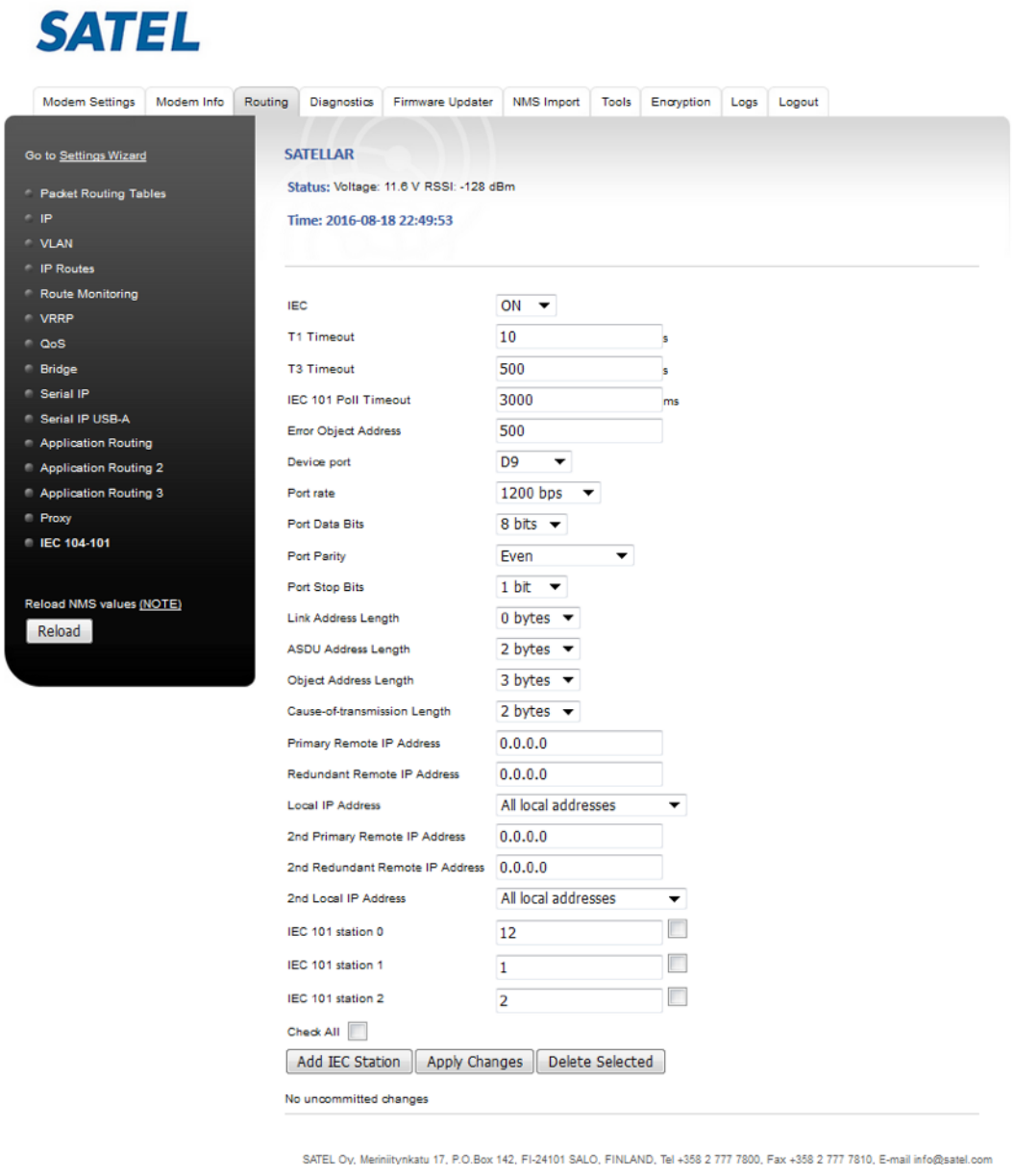
SATELLAR and IEC 104 / 101 conversion

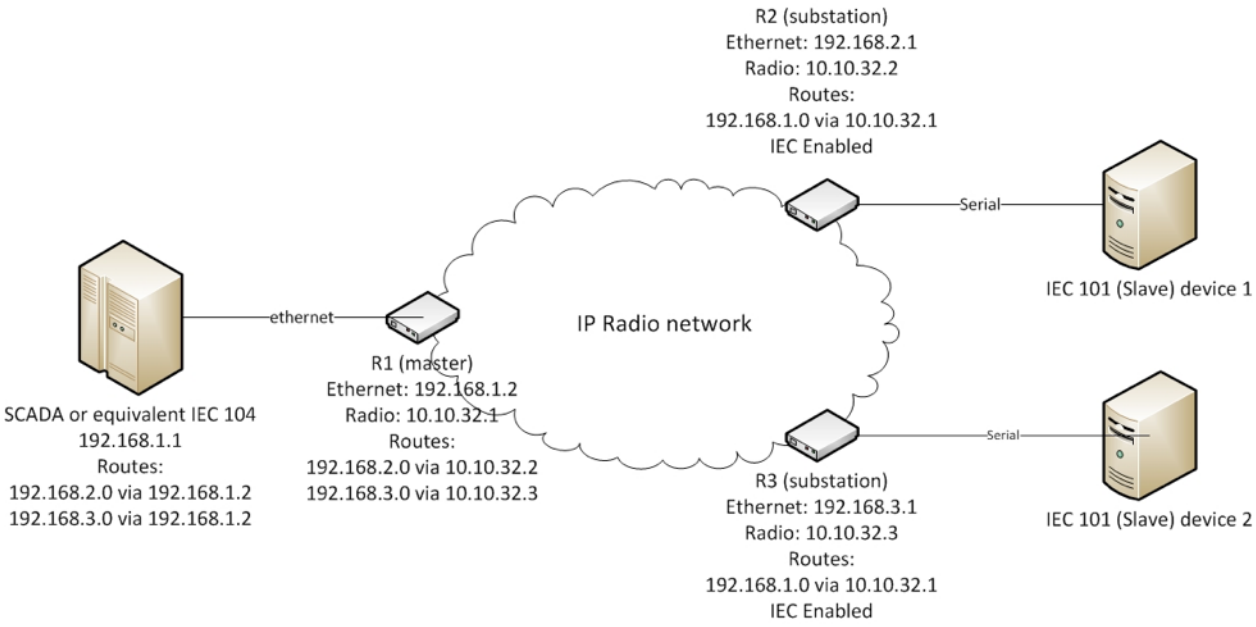
IEC provide a method for supervising and data acquisition in electrical engineering and power system automation applications. It includes several categories including 101 and 104 protocols. IEC 101 provides companion standards is a standard for power system monitoring, control & associated communications for telecontrol, teleprotection, and associated telecommunications for electric power systems. IEC 104 is an extension of IEC 101 protocol with the changes in transport, network, link & physical layer services to suit the complete network access for using TCP/IP interface.

IEC 104-101 includes an interface for enabling IEC 104/101 conversion and 101 and 104 message handling and routing functionality at SATELLAR. When this is set on, CU can receive IEC 104 messages from IP interface and send via defined serial interface as IEC 101 message to their target and correspondingly convert the 101 messages to 104 messages and send them to their target.



SATEL
Mission-Critical Connectivity

In basic scenario master end is acting as a router and substations provide interface to IEC conversion. User enables IEC by setting IEC to state ON at remote substation SATELLAR which is connected to some slave device(s) and is having routes to Satellar at master end which is connected to SCADA. So in this scenario master does not need to have IEC enabled. Master side is connected to SCADA via Ethernet and substations are connected to slave device with serial connection, either D9 connector in SATELLAR or with USB-Serial dongle connected Central Unit. This is selected in user interface. The port where IEC 104 service answers at substations is 2404.



IEC interface includes some IEC traffic related parameters, generic parameters such as definitions of serial interface and some definitions related to usage of service.

Available settings:

Name	Description	Available values (default italic)	Subunit	NMS ID
IEC	Status of IEC service, off or on	*Off*, On	1	1.3621
T1 Timeout	Timeout value for T1 time control by IEC specification as seconds. If no response has been received to I/S/U message sent to master by this time limit, sub-station/slave disconnects	0-65535 (*10*) seconds	1	1.3622
T3 Timeout	Timeout value for T3 time control by IEC specification as seconds. If no I/S/U message has been received from master by this given time, sub-station/slave sends TESTFR (Test Frame) to master.	0-172800 (*500*) seconds	1	1.3623

Name	Description	Available values (default italic)	Subunit	NMS ID
IEC 101 Poll timeout	IEC 101 side polling timeout as in milliseconds. This value sets the time limit for having response for IEC 101 poll messages.	0-65535 (*3000*) milliseconds	1	1.3624
Error Object Address	This value is used with error messages in case polling of some sub-station/slave is not working. If polling of some sub-station is not having responses, IEC service in Satellar sends an alert status message to master with ASDU-address of that station and this object address.	0- 4294967295 (*500*)	1	1.3625
Device port	Selects the interface that is used for IEC 101 traffic serial communication with sub-stations	*D9*, USB-A	1	1.3626
Port Rate	IEC 101 traffic serial port rate	1200, 2400, 4800, 9600, *19200*, 38400 bps	1	1.3627
Port Data Bits	Data Bits of IEC 101 traffic port	7 bits, *8 bits*	1	1.3628
Port Parity	Parity of IEC 101 traffic port	No parity check, *Even*, Odd	1	1.3629
Port Stop Bits	Stop Bits of IEC 101 traffic port	*1 bit*, 2 bits	1	1.3630
Link Address Length	Length of device or station address	0 bytes, *1 byte*, 2 bytes	1	1.3631
ASDU Address Length	ASDU denotes separate segments and its address inside a device. This parameter defines the length of this address field.	1 byte, *2 bytes*	1	1.3632
Object Address Length	Object address provides address of the information object element. This defines the length of that address.	1 byte, 2 bytes, *3 bytes*	1	1.3633

Name	Description	Available values (default italic)	Subunit	NMS ID
Cause-of-transmission Length	Cause of transmission indicates causes of data transmissions like spontaneous or cyclic. This defines the length of that field.	1 byte, *2 bytes*	1	1.3634
Primary Remote IP Address	Primary remote address i.e. IP address that is used for communication to master in the first instance. When defined, connections only from this defined IP are accepted.	IP address (*0.0.0.0 i.e. any address*)	1	1.3635
Redundant Remote IP Address	Redundant remote address i.e. IP address that is used for communication to master in case primary IP is not available. When defined, connections only from this defined IP are accepted (in side of primary IP). Connections cannot be simultaneous. In case connection from redundant IP is done when connection from primary is ongoing, allowed IP primary connection is ended. As a default value is 0.0.0.0 which means that redundant IP is ignored i.e. it does not mean accepting all addresses.	IP address (*0.0.0.0 i.e. any address*)	1	1.3636
Local IP Address	Address that answers to IEC 104 service requests. Value can be selected from any of existing addresses e.g. 192.168.1.1 eth0. To set responding from any of existing addresses, value is set to either All Local Addresses.	Available IPs in device *(All local addresses i.e. no limitation)*	1	1.3637

Name	Description	Available values (default italic)	Subunit	NMS ID
2nd Primary Remote IP Address	2nd Primary remote address is IP address that is used for communication to second or alternative master in the first instance. Second master is a possible alternative IEC service instance. This way user can define two service instances that are limited to answer to requests only from defined IP addresses. When defined, connections only from this defined IP are accepted. Default value 0.0.0.0 means that this service is not started at all. To start second service instance this must be defined to some other than 0.0.0.0 and also first service instance must have at least primary IP defined to something else than 0.0.0.0.	IP address *(0.0.0.0 i.e. any address)*	1	1.3638
2nd Redundant Remote IP Address	2nd Redundant remote address is IP address that is used for redundant communication to second or alternative master in case primary IP is not used. When defined, connections only from this defined IP are accepted (in side of primary IP). Connections cannot be simultaneous. In case connection from redundant IP is done when connection from primary is ongoing, primary connection is ended. Default value is 0.0.0.0 which means that redundant IP is ignored i.e. it does not mean accepting all addresses.	IP address *(0.0.0.0 i.e. any address)*	1	1.3639

Name	Description	Available values (default italic)	Subunit	NMS ID
2nd Local IP Address	Address that answers to alternative or second IEC 104 service requests. Value can be set to any of existing addresses. To set responding from any of existing addresses, value is set to All Local Addresses. This is used only if second master altogether is started.	Available IPs in device *(All local addresses i.e.no limitation)*	1	1.3640
IEC 101 Station	User can manually create list of IEC stations and modify that list or they are added automatically when stations are called. Adding is done with Add IEC station button. If user adds stations manually, only those station numbers are handled, others are discarded.	0-65535 *(No stations)*	1	1.3649

IEC traffic related settings are generic IEC parameters but definitions related to usage of service are more related to this specific device. This parameter set includes two primary and redundant remote IPs and local IP addresses. As a default, all primary and redundant remote IPs are set as 0.0.0.0 and local IP addresses are set to state All Local Addresses.

Remote IP value 0.0.0.0 means that service accepts connection requests from any IP that connect to device. If Primary Remote IP is in that state, then other Remote IP parameters are not used. If user defines Primary Remote IP to something else than 0.0.0.0 it means three things. First, it limits the scope of addresses this main master responds to only to this address. Second, it makes possible to start alternative master by defining some other IP than 0.0.0.0 to 2nd Primary Remote IP Address.

So if e.g. Primary Remote IP Address is defined to 192.168.1.100 and 2nd Primary Remote IP Address 192.168.1.200, there are two processes running which can respond to these and only to these addresses simultaneously.

Third thing is that after defining of primary IP, service can also use redundant IP if it is defined to something else than 0.0.0.0. Redundant IP offers a possibility to use second IP for service. If connection was first made from primary IP and then from redundant, connection to primary IP is disconnected and redundant IP connection established.

Local IP Address parameters are used to limit the connection only to some interface or IP at CU. Default All Local Addresses means that service can use any IP available in device for connection. This means that IPs where it can respond to requests include all IP address currently set to device i.e. Ethernet IPs, radio (tun) IP and possible VLAN IPs. In case some other option (i.e. some particular IP and interface) is selected, then service responses only at that interface and IP.

List of available IEC 101 stations can be formed either automatically by addresses in messages send by SCADA or they can be added manually. In case user adds the stations manually, only those station numbers are handled, others are discarded.