal to Noise Ratio Meter		
	a) Frequency range	300 Hz to 3 KHz or better	B.O.O will check the specified range practically.
	b) Range	-80dB to 0 dB or better	B.O.O will check the specified range practically.
	c) Accuracy	± 1 dB, ± 1 count	B.O.O will check practically and also refers the brochure of the instruments.

W

[Handwritten signature]

[Handwritten signature]

[Handwritten signature]

[Handwritten signature]

[Handwritten signature]

[Handwritten signature]

[Handwritten signature]

5

39

TRIAL DIRECTIVE FOR RADIO COMN TEST SET (ANALOG/DIGITAL)

10.	AUDIO FUNCTION GENERATOR		
	a) Wave Shape	Sine, Square, Triangle, Ramp, Digital Coded Squelch, DTMF	B.O.O will check the specified wave shape practically.
	b) Frequency Range	Sine: 20 Hz to 20 KHz or better Square, Triangle and Ramp: 20 Hz to 4 KHz or better	B.O.O will check the specified frequency range and wave shapes practically.
	c) Level range	1mV to 5V RMS across a 10 kΩ load or better	B.O.O will check the specified level practically.
	d) Frequency resolution	0.1Hz	B.O.O will check the specified range practically.
	e) Level accuracy	± 1 % of setting across 10 kΩ load or better	B.O.O will check practically and also refers the brochure of the instruments.
	OSCILLOSCOPE		
11.	a) Nos of channel	Two channel or more	B.O.O will check practically.
	b) Frequency range (vertical)	DC TO 2 Mhz or better .	B.O.O will check the specified frequency range practically.
	c) Input range (vertical)	0 to 100 Vpeak Max, Cat- II	B.O.O will check the specified voltage range practically.
	d) Accuracy(vertical)	10% of full scale (DC to 2 MHz)	B.O.O will check practically and also refers the brochure of the instruments.
	e) Sweep Factor(Horizontal)	1 μ Sec to 1 Sec/division in a 1, 2, 5 sequence	B.O.O will check the specified range practically.
	f) Accuracy(Horizontal)	>1.5% of full scale	B.O.O will check practically and also refers the brochure of the instruments.
	g) Trigger Selection	Auto, normal Continuous, single shot	B.O.O will check the specified level practically.
	h) Marker functions	Time with amplitude, deviation or % depth.	B.O.O will check the specified function practically.
12.	Digital MultiMeter		
	a) Voltage Range	200 mV to 1000V, or more(150 VAC RMS, or VDC MAX input)	B.O.O will check the specified voltage range practically and ensure its availability and workability.
	b) AC Voltage Freq range	50 Hz to 20 KHz	B.O.O will check the specified range practically.
	c) Accuracy	AC ± 5% fullscale ± 1 LSB DC ± 1% fullscale ± 1 LSB	B.O.O will check practically and also refers the brochure of the instruments.
	d) AC/DC ampere meter	200 mA to 20 A, or better Auto (20 A range uses optional shunt connected to Voltmeter)	B.O.O will check the specified ampere range practically and ensure its availability and workability.
	e) Resolution	3 Digits or more (up to 2000 counts)	B.O.O will check the specified range practically.
	f) Ohmmeter	Full Scale Range: 200 ohms to 20Mohms, Auto.	B.O.O will check the specified level practically

h

[Handwritten signatures and initials including 'JSP', 'HP', 'AS', 'S', 'G', 'L']

8

38

TRIAL DIRECTIVE FOR RADIO COMN TEST SET (ANALOG/DIGITAL)		
13.	RF Spectrum Analyzer	
a)	Frequency Range	250KHz to 2.5 GHz
b)	Frequency Resolution	1 Hz
c)	Frequency Accuracy	Same as freuency standard
d)	Span Accuracy	±5% of span width or better
e)	Span Mode	Start/Stop, Center/Span and Zero Span
f)	Resolution bandwidth (RBW) filters	Slectable from 300 Hz, 3 kHz, 30 KHz, 60 KHz, 300 KHz, 3 MHz or more
g)	Video Bandwidth (VBW)	Selectable from 10 Hz to 1 MHz.
		B.O.O will check the specified frequency range practically and ensure its availability and workability.
		B.O.O will check the specified resolution practically.
		B.O.O will check the specified accuracy practically.
		B.O.O will check the specified accuracy practically.
		B.O.O will check the specified span mode practically.
		B.O.O will check the specified resolution bandwidth practically.
		B.O.O will check the specified bandwidth practically
14.	Audio Spectrum Analyzer	
a)	Freq Range	Start and Stop Frequency - 0 Hz to 20 KHz
b)	Freq Span	2 Khz (Min) to 20 Khz (Max)
c)	Freq accuracy	±50ppm, (±10 ppm typical)
		B.O.O will check the specified frequency range practically and ensure its availability and workability.
		B.O.O will check the specified span practically.
		B.O.O will check practically and also refers the brochure of the instruments.
15.	Automatic Harmonics and Spurious Measurement for Radio	
a)	Harmonic / spurious level range	0 to -50 dBc or better
b)	Accuracy	Same as RF spectrum analyser
		B.O.O will check the specified level range practically
		B.O.O will check practically and also refers the brochure of the instruments.
16.	Tracking Generator	
a)	Tracking generator Output	Refer to RF SIGNAL GENERATOR section for: - Frequency range and accuracy - Output level range, resolution and accuracy
b)	Tracking Generator controls	Output port selection, RF level, Reference cal
c)	Waveform Generaotor	PC based software utility that gives the user the ability to develop their own waveforms to use as the modulation source.
		B.O.O will check the specified voltage level/frequency/ resolution ranges practically and ensures its availability and workability.
		B.O.O will check specified RF level range practically.
		B.O.O will check availability of own waveforms practically.

w

[Signature]

[Signature]

[Signature]

[Signature]

[Signature]

[Signature]

[Signature]

[Signature]

7

37

TRIAL DIRECTIVE FOR RADIO COMN TEST SET (ANALOG/DIGITAL)		
17.	Environment and Safety Standard	
	a) Operating temprature	0 to 45 degree celsious (in accrodance with MIL PRF-2880F class-3)
	b) Storage Temprature	-20 to 60 degree celsious
	c) Relative humidity	75% up to 30 degree celsious
	d) Safety standard	UL61010B-1, EN61010-1, CSA C22.2 No-61010-1 or equivalent.
	Vendor will produce certificate of any accredited labs of International Laboratory Accreditation Corporation (ILAC) or their worldwide affiliated/recognized labs or NABL approved labs.	
18.	PROJECT- 25 (P-25) or Association of Public Safety Communication Official International (APCO-25) Technology (Optional)	
18.1	RF Signal Generator	
	a) Frequency Range	250KHz to 2.5 GHz or better
	b) Output level range	T/R Port: -120.0 to -30.0 dBm or better
	c) Resolution	1Hz
	d) Modulation	C4fm, CQPSK,LSM
	e) Test pattern	STD1011,STD CAL,STD SILENCE, STS IDLE, STD 511(0.153), STORED SPCH, Voice , 1011, SILENCE
	f) Duplex Radio	Should have facility test in duplex mode/Repaeter set test
	g) P 25 Encryption Test	Facilities to test the AES/DES should be available.
	h) Vocoder Test	IMBE/AMBE Vocoder testing facility should be available.
	B.O.O will check the all specified parameters one by one practically after test the P25 technology based radio equipment and ensure their availability and workability in the instrument.	
18.2	P-25 Measurement	
18.3	Modulation Fidelity	
	a) Range	0 to 20%
	b) Resolution	0.01%
	c) Accuracy	<5.0% of reading (2.5 to 5%)
	B.O.O will check the specified range practically.	
	B.O.O will check the specified resolution practically.	
	B.O.O will check practically and also refers the brochure of the instruments.	

A collection of handwritten signatures and initials, including a large signature on the left, a signature with 'JSP' above it, a signature with 'HPLMens' above it, a signature with 'Murch' above it, and several other initials and signatures on the right.

TRIAL DIRECTIVE FOR RADIO COMN TEST SET (ANALOG/DIGITAL)			
18.4	Symbol Deviation		
	a) Range	1500 Hz to 2100 Hz	B.O.O will check the specified range practically.
	b) Resolution	0.1 Hz	B.O.O will check the specified resolution practically.
	c) Accuracy	±10 Hz (1620 to 1980 Hz)	B.O.O will check practically and also refers the brochure of the instruments.
18.5	Freq Error		
	a) Range	±4 KHz	B.O.O will check the specified range practically.
	b) Resolution	0.01Hz	B.O.O will check the specified resolution practically.
	c) Accuracy	Frequency Standard ±1 Count	B.O.O will check practically and also refers the brochure of the instruments.
18.6	UUT TX/RX Bit Error Rate		
	a) Range	0 to 20%	B.O.O will check the specified range practically.
	b) Resolution	0.10%	B.O.O will check the specified resolution practically.
18.7	Error Vector Magnitude		
	a) Range	0 to 20%	B.O.O will check the specified range practically.
	b) Resolution	0.01%	B.O.O will check the specified resolution practically.
	c) Modulation Fidelity Display	Should have Constellation, Distribution, Eye Diagram and Trajectory type display graphics	B.O.O will check the specified display practically.
18.8	Protocol		B.O.O will check the specified protocol sub para practically and ensure their availability and workability
	a) Data Link: Should have Header and Voice Frame.		
	b) Conventional Mode Simulation		
	c) Phase -1 Trunking Simulation		
	d) Trunking Control		
	e) Simulator		
18.9	a) P 25 Phase II - HCPM TX/RX Test :- Upgradation facilities should be available		Vendor will produce the certificate in this regards.
	b) P25 Trunking Operation VHF/UHF/700/800 MHz LSM Generate and Receive/ Analysis :- Facilities should be available		-do-
19.	Digital Mobile Radio (DMR) Technology (Optional)		B.O.O will check the all specified parameters one by one practically after test the DMR technology based radio equipment and ensure their availability and workability in the instrument.
	a) RF Signal Generator	Same as in P-25 except following	
	b) Output level	-do-	
	c) Modulation	4FSK	
	d) Test pattern	STD1B1031, STDIB CAL, STDIB511(.153), STD OB TSYNC (Repeater IDLE pattern)	
	e) Duplex Radio/ Repeater	Should have facility to test in duplex mode/Repaeter set test	
	f) Vocoder Test	IMBE/AMBE Vocoder testing facility should be available.	

W

[Handwritten signature]

[Handwritten signature]

[Handwritten signature]

[Handwritten signature]

[Handwritten signature]

[Handwritten signature]

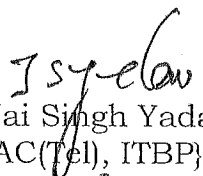
[Handwritten signature]

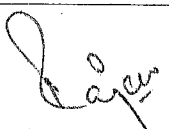
TRIAL DIRECTIVE FOR RADIO COMN TEST SET (ANALOG/DIGITAL)		
19.1	DMR Measurement	
	a) FSK -Error	0 to 20% B.O.O will check the specified range practically.
	b) Range	0.01% B.O.O will check the specified resolution practically.
	c) Accuracy	<5.0% of reading (2.5 to 10%) B.O.O will check practically and also refers the brochure of the instruments.
19.2	Protocol	
	a) Decode	Color code, call ID, Unit ID B.O.O will check the specified decode mode practically.
	b) Simulation	Color code , call ID
19.3	Magnitude Error	
	a) Range	0 to 5% B.O.O will check the specified range practically.
	b) Resolution	0.01% B.O.O will check the specified resolution practically.
	c) Accuracy	<10 of reading (0 to 2%) B.O.O will check practically and also refers the brochure of the instruments.
19.4	Frequency Error	
	a) Range	±4 KHz B.O.O will check the specified range practically.
	b) Resolution	0.01 Hz or better B.O.O will check the specified resolution practically.
	c) Accuracy	Frequency Standard ±1 Count B.O.O will check practically and also refers the brochure of the instruments.
19.5	UUT/Tx/Rx Bit Error Rate	
	a) Range	0 to 20% B.O.O will check the specified range practically.
	b) Resolution	0.1 % B.O.O will check the specified resolution practically.
20	DPMR (Optional)	
	a) RF Signal Generator	Same as in P-25 except following B.O.O will check the specified parameters one by one practically after test the DPMR technology based radio equipment and ensure their availability and workability in the instrument.
	b) Output level	-do-
	c) Modulation	4FSK
	d) Test Pattern	STD 511(.153)
	e) Duplex Radio/ Repeater	Should have facility to test in duplex mode/Repeater set test
20.1	DPMR Measurement	
	FSK-Error Meter	
	a) Range	0 to 20% B.O.O will check the specified range practically.
	b) Resolution	0.01% B.O.O will check the specified resolution practically.
	c) Accuracy	<5.0% of reading (2.5 to 10%) B.O.O will check practically and also refers the brochure of the instruments.

A collection of handwritten signatures and initials in black ink, including names like 'JSP', 'Admiral', and others, located below the table.

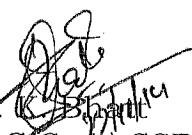
TRIAL DIRECTIVE FOR RADIO COMN TEST SET (ANALOG/DIGITAL)			
20.2	Frequency Error		
	a) Range	±4 KHz	B.O.O will check the specified range practically.
	b) Resolution	0.01 HZ or better	B.O.O will check the specified resolution practically.
	c) Accuracy	Frequency Standard ±1 Count	B.O.O will check practically and also refers the brochure of the instruments.
20.3	UUT/Tx/Rx Bit Error Rate		
	a) Range	0 to 20%	B.O.O will check the specified range practically.
	b) Resolution	0.1 %	B.O.O will check the specified resolution practically.
21	Accessories	All require accessories for testing the all parameters of Equipment and User/ Maintenance Manual.	B.O.O will check the all physically/practically.



Charan Singh
{SI/RO, CISF}



Jai Singh Yadav
{AC(Tel), ITBP}


Rajeev Kumar
{Major, NSG}



Neeraj Phogaat
Dy. Comdt(TC), NSG


D. K. Sharma
{DC(Com), SSB}



Rajesh Kumar
{DC (Com), BSF}


S.K. Thakur
{DC, Assam Rifle}



Hem Pushap Sharma
{DC, CRPF}


Amarjeet Singh
{E. Asst. Dir, DCPW}


Sumit Gupta
{PSO(E), BPR&D}


Jasbir Singh Sandhu
{DIG(Eqpt.) CRPF}


Shailendra Kumar
{IG (Com), CRPF}

Approved / ~~Not Approved~~

(Dilip Trivedi, IPS)
DG CRPF