



Gujarat Energy Transmission Corporation Ltd.
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TECHNICAL SPECIFICATION

FOR

Global Positioning system (GPS) based
Time Synchronizing Equipment

GETCO / E / TS-SCP 3704 / R2 July,2022

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SECTION –II
SPECIFICATION FOR GPS BASED TSE

1.0 SCOPE

- 1.1 The overall scope of work proposed to be assigned to the successful bidder according to this specification covers the following aspects.
 - 1.1.1 The design, preparation of schematic drawings, manufacture, testing at manufacturer's works, mounting and wiring up of all the GPS Based TSE as detailed in the equipment schedule, F.O.R destination supply thereof, testing and commissioning at site.
 - 1.1.2 Design and manufacture of GPS Based TSE and its assemblies to meet the requirements of time synchronization of the substation equipments.
 - 1.1.2.1 Design and fabrication of GPS Based TSE along with all necessary accessories like switches, indicating lamps etc. and wiring up of the same to provide self contained and ready to use GPS Based TSE as per this specification.
 - 1.1.3 Complete testing at manufacturer's works of the GPS Based TSE.
 - 1.1.4 F.O.R. destination supply of completely assembled GPS Based TSE.
 - 1.1.5 Installation, Testing and commissioning of this GPS Based TSE at sight.
 - 1.1.6 It is not the intent to specify completely all the details of the design and construction of GPS Based TSE. However, the equipment shall conform in all respects to high standards of engineering, design and workmanship as mentioned in clause 4.0 and shall be capable of performing continuous commercial operation up to the supplier's guarantee. In a manner acceptable to the purchaser, who will interpret the meaning of drawings and specifications, and shall have the power to reject any work of material which, in his judgment is not in accordance therewith. The offered GPS Based TSE shall be completed with all components necessary for their effective trouble free operation. Such components shall be deemed to whether those are specifically brought out in this specification and/or the commercial order or not.

2.0 **SCHEDULE OF REQUIREMENT**

- 2.1 The delivery of the material, in any case shall be finished within two quarters from date of order.
- 2.2 The consignee details shall be issued to the successful bidder/s after placement of orders and after inspection and testing of GPS Based TSE at manufacturer's works.

2.3 **Recommended spares**

The bidder shall furnish in his offer, a list of recommended spares with unit rates for GPS Based TSE that may be required for trouble free operation for a period of 10 years. The purchaser reserves the right of selection of items and quantities of these spares to be ordered. The bidder is bound to supply spares for maintenance as and when required for service life of the GPS Based TSE as per clause No.17.0.

3.0 **STANDARDS:**

- 3.1. Unless otherwise specified elsewhere, in this specification, the rating, performance and testing of GPS Based TSE and accessories shall conform to the latest revisions, available at the time of placement of order of all relevant standards listed in Annexure – II.
- 3.2. The GPS Based TSE shall also comply the latest revision of Indian Electricity Act and Indian Electricity Rules and any other applicable statutory provisions, rules and regulations applicable in the locations where these are to be installed.

4. **PRINCIPAL TECHNICAL PARAMETERS:**

The GPS Based TSE covered in these specifications shall have the technical requirements listed in Annexure – III.

5. **GENERAL TECHNICAL REQUIREMENTS:**

5.1. **SCOPE OF WORK:**

- 5.1.1. Supply of GPS Based TSE as per the GETCO's specification with required auxiliary equipment and materials. The bidder has to

mention the list of materials (accessories/spares) in the Schedule G. The bidder shall indicate make, type and designation of each GPS Based TSE in the bid.

- 5.1.2. Preparation and furnishing of all the required drawings.
- 5.1.3. Testing of GPS Based TSE and associated items and furnishing of test certificates.
- 5.1.4. Preparation and furnishing of commissioning instructions, operation and maintenance manuals with all operational features/ optional features.
- 5.1.5. Deputation of engineer along with necessary tools/kits/instruments/testing accessories required for testing, commissioning of GPS Based TSE at site**
- 5.1.6. The successful bidders have to submit all types of drawings, operation and maintenance manuals.

5.2. **GENERAL REQUIREMENT FOR THE GPS BASED TSE:**

- 5.2.1. Design, material selection and workmanship shall be such as to result in neat appearance inside and outside with no weld, rivets or bolt heads apparent from outside and with all exterior surface true and smooth.
- 5.2.2. All GPS Based TSE shall conform to the requirements of applicable standards.
- 5.2.3. Timers shall be of continuous rating. Time delay in terms of ms obtained by the external capacitor resistor combination is not acceptable. The variable pot type timer is not acceptable.
- 5.2.4. The technical parameters of the GPS Based TSE offered, if different from the ones specified shall also be acceptable if they meet the functional requirements.
- 5.2.5. Any alternative/ additional equipment/ item considered necessary for providing complete effective and reliable GPS Based TSE shall also be offered separately. The acceptance of this alternative/additional equipment/ item shall lie with the GETCO.
- 5.2.6. The bidder shall include in his bid a list of installations where the GPS Based TSE quoted has been in satisfactory operation.
- 5.2.7. Necessary licensed copy of software and hardware to up/down load the data to/ from the GPS Based TSE from/ to the personal computer / laptop shall be provided.

- 5.2.8. The GPS Based TSE shall be supplied with all the software (License copy for each GPS Based TSE, IO Cards, required cable for local or remote communication mentioned in the catalogue.

6. TESTS

6.1. Type test

The following tests from NABL accredited laboratory shall be carried out in accordance with IEC 60255, IEC 60068, IEC 61000, IEC 60529, IEC 61010-1, IEC 60255-27 & IEC 61850 or the latest / amended / up to date IS/IEC. The bidder has to submit the all type test reports as stated hereunder for the offered item along with the technical bid. The type test reports from NABL approved laboratory shall not be older than seven years. Type test reports shall be valid as on the last date of submission of bid.

- (a) Accuracy Test
- (b) Bump test
- (c) Vibration test
- (d) Shock Test
- (e) Dry Heat test
- (f) Cold Test
- (g) Damp heat cyclic test
- (h) Radiated Emission test
- (I) Electrostatic discharge immunity test
- (J) Electrical fast transient
- (k) High frequency surge test
- (l) Radiated susceptibility test
- (m) Conducted RF Immunity test
- (n) 1 M Hz burst test
- (o) Voltage dips, short interruptions and variations immunity test
- (p) Dielectric strength
- (q) Power frequency magnetic field immunity test.

Note:

In case of non-submission /partial submission or type test reports of which validity is over, bidder shall submit pending type test report/s from NABL accredited laboratory, in the event of an order, before commencement of supply without affecting delivery schedule, free of cost to GETCO. Confirmation for above shall be invariably submitted along with technical bid.

- 6.1.2. The purchaser reserves the right to demand repetition of some or all the type test in the presence of the purchaser's representative. For this purpose the bidder may quote unit rates for carrying out each type test. In case, the equipment has not been type tested earlier, the entire type test as per relevant

standards shall be carried out by the successful tenderer in the presence of purchaser's representative without any extra cost.

6.2. **Acceptance and routine tests**

6.2.1. All acceptance and routine test as stipulated in the relevant standards shall be carried out by the supplier in presence of Purchaser's representative without any extra cost.

6.2.2. Immediately after finalization of the programme of type/ acceptance/ routine/ testing the supplier shall give two weeks' advance intimation to the purchaser to enable him to depute his representative for witnessing the tests.

7. **INSPECTION DURING MANUFACTURING**

7.1. The inspection may be carried out by the purchaser at any stage of manufacture. The successful bidder shall grant free access to the purchaser's representative at a reasonable time when the work is in progress. Inspection and acceptance of any equipment under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specifications and shall not prevent subsequent rejection if the equipment is found to be defective.

7.2. The supplier shall keep the purchaser informed well in advance, about the manufacturing program so that the arrangement can be made for inspection.

7.3. The purchaser reserves the right to insist for witnessing the acceptance routine testing of bought out items.

8. **QUALITY ASSURANCE PLAN**

8.1. The bidder shall invariably furnish along with his offer the quality assurance plan adopted by him/his sub-supplies in the process of manufacturing all major equipment/component.

8.2. Precaution taken for ensuring usage of quality raw materials and sub- components shall be stated in the quality assurance plan.

8.3. The bidder should specifically express their consent to accept additions, revisions to their quality assurance plan to meet the purchaser's requirements if needed.

8.4. **In the event of supply order, bidder shall have to submit Quality assurance plan comprising above details for approval.**

9. PERFORMANCE GUARANTEE

All equipment supplied against this specification shall be guaranteed for a period of **36 months** from the date of receipt at the destination store center. Any engineering error, omission, wrong provision, equipment failure etc., if found during actual commissioning of the equipment shall be attended by the bidder free of cost.

10. Demonstration

During technical scrutiny of the bid purchaser may ask to give demonstration of all or any of the GPS Based TSE. The bidder shall demonstrate the same within two weeks of intimation from purchaser. The purchaser will evaluate the suitability of product for their application, present practice & test equipment used. Based on demonstration, the purchaser decision will be last & unchallenged for acceptance/ non acceptance of product even if product will comply bid's other terms.

11. DOCUMENTATION

11.1. The bidder shall furnish as a part of their offer, complete set in duplicate of technical literature/catalog & manuals (one no. shall invariably be the original one and not Xerox copy), and one set of typical schematic drawings in respect of all the GPS Based TSE offered by them.

11.2. Before dispatch of GPS Based TSE to various consignees, the supplier shall furnish sets of drawings, including bill of materials and wiring schedules and also sets of technical literature and commissioning manuals in suitable files.

All the drawings submitted in soft form shall be in pdf format. However, requirement in AutoCAD form shall be at the discretion of GETCO.

12. PACKING AND TRANSPORT

12.1. All equipment/material shall be suitably packed for transport, carriage at site and outdoor storage during transit. The **bidder** shall be responsible for any damage to the equipment during transit due to improper and inadequate packing. The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbols i.e. 'FRAGILE' 'HANDLE WITH CARE', 'USE NO HOOK' etc. The contents of each package shall bear marking that can be readily identified from the package list and packing shall provide complete protection from

moisture, termites and mechanical shocks etc.

- 12.2. Wherever necessary proper arrangement for attaching slings for lifting shall be provided and all packages clearly marked with grossweight, signs showing `UP` and `DOWN` sides of boxes, contents of each package, order no. and date, name of the plant/SS/ of which the material in the package forms part of and any handling and unpacking instructions considered necessary. Any material found short inside the intact packing cases shall be supplied by the manufacturer/supplier without any extra cost.
- 12.3. Bidder shall ascertain, prior to shipment, from concerned authorities, the transport limitations like weight and maximum allowable package size for transportation. Fragile material such as relay cases, Instruments and other glass material shall be carefully covered with shock absorbing protective materials, such as thermocol, silica gel or equivalent moisture absorbent material in small cotton bags shall be placed inside the packing wherever necessary.
- 12.4. Each consignment shall be accompanied by a detailed packing list containing the following information.
 - a) Purchase order reference.
 - b) Name of consignee
 - c) Details of consignment
 - d) Destination
 - e) Total weight of consignment
 - f) Handling and unpacking instructions.
 - g) Bill of materials indicating contents of each package
 - h) Sign showing upper/lower side of the crate.

13. Field Demonstration and Training

- 13.1. The successful bidder shall have to provide filed demonstration / training at site at 2 or 3 locations, as decided by GETCO, to GETCO staff where GPS Based TSE is to be supplied. The training shall cover familiarization with techniques & procedures of installation, testing, commissioning, operation of software, creation of database and trouble shooting of GPS Based TSE.
- 13.2. The program of the training shall be mutually discussed and finalized by the purchaser with suppliers.

14. SUPERVISORY ERECTION & COMMISSIONING

- 14.1. The Bidder shall depute their Engineer to the various sites for

carrying out the installation, testing and commissioning of GPS Based TSE. The purchaser shall provide an adequate number of skilled/unskilled workers as well as all ordinary tools and equipment required for equipment erection at his (purchaser's) expenses.

15. SCHEDULES

15.1. The bidder shall fill in the following schedules which form part of the bid tender specification and offer. If the schedules are not submitted duly filled in with the offer, the offer is likely to be rejected.

Schedule – B	Guaranteed Technical particulars
Schedule – G	List of accessories / spares for satisfactory performance for next 10 years.

15.2. For any deviation from the specification which is not specifically brought out in the schedules shall be supported by authentic documents, standards and clarifications, otherwise the offer may be liable for rejection. Any deviation from the specification shall be high lighted giving reasons.

16. INFORMATION TO BE FILLED IN INVARIABLY BY THE BIDDER:

For ready reference of the purchaser, the items of information required to be invariably furnished by him in his offer, are listed below:

1. A copy of the authentic English translation of each of the standards to which the offered equipment conforms.
2. Schedule - '***B*** and '***G***'.
3. Documents and drawing listed in Clause no.11.
4. Documents specified in clause no.8.0

17. GUARANTEE FOR MAINTENANCE SPARES AND SERVICES:

17.1. The bidder shall guarantee for supplying maintenance spares and services as well as repairing of GPS Based TSE for a period of the life expectancy of 10 years.

ANNEXURE - I

Recommended spares:

Sr. No.	Name of GPS Based TSE	Particulars of recommended spares	QTY.
1		Sp. Tools	
2		Any other (if required list below)	
3			
4			

ANNEXURE: II**GPS BASED TSE – LIST OF STANDARDS**

Sr. No.	Standard No.	Title
1	IS – 2147 IP-54	Degree of protection Ingress protection, dust & moisture.
2	IS – 1554 Part-I, 1988	PVC insulated cables up to and including 1000 volts.
3	IS – 11353	Guide for uniform system of marking and identification of conductors and apparatus terminals.
4	IS – 2206	Fuses
5	IEC – 801-4	Electrical heat transient bursts.
6	IEC-60255-22-1	MHz burst disturbance
7	IEC-60255-22-2 IEC-61000-4-2	Electrostatic discharge Direct application Indirect application
8	IEC-60255-22-4	Fast transient disturbance
9	IEC-, 60255-22-5	Surge immunity test
10	IEC-60255-22-7	Power frequency immunity test
11	IEC-61000-4-8	Power frequency magnetic field test
12	IEC- 60255-22-3 / EN-61000-4-3 / IEEE/ANSI/C37.90.2	Radiated electromagnetic field disturbance
13	IEC- 60255-22-3	Conducted electromagnetic field disturbance
14	IEC- 60255-25	Radiated emission
15	IEC- 60255-5	Dielectric test Impulse voltage test Insulation resistance
16	IEC-60068-2-1	Cold test Storage test
17	IEC-60068-2-2	Dry heat test
18	IEC-60068-2-3	Damp heat test, steady state
19	IEC-60068-2-30	Damp heat test, cyclic
20	IEC- 60255-26	Immunity / Emissivity
21	EN-50178	Low voltage directive
22	IEC- 60255-21-1 IEC –60088-2-6	Vibration Vibration during operation and transport
23	IEC- 60255-21-2 IEC-60088-2-29	Shock and bump Bumping during transport
24	IEC- 60255-21-3	Seismic
25	IEC-60088-2-1	Low temperature test
26	IEC-60088-2-2	High temperature test

27	IEC-60088-2-3	Humidity test
28	IEC-61010-1 & 2	Safety 300V Phase to Earth
29	EN 61326	Electromagnetic compatibility
30	IEC-56	Reliable measurement
31	IEC-60068-2-27	Shock resistance (operation)
32	IEC 61010-1/ <u>IEC 60255-27</u>	Safety requirement for electrical equipment for measurement, control and laboratory use.
33	IEC 1010-1: 2001	Protection against input transients between any terminals.
34	IEC-60068	Environmental Testing

Whether mentioned or not all the type test reports regarding measurement, accuracy, calibration, repeatability, Radio frequency interference etc. for the GPS Based TSE offered are required to be submitted.

ANNEXURE: III

PRINCIPAL TECHNICAL PARAMETERS OF GPS BASED TIME SYNCHRONIZING EQUIPMENT

Sr No	Name of Item	Specifications
1	GPS Based Time Synchronization Equipment	<ul style="list-style-type: none"> ■ Continuous IST Reference ■ Programmable pulse output ■ Large size of Time of day Display ■ All weather, water proof Antenna ■ Synchronization software for the server ■ Time code output compatible with Relay ■ SCADA system compatibility ■ Event Loggers <p style="text-align: center;">❖ Technical parameters</p> <p>(1) Antenna:-</p> <p><u>1.1 Environmental Specifications :</u> -> Operating temperature : -40 to +85° Temp -> Storage temperature : -40 to +100° Temp -> Humidity : 10 to 90% non condensing -> Waterproof : Submersion, 1 meter</p> <p><u>1.2 Technical Specifications:</u></p> <ul style="list-style-type: none"> -> Power Consumption: 30 mA Max. at 5 v d.c <3 watts. -> Output Impedance : 50 ohms -> Frequency : L1 band (1575.42 MHZ) -> Gain Azimuth Coverage: Omni directional -360 deg -> Noise : 5 db maximum <p><u>1.3 .Physical Specifications</u></p> <ul style="list-style-type: none"> -> Antenna Weight: Low Weight. -> Mounting pole height: Maximum of 3 meter. <p><u>1.4 Cable Specifications.</u></p> <ul style="list-style-type: none"> -> Type: Coaxial, RG-59/58 -> Impedance: 50 Ohm/75 ohm -> Connectors: Whether proof. -> Signal Attenuation : Less than 10 db

		<p>-> Length of cable: Min. 20 meter.</p> <p>(2) GPS Receiver</p> <p>-> Technology : SMT -> L1 frequency, C/A code (1575.42 M HZ) -> 8 channel, parallel tracking receiver -> Timing accuracy :1 I (micro) second or Better</p> <p>-> Acquisition time: Hot start : < 15 sec. Warm start : < 45 sec Cold start : < 150 sec</p> <p>Memory & RTC Battery</p> <p>->Type: : Lithium ->Life: 10 years.</p> <p>(3) Time code Generators:-</p> <p>-> Timing Accuracy: Better than 1 milli sec. -> Display of Time : HH: MM:SS , IST</p> <p>-> Local Display – No. of Lines & Characters, LCD back lit : Min. 20 characters , 4 lines</p> <p>-> Key board : Sufficient nos. to operate Menu.</p> <p>Programmable output contacts</p> <p>-> 4 nos. Independent , User friendly & site programmable for Pulses per second/minute/quarter hour/half hour/hour</p> <p>-> 3 no. IRIG-B AM Modulated -> 2 nos. IRIG-B Pulse width modulated -> Port : RS-232 /RS 485/RS-422 & Ethernet</p> <p>Potential free contacts :</p> <p>->Relay type : Solid state relay, 100 m Amps with -220 V D.C</p> <p>Aux Power Supply ->Universal DC Power Supply 80- 270 V DC</p> <p>Special features ->Short circuit protection</p>
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		<p>->Feed line fault protection</p> <p>(4) Remote Time Display:-</p> <p>LED Display</p> <p>->Height: 100 mm</p> <p>->Type : Numeric LED, 7 segment</p> <p>->Digit display : Time : HH:MM:SS(IST) & Date :- DD:MM:YY</p> <p>->Input : RS 422 / RS 232/RS 485</p> <p>->Supply : Universal D.C. Power supply 80-270 V D.C</p> <p>->Updating rate : 1 Sec</p> <p>(5) Synchronizing Software :</p> <p>->Interface with P.C :- USB</p> <p>->Compatibility with : Windows XP , or higher Operating Sys.</p> <p><u>(6) Compliance with Networking protocols</u></p> <p>(i) NTP</p> <p>(ii) SNTP</p> <p>(III) TCP/IP</p> <ul style="list-style-type: none"> ● Synchronization of IEC 61850 compliant devices using SNTP. ● Compliance for Internet protocol IP v4 <p>Serial port I/O (RS 232 / RS 422 /RS 485/Ethenet)</p> <p>Time string in broadcast / extended ASCII mode 9600,N, 8 , 1</p> <p>RS 232 Data: DOY & Time (Connector:9 pin D Female)</p> <p>RS 485 Levels : DOY & Time (Connector : 2 pin MIL Grade)</p> <p>Data Display : 4 x 20 alphanumeric Date & IST Receiver & Clock status Position- Latitude, Longitude</p> <p>Status LED : Size 5 mm GPS locked – Green GPS failed / Local RTC on Red</p> <p>Keypad : Sufficient to operate menu</p> <p>Environmental Characteristics</p>
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		Operating temperature: 0 -55° C Humidity : 10 -90 % Non Condensing Radiated : IEC 61000 – 4/3 , 1995 compliant Susceptibility Radiated : CISPR 22 , 1997 , Class A compliant emission
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SCHEDULE – B
GUARANTEED TECHNICAL PARTICULARS

(TO BE FILLED IN BY THE BIDDER AND FURNISH WITH TECHNICAL BID)

The bidder must fill up all the point of GTP for offered item/s. Instead of indicating “refer drawing, or as per IS/IEC”, the exact value/s must be filled in.

Sr. No.	Description of Technical Parameter of the GPS Based TSE	GETCO Acceptable Range	Rating/ Range of offered TSE
1	Manufacturer or Trader		
2	If Manufacturer, in-house or licensed technology		
3	Is the Company ISO 9001:2000 qualified for GPS-TSE (Attach copy of certification)		
4	GPS-TSE antenna		
4a	Environmental Specifications:		
	i) Operating Temp.	-40 to +85 deg C	
	ii) Storage Temp.	-40 to +100 deg C	
	iii) Humidity	10 to 90% non condensing	
	iv) Waterproof	Submersion, 1 meter	
4b	Technical Specifications		
	i) Power Consumption	30 mA Max. at 5 v d.c <3 watts.	
	ii) Output Impedance	50 ohms	
	iii) Frequency	L1 band(1575.42 MHZ)	
	iv) Gain Azimuth Coverage.	Omni directional -360 deg	
	v) Noise	5 db maximum	
4c	Physical Specifications		
	i) Antenna Weight	Low weight	
	ii) Mounting pole height	Maximum of 3 meter.	
4d	Cable Specifications		
	i) Type	Coaxial, RG-59/58	
	ii) Impedance	50 Ohm/75 ohm	

	iii) Connectors	Whether proof	
	iv) Signal Attenuation	Less than 10 db	
	v) Length of cable	Min. 20 meter.	
5 .GPS receiver			
5a	Technology (SMT or any other)	SMT	
5b	Specifications of GPS receiver:		
	ii) Frequency	L1, 1575.42 MHZ	
	iii) No. of satellites	Min. 8 Channel , Parallel tracking	
	iv) Time accuracy of PPS	1 Q (micro) sec or better	
	v) Acquisition time - Hot Start	< 15 sec. (90%)	
	vi) Acquisition time - Warm Start	< 45 sec (90%)	
	vii) Acquisition time - Cold Start	< 150 sec. (90%)	
	viii) Battery Backup	Lithium , min. 10 yrs.	
6 Time Code Signal Generator			
6a	Specifications of Time Code Signal Generator:		
	i) Timing Accuracy	Better than 1 mili sec.	
	ii) Display of Time	HH:MM:SS , IST	
	iii) Local Display – No. of Lines & Characters, LCD back lit	Min. 20 characters ,4 lines	
	iv) Keyboard	Sufficient to operate menu	
6d	IRIG-B Output		
	i) IRIG-B AM modulated	3 nos.	
	ii) IRIG B PWM modulated	2 nos.	
6c	RS-232 /RS 485/RS-422 & Ethernet output	Yes	

6d	Pulse Outputs : Buffered PPS (for calibration purposes only), Minute Pulse, 15-minute pulse, 30 minute pulse, 60 - minute pulse	4 nos. Independent , User friendly & site programmable	
6e	Relays for Potential free contacts:	Yes	
	i) Solid State ii) min. 100 mA at 220 VDC .		
9 .Front Panel Visual Indications			
	i) GPS LOCKED	Yes	
	ii) GPS FAIL	Yes	
	iii) RTC ON	Yes	
10 .Distant View Display (DVD)			
	i) Signal interface with Time Code Signal Generator RS-422/ RS-485/RS-232	RS -422 /RS-485/RS-232	
	ii) Display Size	100 mm height	
	iii) Display type	7 segment LED, Red for Day light viewing.	
	iv) Display Format -Time	HH:MM:SS	
	Display Format - date	DD:MM:YY	
	v) Updation rate	1 sec.	
	vi) Supply	80-270 V d.c.(Universal)	
11 Power Supply			
	ii) DC – Min & Max	80-270 V d.c.(Universal)	
12 Synchronization Software			
	i) Interface with PC – USB	Yes	
	ii) Compatibility with Windows XP and higher OS.	Yes	

13	Compliance for networking protocols i) NTP ii) SNMP iii) TCP/IP	Yes	
14	Synchronization of IEC 61850 compliant devices using SNMP.	Yes	
15	Compliance for Internet protocol IP v4	Yes	
16	Type Tests (a) Accuracy Test (b) Bump test (c) Vibration test (d) Shock Test (e) Dry Heat test (f) Cold Test		
	(g) Damp heat cyclic test (h) Radiated Emission test (I) Electrostatic discharge immunity test (J) Electrical fast transient (k) High frequency surge test (l) Radiated susceptibility test (m) Conducted RF Immunity test (n) 1 M Hz burst test (o) Voltage dips, short interruptions and variations immunity test (p) Dielectric strength (q) Power frequency magnetic field immunity test.		
17	Special Features		
	Short circuit protection	Yes	
	Feed line fault protection	Yes	
18 GENERAL			
i	Commissioning at site.		
ii	Performance Guarantee.	36 months	
iii	Demonstration of the offered material or any loose item to be used, before the opening of	Yes	

	the price bid.		
iv	Training by the purchaser.	Yes (As per training clause.)	
v	Schedule A to G dully sealed and signed attached.	Yes	
vi	TOOLS List of Optional tools required for testing/commissioning/maintenance is listed and price for the same is given	Yes	
vii	SPARES: List of recommended spares for normal maintenance for Period of 10 years furnished.	Yes	

SCHEDULE: G
LIST OF MATERIAL FOR GPS BASED TSE
(TO BE FILLED IN BY THE BIDDER)

Sr. no.	Description	Qty. reqd.	Make and type designation