CERTIFICATE OF DESIGN AND CHECKING FOR NON-COMPLEX WORKS FORM Issue 1.02

Title of Scheme: West Anglia Station Project			**PRS Ref:**	
Location:	**ELR:**	**Mileage:**	**OS Grid Ref:**	**Structure No:**
Bush Hill Park Station	HDT	5m 3ch	TQ 334880	NA

There is 1no. wall mounted SOD on platform 2.

1.2 Proposed works

The scope of works to be carried out at this station has been devised from the specification provided by LOROL: Project Specification:

Bush Hill Park document ref WASP-LBSH-GEN-SPE-RFL-00001 rev A01 of the services required for the station improvements project.

The requirements can be separated into four specific sub-systems, Public Announcement, Closed Circuit Television, Customer Information and Passenger Help Point Systems. A breakdown of the requirements and the specific solution for each of the sub-systems is provided below.

PUBLIC ANNOUNCEMENT SYSTEM

The remit with the WASP specification for this station requires the supply of a Network Rail Compliant Public Announcement system.

A complete new system will be provided based on the Ateis IDA8 product that is currently in place at one other London Overground station.

During the process of the production of this document a design elevation between the two systems used by London Overground on their stations, namely the ASL and Ateis system, was carried out.

In the comparison of the two systems it was found that the price difference of the procurement of the hardware and build of the system itself was negligible, whilst differences between the systems themselves where significant.

Ultimately the Ateis IDA8 based system was selected based on the fact that the ASL PA system is currently being phased out be the manufacturer and replaced with the more expensive Vipedia solution. In comparison the Ateis IDA8 system is a current product with a sustainable maintenance path, which also provides a greater level of future expandability and also offers the additional benefit of being able to form part of a compliant Voice Alarm system should the station later be upgraded or any lifts be installed at the station.

The new Ateis based IDA8 PA system will be formed of a single IDA8C audio router which will manage all inputs, outputs and interfacing with the PCDVA system which will is detailed.

The IDA8C audio router will manage the station announcements which will be provided via a single DPAfour125 amplifier unit capable of providing up to 500W of PA amplification across a total of 4 separate zones.

The audio router and PA Amplifier will be installed within a new central SISS equipment cabinet which will be provided with the store room where the existing CER is located.

New speakers have been provided for non-platform areas and all areas of the station platforms within which the current 8 car rolling stock comes to rest.

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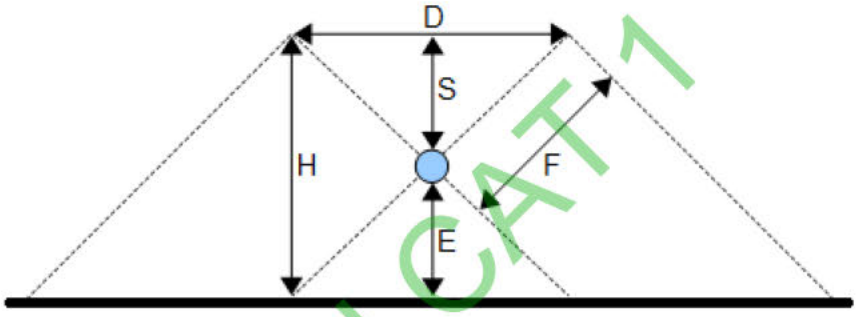
Bush Hill Park Station	HDT	5m 3ch	TQ 334880	NA

Open areas of the platform will be served by lighting column mounted Penton CAD10/TC speakers which will be cabled in an A/B arrangement in order to provide redundancy for the failure, damage or vandalism of a single speaker chains cabling.

A desktop calculation of the suitability of the speaker selected against the arrangement that is being provided for the PA system has also been carried out as part of the design process for the PA system. The below details show the calculations formulated to evidence the conformance and suitability of this design for SPL levels that will be provided be the PA system:



Speaker Height (H)	2.5	m
Distance Between Speakers (D)	11	m
Furthest Distance to Hear (F)	5.6	m
Shortest Distance to Hear (S)	2	m
Height of Ear (E)	1.5	m

CAD10T	Metres						
Watts	**1**	**2**	**3**	**4**	**7**	**8**	**5.6**
1	90 dB	84 dB	80 dB	78 dB	73 dB	72 dB	75 dB
1.25	91 dB	85 dB	81 dB	79 dB	74 dB	73 dB	76 dB
2.5	94 dB	88 dB	84 dB	82 dB	77 dB	76 dB	79 dB
5	97 dB	91 dB	87 dB	85 dB	80 dB	79 dB	82 dB
10	100 dB	94 dB	90 dB	88 dB	83 dB	82 dB	85 dB

90 dB	= Quoted performance figure from Penton data sheet
66 dB	= Assess average SPL for station + 10db

During the comms sites surveys at this station the average ambient noise level for the platforms with calculated to be approximately 69db. For this reason, it is assumed that the PA speakers on the platform will need to be capable of announcing at approximately 79db, notwithstanding gain alterations that will be made as part of the systems commissioning process.

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Bush Hill Park Station	HDT	5m 3ch	TQ 334880	NA

Spare capacity for PA systems on Network Rail train stations is specified under NR L2 TEL 30134. It is stated that the PA system should have capacity available for 1.25 X the total used speaker loading. The below calculation shows this designs conformance with the standard criteria:

Zone 1 A&B = 90.625W

Zone 2 A&B = 90.625W

Zone 3 A&B = 7.5W

Total Amplifier Loading = 188.75W

Total Amplifier loading x 1.25 = 235.94W

Total Available Capacity = 375W

Spare capacity in way of total number of outputs is al o specified within NR L2 TEL 30134. 10% spare capacity is stated as a requirement of PA systems on Network Rail train station. The below calculations confirms the compli ce of the proposed system with the standard requirements.

Tota Used Outputs = 3

Total Available Outputs = 4

Used Percentage Capacity = Total Used (3) / Total Available (8) = 0.75 or 75%

Spare Capacity = 100% - Used Percentage Capacity (75%) = 25%

Non-platform and indoor areas of the station will be supplied with PA via Penton Sentry 6STC speakers which will predominantly be made up of station subways, over bridges and Booking Halls.

In order to ensure that the PA volume at the station does not become a potential noise nuisance to the surrounding residential area, the PA system will be fitted with 1no ambient noise sensor for each of the individual zones of the system.

The ambient noise sensor will be used to measure the current level of ambient noise in the particular zone at the point just before an announcement is made. The subsequent announcement will then be made at a level of 10db above the measure level of ambient noise, not exceeding 90db.

Each PA zone at the station will also be provided with a passive Audio Frequency Induction Loop (AFIL) which will provide a facility for the hearing impaired user of the station to be provided station announcements.

The AFIL will consist of a MNTech OmniT unit that will sit on one of the two speaker cable legs for each of the zones at the station.

AFILs for this station will be sited in such a way as to allow a general ability to see the Customer Information display (CIS) for the area of the station hat hey are being installed.

Within the Ticket Office at Bush Hill Park a zone selectable local microphone will be provided for station staff. This microphone will all the member of staff that is using it to pick one or multiple of the

CERTIFICATE OF DESIGN AND CHECKING FOR NON-COMPLEX WORKS FORM Issue 1.02

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Bush Hill Park Station	HDT	5m 3ch	TQ 334880	NA

stations zones as well as being able to provide and all call facility when making station announcements.

The staff at this station will also be provided with a Roaming Public Announcement (RPA) system consisting of 2no radio microphone which will be capable of making zone specific announcement for the platforms only.

The 2no RPA microphone will be of the same Teleque manufacturing as those that are used throughout other London Overground stations and will be provided with a RPA charging station which will be located in the station staff accommodation.

Finally, the PA system will be provided with a new ATOS Personal Computer Digital Voice Announcement (PCDVA) system. The PCDVA for this station will be installed within the same central SISS equipment cabinet mentioned above and will interface directly w th the PA audio router.
The PCDVA's purpose is to provide automated station train an station information announcements across the zones provided.

The PCDVA system will be driven by a new central control server at Swiss Cottage station which will be provided by LOROL separately from the scope of this station improvement.

Details of the PA equipment, locations, and cabl ng of the PA system overall can be found within the appendices which accompany this document.

CLOSE CIRCUIT TELEVISION SYSTEM

As part of the original project specification for the works to take place at this station, there was a requirement for the adjustment o the existing CCTV system to provide coverage to the Network Rail standard requirements, tilising existing cameras where possible.

Following a survey of the site and analysis of the best case CCTV coverage that can be achieved with the existing system and components it was identified that the equipment that is currently installed cannot achieve the level of coverage which is required. Furthermore, it was evaluated that the design and installation of a new IP based high definition cameras system would be able to provide the required coverage at an equally cost effective and more maintainable solution than the adaption of the existing system at the station.

It has been specified that the replacement IP based HD CCTV system should be made up of assets that are commonly interchangeable with those that are already in place on other London Overground Train stations.

In accordance with agreed specifications, the new equipment chosen is a Verint Nextiva based system, which is the comparable current version of the Verint CCTV platform already in use on London Overground, will be used for all recording and transmission of CCTV video on this station.

A new Network Video Recorder (NVR) will be provided to manage and record all cameras that will form part of the stations CCTV system. The new NVR will be located within a new SISS equipment cabinet that will be provided as part of the overall station improvement works, co-located with all the other central station equipment for CCTV and also for PA, CIS and PHP systems.

VANDALPROOF METAL CABINET Loudspeakers

SENTRY6/STC SENTRY6/TBBC

TECHNICAL SPECIFICATIONS

Rated power, Watts	6
Tappings 100 volt line, Watts	6/3/1.5/0.75/0.25
Transformer Impedance, Ohms, 100V	1.67k/3.33k/6.66k/13.3k/40k
Tappings 70.7 volt line, Watts	3/1.5/0.75/0.375/0.125
Driver impedance, Ohms	8
Effective frequency range, Hz (BSEN60268-5)	Sentry6/STC: 180 - 18,000 Sentry6/TBBC: 180 - 17,000
S.P.L @ 1m, 1 watt, dB, Test Signal Bandwidth 100Hz-10 kHz	Sentry6/STC: 93 Sentry6/TBBC: 92
S.P.L @ Full power Octave Bandwidth, dB	Sentry6/STC: 99 Sentry6/TBBC: 101
Acoustic Power (dB-PWL@1 watt) 1 k/2kHz, dB	Sentry6/STC: 89/89 Sentry6/TBBC: 91/93
Dispersion at 1k/2k Hz, Degrees	Sentry6/STC: 170/120 Sentry6/TBBC: 130/120
Directivity Axial Q factor, 1 k/2kHz	Sentry6/STC: 4.8/6.3 Sentry6/TBBC: 2.3/4.9
Dimensions, front & depth, mm	190 x 190 x 75
Net weight, Kgs	1.8 / 1.7
Colour/Finish	White RAL9016
Material	Steel Front, Die cast back box
Mounting	Screw
Flush Mounted Version Available	SENTRY6/TBBC

- BS5839 Part 8 voice alarm compliant

EASE, CATT, ULYSSES and Architectural specifications are supplied on the disc inserted at the back of this folder

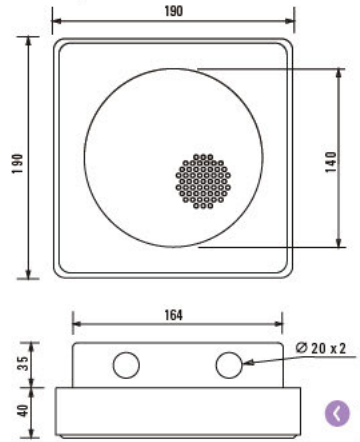
Manufacturer reserves the right to alter specifications without notice – March 2007

SENTRY6/STC SENTRY6/TBBC

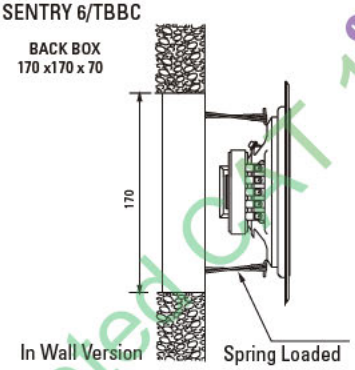
VANDALPROOF METAL CABINET LOUDSPEAKERS

front view unit: mm

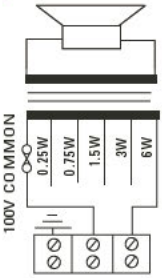
SENTRY6/STC



SENTRY 6/TBBC



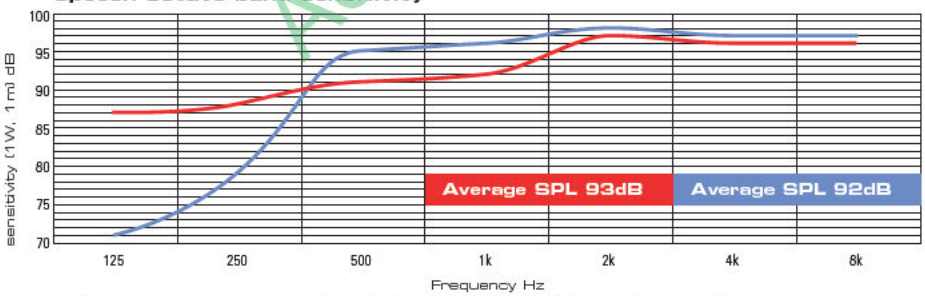
circuit diagram



top view unit: mm

CE

speech octave band sensitivity



Effective Frequency Range
- **SENTRY6/STC** 180Hz - 18,000Hz
- **SENTRY6/TBBC** 180Hz - 17,000Hz

PENTON

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www.pentonuk.co.uk

MOULDED SOUND PROJECTORS

CAD10/T
CAD10/TC

TECHNICAL SPECIFICATIONS

Rated power, Watts	10
Tappings 100 volt line, Watts	10/5/2.5/1.25
Transformer Impedance, Ohms	1k/2k/4k/8k
Tappings 70.7 volt line, Watts	5/2.5/1.25/0.375
Driver impedance, Ohms	8
Effective frequency range, Hz (BSEN60268-5)	120–18,000
S.P.L. @ 1m, 1 watt, dB Test Signal Bandwidth 100Hz – 10 kHz	90
S.P.L. @ Full power, Octave Bandwidth dB	100
Acoustic Power (dB-PWL@1 Watt) 1k/2k Hz, dB	87/89
Dispersion at 1k/2k Hz, Degrees	180/120
Directivity Axial Q factor, 1 k/2kHz	2.5/5.8
Dimensions, front & depth, mm	Ø138 x 204
Net weight, Kgs	1.3
Colour/Finish	White
Material	ABS Plastic with UV inhibitor and Stainless steel hardware
Mounting	Aluminium U bracket

- CAD10/TC is BS5839 Part 8 voice alarm compliant

EASE, CATT, ULYSSES and Architectural specifications are supplied on the disc inserted at the back of this folder

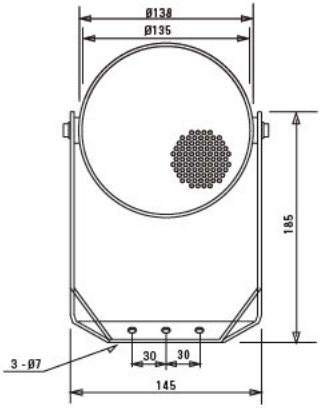
Manufacturer reserves the right to alter specifications without notice – March 2007

CAD10/T CAD10/TC

MOULDED SOUND PROJECTORS

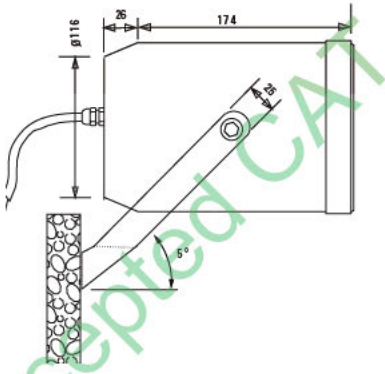
front view

unit: **mm**



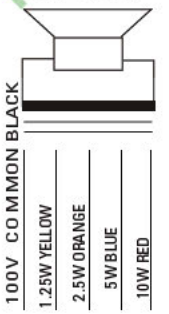
side view

unit: **mm**



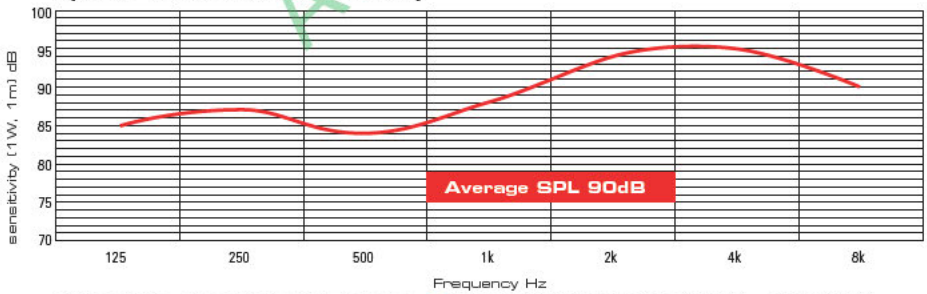
circuit diagram

CAD10/T



CE

speech octave band sensitivity



Effective Frequency Range **CAD10/T CAD10/TC** 120Hz - 18,000Hz

PENTON

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Teleque

Sound Design

T101 Announcement System

- Reliable RF solution For Rail Platform Announcements
- Robust Transmitter Design
- Intuitive Operation
- Multi-platform/zone Capability
- Ergonomic Design
- Meets the requirements of Network Rail (NR/L2/TEL/30147)

T101 Overview

The Teleque Wireless radio platform announcer offers Train operators the opportunity to implement a cost-effective and visible upgrade to existing PA systems. This significantly enhances "station" based operations by increasing the mobility and safety of its platform based staff. In a recent review of installed systems the T101 was found to be ideal for addressing individuals or small groups, personalised messages being more effective than the automated CIS announcement.

Designed specifically for rail applications the Teleque T101 conforms to the National Rail product specification for wireless connectivity (NR/L2/TEL/30147). Its scalable architecture makes it easy to integrate, either as a stand-alone single unit or as a multiple platform system offering ease of use, and interference free communications, over multi-zones.

For Example
A station with 5 platforms may require the T101 to operate with Platform 1 as zone 1, Platform, 2 & 3 as zone 2 and Platform 4 as zone 3. This is easily implemented using the T101 with the added advantage of an additional channel allowing a "Broadcast all" to all zones.

Teleque's Sound Design
Unlike conventional wireless microphones made for general use the T101 is designed to operate over distances in excess of the typical 100m maximum. This allows significantly enhanced station coverage-extending over the entire active platform area from a single pair of T101 active antenna.

Teleque's attention to detail encompasses all aspects of operation and installation. From the easy to operate hand-held voice transmitters, which incorporate an always visible LCD display, to their corresponding receivers with visible performance indicators designed for ease of installation. With several installation configurations available, including equipment room based multi-channel solutions and platform based IP65 enclosed systems, installation time and costs are significantly reduced.

Teleque Service and Support.
The Teleque T101 is designed and manufactured in the UK to ISO9001. We are on hand to offer installation support from initial survey through to final commissioning and testing, ensuring the smooth implementation of our products.

Teleque T101 System Features:-

Robust Transmitter construction coupled with ergonomic design

The T101 Transmitter, manufactured using a high quality "two shot" mouding technique with the inner core made of high impact ABS and the outer shell of a rubberised material for maximum robustness. This shirt pocket sized Transmitter has been designed for maximum user comfort in both operation and storage.

Intuitive operation

Simple to use buttons on the transmitter minimise operator errors and extensive receiver monitoring makes installation and setup simple, thus reducing cost.

Tone key for interference free operation

The T101 features extensive circuitry to eliminate external interference, which is common on other 863-865MHz equipment, by adopting a specific "key" and extensive noise detection circuitry without compromising the system's operational range.

Licence exempt 863-865Mhz operation

Licence free operation reduces any operational limitations and conforms with the rail product specification for wireless connectivity NR/L2/TEL/30147 – IR2030

Secondary signalling functionality

Additional secondary signalling functionality activated by the transmitter suitable for use as an alarm function.

Enhanced operational range

Efficient antenna olutions coupled with low noise receiver circuitry result in ranges far in excess of the standard 60-100m with conventional r dio microphone systems.

Easy to understand Transmitter and Receiver displays

The Transmitter display provides almost foolproof operation via its highly visible and backlit LCD display which is always present in standby mode. In addition the receiver LCD displays Transmitter information including RF signal strength, making installation straightforward without the necessity to take specialised expensive RF test equipment on site.

Custom transmitter programming.

As standard the Transmitter is programmed to display 10 separate platform desiginators. Should an alternative display be required e.g. "Station Hall" Teleque can easily re-configure the display.

High speech intelligibility.

The T101 has been designed to provide high speech intelligibility and features an internal audio dynamics processor to enhance this function.

Transmitter Battery life

The T101 Transmitter uses a modern internal Li-ion cell which is rated for over 200 charge cycles, significantly reducing service and maintenance. In normal operational use the battery remains active for typically 7 days before requiring recharging. Recharge times using the T101 charger are typically 2-3 Hours.

Handheld wireless PTT microphone

- The handheld communicator measuring 140 x 40 x 30mm slips easily into a top shirt pocket.
- Controls include channel up/down buttons, PTT and alarm function.
- LCD display easy to read and understand.
- Battery life greater than 12 hrs continuous PTT operation meaning average time between recharging is over 7 days. (Gang charger available).
- Rubberised external finish improves feel and drop resistance.

T101/70/RX Single Receiver

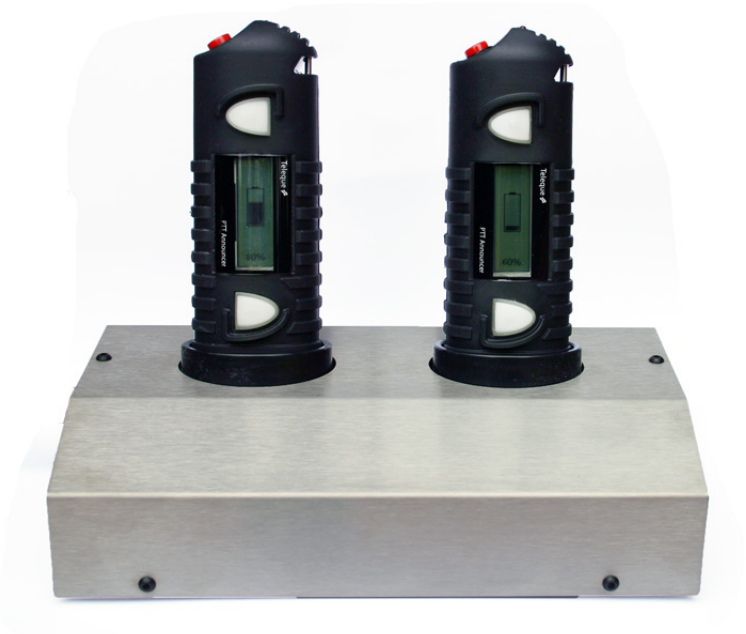
The T101 Announcement Receiver is a high quality, fully synthesised UHF receiver designed specifically for railway station platform announcements.It is a double conversion, true diversity system featuring RF high level balanced circuitry for maximum IP3 performance. The audio circuitry boasts a high quality audio dynamics processor which considerably enhances the audio fidelity. The receiver has an easy to read LCD that displays the RF signal level, the current selected operating channel, the squelch level and AF present indication.

T201/70/RX Dual Receiver

Housed in a standard 19" 1U rack the T201 Announcement Receiver is a high quality, fully synthesised UHF receiver designed specifically for railway station platform announcements.
It is a double conversion, true diversity system featuring RF high level balanced circuitry for maximum IP3 performance. The audio circuitry features a high quality audio dynamics processor which considerably enhances the audio fidelity. The receiver has an easy to read LCD that displays the RF signal level, the current selected operating channel, the squelch level and AF present indication.

TC101-2/110-230V/PS Charger

The T101 Charger allows up to 2 x T101 PTT Announcers to be charged simultaneously.
When powered through it's wall mounted power supply an LED shows that the charger is on and working.
To initiate charging gently place a transmitter into one of the receptacles on top of the charger, at this point the LCD on the transmitter will switch from showing its platform number to showing an animated battery symbol along with a number showing the percentage charged.



ADU2-4/PS Antenna Distribution Unit

The ADU2-4/PS is a mains powered 4-way antenna distribution unit with 4 power supply outputs. It features 2 antenna inputs for each RF channel, all 4 are able to supply a current limited phantom supply to remote antenna amplifiers. The ADU2-4/PS is packaged in a 1U high 19" rack mount box and is specifically designed for use with the Teleque T101 product range.

AA101/70 Active Antenna

The AA101/70 Directional Antenna allows tailored antenna response, designed specifically for platform applications. It's clever design gives it a cardiod receiving pattern making it ideal for wall mounting. Included in the design is a filtered low noise amplifier giving a gain of approximately 15dB making the use of low-cost RG58 cable viable.
Sealed in a robust IP67 rated box this antenna is ideal for any platform environment

HA101/70 Head Amplifier

The HA101/70 Head Amplifier coupled with the TDP101/70/BA antenna is ideal when an omni-directional receiving pattern is required. The antenna is supplied with a stainless steel mounting bracket.
The HA101/70 can also be used as a RF line booster in applications where extended cable runs are required.

Technical Details

Transmitter T101/70/TX

RF

Effective Radiating Power (ERP)	10 mW (863 -865 MHz)
Audio Frequency Response	200 Hz – 10 kHz
Antenna	Internal dipole
Grid Spacing	25 kHz
Pilot Tone Frequency	32.718 kHz

Battery

Type	Internal Lithium Ion
Talk Time	Up to 8 hours
Life Cycle	>200 charge cycles
Quiescent battery life	7 days

General

Material	ABS with rubber overmould
Colour	Black
Supplied with wrist strap	T101/BS

Environmental

Temperature (storage and operating)	−10 °C to +50 °C
Humidity Range (non-condensing)	0% to 93%

Dimensions and Weight

Dimensions	Height : 148 mm Width : 43 mm Depth : 30 mm
Weight	120 g

Specifications

EU Directives	EN60065:2002, EN301-489-9,EN300-422-2 EN50121-4
Network Rail	NR/L2/TEL/30147

Antenna Distribution Unit ADU2-4/PS

General

Mains power	120/240 VAC 50/60Hz 20VA
DC power	24 Volt DC input @ 1 Amp
ADU operating frequency	850-870 MHz
Antenna Input	2 Inputs for each channel, 50 Ω, TNC
Antenna Outputs	4 outputs for each channel, 50 Ω, TNC
Phantom Power	10 V, Current Limit 60 mA
Power outputs	4 x 2.1mm DC jacks (centre hot)
Current	400mA max. or each Rx output
Power output	15 VDC, (mains), 28 V (DC)

Enclosure

Material	Stainless Steel
Colour	Brushed Natural
Front Panel	Perspex

Environmental

Temperature	−10 °C to +50 °C
Humidity Range	0% to 93% (non-condensing)

Dimensions and Weight

Dimensions	Full width 1U 19” rack enclosure
Weight	1.5 Kg

Head Amplifier HA101/70

Gain	8dB
DC Power	7.5 - 12 V DC @ 30mA
Connector type	TNC- TNC
Dimensions	Height 30mm, Width 30mm, Depth 80mm
Weight	90 g

Receiver T101/70/RX

RF

Receiver operating frequency	863-865 MHz (other channels on request).
RF input impedance	50 Ω
RF sensitivity	-114 dBm for 12 dB SINAD at 1 kHz mod 40 kHz dev.
RSSI mute range	Approx 20 dB selectable in 5 fixed settings.
Audio Frequency response	100 Hz – 15 kHz (-3dB)
Audio signal to noise ratio	Greater than 96 dBA.
Audio output	0 dBm (-20 dBm*) @ 22 kHz deviation.
Max Audio Output	+6 dBm.
DC Power source	11-28 V DC
Current consumption	Typically 100 mA @24 V DC.
Phantom Power (RFA,RFB)	9 V
Phantom Power Current Limit	60 mA
Pilot Tone Frequency	32.718 kHz
System monitor output	Microprocessor based +5V in “Good Health”

General

Material	Stainless Steel
Colour	Brushed Natural

Environmental

Temperature	−10 °C to +50 °C (storage and operating)
Humidity Range	0% to 93% (non-condensing)

Dimensions and Weight

Dimensions	Height : 152 mm, Width : 43 mm, Depth : 192 mm
Weight	860 g

Dual Receiver T201/70/RX

Dual receiver has same specifications as single system

Dimensions and Weight

Dimensions	Height : 420 mm, Width : 43 mm, Depth : 204 mm
Weight	1.5 Kg

Charger TC101-2

General

DC Power source	11-24 V DC
Current consumption	350 mA Max.

Power Supply

Type	Wall mounted UK style
AC Input	100-240V 50/60 Hz 0.5A
DC Output	12V 1A

Enclosure

Material	Stainless Steel, Brushed Natural

Environmental

Temperature (storage and operating)	−10 °C to +50 °C
Humidity Range (non-condensing)	0% to 93%

Dimensions and Weight

Dimensions	Height : 51 mm, Width : 211 mm Depth : 112 mm
Weight	750 g

Active Antenna AA101/70

RF

Gain	15dB
Connector type	TNC
DC Power	7.5 -12 V DC @60mA

Enclosure

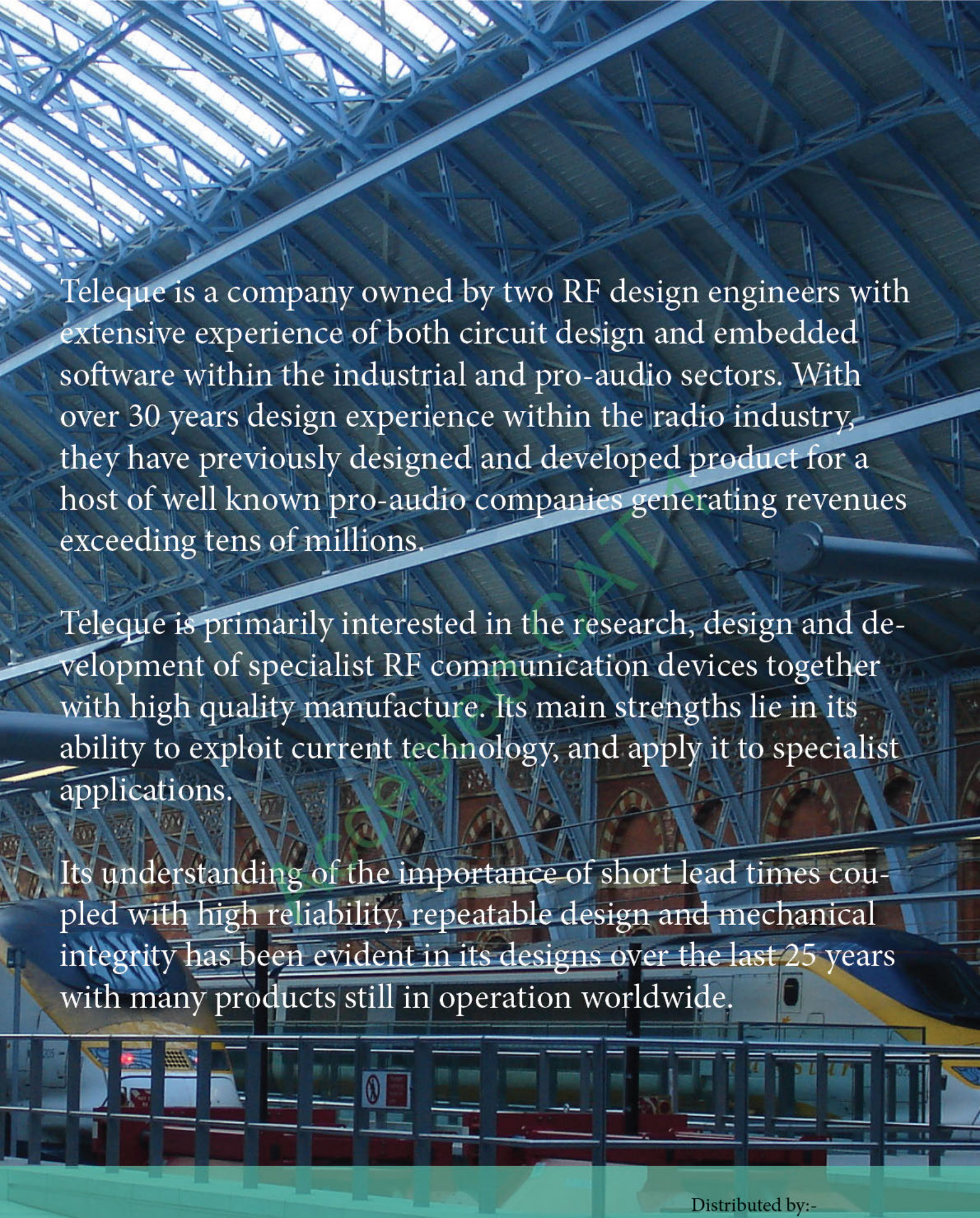
Material	PC
IP Rating	IP67

Environmental

Temperature (storage and operating)	−10 °C to +50 °C
Humidity Range (non-condensing)	0% to 93%

Dimensions and Weight

Dimensions	Height :145 mm, Width : 130 mm, Depth : 180 mm
Weight	300 g



Teleque is a company owned by two RF design engineers with extensive experience of both circuit design and embedded software within the industrial and pro-audio sectors. With over 30 years design experience within the radio industry, they have previously designed and developed product for a host of well known pro-audio companies generating revenues exceeding tens of millions.

Teleque is primarily interested in the research, design and development of specialist RF communication devices together with high quality manufacture. Its main strengths lie in its ability to exploit current technology, and apply it to specialist applications.

Its understanding of the importance of short lead times coupled with high reliability, repeatable design and mechanical integrity has been evident in its designs over the last 25 years with many products still in operation worldwide.

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