

E Series

User Manual

Teleste Corporation



E3 Compact amplifier

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Introduction

E3 is a compact dual output amplifier with wide 16...42 dB gain adjustment range making it suitable for both distribution purposes and line extender use. The E3 amplifier supports 1.2 GHz frequency range which ensures fulfilment of all future bandwidth needs. The upstream signal path is flexible and it can be updated to 204 MHz.

Adjustments use electrical controls thus eliminating the need of the usual plug-in attenuators in the system set-up. Other standard features include reliable power supply, built-in return path amplifier as well as an efficient surge and ESD protection.

Ingress switches can be remotely controlled via FSK communication of an optional E61 RIS receiver. This one way communication channel also enables remote update of software.

Local configuration of E3 is done via its built-in display and pushbutton user interface. E61 module can be used to add USB interface for configuration using a Windows PC or tablet equipped with CATVisor Commander software or Android mobile device equipped with Teleste Commander software. Wireless Bluetooth connection can be established with AC6901 USB to Bluetooth adapter.

E3 hardware generations

E3 has 2 generations with some differences in hardware and functionality: 1st generation E3 was manufactured until Q3/2018. It has 0 / 13 dB selectable interstage slope. 2nd generation E3 manufacturing started Q2/2018. It has 0...15 dB 1 dB step adjustable interstage slope.

Installation

Mounting

The E3 can be installed either into a street cabinet or to a sheltered outdoor environment. The amplifier should be installed vertically so that the external cable connectors and ventilation hole are facing downward. Figure 1 depicts for the positions of mounting brackets as well as other installation dimensions. Mount the E3 securely onto a wall using appropriate length 5 mm mounting bolts/screws (not supplied) and tighten the mounting bolts/screws. The amount of torque required depends on the mounting surface.

When installing the amplifier in its final location, make certain that it has adequate ventilation on all sides. In particular, it is necessary to provide at least 150 mm of room above and below the node for air circulation. The lid of the amplifier may be opened from either the left or right hand side or removed altogether. This flexibility improves accessibility and permits greater freedom to install the amplifier in confined spaces. Hint! Easiest way to remove the lid is to pull it from retaining bolt after it has been detached from the base.

The lid retaining bolts are fastened with a 4 mm hex key. Use no more than 3 Nm torque. The E3 enclosure classification is IP67. However in standard delivery condition the lowest side wall is equipped with a 1 mm ventilation hole. Thus the practical class of enclosure is IP54 when amplifier is correctly installed and tightened.

Note: IP54 type enclosure - This enclosure provides protection from airborne dust and light sprays or splashing water from all directions.

Before closing the lid is should be checked that:

- nothing is trapped between the lid and the case
- all case gaskets are intact and in their correct positions
- lid seats evenly on the rubber gasket

E3 housing should be grounded using a copper conductor of least 4 mm² cross section area from a proper earth to the housing ground lug.

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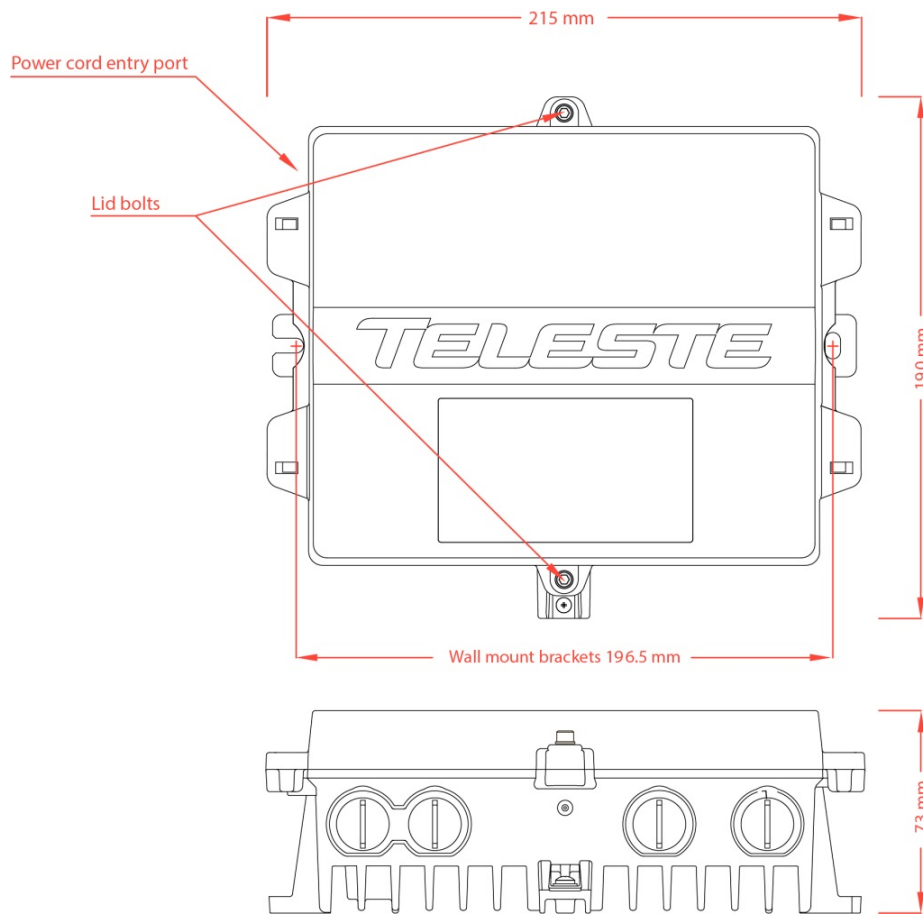


Figure 1. E3 housing dimensions – top and side view

Interfaces

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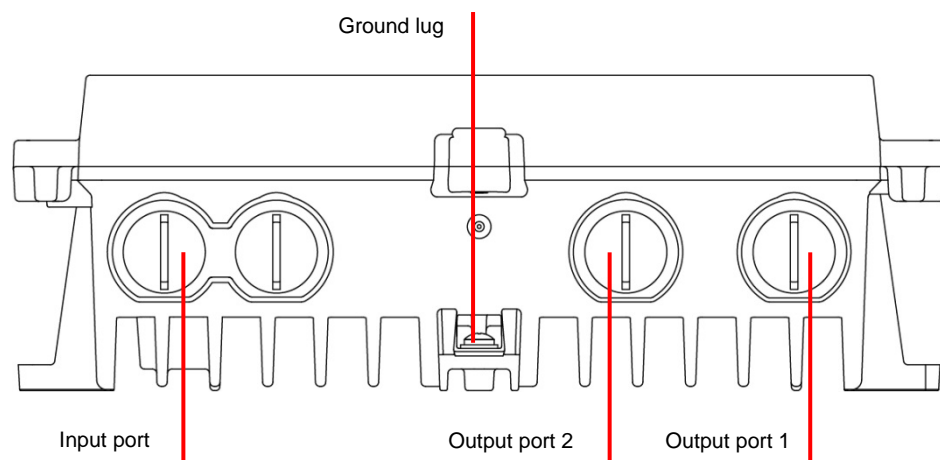


Figure 2. Port locations

The E3 has three dedicated cable connection points: Input and two outputs.

Coaxial connections

The E3 amplifier requires pin-type connectors for all RF connections. The E3 amplifier has spring loaded seizure assemblies on coaxial ports that provide a tight connection with precise alignment between contact points. All coaxial output ports have a standard PG11 thread. Note that Teleste KDC327 (PG11–F) and KDC328 (PG11-3.5/12) connectors fulfils the centre pin equipment requirement for E series.

Suitable length for the centre conductor pin is approximately 21 mm (Figure 3). Pin-type connectors, with pins extending from 19 mm to 23 mm from the connector shoulder, require no trimming. Any longer pins must be trimmed before inserting them into the housing. After cutting the pin, trim the sharp edges. Using connectors with centre conductors pins exceeding 1.8 mm in diameter will permanently damage spring loaded seizure assemblies. Ensure that the centre conductor pin is not deformed, causing destruction of the spring loaded seizure assembly. Note! When using KDC314 (PG11-5/8) adapter, the length of connector's centre connector pin must be 33 mm \pm 2 mm.

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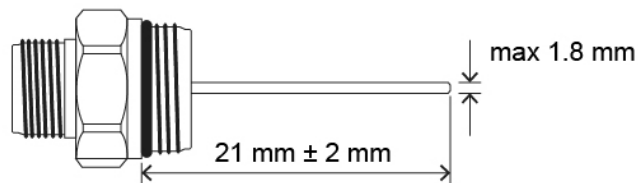


Figure 3. Centre conductor length

Powering



NOTE! Do not remove the shielding cover. There are no user serviceable parts inside. Unauthorized repairs or modifications result in permanent damage to the equipment, and will void the warranty.

Common precautions:

- The E3 amplifier is intended for installation in restricted access locations (dedicated equipment rooms, equipment closet, or the like)
- Operate the device only on the specified supply voltage.
- The E3 must never be operated without its power supply unit shielding cover.
- The E3 has no separate power switch thus the power plug must be easily accessible.
- Disconnect the power cord by the connector only. Never pull on the cable portion of the power cord.
- Do not place or drop heavy or sharp-edged objects on the power cord.
- The power must be disconnected when installing or removing the E3.

Additional safety requirements for Norway and Sweden:

Equipment connected to the protective earthing of the building installation through the mains connection or through other equipment with a connection to protective earthing and to a cable distribution system using coaxial cable, may in some circumstances create a fire hazard. Connection to a cable distribution system must be provided through a device providing electrical isolation below a certain frequency range (galvanic isolator, see EN 60728-11).

The E3 is available either with a remote or local powering option. The E3 has an integrated power supply that cannot be replaced. The following subsections describe the differences.

E3 with remote powering (27...65 V AC)

The supply voltage of the remote powered E3 model (27...65 V AC) is supplied via input/output RF ports only. Feed through capacity is max. 7 A / port. On delivery, RF ports are provided with fuses. Local connection for remote feed is not possible thus the power cord entry port must be plugged.

E3 with local powering (205...255 V AC)

The locally powered E3 model is connected to the mains voltage of 205...255 V AC with its own power cord and has no fuses nor AC feed-through in its RF ports. The power supply unit is double shielded and does not require separate grounding. However, ensure that the housing of the E3 is properly connected to the earth in order to meet safety requirements. Proper grounding will also improve protection from the effects of interference and thus increase the overall reliability of the system.

Front panel

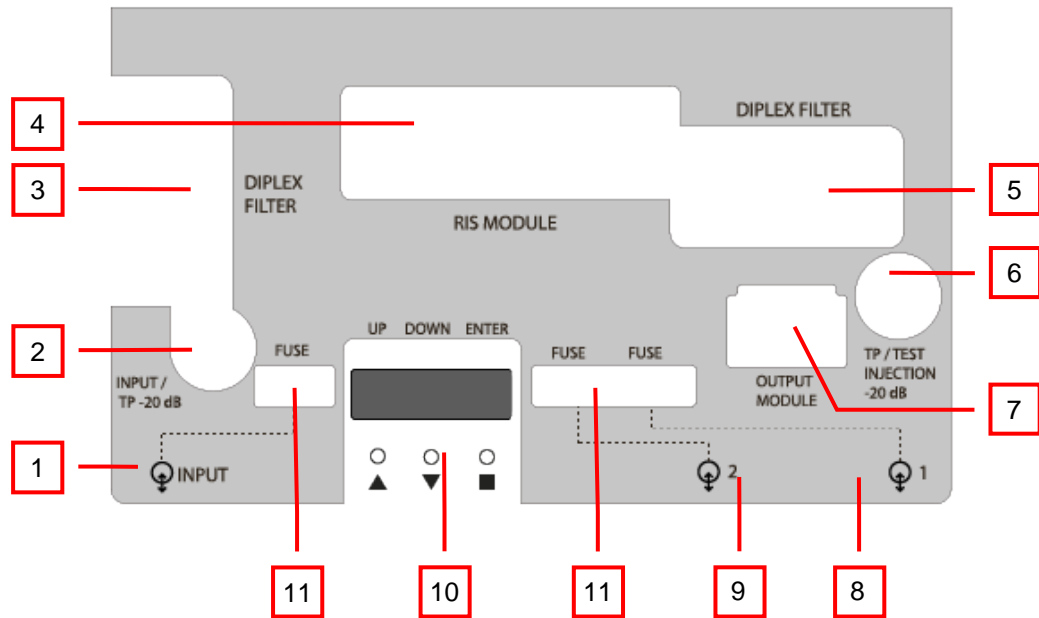


Figure 4. E3 front panel (remotely powered model)

- | | |
|--|---|
| 1) Input port | 6) Output test / injection point, F female (-20 dB directional coupler) |
| 2) Input test point, F female (-20 dB resistive coupler) | 7) Output module (see Table 2) |
| 3) Input diplex filter module | 8) Output 1 port |
| 4) Slot for RIS module | 9) Output 2 port |
| 5) Output diplex filter module | 10) Local user interface |
| | 11) Fuses (only in remote powered model) |

Features

Diplex and output modules

The E3 amplifier is delivered according to the ordering code.

The installed diplex filters (Figure 4 positions 3 and 5) must be new 1.2 GHz types which are automatically detected by the software. The supported diplex filter types listed in Table 1. It is also possible to order the amplifier without diplex filters.

Diplex filters are automatically recognised by the software. "Unknown module" alarm is activated if diplex filter type cannot be detected or if input diplex filter frequency is different than output diplex filter frequency.

Diplex filter	Functionality
CXF065	65/85 MHz frequency split
CXF065 10	65/85 MHz split with ingress blocker, passband f>10 MHz
CXF065 19	65/85 MHz split with ingress blocker, passband f>18MHz
CXF085	85/105 MHz frequency split
CXF204	204/258 MHz frequency split

Table 1. Supported diplex filter types

Output modules are passive plug-ins used to control the outputs – see Table 2.

Module	Functionality as output module	Output 1	Output 2
AC6120	0 dB output module, 1 output in use	0 dB	not used
AC6113	2/8 dB tap, 2 outputs in use	-2 dB	-8 dB
AC6114	2/12 dB tap, 2 outputs in use	-2 dB	-12 dB
AC6115	1/16 dB tap, 2 outputs in use	-1 dB	-16 dB
AC6124	Two-way splitter, 2 outputs in use	-4 dB	-4 dB

Table 2. Output modules with corresponding nominal attenuation values

Forward path

The input and output amplifier stages are both based on high performance solutions which allow the user to set E3 outputs for high and low output levels. The output stage uses a GaN hybrid to improve RF performance over the entire 85 to 1218 MHz passband. Note that E3 must have a proper matching at output port(s) to ensure optimal and reliable operation.

Forward path gain control

E3 has two gain control elements in its forward path signal route: input gain and interstage gain. The software automatically adjusts these elements based on the desired total gain. The total gain is adjustable between -26 and 0 dB in 0.5 dB steps.

When the built-in cable simulator is enabled (input slope < 0 dB) by the user, the available forward path gain decreases by 13 dB. The software automatically compensates for this as far as possible by changing the total gain value by + 13 dB. The opposite happens when cable simulator is disabled.

Forward path slope control

Forward path slope is the frequency response level difference between 85 and 1218 MHz. It is controlled by two elements:

- 1) **Input slope**, coupled with built-in cable simulator: Adjustable between -13 and 20 dB in 0.5 dB steps. Negative values enable the built-in 13 dB cable simulator and reduce the maximum gain by 13 dB. Forward path gain is automatically adjusted to 13 dB higher value, if possible, to compensate for the gain loss caused by the cable simulator.
- 2) **Interstage slope**: Adjustable between 0 and 15 dB in 1 dB steps. Note that 1st generation E3 amplifiers have only two choices: sloped (13 dB) and flat (0 dB).

Interstage slope should be set according to desired output slope. After selecting the correct interstage slope the low frequency output signal levels should be adjusted with a measurement instrument using input slope control.

Increasing slope value decreases low frequency signal levels.

Power save

The RF performance and power consumption of E3 can be adjusted by controlling the output hybrid's current. Power save is disabled as factory default. This ensures full performance and should be used if output levels are close to maximum.

If output levels are more than 2 dB below the specified maximum levels the power save can usually be enabled to achieve a ~3 W reduction in power consumption without any effect on RF performance.

Return path

E3 amplifier supports 65 MHz, 85 MHz and 204 MHz return path. The return path bandwidth is automatically set according to the installed diplex filters. If diplex filter type cannot be detected, or the installed diplex filters are not the same type, the "Unknown module" alarm is set and 65 MHz bandwidth is used.

Return path gain and slope control

Return path gain can be adjusted between -20 and 0 dB in 0.5 dB steps.

Return path slope can be adjusted between 0 and 15 dB in 0.5 dB steps.

The return path slope control pivot frequency is 204 MHz (slope measured between 5 and 204 MHz) when 204 MHz diplex filters are installed, otherwise 85 MHz (slope measured between 5 and 85 MHz). Note that in 65 MHz operation the signal level at 65 MHz is thus also affected by slope control which has 85 MHz pivot frequency.

If diplex filters are changed so that the slope pivot point frequency changes, the E3 software automatically readjusts return path gain and slope controls to obtain similar frequency response.

RFF (Return Follows Forward) functionality

When forward path gain and slope are adjusted by the user, E3 software automatically adjusts return path gain and slope accordingly. This RFF calculation assumes that all needed forward path gain & slope is due to splitting (flat) and cable losses between this and previous amplifier. If the forward path output levels are the same for this and previous amplifier, RFF typically adjusts return path so well that fine-tuning may not be needed at all.

RFF is enabled as factory default. It is automatically disabled if return path gain or slope is adjusted manually. RFF can be re-enabled or disabled by the user.

RFF adjusts only gain and slope. It does not change return path input gain and ingress switch settings and does not take these into account in calculation.

Return path input gain

The return path input gain can be used to add a fixed 10 dB flat attenuation to the first return path gain control element. This can be useful in certain situations, e.g. to force cable modems to transmit at higher levels resulting in better SNR.

The use of return path input offset is similar to adding a return path input attenuator plug to a traditional amplifier equipped with plug-in slot.

Ingress switch

Ingress switch can be used to attenuate return path by 6 dB or to cut it off completely. The ingress switch can also be controlled remotely using Teleste RIS system when E61 module is installed. Remote control overrides local ingress switch control.

Teleste CATVisor Argus element management system supports SmartRIS which can automatically control ingress switches and isolate ingress problems based on ingress measurements in intelligent Teleste amplifiers and nodes.

Alarms

The E3 alarms displayed in local user interface and PC / Android viewer are described in the table below.

The alarm texts are displayed in separate rows in the local user interface. When the display is sleeping, slowly blinking dot “.” means no alarms and rapidly blinking “E” means at least one alarm. See also “Local user interface” chapter.

Local UI text	Alarm in viewer	Description & suggested corrective action
E . INT	Internal error	E3 has an internal error. If resetting the unit doesn't help, contact Teleste support.
E . PLu	Unknown module	E3 is not able to recognise RIS module or diplex filter type, or diplex filter frequencies do not match. If software is up to date and removing and reinstalling the plug-in modules doesn't help, contact Teleste support.
E . PSu	Power supply failure	Internal voltages are not OK. If the AC supply voltage is within specification and resetting the unit doesn't help, contact Teleste support.
E . ACV	AC voltage high	Remote AC voltage is above 65 V _{RMS} .
	AC voltage low	Remote AC voltage is below 27 V _{RMS} .
E . TMP	Temperature high	Internal temperature is above 85 °C.
	Temperature low	Internal temperature is below -20 °C.

Table 3. E3 alarms

Local user interface

E3 has a local user interface consisting of a 4*7-segment display and 3 buttons. This local UI can be used for E3 configuration in cases where E61 RIS module is not installed or the use of a PC, tablet or smartphone equipped with CATVisor Commander is not desired.

Using the local user interface

During power-up "Teleste E3R/L X.Y" text (where X.Y indicates the installed software version, R indicates remote powering and L local powering) scrolls through the display. Pressing the "Enter" button (right button with ■ symbol) wakes up the display and activates the first menu item. If there is no button activity during ~3 minutes, the display will go to sleep mode. When in sleep mode, a slowly blinking dot "." in the display indicates no alarms and rapidly blinking "E" indicates alarms.

The menu structure is described in Figure 5. The "Up" (left button with ▲ symbol) and "Down" (middle button with ▼ symbol) buttons browse through the menu items, The "Enter" button selects the item for modification / reading, "Up" / "Down" changes the value of the selected item and "Enter" returns to the menu.

Possible alarms are displayed in separate rows in the beginning of the menu. For additional information about alarms, see the "Alarms" chapter.

PIN code

A PIN code can be used to prevent unauthorised local access. The PIN code is disabled (0000) as factory default. It can be changed via the local user interface or via PC / Android viewer when using E61 module.

If the PIN is enabled, i.e. set to value other than 0000, it needs to be entered with "Up" / "Down" / "Enter" buttons each time the display wakes up from sleep. If the PIN is enabled and forgotten it can only be reset via PC / Android viewer and E61 module.

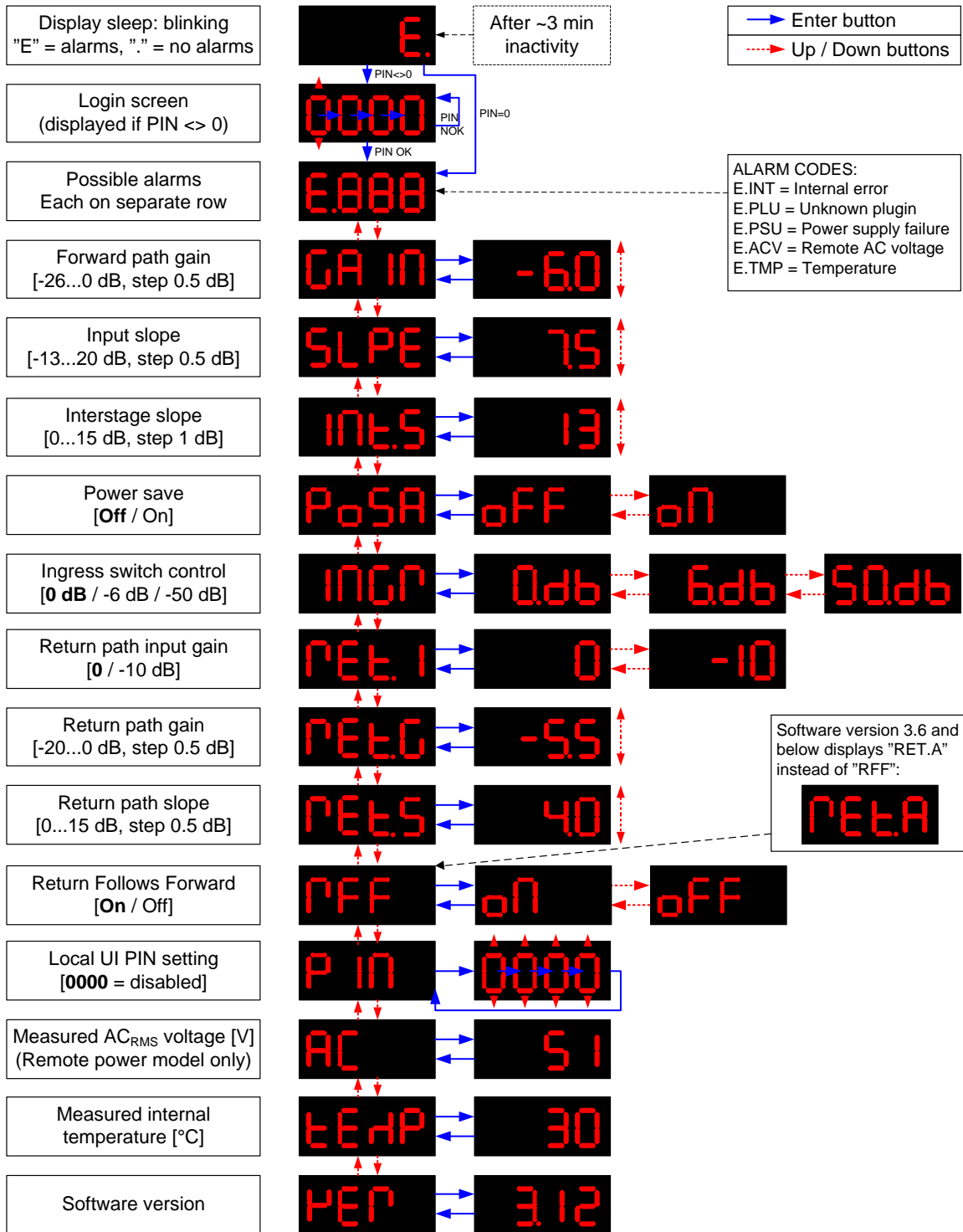


Figure 5. E3 local user interface menu structure. Factory default values are in bold.

E61 RIS receiver with USB

Installation

E61 can be installed without turning off the power by simply pushing the unit firmly to its location marked with “RIS module” until it snaps into place.

The MAC address visible in E61 front panel should be recorded during installation together with unit location and other information. This makes it possible to later add the unit into HDM155 RIS controller device table and EMS system. This data can also be stored and transferred easily using Teleste Commander software for Android devices.

Note that E61 automatically updates E3 software if it detects different version that is included inside E61. Thus it is recommended to make sure the E61 software version is up to date before installing it into E3. See the “Software update” chapter for details.



Figure 6. E61 installed into E3

E61 automatically scans for RIS carrier generated by HDM155 RIS controller within its tuning range. When a carrier is found, E61 locks to the carrier and reacts to commands sent to its MAC address. If E61 doesn't receive any packets during 1 minute it starts scanning again.

E61 front panel has a “RIS” led which indicates communication status:

- **Dark:** Searching for RIS carrier.
- **Blinking green:** Locked to RIS carrier, but no commands received in last 2 minutes. This usually means that this E61's MAC address has not been entered in RIS controller's device list.
- **Green:** Locked to RIS carrier and receiving commands.
- **Yellow:** Locked to RIS carrier and received “Ingress attenuate” command.
- **Red:** Locked to RIS carrier and received “Ingress off” command.

Establishing connection

In addition to the local user interface, the E3 amplifier can also be configured with a PC, tablet or smartphone when E61 module is installed.

Connection to E3 is possible using the following methods:

Local configuration with a PC through E61 RIS receiver USB port

CATVisor Commander 2.10 or later and up-to-date DUS100 user interface collection is needed for USB and Bluetooth support. These both are available for download in Teleste extranet (MyTeleste).

Connection to E61 USB port can be done with a standard USB A plug to USB mini B plug cable, or via AC6901 USB to Bluetooth adapter. The cable or adapter should be disconnected when not in use to avoid possible EMC problems caused by the cable acting as an antenna.

E61 will draw power from the USB connector for E61 and E3 microcontroller and memory if no external power supply is available. This makes it possible to configure E3 settings and update the software without any power supply.

Note that as only the CPU part of the unit is powered via USB, many parameters visible via the user interface may display incorrect values. Installing and removing plug-in modules while the unit is USB powered is not recommended and may lead to unexpected behaviour.

Local configuration with an Android device

Teleste Commander software for Android devices can be downloaded from Google Play. Connection to E61 USB port can be done via AC6901 USB to Bluetooth adapter. The adapter should be disconnected when not in use to avoid possible EMC problems caused by the adapter acting as an antenna.

Remote ingress switch control via RIS link

RIS controller module HDM155 can be used for controlling E3 ingress switch remotely when E61 is locked to HDM155's carrier. Remote ingress switch control overrides local control. See HDM155 documentation for more details.

Software update

New software versions for E3 and E61 are published at Teleste extranet (MyTeleste). These may contain bug fixes, enhancements and completely new features. For details see the software release history documents also available in MyTeleste.

E3 software

E3 software can be only updated using E61 module. The E61 software includes the E3 software image. Every time E61 software starts it checks the E3 software version. If it does not match with the version of the E3 software image included in E61 software, the E61 automatically updates E3 software.

Ongoing E3 software update is indicated with multicolour blinking of E61's "RIS" led and typically takes half a minute to complete. E3 new software starts automatically when the software update completes. If the software update is interrupted by e.g. a power failure, E61 resumes update immediately when power returns. Note that E3 does not have functioning software during the software update, so short RF breaks will appear. If E61 is removed during the software update the E3 will not have any software and does not function at all until E61 is installed again and it completes the software update.

E61 software

E61 software can be updated locally via USB or AC6901 Bluetooth adapter using CATVisor Commander or Teleste Android Commander. It is also possible to update E61 software (and thus also E3 software) remotely via the RIS link. Contact Teleste support for more details on remote software update.

The new E61 software is taken into use after it has been completely transferred and the device is reset. This reset takes ~10 seconds after which the E61 is fully functional and running the new software and, if needed, starts to update the E3 software. If the E61 software update fails, E61 continues to use its original software.

Viewer pages

This chapter presents E3 graphical user interface (=“viewer”) pages when connecting to E3 with CATVisor Commander PC software via E61 module USB port using USB cable or AC6901 Bluetooth adapter.

The same settings but in slightly different layout are also available when using an Android tablet or smartphone with Teleste Commander software.

Status viewer page

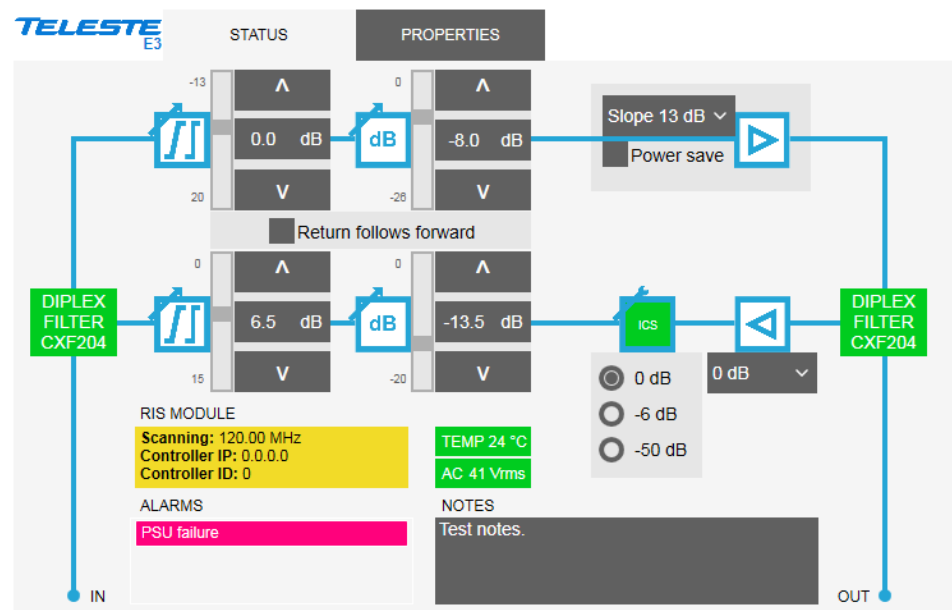


Figure 7. The Status page

The Status page displays unit's alarms and controls together with measurement data and a graphical view of the current configuration.

Forward and return path controls

Forward path interstage gain and slope and return path input gain can be selected from the drop-down menu according to installation requirements.

Gain and slope can be adjusted by clicking the up and down buttons or typing a value into the fields. The slider indicates relative position of the control to its limits.

When “Return follows forward” is checked, return path gain and slope are automatically adjusted based on forward path settings and frequency range. Adjusting return path manually disables this RFF feature.

The radio buttons control the ingress switch. The “-50 dB” selection cuts off the return path RF signal and thus disconnects all cable modems behind this unit. If ingress switch commands are received via RIS link they override local control.

Detected diplex filter types are shown in respective positions in green when the types are detected OK and match each other, otherwise in red.

RIS module

When E61 module is installed, the communication frequency and status is shown with:

- **Scanning:** Searching for RIS carrier.
- **Locked:** Locked to RIS carrier, but no commands received in last 2 minutes. This usually means that this E61's MAC address has not been entered in RIS controller's device list.
- **Connected:** Locked to RIS carrier and receiving commands.

The **Controller IP** and **Controller ID** fields display the RIS controller (HDM155) identification data received via RIS link. These are needed in networks equipped with multiple RIS controllers for assigning the RIS receivers to correct RIS controllers.

Alarms

Active alarms are listed in the bottom left corner and colour coded according to severity. For additional information about alarms, see table of module alarm descriptions in the "Alarms" chapter.

Measurements

The "TEMP" field displays E3's internal temperature. It is typically 10...25 degrees above ambient temperature depending on installation.

The "AC" field is visible only with remote powered E3 model and shows the measured RMS value of the remote supply voltage. This value is calculated using sliding average and thus reacts quite slowly to changes.

The background colour of each field shows the parameter's alarm status.

Notes

The "Notes" field allows storing up to 200 character message into unit non-volatile memory.

Properties viewer page

IDENTIFICATION		STATISTICS	
NAME	Test unit	UPTIME	0 d 00:08:40
LOCATION	PAT	TOTAL UPTIME	106 days
CONTACT	salosa	RESET COUNT	5
COORDINATES	NORTH: 60° 26.575' EAST: 22° 22.392' FORMAT: dd° mm.mmm' v	FOSS LIST	
SAVE RIS INFO			
PROPERTIES		SECURITY	
	STATION	RIS MODULE	PIN CODE
TYPE	E3	E61	0000
HARDWARE VERSION	A1.0	B1.0	
SERIAL NUMBER	SK12345678	SK11012017	
SOFTWARE VERSION	2.3	2.3.4	
MAC ADDRESS	N/A	009050AC6992	

Figure 8. The Properties page

The “Properties” page displays unit identification and statistics data.

Identification

A descriptive alias name for the station can be entered into the “Name” field, site location into “Location” field and contact information into “Contact” field. All these fields can contain up to 63 characters.

The geographical coordinates can be entered into respective latitude and longitude fields. The preferred format for the coordinates can be selected from the "Format" drop-down field. When entering coordinates, special characters (°/'") can be simply omitted.

The "Save RIS info" button opens a dialog for saving RIS identification data to a file. This file can then be used for adding the amplifier to management system.

Properties

The type, hardware version, serial number and software version are shown for both station and RIS module. RIS module MAC address used for remote communication is displayed here and on RIS module front panel.

Statistics

The “Uptime” field shows the time since the last reset or power up. The format is days, hours, minutes and seconds, with ±5 s/day accuracy.

The "Total uptime" field shows the total number of full operating days.

The "Reset count" field shows the total number of resets.

Security

The PIN code can be enabled to protect the E3 local user interface from unauthorised access. When a value other than 0000 is entered, the correct PIN needs to be entered every time the local user interface is used. Note that the PIN is not needed for PC/smartphone/tablet configuration via E61.

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http://www.st.com/software_license_agreement_liberty_v2
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"dspic", MPLAB X (free edition): <http://www.microchip.com/pagehandler/en-us/family/mplabx/#documentation>
"redlib", RedSuite (FULL) redlib: <http://www.code-red-tech.com/RedSuite5/red-suite-5.php>
"dspic", MPLAB X (free edition): <http://www.microchip.com/pagehandler/en-us/family/mplabx/#documentation>
"steeprom": <http://www.st.com/web/catalog/tools/FM147/CL1794/SC961/SS1743/PF257846>
"cdc": UART to CDC Modem Sample Application: <http://www.ftdichip.com/Firmware/Precompiled.htm>

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