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SYLLABUS FOR
**Mechanic-cum-operator Electronic
Communication Systems**

UNDER
CRAFTSMEN TRAINING SCHEME

As approved by
GOVERNMENT OF INDIA

In consultation with
THE NATIONAL COUNCIL FOR
VOCATIONAL TRAINING

Issued by
GOVERNMENT OF INDIA
MINISTRY OF LABOUR
DIRECTORATE GENERAL OF
EMPLOYMENT & TRAINING
NEW DELHI

2002 (Revised)

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GENERAL INFORMATION

1. Name of the Trade : **Mechanic-cum-operator Electronics Communication Systems.**
2. Entry Qualification : Passed 10 class examination under 10+2 System of Education with Science having Physics and Math. as subject or its equivalent.
3. N.C.O. :
4. Duration of Craftsman Training : 2 Years.
5. Duration of Apprenticeship Training : 3 Years including Basic Training
6. Rebate : Trainees who have passed in AITT in the Trade "Mechanic-cum-Operator Electronics Communication Systems" under CTS will be eligible to get 2 Years Exemption in ATS.
7. Apprenticeship Ratio : 1 : 5

ORIGINAL COPY
For recommendation
OR SALE

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ACHIEVEMENT

- I. After completion of Ist Year of Training, the Trainees should be able to :
- (i) Identify the various Active and Passive Components used in Electronic Circuits.
 - (ii) Master soldering and desoldering various components.
 - (iii) Understand the working of principles of different electronic devices/Circuits
 - (iv) Handle basic measuring Instruments.
- II. After completion of IInd Year, the trainees should be able to understand the working principle of various Communication Equipments and able to operate them.
- III. After completion of 3rd Year, the trainees should be able to understand the working of various Communication Equipment and associated measuring Instruments available in the Industry/Establishment and able to operate, maintain and repair them.

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**LIST OF MEMBERS PARTICIPATED IN THE TRADE
COMMITTEE MEETING FOR THE TRADE OF
"WIRELESS MECHANIC-CUM-OPERATOR"
HELD ON 08.05.1998 AND 05.06.1998**

Sl.No. Name, Designation & Organisation**S/Sri**

- | | | |
|-----|--|----------|
| 1. | S.R. Majumdar
Director, CSTARI, Calcutta | Chairman |
| 2. | Col. S.B. Nag
Quality Assurance Officer, SQAE (Electronics)
Ministry of Defence, Calcutta
Commissonate Road, Hastings | Member |
| 3. | A.K. Saha
Joint Director, ERTL (DOE)
Block DN, Salt Lake, Calcutta-91 | Member |
| 4. | M.M. Nigam
Dy. General Manager, ECIL,
Park Street, Calcutta-16 | Member |
| 5. | S. Mukherjee
Sr. Manager (Engg.) M/S Philips, Block GP,
Sector-V, Salt Lake, Calcutta-91 | Member |
| 6. | Gulab Chand
Engineer, Regional Monitoring, Headquarter (E.R)
Min. of Communication, Gopalpur,
24 Pgs (South)-743382 | Member |
| 7. | Dipankar Datta
Wireless Regional Monitoring Organisation
Dept. of Telecommunication, Min. of Communication | Member |
| 8. | N.K. Das
Director, NIC, Vidyut Bhavan, Salt Lake, Calcutta-91 | Member |
| 9. | Indranil Majumdar
Chief Executive, Fox Radio, Calcutta-19 | Member |
| 10. | N. Srinivasan
Superintending Engineer, AIR & T.V
Akashwani Bhawan, Calcutta-1 | Member |
| 11. | S.K. Arora
Dy. Director (Engg.)
AIR, Akashwani Bhawan, Calcutta-1 | Member |

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- 14. C.S. Murty
ADT, Dasnagar, Calcutta Member
- 15. Anjan Karmakar
Project Engineer, M/S WEBEL Electronic
Communication System Ltd., Salt Lake, Calcutta-91 Member
- 16. Ms. Nupur Das
Asstt. Engineer, M/S WEBEL Electronic
Communication System Ltd., Salt Lake, Calcutta-91 Member
- 17. B.C. Pal
Dy. Director, DIT, Govt. of West Bengal
Vikas Bhavan, 10th Floor, North Block,
Salt Lake, Calcutta-91 Member
- 18. R.M. Sinha
Joint Director of Training, CSTARI, Calcutta-91 Member
- 19. D.P. Ganguly
Joint Director of Training, CSTARI, Calcutta-91 Member
- 20. T. Mukhupadhyay
Dy. Director of Training, CSTARI, Calcutta-91 Member
- 21. B.K. Chatterjee
Asstt. Director of Training, CSTARI, Calcutta-91 Member

Member Secretary

- 1. G. Giri
Asstt. Director of Training, CSTARI, Calcutta-91

Suggestion Received through Letter from

- 1. DTE & IT, Punjab
Plot No.1, Sector 36A,
Chandigarh.
- 2. Fox Radio
9, Mandeville Gardens,
APT-5F, Calcutta-19.
- 3. Indian Air Lines, Calcutta.

**S FOR THE TRADE OF MECHANIC-CUM-OPERATOR ELECTRONIC COMMUNICATION SYSTEMS
UNDER CRAFTSMENSHIP TRAINING SCHEME**

ing : 2 Years.

yllabus given below is a guide for the Instructors to prepare their own schedule of training. The portion in respect of
is which has been indicated against different weeks may be adjusted according to the training schedule prepared by the
cerned. While teaching Engineering Drawing, emphasis should be laid on free hand sketching, blue print reading,
uits and parts related to the trade. Similarly emphasis should be given on problems related to the trade according to the
and team teaching/learning should be encouraged so to develop some social and methodological competency like co-
operation, communication, systematic approach, self responsibility etc. along with technical competency.

Publications for components and measurements for Radio communication are available as standard publications. The
uld emphasise the use of these specifications during course of teaching.

itle of Topic	Theory	Practical	Equipment Required	Engineering Drawing	Workshop Calculation
2	3	4	5	6	7
your te	(a) Organisation of the institute of various trades & function, (b) Introduction to Na- tional Vocational Training system and different schemes and link them.	(a) Visit to the Institute	(a) Well arrang- ed main ac distribution room of the institute. (b) First Aid kit. First Aid chart.	Basic Geometri- cal Drawings: St. Line, Triangle, Poly- gons etc.	Standard Units used in CGS, MKS and FPS System.

- (c) Types of work, responsibility to be undertaken, incentives and future.
- (d) Safety precaution to be observed in the trade during Operation and Practice in workshop.
- (e) Elementary First Aid.
- (f) Types of Earthing and importance.
- (g) Introduction of Wireless & Telecommunication, Radio Regulation & Communication, CCIR Recommendation. Introduction to Modern Wireless Communication and area of application.
- (h) Care & Safe work habits, safety precaution to be demonstrated. Institute AC distribution.
- (i) Elementary First Aid Practice.
- (j) Practice for making good earthing.
- (k) Visit to workshop or Industry/organisation using or manufacturing the wireless equipment and demonstrate in brief to motivate Trainees; or Video Show.
- (l) Well Furnished workshop as per list of equipment. 1st and 3rd.
- (m) Orthographic and Isometric view of square and rectangular object.

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- National and International Radio Traffic Rules and Regulation.
- Identification, specifications, uses and maintenance of hand tools.
- Morse code demonstration and Log Book entry practice.
- Sending and Receiving Morse Signal Practice to achieve 20 WPM.
- Demonstrate the various Hand tools as per tool List and allow the Trainees in Group to discuss and recognise the tools.
- Demonstrate Simple mechanical fixtures, types of screws, washer clamps, rivets, taps, connectors, other latest design accessories used.
- Fitting, Threading, Drilling Practice.
- Simple sheet metal work.
- Identification of conductor Insulators, Break and Continuity Test. Use of general Electric principles, Conductor, semiconductor insulators, General Electric principles, Use of
- As per Tool List
- Study the Drawings of Tools from Charts etc.
- Free hand sketch of Nut & Bolts.
- Analog/Digital Drawing of different Electrical Symbols/simple
- Calculation of Voltage, Current Resistance, power using,

Electronic Theory, Electrical Units, Ohm's Law, Ampere's Law, KCL and KVL Law and their application. Superconductivity.

Use of Volt meter, Ameter, Watt Meter and their connection in actual circuit.

Resistivity, Resistance of conductors, Temperature effect, Skin effect, conductance, Resistor Parallel and series combination. Different type of Resistors, (fixed and variable) and their uses. Equivalent Resistance using Nortons and Thevinin's Theorem.

Thermistor and Varistors.

Multimeter for voltage and current measurement earth resistance measurement by Earth Tester.

Identification of different type of Resistors (Fixed & Var) calculation of Resistance using colour code, confirm through multimeter, Practice measurement by Multimeter, Calibration of Standard Resistance Demonstration of Digital and Analog Multimeter. Identification of Different type of Resistances used in a Radio Receiver.

V o l t m e t e r , circuits Practice. simple circuit Drawings.

Analog/Digital Multimeters. Draw different symbol used for Resistance in and PCC and PCB. Resistance Calculation. Draw the front panel of Multimeter.

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Verify Relation between Temperature and Resistance.

Inductance, Units of inductance in series and parallel, coefficient of coupling, Hysteresis and Eddy current losses, Principle of Transformer, Construction of core, Transformer losses, Importance of Matching, step-up, step-down, Principles, Simple calculations of Turns Ratios, Power primary and secondary. Types of cores to be used in L.F. HF/VHF. Use of Iron core, Aircore, Ferrite core Inductors, Magnetic Energy storing. Explanation of capacitance and capacitive reac-

Identification of different types of indicators used, identification of Transformer primary & secondary, Testing of coil and setting. Demonstration on self and mutual inductance.

Draw the different inductance circuit symbols and transformers symbol and Voltage Loss etc. Calculation.

Equivalent Inductance Calculation, transformer Ratio, Voltage Loss etc. Calculation.

Identification of types of condensers used and col-

—do—

Draw the different circuit symbols, Calculate capacitance values, Rela-

tance, Dielectric constants, our code, their testing and Types of capacitor, specification. Calibration Permittivity, Dielectric of St. Capacitance Dem- strength, Breakdown volt- onstration on a Radio age, capacitance in series Receiver PCB for identi- and parallel. Storing of fication of different type of capacitors used.

ory
Peak, RMS, Instantaneous, Measurement of Low Average Values, Phase frequency signal in CRO Difference, Vector Intro- and explain peak rms and duction, Reactance & Im- Average value, calculate pedance, Power factor, Frequency. Different Reactive and Resistive type of waves. Phases, Power, Frequency, Time Lissajous figure. Period, Different Type of Demonstrate the use of Waves, Eddy Current. CRO.

Magnetism & Electromag- Demonstration on the Relays, Buzzer for netism, Properties of mag- properties of P.M. Drawing for netic Material & Ferrites, Use of Magetic field, Magnetic fields, Magnetic Converting a magnetic Symbol of Relay Flux Density, Permeabil- material into a Magnet and contacts. ity, Magnetic Motion, by a Bar magnet.

bol used and par- tionship with V.C. allel series cir- Q. CGS, MKS and cuit. their conversion.

Function Genera- Calculate for Fre- tor. ent waves, quency, Period Oscilloscope. Lissajous Fig. peak, RMS and Draw the Front Average value of Panel of CRO. Signal.

Force, Magnetic Effects on Preparation of Solenoid. Electric Current, Magnetic Preparation of Electro- fields, Principle of Relays, magnet for calling Bell/ types Adjustment/Mainte- Buzzer, EM Relay, Test- nance & Common faults in ing of Relay, Rewinding Relays, their uses in com- and Repair. munication circuits.

Explanation of Induction & induced E.M.F. Faraday's Law, Lenz's Law, Left hand and Right hand rules.

Explanation of resonance, Identification of Differ- Series and parallel reso- ent of Tank circuit used nance, Ckt. elements, natu- and design. ral resonance, tuning, volt- Study of Behavior of L age, gain, Anti-resonance and R in series. ckt. Uses in electronic ckts. Study of Behavior of C Bandwidth 'Q' factor of and R in series. coil, passive Filter circuits Study of Series and Par- (LPF, HPF, BPF and BSF), allel Resonance and its SAW Selectivity, Time Response curve. Constant.

Draw the Circuit Calculate frequen- Symbol of Tank ctes. Circuits, Filter etc.

2	and Alternators, Principle and Constructions, Single and three Phase A.C. System, Eddy current.	Study of Different Parts of Alternator and Repair.	Motor & Generator sets and other accessories.	Draw the Different Symbol of different parts motor and Generator, and draw sheet of various motors and Generators.	EMF Calculation
	D.C. Generator Principles, Comutator, Brushes and Construction, Automatic Voltage Regulation.	Study of Different parts of DC Generator and Repair.			
	Motor Principle, Back EMF, Speed Variation, Classification of Motors and uses, General maintenance.	Starting and Loading of Generator and regulating voltage.			
	Explanation of cells, Primary & Secondary Cells, General Principles, Construction of Lead Acid, Nickel cadmium, Nickel Iron cells, Electrolyte, Initial charging & Discharging Needs & Methods, Specific Gravity, D-effects & Remedies, Maintenance free Panel.	Testing of Primary and Secondary cells, Specific Gravity and Voltage measurement, Preparation of Electrolyte, Charging of Battery.	Multimeter, Sp. Gravity Meter Battery charger. Battery and Cell Tester.	Symbol of Battery cell and circuit connection practice.	Calculation for V.I.R for different power source with different cct.

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3	Tubular battery, Solar cells, SMPS based battery charger, Lithium Cells.	Demonstration of MC, MI, Voltmeter Ameter and Watt Meter	Circuit drawing different, meter connection.	Internal Parts various measuring instruments.	Study and calculation of various parameters on specification sheets of various measuring instruments.
	Surging Moving Coil, Moving Iron type, Different type of Transducers. VTVM, FET Multimeter, DMM etc. Frequency counter, Power meter CRO, AM/FM Signal Generator, RF Signal Generator, Function Generator Whetstone Bridge, Impedence meter.	MC, MI, Voltmeter Ameter and Watt Meter CRO, Signal Generators, multimeters, Counter etc. Servicing of Multimeter (Analog) Multimeter. Construction and Calibration of series Ohm Meter.	Practice.		
	conduc- Semi-conductor Theory, Type of Devices and Symbols and uses.	Video Films on Semiconductor Theory.	Multimeter, CRO, Trainer for different semiconductor amplifier, Oscillator	Draw the symbol of different semi-conductor de-	Voltage and current gain calculation, frequency

es	Characteristics of Diodes, Different type of Rectifiers circuit along with different Filter circuit. AF/IF Detectors	Semiconductor devices., Testing by Multimeter, Tester.	lators, Rectifiers.	ices.	Calculation. Biasing voltage calculation using different ccts.
istor	PNP and NPN Transistors, Symbols, different type of amplifiers & its classification, Oscillators, Multivibrators.	Soldering and Desoldering Practice. Characteristic Check of Diode, Transistor. Identification of components in a PCB. (Group) Transistor biasing arrangement Application of Transistor as amplifier, Oscillator, etc and testing.			Different Transistor biasing ccts. CCT drawing.
al	Explanation of characteristics of UJT, FET, MOS, CMOS, SCR, SCS, DIAC, TRIAC, IC, SMD, ESD, etc. and application memory devices RAM, ROM, EPROM etc. Optical Devices, RF Devices,	Characteristic Check of various Devices. Testing in actual application by using trainer.	Trainer using FET CMOS, OP-AMP etc. for different application.		Different amplifier and oscillator circuit.
onduc- vices			Linear/Digital I/C Tester.		Study of Component Data Book.

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MP	Crystal, PCBs Single and double Layer, PTH and Multilayer and application Electronic Component Packages.	Demonstration of characteristics and applications of OPAMP by using OPAMP Trainer.			
	Differential Amplifier, Basic OP-AMP Circuit - Inverting and Non-Inverting Amplifier, Integrator and Differentiator, Limitation of OP-AMP High Current, Power and Voltage application, wave shaping Circuits Active filter ccts, Study of Manufacturer specifications.				
	Half wave, Full wave Rectifier Bridge Rectifier with different filter combination, HT and LT power supply, Voltage Regulation Switch Mode Power Supply	UPS Trainer (On Line/Off Line Rectifier drawings. SMPS Trainer			Different type of Rectifier cct drawings. SMPS Power cct etc related to various power cct examples.

2	3	4	5	6	7
	(SMPS), UPS, Battery Charger, RFI/EMI filter, Isolation Transformer Electro-Optical Coupler. Fault Clearing process, Switch Gears, Reactors, HRC Fuse, Circuit Breakers, Protective Relays, Lightning arrester etc.	Rectifier cct and Testing (Individual) Demonstrate a SMPS power supply unit and identify, Trace Circuit and conduct tests by CRO and Multimeter.	Battery Charger	Battery charger	Study & calculation of various parameters of different power supply equipment like CVT, UPS etc.
	Linear and switching Regulators.	Design a SMPS cct and solder components and Test.			
		Demonstration of a UPS and Identify ccts, Trace Path, Test.			
		Demonstration of Battery Charger and Practice Testing of Power Transformer			
		Project Work : 12V Eliminator Design and manufacturing.			

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3	4	5	6	7	
Soldering and different type Soldering technique.	Theory of Soldering, different type Soldering and Desoldering technique for electronic components/SMD Automatic Soldering, Wave Soldering, DIP Soldering, PCB wiring.	Soldering and Desoldering Practice continue. Both Manual and Automatic PCB Repair, Handling of ESD Devices, Bad & Good Solder Check Video Film for SMD Soldering.	Digital Logic System Trainer	Symbol of Logic Gates, FF, Different CCt Using gates for Various Boolean Functions, A/D etc.	Out put calculator different cct of Boolean Functions, A/D etc.
lay and Revision/ Practice Topics.	Fundamentals of Digital Electronics, Boolean Function, Coding, Logic Gates, Flip-Flops, TT, Counter Registers, Microprocessors etc. Analog to Digital Conversion and Vice-versa, Multiplexer/Demultiplexer, ICs.	Testing of GATES, FF etc and Draw the truth Tables. Conduct various test for microprocessor using trainers. Conversion of Analog to Digital and Vice versa. Study/test through SAP-1, SAP-2, SAP-3	Universal Micro Processor Trainer	Boolean Functions, Other cct drawing Practice a per theoretical Topics	Calculation of out put frequencies, i.e. Carrier, Sidebands,
ulation	Basic Principle of Modulation, Amplitude, Phase and Frequency Modulation	Check the output of Function Generator for different Modulation by	Different Modulator Block diagram and cct dia		

tion, Digital Modulation : CRO and Observe Pattern Practice. Phase etc.
 Frequency Shift Keying term
 (FSK), ASK, BPSK, Design simple modulation of Modulator and for circuit and Testing.
 Demodulator both Analog and Digital and their use. Analog to Digital Conversion Sampling principle check by using PTM, PWM, PAM FDM/TDM Multiplexing. Model.
 Basic Data Communication Digital Communication Training System.
 Concept, Data Security, Modem, Email, Documents. Receive Practice, Service Demonstration on different Internet Connectivity, Data Communication device and their inter- through NIC, INET, connectivity, Protocols, GPSS, VSAT. Data Coding : ASCII, EBCDIC etc. Call signal Rules.
 Introduction to PC
 I/O Operation and instruction Interfaces and Peripherals LAN, WAN,

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Internetwork Processor :
 Bridges, Router, Hub, Gateway
 Characteristic of Radio waves, Ionosphere, Troposphere, VLF, LF, MF HF and VHF Propagation, Ground, Sky and space waves. Properties of different reflecting Layers, Skip distance, MUF, Fading, Critical Frequency, Effect of Rain and sunspot cycle, use of Day and Night Frequency, Principle of Line of sight Communication and factor affecting this. Reflection and Refraction Principle.
 Principle of Radiation, Interception of Radio Signal, Polarisation of Waves, Radiation, Reflection/Refraction Practice.
 RF-RF Response Test. Two sets of Radio TX/Rx. Path Loss Calculation.
 Checking and setting AGC gain Margin.
 Field intensity Measurement.
 Orientation of antenna both Trans and Receive for max receive signal strength.
 AF-AF Response Test.
 Study of different type of Aerials and Installation Aerials and Matching. Different type of Aerials/antenna for different i.e. Antenna Parameter and Matching. Radiation Pat-impedance, Gain

2 diation, Resistance, Bandwidth, Effective height, Ground Effects, Aerial Capacitance & Reactance, Distribution of current & Voltage in aerial, Impedance, SWR, Different type of Aerials : Dipole, Folded Dipole, Loop Aerial Unidirectional, Bidirectional and Omnidirectional antenna, UHF Antenna, Dish Antenna. Whip Rod Antenna. Tower Method of Coupling and matching to Tx and RX. Multi Element Yagi Antenna, Dish Antenna, etc. Different Type of Feeder cables and Transmission Line, Wave Guide.

3 connecting feeder cable, establishing link.

4 Study of Vertical Aerial and different loop aerials.

5 Assembling 5 Element Yagi Antenna.

6 Study of Different connectors and matching

7 Mast/Tower Construction

Hoisting Antenna.

Connector connecting Practice.

Radio Transmission Identification of Different AM/FM Dynamic Demonstration and Reception Concept using stages of a Simple

Block Diagram

Different Transmission units : Decibel,

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3	4	5	6	7
Block Diagram RF stage, IF Stage, AF Stage, Class-A, Class-B, Class-AB, Push-Pull amplifier, Feed Back, different types of coupling, Cascade amplifiers, Audio filter, matching transformer etc.	Radio Tx and Receiver. Identify the different components and circuit used.	strator. Or TV Trainer Kit.	Different Power Amplifiers, Oscillator diagram Practice.	Neper and other derived units. Calculation and version, Gain and Attenuation Calculation.
Different Type of Microphones and speaker, their application and theory. IF Filter, IF Amplifier, AFC Circuit, AGC Circuit, IFT for matching.	Testing of different amplifier and characteristic measurements.			
Different Method of coupling and Matching, RF Amplifier, Mixer, Local oscillators, Filter etc. VCO, PLL.	Testing of different type of microphones and structural feature. Study of AFC/AGC Circuit Alignment of IFT and replacement.	Power Freq.	Meter diagram Practice	Level and loss calculation at different

CW, MCW, ISB, DSB, Tuning of Tank circuits Counter. stage.
 SSB and Packet Mode, at different stages, Trans, Modulators used. Function Local oscillator tuning Radio Transmitter
 of various stages, operation for power and output ter
 tion and Monitoring, Me-freq. degree of modulation
 ting and safety Devices, tion setting, drive signal
 adjustment and Measure- setting at different stages.
 ment. Adjustments.

Study of power supply Circuit used. Setting and tuning of
 Matching circuit for antenna for Max. Power.
 Reflected Power and SWR measurement.
 Electrical Faults and alarm in transmitter.
 Tracing and Rectification of Practical Power supply cct.

Frequency changing and Study of Receiver con- AM/FM Dy- Practice for Ra- Level Calculation
 detection Types of mixer, trols etc. namic Demon- dio Receiver cct. at different stage
 Necessity of Local Receiver Tuning and Re- strator. considering Loss
 osillator and its Genera- ceiving Signal Monitor- and Gain of devices

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tion. Stages of Mixing, Im- ing. used.

age frequency rejection, Identification of different
 AM, FM & Digital Signal internal circuits and
 Detectors, Demodulator/ Component and their set-
 Discriminators, LNA etc: tings.
 Noise Selectivity, fidelity, NF
 Selectivity, Fidelity, AF signal to Noise Ratio test.
 Response etc. Power supply cct test.
 Electronics War-fare Jam- Project-Design of Radio
 ming and its remedial meas- Rx.

Direction Finder, Basic Study component loca- Industrial Visit to Block diagram Study & calculation
 Principle Polar Diagram tion of Direction Finder. a suitable Indus- Practice for dif- of various para-
 Sense finding, Gonio me- try. ferent systems. meters of specifica-
 ter, calibration and its use, tion of Navigation
 Direction finder errors, Study the panel of Direc- equipment.
 Magnetic compass, Magnetic tion Finder.

True Bearing, Radio Bea-
 cons, Basic Knowledge of
 Radar Beacons Echo tice on the Direction
 Sounder, LORAN, Charts
 Finder.
 Space Communication and

its use in future.

Global Maritime Distress Safety System, Electronic Counter Measure.

Study of Auto alarm Equipment and testing. Radio Direction Finding Procedure, Class of Bearing for Fix and Mobile station.

Beacon, Instrument Landing System, OMEGA Systems.

Working principle of Different type of telephone instruments, Telephone lines, Auto and mechanical changes, Working of EPBAX, PCO Monitor, Conference Phone System, Intercom, Telex Working Principle, FAX, PSTN and ISDN.

Fault finding.

Study of Auto alarm Equipment and testing. Radio Direction Finding Procedure, Class of Bearing for Fix and Mobile station.

Sending and Receiving Message Document study in organisations.

Demonstration on different type telephone instruments. Identification of different components in the instrument probable faults and repairing. Operation and Maintenance of small Intercom/EPBAX and console.

Various Telephone Instruments. Telephone Analyser. Small EPBAX, TP, PCO Call Monitor, Conference System

Drawing practice for internal of various parameters of specification for Telephone Instrument. Communication equipment.

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Feature Telephones, Picture Telephone.

and Jumperwire, Subscriber Line cables flexible Wires, and Co-axial Cables, RF Cables, Power cables, Optical Fibre cables, Flat Cable etc. Optical Fibre Cable System. Cordless Telephone, Pager, Cellular Telephone System Working Concept, and users equipment. Basic Digital enhanced cordless Telephone (DECT) Personal Handy Phone System (PHS). Introduction to Satellite Phones. UHF/VHF/HF Comm.

Introduction to Telex System, Demonstration be arranged.

on Electronic Teleprinter and Practice. Demonstration on PCO Call Monitor, Conference System Repairing Practice. Identification of different type of Cables and use. Jointing Practice. Line Wire Practice with TB Termination. Demonstration on Transceiver Operation and Maintenance. Demonstration on Cordless and cellular Telephone, Maintenance and repair

Fibre Optic Trainer

Block Diagram Practice for Different System.

Demonstration on cable TV and manual tracking of Antenna.

tem, V-SAT.

Industrial visit to be arranged

ire- Police Wireless Equip-
m ment, Wireless System at
Air Port and their Opera-
tion, Walkie-Talkie, FM
Transmitter and Receiver,
Air to air and Air to ground
Communication. Data
Modem for wireless. TV/
VCR Remote Control.

Demonstration on FM FM Portable
Transmitter and Re- Transreceiver
ceiver, Walkie-Talkie. hand held, TV/
VCR Remote Control.

Study & calcula-
tion of various
parameters of
specification for the
equipment.

All India Trade Test

ies As per approved syllabus of Social Studies same for all the Trades.

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**LIST OF TOOLS AND EQUIPMENT FOR THE TRADE OF
MECHANIC-CUM-OPERATOR ELECTRONIC
COMMUNICATION SYSTEMS**

(For a batch of 16 Trainees)

Sl. No.	Description	Qty.
1	2	3

TRAINEES' KITS

1.	Combination Plier 15 cms Insulated	16+1
2.	Longnose insulated Plier 15 cms	16+1
3.	Digonal Cutter 15 cms Insulated	16+1
4.	End cutting Nipper Insulated	16+1
5.	Tweezers 10 cms Insulated	16+1
6.	IC Tweezer/Puller	16+1
7.	Knobscrew driver insulated 10 cms.	16+1
8.	Screw Driver set of 6 Nos. Philips	16+1
9.	Knife electrician 150 mm	16+1
10.	Adjustable spanner/slide Wrench 15 cms	16+1
11.	Wire Striper	16+1
12.	Pocket Multimeter	16+1
13.	Soldering Iron 25 Watt	16+1
14.	Neon Tester	16+1

SHOP OUTFIT PER UNIT

Sl. No.	Name of Equipment	Quantity
1	2	3

1.	Fire extinguisher	2 Nos.
2.	First Aid Kit	1 No
3.	Rubber Mat 180 × 45 × 2.5 cm.	3 Nos.
4.	Rubber Gloves Pair	8 Nos.
5.	Steel Rule 30 cm.	4 Nos.
6.	Steel Rule 60 cm.	2 Nos.
7.	Centre Punch 10 cm.	4 Nos.
8.	Spanner Set Double ended	2 Nos.

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5. Files assorted smooth & rough 20 cms.	24 Nos.
6. Needle file set of 12	2 Sets
7. Bench Vices 5 cms. jaw	2 Nos.
8. Bench Vices 10 cms. jaw	2 Nos.
9. Tap set 2 mm. to 10 mm.	1 Set
10. Dies set 2 mm. to 10 mm.	1 Set
11. Bench Grinder (Electrical)	1 No.
12. Heat Sink Plier	4 Nos.
13. Watch maker Screwdriver set	4 Sets
14. Head Phone 1K. Ohm impedance	8 Nos.
15. Allen Key	2 Sets
16. Wire gauge	1 No.
17. Micro-meter 0-25 mm out side	4 Nos.
18. Vernier Caliper 20 cm.	4 Nos.
19. Soldering iron 25 w/230 V	8 Nos.
20. Soldering iron 10 w/230 V	8 Nos.
21. Soldering iron 35 w/230 V	4 Nos.
22. Soldering iron 65 w/230 V	2 Nos.
23. Permanent Bar Magnet type 15 cms	4 Nos.
24. Electro Magnetic Relays assorted	1 each type.
25. Battery lead acid 12 V/Heavy duty.	2 each type
26. Battery charger 10 Amp. Cap.	1 No.6.12
	24 tapin
27. Hydrometer	2 Nos.
28. Battery Life Cycle Tester	1 No.
29. Battery Monitoring System	1 No.
30. Rheostats various values and rating	20 Nos.
31. Ammeters AC & DC in various ranges	10 Nos.
32. Voltmeter DC & AC in various ranges	15 Nos.
33. Micro-phone Assorted types	8 Nos.
34. Loud speaker assorted 'Z' & pin	3 Nos.
35. Loud speaker Multitester	1 No.
36. Insulation tester DC 1000 V	1 No.
37. Signal Generator upto 1.3 GHz.	2 Nos.
38. Audio frequency Two Tone Generator (800 Hz and 1800 Hz.)	2 Nos.
39. R.F. output meter 50 watt. (Power Meter)	1 No.

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55. Digital multimeter 3 1/2 digit with transistor, diode and capacitor Testing Facility.	2 Nos.
56. Digital Line Frequency Monitor	1 No.
57. Linear/Digital IC Tester Micro processor based.	1 No.
58. Variable power supply 0-50 VDC, 4A	4 Nos.
59. Portable Digital Storage Oscilloscope 100 MHz.	1 No.
60. Push Button Telephone set	4 Nos.
61. Telephone Dialler (Push button, Cordless)	1 Each
62. Telephone Handset Tester	1 No.
63. Telephone Analyser	2 Nos.
64. PCO Monitors	2 Nos.
65. Call Conference Unit	2 Nos.
66. Stereo Type Tape Recorder	1 No.
67. P.C.B. Making Kit complete	2 Nos.
68. Temperature controlled soldering Station	4 Nos.
69. Temperature controlled desoldering Station	4 Nos.
70. Magnifier 4" with stand for soldering Check	2 Nos.
71. Electronic Devices Characteristic Checking Model (Diod, Transistor, MOSFET, FET, Diac, Triac, etc.)	2 Nos. (for each)
72. Universal Micro-computer Trainer with application of Step Motor and Comm.	2 Nos.
73. Computer and Micro-computer Trainer	1 No.
74. Universal Logic System Trainer/Digital IC Trainer full system	4 Nos.
75. SMPS Trainer Kit.	4 Nos.
76. AM/FM Modulator & Demodulator demonstrators	2 Nos.
77. Pulse Code Modulation/Demodulation Demonstrator	2 Nos.
78. Digital Communication Training System	2 Nos.
79. Fibre Optic Trainer	2 Nos.
80. Fibre Optic Laboratory Kits	1 set
81. Logic Probe	4 Nos.
82. Amplifier Trainer with variable Biasing Setting	4 Nos.
83. RC Oscillator Trainer	4 Nos.
84. Multivibrator (Astable/Monostable/Bistable)	2 Nos. each

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| 9. RF Milli Voltmeter | 1 No. |
| 10. RF Modulation Meter | 1 No. |
| 11. Radio Communication Analyser | 1 No. |
| 12. Distortion Analyser | 1 No. |
| 13. DTMF/CTSSS Signalling Test Kit | 1 Set |
| 14. Portable Hand Blower | 1 No. |
| 15. Trade Related Technical Films | |
| 16. Components Storage Box | 1 No. |
| 17. Analog and Digital Communication Trainer | 2 Nos. |

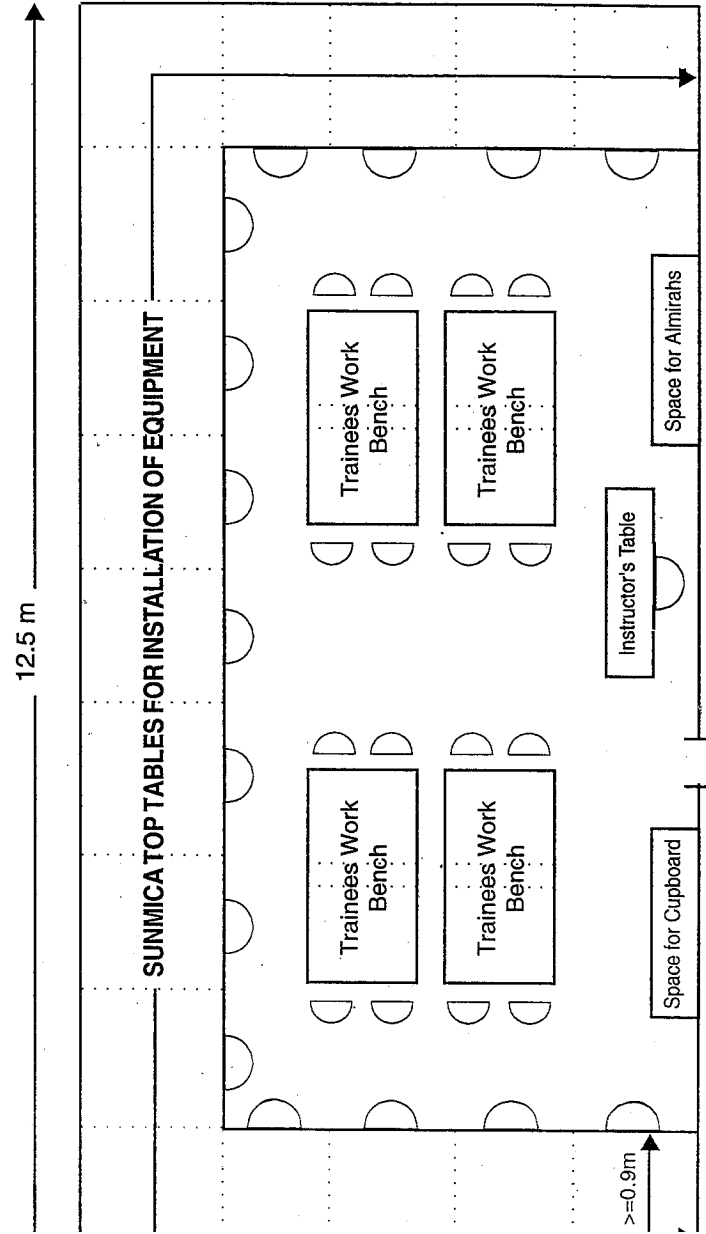
General Equipment Installation

(Stn. to be registered as Non-Radiating Experimental Station)

- | | |
|---|---------|
| 1. Radio Transmitter Demonstrator | One |
| 2. Direction Finder with Beacon (ARC-610 (HAL) or Equivalent Model. | One |
| 3. Automatic Alarm Apparatus (MARCONI) LIFEGUARD 3 or Equivalent Model | One |
| 4. SURVIVAL CRAFT RADIO Equipment SURVIVOR (MARCONI) or Equivalent Model | One |
| 5. FM Portable Transceiver Hand Held Model Kenwood TK-708 or Equipment. | Two |
| 6. Dynamic Radio Receiver Demonstrator (AM/FM) | One |
| 7. Air Craft Communication Monitoring System | One |
| 8. ADF/Time Beacon Monitoring System | One |
| 9. VOR/ILS Monitoring System | One |
| 10. Infrared Remote Control System | One |
| 11. Air Craft Band Receiver | One |
| 12. TV Trainer Kit | One |
| 13. Cable TV Receiving System-(DRS) | One set |
| 14. Walkie Talkie Demonstration Kit | One |
| 15. Data Communication Equipment with Internet Facility Including latest Available PC and Necessary Software. | One set |
| 16. Small EPABX (8 Lines or 16 Lines) | One |
| 17. Desk Jet Printer | One |
| 18. Fax Machine | One |
| 19. 1KVA UPS | One |
| 20. 1 KVA CVT | One |
| 21. +12 V Solar Power Supply Panel | One |

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WORKSHOP LAYOUT FOR ELECTRONICS COMMUNICATION (CTS)



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Furniture for Section

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|--|---------|
| 1. Work bench wooden with Sunmica Top
2.0m × 1.5m × 0.75m | 4 Nos. |
| 2. Pegion hole locker-8 drawers. | 4 Nos. |
| 3. Steel cupboard standard size (two with glass doors). | 8 Nos. |
| 4. Wooden stools | 16 Nos. |