INDRADHANUSH GAS GRID LIMITED
(Joint Venture of IOCL, ONGC, GAIL, OIL and NRL)
GUWAHATI, ASSAM

CORRIGENDUM # 2

FOR

SCADA & APPS SYSTEM FOR PIPELINE SECTIONS (1,2,3,4,5,6,7,8,9,12,13&14) UNDER NORTH EAST GAS GRID PIPELINE PROJET OF M/s IGGL

OPEN DOMESTIC COMPETITIVE BIDDING

Tender no.: 05/51/23VC/IGGL/094

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PREPARED AND ISSUED BY

MECON LIMITED
(A Govt. of India Undertaking)
Delhi, India

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Date: 23.03.2022

Sl. No.	Description	Volume	Page No.	Clause / Para / Section	Amendment / Addition / Modification / Deletion	
1	SPECIFICATION FOR REMOTE TELEMETRY UNITS	II of II	142-160		Modification	The revised SPECIFICATION FOR REMOTE TELEMETRY UNITS is enclosed as Annexure-I to this Corrigendum.

All other terms & conditions of tender document remain unaltered.

ANNECURE-I TO CORRIGENDUM 1

Rev. : 1
Edition : 1

SPECIFICATION

FOR
REMOTE TELEMETRY UNITS

SPECIFICATION NO.: MEC/S/05/E5/099

ELECTRICAL & INSTRUMENTATION
(OIL & GAS SBU)
MECON LIMITED
DELHI 110 092

AMENDMENT STATUS

Sl. No.	Clause / Paragraph / Annexure / Exhibit / Drawing Amended	Page No.	Revision	Date	By (Name)	Verified (Name)
1	Cyber security update		01	02.07.2019	Ratnadeep	Pankaj

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1.0 GENERAL

The RTU's shall be 32 bit microprocessor based programmable units with both erasable RAM and ROM memory. Each of the RTUs shall have its own processor, battery backed / non-volatile memory, power supply unit & communication processors confirming to communication protocol like DNP 3, Ethernet etc and I/O cards complete in all respects. The RTUs shall have TCP/IP port and serial port for polling from MMS & BMS.

The I/O cards shall not be combined for the functionalities i.e. each card shall have dedicated modules for Analog input, Analog output, digital Input, Digital output etc. The RTU's shall be designed to function such that no single point of failure or the inadvertent leaving of a printed circuit board out of the RTU shall cause a control mal-operation or result in any false operation or continuous communication transmission.

The complete RTUs shall be supplied with all its components including the cabinets. The cabinets should be weather proof and suitable for non-air-conditioned room. The actual layout of RTU along with its internal wiring, mounting arrangement etc. shall be carried out in detailed engineering. Proper illumination shall be provided inside the RTU cabinet.

2.0 Environmental

The equipment selected will operate in the following conditions:

- Ambient Temperature 55 ° C
- Humidity 05-95% RH.
- Non air-conditioned environments

3.0 Power Supply

The power supply available will be 24V DC UPS Power supply. RTU shall operate at 24 V DC power supply. The bidder shall furnish the detailed consumption of each equipment.

4.0 RTU SUBSYSTEMS

4.1 The RTUs shall comprise the following subsystems**:**

- Central processor with system software.
- Back pane/ chassis
- Analog input Module
- Digital (contact) input Module
- Digital (contact) output Module
- Analog Output Module
- Ethernet ports for polling from MMS and BMS through DNP 3.0 (TCP/IP).
- Serial ports/Ethernet port to connect Portable Diagnostic Test Unit (PDT)
- Serial ports for connecting IEDs e.g. Flow computers
- Battery backed power supply module.
- Diagnostic tools
- Interposing Relays for Digital Output

The RTU's shall be configured such that interdependence of function is minimized and failure of any part of a RTU Module subsysterm except the common logic subsystem shall not directly affect the integrity of the unit, as a whole.

The RTU should be able to store alarm/ events in case of communication failure till the time of communication restoration.

4.2 The RTU system software shall provide the overall management of the supervision, monitoring and control function within the RTU and also manage the local Programmable Diagnostic Test Unit, communications, comprehensive diagnostic facilities and RTU start up procedures.

4.3 The RTU shall be programmable and shall have facilities for developing logic to interface with the IEDs as and when required. To this effect, all necessary tools, software and documentation shall be part of supply of the RTUs within the scope of this tender.

5.0 POWER SUPPLY

- RTU shall have single power supply modules.
- RTU shall have Power Supply module having 24V DC input which shall cater output requirement of all the modules of RTU. Power supply card shall have an independent on- off switch
- If RTU requires other voltage levels, then the necessary converter shall be supplied and provided without any additional financial implication to Client

6.0 CENTRAL PROCESSOR MODULE

- The RTU shall be a 32-bit microprocessor based programmable unit with both non-volatile RAM and FLASH memory.
- Central Processor module shall have CPU & power supply for total functionality of the RTU
- Minimum 100 command logs, 3000 events and alarms shall be stored in RTU. Accordingly the RTU memory shall be provided.

7.0 DIGITAL INPUTS

Typical specification of Digital Input Modules to be supplied is as given below:

Input Type	:	Min. 16 nos. of Volt free contacts (2 wire isolated)
Contact Wetting	:	2-4mA per input at 24V DC
Resistance recognized	:	Not exceeding 1 Kilo Ohms as a closed contact
Resistance recognized	:	Not less than 50 Kilo Ohms as an open contact
Isolation	:	Using optocouplers/ external isolation
Insulation Resistance	:	20 M ohms at 500 V Dc inputs
Debounce circuitry	:	10 m/sec
Indicators	:	Loop & State LEDs for each DI point
Filter	:	Support for chatter and de-bounce filter
Voltage withstand Capacity	:	1.5 KV RMS
No/NC contacts	:	mixing of NO/NC contacts in the same card.

Security	:	Each DI channel shall be protected by suitable mechanism like fuse with suitable fuse blow indication provided

8.0 DIGITAL OUTPUTS

Typical specification of Digital Output Modules to be supplied is as given below:

Output Type	:	Max. 16 nos. of relay contacts, individually isolated
Indicators	:	LED indication for each DO point
Relay Type	:	Miniature power relay
Contact arrangement	:	1 NO + 1 NC relay contacts configuration to be provided up to the RTU terminal block
Contact Rating	:	Potential free contact rating of output interposing relay for each DO point (Contact rating 24 V DC, 5A)

(RTUvendor to provide interposing relays for each digital output point)

Isolation	:	2KV RMS Contacts to Logic/ external isolation
DO command activation	:	Configurable Pulse duration (min 2 sec) / Latch. For repeat DO output requirement, permanent DO shall be provided
Security	:	Output contacts shall be monitored via Opto-isolators and must be short circuit proof and protected by suitable mechanism like fuse with suitable fuse blow indication provided.

9.0 ANALOG INPUTS

Typical specification of Analog Input Modules to be supplied is as given below:

Input Type	:	Min 8 isolated, Current Inputs
Ranges	:	4 - 20 mA, 0-5 V
Input impedance	:	Not less than 100 K for Voltage input Not more than 0.4 K for current Input, 250 Ohm nominal
Multiplexer	:	Vendor Standard
ADC type	:	12 bit binary, (exclusive of sign bit)
Series Mode Rejection	:	Greater than 30 db at 50 Hz
Common Mode rejection	:	Greater than 100 db at 50 Hz
Roll over error	:	1 bit
Temperature coefficient	:	0.005% per degree C
Resolution	:	min. 14-bit data + 1 sign bit
Accuracy	:	± 0.1% of range including drop in resistor @25 deg

10.0 ANALOG OUTPUTS

Specifications of Analog Output modules to be supplied is as given below:

Output type	:	Min.4 Completely Isolated current (4-20 mA) outputs The external isolator, if required, for isolated output shall be included for each AO point
DAC Type	:	12 bit binary (exclusive of sign bit)

DAC span	:	10 V or 5 V
Output Range	:	4-20 mA DC
Isolation	:	Each output shall be isolated from logic and others to 500 Volts
Loading	:	1K ohm for Current outputs
Differential Linearity	:	½ L.S.B.
Accuracy	:	± 0.1% of range at 20 degree C @ 25 deg
Temperature coefficient	:	0.01% FSD per degree C
Update	:	within 10 msec.
Retentivity	:	Set-point value to be held by AO card till update by new set-point value from GAIL SCADA system

11.0 COMMUNICATIONS

The RTU shall support both internal and external communications functions.

The communication network internal to the RTU shall be designed and implemented in such a way that the passing of data and commands between modules shall not be prevented by the failure of any module not directly involved in the communication exchange. In addition the internal network shall not become overloaded under the heaviest traffic possible in the RTU's ultimate expansion configuration.

The MMS / BMS shall initiate communications with a selected RTU by the addressing function. Each RTU shall recognize its own unique address and shall have the capability of being assigned any address within a range of possible addresses (minimum 256). It shall be possible to address all or selected number of RTUs from the MMS/BMS in order that global or broadcast message may be sent. The LED indication shall be provided in the RTU to check the health of RTU communication.

The RTU shall support DNP 3.00 (TCP/IP) / IEC-5-104 protocol for communicating with SCADA system at MMS / BMS.

The RTU shall be polled through Ethernet port from MMS / BMS.

12.0 RTU FEATURES

12.1 The RTU sub-system shall support the following:

a) Scanning of Input and Output points.
b) Fast scanning of selected I/O's points.
c) Field input initiated discrete control action.
d) Discrete control action corresponding to Remote Control Command reception.
e) RTU shall store all Alarms, events and command log with time stamping in its non-volatile memory in FIFO basis. The command log and event log shall be available in RTU such that it shall be possible to know about the source of command by logging in the RTU. Similarly, it shall be possible to know about the events and critical alarms by logging in the RTU. All commands executed through RTU (whether given through SCADA or through RTU) shall be stored in RTU log. Minimum 100 command logs, 3000 events and alarms shall be stored in RTU. Accordingly the RTU memory shall be provided.
f) Operator initiated discrete control action with check before execute and time out feature.

g) Operator initiated discrete control action with sequencing and interlocking.
h) Derivation of calculated digital points based on logical functions AND,OR,NOT etc from Digital and Analog input points.
i) Derivation of calculated analog points based on arithmetic functions +, -, /, *, sq, root etc. and driving external hardware. Calculation shall be performed in RTU in engineering units with 16 bit or higher floating point accuracy in case engineering conversion is being done at RTU level. (Calculations shall be performed in the SCADA server in case engineering conversion is being implemented in the SCADA server.)
j) Deviation of counter values using Integration of hardware and software generated analog points
k) All RTU cards, serial ports, and communications channels health points are to be configured in RTU and DNP3.0 index of same are to be reflected in I/O list and all serial ports should be independently configurable
l) RTU should have diagnostic feature for hardwired I/Os, DNP3.0 and IED (serial) communication
m) All the field / IED parameters should be configurable at RTU end
n) IED (Flow computers, CP Panel, UPS panel etc.) interfacing through RS232/ RS 485 ports/ Ethernet ports for serial data on MODBUS protocol. RTU shall support standard MODBUS (ASCII and RTU) protocol.
o) The RTU shall have provision to give analog and digital data (available in the RTU) over MODBUS protocol to third party systems (other than SCADA servers) through serial port. The register addresses for AI and DI parameters shall be configurable.
p) It shall be possible to do configure / write IED interface in RTU for which necessary software tools shall be supplied.
q) For communication with IEDs through serial ports, the RTU shall support 16-bit, 32-bit, signed, unsigned, integer and floating point data type
r) Rate of change of alarm
s) RTU resident accumulator points driven by analog points.
t) RTU should be capable to bulk AO (writing): SCADA – RTU on DNP protocol, RTU To IED (FC) on Modbus [RTU take AO all the around 10 gas composition parameter (as per AGA-3/8]

12.2 Time synchronization of Remote Telemetry Units shall be possible from SCADA System with a resolution of 100 msec.

12.3 The RTU shall scan and acquire parameters from field as per programmed (user configurable) scan cycles.

12.4 RTU should have event logging and buffering feature. In case of communication loss, RTU shall store the time stamped 5000 analog events and 1000 digital events in the buffer and transmit to master station on receiving the poll request after restoration of link.

12.5 The RTUs shall have a self diagnostic feature and software watchdog timer devices to monitor & report the healthiness of CPU, memory, power supply, comm. interfaces and Input/Output modules at the local level. Further the RTUs shall support remote diagnostics from MMS / BMS so that all these status shall be transmitted to MMS / BMS and displayed in the RTU status graphic.

12.6 Analog input card and Analog output card shall be self calibrating type and event shall be sent to MMS / BMS for out of calibration. Analog input card shall generate an event, if it is out of calibration, which shall be sent to MMS / BMS. Further if Analog output card is not self-calibrating type then all

Analog outputs shall be wired back as along inputs and calculations performed on each channel to detect AO card out of calibration. This out of calibration shall be available as part of RTU status graphics along with set point value displayed in the graphics, next to the corresponding controller symbol.

12.7 It shall scan and acquire parameters from process as per programmed scan cycles.

12.8 RTUs shall be intelligent in support of the following:

a) It shall process the analog data for high-low limit violations as per stored limit tables and communicate the same to MMS / BMS along with time stamping.
b) Linear conversion to engineering units and input filtering, in case engineering unit conversion is being done at RTU level [conversion of raw data to normalized values (e.g. 0 to 1.0) for communication shall also be acceptable].
c) To support remote reconfiguration and downloading of parameters i.e. addition, deletion, modification and reassignment with different range, limits etc. from workstations to avoid local engineering at RTU level. The following requirements of RTU configuration form MMS / BMS shall be fulfilled:

(i) The remote configuration wrt following parameters for the points defined in the RTUs shall be remotely done form active SCADA Server at MMS / BMS, in case the features of Alarm generation, association of the alarm priority and engineering unit conversion are implemented at the RTU level.

- Analog alarm limits
- Analog scaling factor for engineering unit conversion
- Threshold value
- Smoothing factor (filter time constant) etc.

These shall be automatically updated to the standby SCADA Server also.

(ii) PDT configuration unit (Laptop, hardware & software with cables & connectors) shall be provided to create configuration file involving definition of:

- I/O modules attached to the RTUs
- Type of each I/O modules and time stamping requirements for points in each module.
- Software logic in RTUs
- Physical and software interfaces connected to the RTUs

(iii) The configuration file shall be able to be transferred online from MMS / BMS using the existing data channels to the corresponding RTU.

(d) Time stamping of all exception reports.

12.9 RTU shall comply the following:

a) RTU shall be capable of updating process parameters data and configuration data in its own built-in memory. Time stamping of all field values at RTU shall be required. In the event of failure or break of communication link, the RTU shall continue to scan all parameters and update its database.

b) RTU shall retain in its database the complete analog and digital information of the field till it is completely and correctly read by MMS / BMS in order to take care of no loss of data in case of failure of MMS / BMS. The RTU shall scan the field and the memory buffer is to be sized to store all the changing data (i.e. new exception report for the data every poll time) and MMS / BMS receive the same without any loss of data and alarms in the SCADA system.

c) Further to take care of long term communication outage with SCADA system, the RTUs shall be designed to also scan the field and store in the memory time stamped 5000 analog events and 1000 digital events during the period of communication outage for retrieval by SCADA system subsequently. The RTU memory sizing shall be adequate for the same. In case additional memory cards are required to meet this requirement, the same shall be provided by the vendor. RTUs buffer shall also be circular buffer with new events replacing old events.

d) The RTU system shall have the facility to attach to each digital event signal a time tag generated by the RTU local clock to enable the occurrence to be recorded and transferred to SCADA system.

12.10 At the RTU, failure of a module in a subsystem shall be identified by an individual LED display

12.11 Each I/O shall be protected against the reversal polarity of the power voltage to I/O

12.12 The RTU should have provision for time stamping of all analog exception reports and digital state changes. The RTU time stamped analog & digital data shall be sent to SCADA system

12.13 The RTU shall support communication protocol supporting report by exception to prevent unnecessary data communication when data is not changing and also support downloading of exception value deadband (each analog input wise) from SCADA system

12.14 It shall be possible to have highest priority of alarms, in order for the same to be sent to MMS / BMS.

12.15 It shall provide 'Check before Execute' feature before execution of command.

12.16 Every control associated with the RTU shall report the status of the point after control execution. In case the status has not changed within fixed specified time it shall report to MMS / BMS for not having executed the control.

12.17 RTU shall not generate any false control signal due to power supply on-off conditions.

12.18 RTU shall support communication protocol supporting report by exception to prevent unnecessary data communication when the data is not changing.

12.19 It shall provide error detection and control feature for data communication with SCADA Server to ensure data integrity.

12.20 It shall have feature of connecting a pluggable Programmable Diagnostic Test unit (PDT) with keyboard & monitors diagnostic and programming aid to trouble shoot and configuration tool for RTU and I/O boards. It shall be possible to exercise all the functions of the RTU without disconnecting the RTU from process.

12.21 RTU shall have provision for applying filtering on the input signals and scaling for engg. units conversion.

12.22 From SCADA Server, it shall be possible to off-scan complete RTU individually in addition to off-scan RTU points. In case of failure of complete RTU or off-scan of complete RTU only one alarm shall be generated and the RTU along & digital points shown in various graphics and printed in reports shall correspondingly have data integrity qualifier flag.

12.23 The RTU shall be able to store the configuration data and the process database upon power failure for at least one month on continues basis. Upon restoration on the power, RTU shall resume the normal operation automatically.

12.24 The failed RTU once put online shall initiate service requirement to SCADA Server for reinitialization

12.25 RTU shall operate power supply (230 V AC or 24 V DC as define elsewhere) as per power availability at site. Separate on/off power supply switch and fuse shall be supplied with each RTU. Vendor shall indicate power consumption for all the RTUs. Adequate isolation of input, output and power supply circuits shall be provided along with over voltage and short circuit protection.

Wherever 230V AC supply is provided for RTU, SCADA vendor shall carry out necessary conversion to covert the AC voltages to 24V DC for supply to field instrumentations and to RTU. The power to the field instrumentations is to be provided through barriers and all the digital output has to be driven through 3-5 A interposing relays. The necessary converter to covert the AC voltages to 24V DC, the barriers and the imposing relays shall form the integral part of the RTU.

12.26 All the field instrument connections for RTUs shall be terminated in the Control cum TIC panel. The I/O point wires shall not be directly terminated on the RTU I/O boards. Terminal blocks/panels is to be provided in the RTU cabinet. I/O termination blocks shall have both male and female portions so that to isolate the field wiring at RTU level, male/female termination block attached to be field wiring can be pulled out instead of removing the wiring. Printed tube type Cross ferruling shall be done.

12.27 The RTU shall be Immune to radio frequency interference generated by any nearby source meeting the latest international standards in this regard (MIL, VDE etc.)

12.28 The RTU equipment shall function continuously without requiring any preventive maintenance.

12.29 RTUs shall be multidropped on a pair of communication channels. Upon failure of primary channels, RTU shall respond to MS / EMS requests/ interrogation on secondary channel automatically without any loss of data & operation. System shall provide status on the availability of each of the channels.

12.30 It shall be possible to output any AI (Including serial data from IEDs) & DI point value available in real time database at SCADA Server, as AO (Including serial data from IEDs) & DO to any RTU respectively. The relay contact configuration shall be provided up to the RTU terminal block. The DO

command contact closure duration shall be configurable. It shall be possible to configure DO contact duration open or close for a long duration as per the DI status. Within the scope of this tender, vendor shall down load Gas Chromatograph value to those Flow Computers, in whose locations Gas Chromatograph is not available, through the same serial link which is used for reading the Flow Computer values. Source Gas Chromatograph and target Flow Computers will be finalized during detail engineering.

12.31 For Gas Composition AGA Data writing from SCADA to Modbus Slave Flow Computer through RTU, Vendor should implement logic in RTU for smooth writing of AGA parameters in Modbus Slave after checking its validity and Gas Composition value of 100% as aggregated value. SCADA will writeGC Analysis data to RTU over DNP Protocol, RTU will write all the GC data analysis data to IED (Flowcomputer over Modbus Protocol) Location, Modbus address shall be provided by GAIL/ MECON.

12.32 Non availability of any one of the two communication channels should not hamper the functioning of the other RTUs multidropped on the pair of channels.

12.33 It shall have feature of connecting a pluggable Programmable Diagnostic Test unit (PDT) with keyboard & monitors diagnostic and programming aid to trouble shoot and configuration tool for RTU and I/O boards. It shall be possible to exercise all the functions of the RTU without disconnecting the RTU from process.

12.34 Vendor shall detail the shelf and inter-shelf wiring and the termination of the wiring harness between the RTU, the terminal block area and the field instrumentation. Easy access to cabinet wiring, for maintenance purposes is essential. The RTU components shall be designed for high temperature rating and low power consumption so that air exchange with the ambient environment will not be required.

12.35 Identification labels for RTUs, RTU card files, power distribution boards, terminations etc complete in all respects properly correlating with the drawings is to be ensured by the vendor.

12.36 SCAN RATES

The local scan rate for the individual I/O modules shall be such that the time-tagging resolution and system performance requirements are achieved.

The consideration of scan times shall include the acquisition of data, processing and updating of the RTU database. The overall RTU local scan shall be defined as the time required to acquire field data and update the RTU database and the same shall be much faster than RTU poll time by MS / EMS. It is expected that scan rate shall not exceed 100 msec.

12.37 DIGITAL OUTPUT (CONTACT) SUBSYSTEM

- The contact output subsystem shall provide momentary closure of potential free contact relay output for the operation of equipments.
- The relay contact configuration shall be provided up to the RTU terminal block.

- The DO command contact closure duration shall be configurable. It shall be possible to configure DO contact duration open or close for a long duration and all contacts shall be voltage free.

- It shall not be possible for the RTU to energize an output that has not been selected for control.

- At RTU restart, following an RTU power failure, shall not reset the output circuits, shall not generate false control signal and shall cancel any pending control selection.
- The Digital Output should be configured for pulse duration. No separate program or logic will be acceptable at RTU end.
- The RTU shall provide 'Check before execute' feature as part of RTU protocol before execution of command
- Every control associated with RTU shall report the status of the point after control execution. In case, the status has not changed within specified time, it shall report to SCADA system for not having executed the control
- Each I/O shall be protected against the reverse polarity of the power voltage to I/O.

12.38 RTU Panels

RTU Panels shall be free standing and conform to NEMA-4 (IP52) requirement. The panels shall have lockable front and rear doors and bottom cable entry and provided with gasket and fitting to keep out moisture, dust, gases and corrosives. The panel shall be naturally cooled.

All doors, drawers, trays and other weight supporting parts shall be fabricated of metal and adequately reinforced to limit vibrations. All components and devices inside the panel shall be well highly and the panel shall have a tidy look.

The bidder shall furnish details of the shelf and inter-shelf wiring and the termination of the wiring harness between the RTU and the terminal block area.. the connections from PCB's to back frame wiring shall preferably be with gold plated edge connectors which utilize a wiping action. Easy access to cabinet wiring for maintenance purpose is essential. The I/O point wires shall not be terminated directly on the I/O boards. Termination panel is to be provided for this.

The CONTRACTOR shall guarantee satisfactory functioning of the system hardware mounted in the panels even in the event of failure of air-conditioning unit.

Each panel shall have provision for fully wired 20% spare additional space on the back pane/ chassis for mounting of additional IOs in future.

Hardware mounted and wired panels of all systems included in the scope of the CONTRACTOR shall be subjected to burn-in operation for minimum 15 days before dispatch to site.

12.39 SET POINT CONTROLS

- All analog output control functions shall utilize the select-check-operate control sequence associated with set point control.

12.40 COMMUNICATION PORT

- The RTU shall support both internal and external communication functions. The communications network internal to the RTU shall be designed and implemented in such a way that the passing of data and commands shall not be prevented by the failure of any module not directly involved in the communication exchange. In addition, the internal network shall not become overloaded under the heaviest traffic possible in an RTU's ultimate expansion configuration.
  a) Each RTU shall recognize its own unique address and shall have the capability of being assigned any address within a range of possible addresses. The LED indication shall be provided in the RTU to check the health of RTU communication.
  b) The RTU shall support DNP 3.0 protocol (both DNP 3.0 (Serial) and DNP 3.0 (TCP/IP)) for communicating with SCADA servers.
  c) The RTU shall have the provision of being polled through its serial port as well as Ethernet port simultaneously from SCADA server.
  d) The RTU shall have dual Ethernet ports (IEEE 802.3) for TCP/IP communication with GAIL SCADA system in multi-dropped environment.
  e) The RTUs shall have the provision to be polled for data by GAIL SCADA system, independently and simultaneously on both communication ports. Both the primary and secondary ports (for SCADA server communication) shall have same data in their buffer at a time.
  f) RTU buffer shall be sized in such a way to include simultaneous polling of 10 flow computers over dedicated point to point serial communication and simultaneous polling of flow computers shall not degrade the performance of RTUs.
  g) Each communication port of RTU shall be isolated and surge protected.

12.41 SERIAL PORT FOR POLLING IED OVER MODBUS (MASTER AND SLAVE)

- The RTU shall be equipped with the necessary no of serial ports for polling the IEDs as specified.
- Each serial port of the RTU shall have following provision for communication with Flow Computer / Gas Chromatograph/Sulfur & Moisture Analyzer / PLC:

a) RS-232C communications
b) Support for baud rates from 4800 bps to 64 kbps.
c) Variable parity: Odd, Even, None
d) Variable data bits: 7, 8
e) Support for various Modbus function codes.
f) Support for Modbus ASCII and RTU
g) Provision to be configured as Modbus Master or slave.
h) DB-9 port for serial communication
i) Diagnostic feature for Modbus communication. It shall be possible to view the Modbus data transfer either in the RTU serial card or through the RTU configuration software for diagnostic purpose

12.42 RTU DIAGNOSTIC AND CONFIGURATION SOFTWARE

- The RTU diagnostic and configuration software shall provide the overall management of the supervision, monitoring and control function within the RTU and communications, comprehensive diagnostic facilities and RTU startup procedures. Bidder to supply licenses for 6 Nos of RTU configuration software.
- RTU configurator / diagnostic software shall have the following provisions:

a) The software shall be compatible with latest Windows OS. It shall be the responsibility of the vendor to install & configure the software in the PC/Laptop provided by GAIL in addition to the laptop supplied by the vendor.

b) DNP index of all I/O points along with real time field value shall be viewable in diagnostic software table/window.
c) Facility to issue controls (DOs) from RTU to field.
d) The RTU configurator shall have provision for configuring / interfacing IEDs (Flow computer/ PLCs/ GC) over MODBUS protocol (ASCII and RTU) with the RTU.
e) The RTUs shall have a self-diagnostic feature (without uploading / downloading RTU configuration to PC/Laptop) and software watchdog timer devices to monitor and report the healthiness of CPU, memory, power supply, comm. Interfaces (both DNP communication with SCADA system and serial communication) and input/output modules at the local level. Further the RTUs shall support remote diagnostics from GAIL's SCADA system so that all these status shall be transmitted to GAIL's SCADA system for displaying in SCADA graphics.
f) The RTU configurator shall have provision for configuring RTU serial port as Modbus slave for polling by third party systems (other than GAIL SCADA servers). It should be possible to assign AI and DI data available in RTU to Modbus register addresses for accessing by 3rd party systems.
g) It should be possible to download configuration to RTUs from the GAIL's SCADA system / PDT online and offline.
h) RTU configurator licenses shall be preferred in software (software key) form instead of hardware (dongle).
i) RTU shall have error detection/control feature to ensure data integrity.
j) It shall be possible to configure, generate and compile RTU configuration file in Offline mode that can be downloaded in RTU

13.0 PACKAGING:

The RTU shall be packaged to withstand rough handling during ocean shipment and in-land journey. It shall be vendor's responsibility to make good any deterioration that occurs during shipment. Sling points shall be clearly indicated on crates.

14.0 DATA AND DRAWING DETAIL

Vendor shall furnish all the documents as per "Vendor Data Requirements" enclosed with Material Requisition/ Job Specifications. All the other documents as per Technical specification and the documents required for better understanding and execution of the job to be supplied by the Vendor.

A certificate from statutory authorities confirming suitability of design / construction of all electrical and electronic items for use in hazardous area classification has to be furnished.

ANNEXURE-1

TECHNICAL SCHEDULE TO BE FILLED BY THE TENDERER

The Bidder shall fill the following technical particulars and submit the same with the offer for selected Remote Telemetry Unit.

Item	Description	Particulars
	GENERAL	
1.	Make	
2.	Model no.	
3.	Degree of protection (IP No.)	
4.	Operating temperature range (degree centigrade)	
5.	Operating relative humidity range %	
6.	Maximum number of I/O modules per subrack Main subrack Extension subrack	
7.	Maximum number of communication modules per subrack	
8.	Selectable communication speed range	
09.	Resolution of time tagging	
10.	High/low limit checking yes/no	
11.	Whether RTU supports self-checkback-execute and time out feature yes/no	
12.	Interfacing with flow computers of different makes (Instromet/Spectra Tek, etc.) yes/no	
13.	Remote configuration and downloading of parameters from Master Station supported yes/no	
14.	Self diagnostic of RTU and reporting it to Master Station yes/no	
15.	Number of serial ports supported in addition to redundant communication links with Master Station (minimum 4 nos.)	
16.	Whether RTU supports connection of portable maintenance diagnostic test unit yes/no	
17.	Whether hardware for 25 % spare installed I/O's for RTU included yes/no	
18.	MTBF for a fully equipped RTU h	
19.	Equipment availability %	
20.	MTTR for a fully equipped RTU h	
21.	Power requirement for a fully equipped RTU W	
22.	Maximum number of I/O modules per RTU (separately for each type to be given)	
23.	Spare capacity for each type of I/O	

Item	Description	Particulars
24.	Rack dimensions	
25.	**Main Processing Module** Module designation	
26.	Microprocessor type	
27.	Word length	
28.	Basic clocking rate	
29.	Engineering unit conversion yes/no	
30.	Arithmatic processor facility with floating point capability yes/no	
31.	Programe location (i.e. EPROM,RAM)	
32.	EPROM k bytes	
33.	RAM k bytes	
34.	RAM battery back up for one month yes/no	
35.	Type of data bus available for communication among the I/O modules (serial/parallel)	
36.	MTBF h	
37.	Equipment availability %	
	Response Times	
38.	Time taken to access and display information requested by the user from the Master Station	
39.	Time taken to write one modified entry to the data base from Master Station	
40.	Time taken to write one modified entry to the data base from RTU maintenance facility	
41.	Time taken to validate a complete database following an instruction from the Master Station	
	Compliance with CCITT recommendations	
42	Physical interface	

Item	Description	Particulars
	ANALOG INPUT MODULE	
1.	Module designation	
2.	Microcontroller/microprocessor type	
3.	No. of inputs per module	
4.	Type of ADC	
5.	Scanning resolution bits	
6.	Whether AI module of self calibrating type and event reporting to Master Station if out of calibration yes/no	
7.	Accuracy %	
8.	Conversion time ms	
9.	Type of Analog multiplexer	
10.	Method of isolation	

11.	Surge withstand capability (as per IEEE Standards)	
12.	MTBF h	
13.	Equipment availability %	
14.	Power requirement W	
15.	Signal support: 4-20 mA and 0-5 V(Yes/No)	
	DIGITAL INPUT MODULE	
15.	Module designation	
16.	Microcontroller/microprocessor type	
17.	No. of inputs per module	
18.	Is input module type configurable as a) Status and alarms b) Sequence of events c) Parallel input d) Pulse accumulator e) Any combination of these	
19.	Contact bounce protection yes/no	
20.	Optical isolation yes/no	
21.	Scan time ms	
22.	Noise rejection yes/no	
23.	Surge withstand capability (as per IEEE standard)	
24.	MTBF h	
25.	Equipment availability %	
26.	Power requirement W	

	DIGITAL OUTPUT MODULE	
27.	Module designation	
28.	Microcontroller/microprocessor type	
29.	No. of outputs per module	
30.	Maximum output current mA	
31.	Maximum switched output voltage V	
32.	MTBF h	
33.	Equipment availability %	
34.	Power requirement W	
	ANALOG OUTPUT MODULE	
35.	Module designation	
36.	Microcontroller/microprocessor type	
37.	No. of outputs per module Max. no. of voltage outputs Max. no. of current outputs	
38.	Type of output interface (DAC)	
39.	DAC resolution bits	

40.	Overall accuracy	
41.	Type of isolation	
42.	Whether module of self calibrating type and event reporting to Master Station if out of calibration yes/no	
43.	MTBF h	
44.	Equipment availability %	
45.	Power requirement W	
	COMMUNICATION MODULE	
46.	Module designation	
47.	Microcontroller/microprocessor type	
48.	No. of communication channels	
49.	Type of communications interfaces supported	
50.	Designation of communication protocol	
51.	Type of protection	
52.	Type of isolation	
53.	MTBF h	
54.	Equipment availability %	
55.	Power requirement W	
56.	The standards to which modem conforms to	

	POWER SUPPLY MODULE	
57.	Module designation	
58.	Nominal input voltage V	
59.	Operating voltage range %	
60.	Output voltage range V	
61.	Input voltage protection kV	
62.	Output voltage protection kV	
63.	MTBF h	
64.	Equipment availability %	
65.	Power requirement for a fully equipped RTU W	