ASR550 / ASR650 Accessories

- Technical Overview -

This document should give a short technical introduction about the ASR550 and the ASR650 and their accessories to new customers. It does not cover all functional details and is no operational manual. Please refer to the corresponding manuals for further technical details and installation instructions.

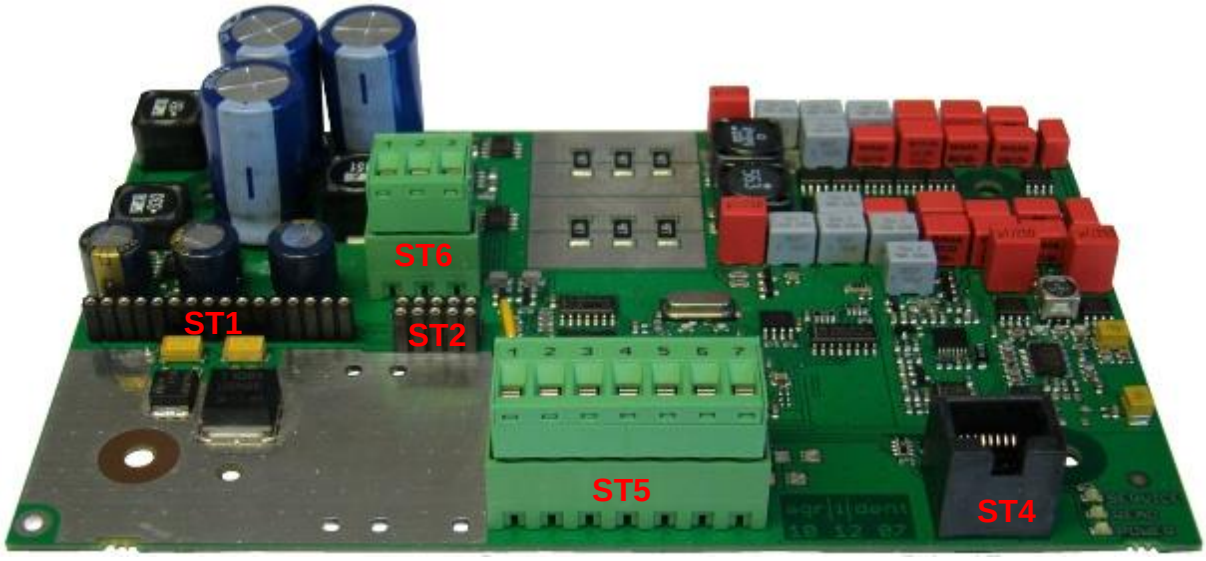
The ASR550 (p/n 2125) is the mid-range **A**grident **S**tationary **R**eader. It replaces the former mid-range readers ASR400 and ASR500. Due to the increased reading performance it might even be suitable for applications where an ASR600 had to be used before. The term 'mid-range' refers to a maximum recommended antenna size resulting from the transmitter power level. The ASR550 was designed to cover all stationary reader applications for pigs and sheep. If the antennas are not too large, even cattle applications are possible. The ASR650 (p/n 2128) is the long-range version of the ASR550. The higher output power results in an even higher reading range and it allows to drive larger antennas. In addition, the transmitter power level is adjustable.

Advantages of the ASR550 / ASR650 over previous stationary readers:

- Higher immunity against electromagnetic interference for FDX and HDX
- Less influence of metal close to the antenna
- Reduced impact of antenna vibrations (FDX)
- Improved FDX-B reading range and reading speed
- Wider input voltage range (12-24V DC)
- Fast 32 Bit processor provides algorithms for noise reduction
- RS232 and RS485 configurable from 9600 Baud to 115200 Baud
- Socket for Add-on modules like Bluetooth, WLAN, Ethernet or Antenna Multiplexers
- Antenna Multiplexers offer a very economic solution for reading at several points
- Autotuning after power on and continuously in the background (configurable)
- Wireless ISO Synchronization
- Wired ISO Synchronization optional
- **I**ntegrated **D**iagnosis **F**unctions (IDF)
- Two single antennas can be connected as one double antenna using the double antenna box
- Single-turn antennas can be connected using a customized converter box
- Several new software functions

For OEM applications or in case the customer wants to mount the reader board into his own housing, the ASR550 and ASR650 are available as the reader board only.

The following picture shows the ASR550 reader board. The connector names and description only refer to the ASR550, not the ASR650.



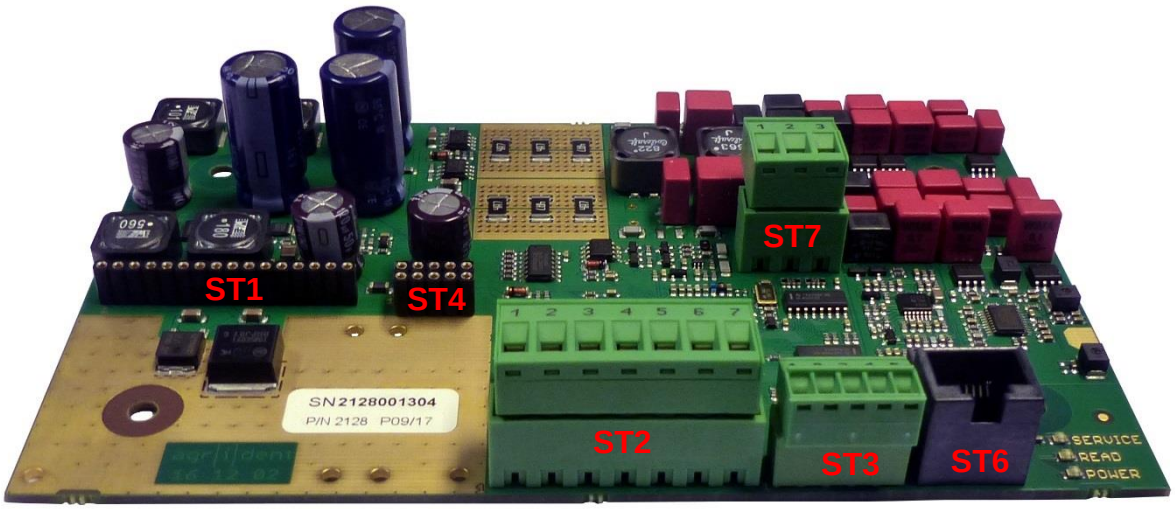
The reader board provides the following connectors:

Connector	Function
ST1	Socket for Add-On Module (Bluetooth, WLAN, Ethernet or Multiplexer)
ST2	Socket for Wired Sync Module
ST4	Connector for external LED board (RJ45)
ST5	Connector for DC power supply and RS232 / RS485 interface
ST6	Antenna connector

Socket for Add-On Module ST1:

This socket is used for attaching optional modules to the reader. Such modules can be Ethernet, Bluetooth or WLAN as additional interfaces for communication but also Antenna Multiplexers ('MUX'). Please note that only one module type is connectable, not several at the same time. This means that you cannot connect an additional communication module plus an antenna multiplexer. In case you require a MUX and another interface (beside RS232 or RS485), you can use external converters, which are commercially available from lots of manufacturers. These converters have to be connected to one of the reader's standard interfaces (RS232 or RS485) and provide an additional interface like Bluetooth, WLAN or Ethernet on the other side.

The ASR650 has some deviations compared to the ASR550. The connector names are different, the antenna connector is at another position and there is an additional connector that allows the direct connection of 4-channel- or 8-channel antenna multiplexers (ST3).

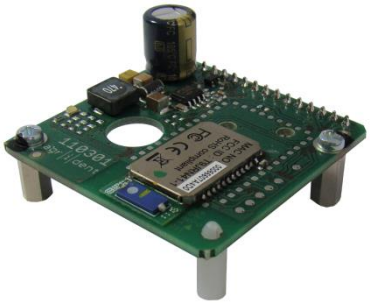


Connector	Function
ST1	Socket for Add-On Module (Bluetooth, WLAN, Ethernet or 2-channel MUX)
ST2	Connector for DC power supply and RS232 / RS485 interface
ST3	Connector for 4-channel or 8-channel MUX
ST4	Socket for Wired Sync. Module
ST6	Connector for external LED board (RJ45)
ST7	Antenna connector

Socket for Add-On Module ST1:

Basically ‘ST1’ offers the same functionality as on the ASR550. It is possible to connect additional interfaces for communication, like Bluetooth, WLAN or Ethernet and a 2-channel multiplexer would also be used on ‘ST1’. But 4-channel- or 8-channel antenna multiplexers are directly connected to ‘ST3’. Hence it is possible to use multiplexers AND an additional communication module with the ASR650 – this is not possible with the ASR550.

Bluetooth:



The Bluetooth module ABT100 (p/n 4500) adds Class 1 Bluetooth connectivity to the ASR. The module is configurable using the ASR-PC-Demo Software. It can act as Bluetooth Master or Slave.

Bluetooth Versions	2.1 + EDR, 2.0, 1.2, 1.1
Data rate	With on-board stack: 300Kbps
Frequency Band	2.412 - 2.484 GHz
Profiles	SPP (Serial Port Profile)
Antenna	on-board chip antenna
Output power	+15dBm
Range	Up to 100m in open air

WLAN:

The AWL100 (p/n 4503) offers wireless communication using WLAN. WLAN Settings are configurable via the ASR-PC-Demo Software.

Networking Standards	IEEE 802.11 b/g
Data Rates 802.11 b	1, 2, 5.5, 11 Mbps
Data Rates 802.11 g	6, 9, 12, 18, 24, 36, 48, 54 Mbps
Frequency Band	2.412 - 2.484 GHz
Antenna	on-board chip antenna
Output power	+18dBm
Range	Up to 300m in open air
WLAN security	WEP, WPA, WPA2
Protocol	TCP, UDP, DHCP

Ethernet:

The AET100 (p/n 4502) adds Ethernet connectivity to the ASR. You can change the settings of the module using the web interface provided by the 'Digi Connect ME' module itself.

Networking Standards	IEEE 802.3
Physical Layer	10/100Base-T
Data Rates	10/100 Mbps (auto-sensing)
Mode	Full- or half-duplex (auto-sensing)
Protocol	TCP, UDP, DHCP
Connector	RJ45

The specified data rates above always refer to the additional interface like Bluetooth, WLAN or Ethernet. All modules are connected to one 'UART' interface of the ASR. The UART baud rate is configurable between 9600 and 115200 Bps. It is set via the *ASR-PC-Demo* in case of using Bluetooth or WLAN. For the Ethernet module the serial baud rate has to be configured via the 'Digi Connect ME' web interface.

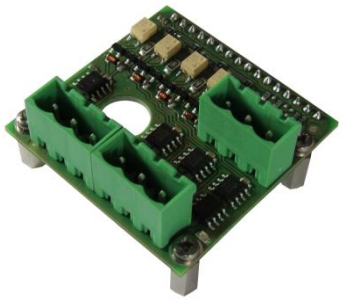
Multiplexer:

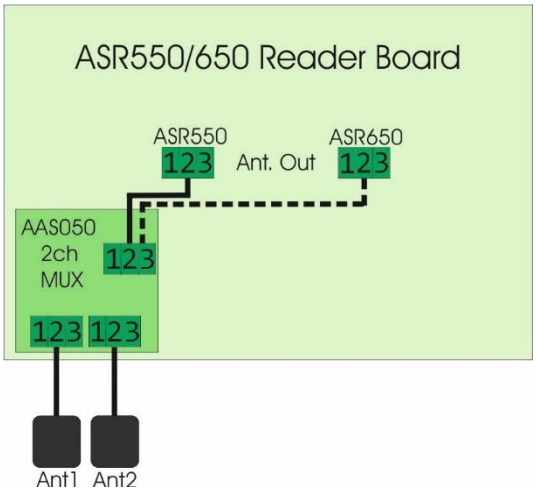
What is a multiplexer? An Antenna multiplexer contains several electronic switches. It allows connecting several antennas to one reader and thus provides an excellent cost benefit ratio for applications, where the reading speed is not critical. In case of using a MUX, there is only ONE antenna active at any given time. It is not possible to activate more than one antenna simultaneously. There are several possible applications for an antenna MUX like feeding stations, drinking troughs or milking parlors. In all these applications the animals stay in the antenna field for a while and thus high-speed reading is not required. For applications with a high animal throughput, the multiplexers should not be used since the risk of losing IDs is too high.

There are 3 different types of multiplexers available: for 2 antennas, 4 antennas and 8 antennas. The 2-channel MUX goes directly onto ST1 of the reader board. The 4- and 8-channel MUX are external PCBs of the same size as the ASR board (160mmx100mm). An additional adapter board is required on the ASR550 for connecting them to the reader. This adapter board has to be connected to ST1. For the ASR650, the 4-channel- or 8-channel multiplexers are directly connected to 'ST3', thus the MUX adapter is not required here.

The reader supplies the MUX with power and controls the antenna sequence. When the ASR detects a multiplexer after powered on, it will automatically auto-tune all antennas. In case of receiving a tuning command, all antenna channels will be tuned as well. The configurable 'Background-Tuning' also works for all connected antennas. The reader can control the antenna channels which should be used and also the switching speed within certain limits (configurable). It is also possible to start software- triggered reading events on particular antennas only.

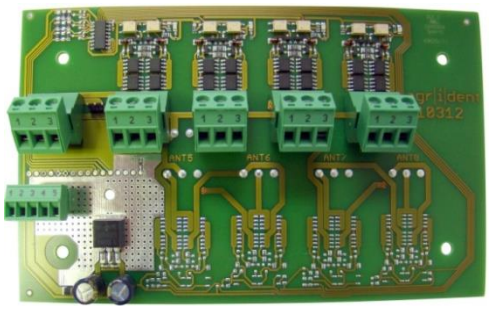
2-channel MUX:

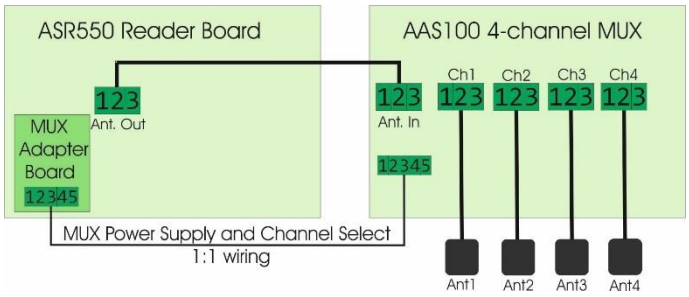




The AAS050 ('**A**grident **A**ntenna **S**witch', p/n 4509) is connected to ST1 of the reader board. The antenna output of the reader has to be connected to the antenna input of the MUX. The wiring is 1:1 and you should use at least 0.5mm² cross section; wires should be twisted. Two antennas can be connected to the AAS050.

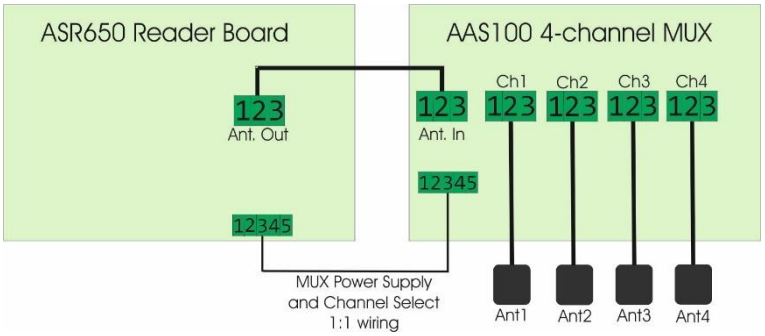
4-channel MUX:





The 4-channel MUX ‘AAS100’ (p/n 4504) can control up to 4 antennas with only one reader. In combination with the ASR550, the ‘AAS Adapter’ board is required (p/n 4506). The adapter is mounted to ST1 of the reader. A cable with 5 wires has to be connected between the adapter board and the MUX itself (wiring 1:1, standard data cable is good enough). This connection supplies the MUX with power and controls the antenna activation. As for the AAS050, the antenna output of the reader has to be connected to the antenna input of the MUX.

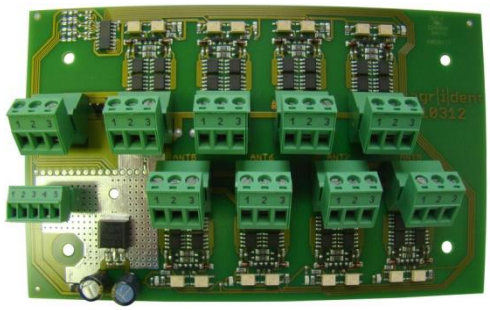
As already explained, the ASR650 does not require the ‘AAS Adapter’ because the appropriate hardware is directly on the reader board.

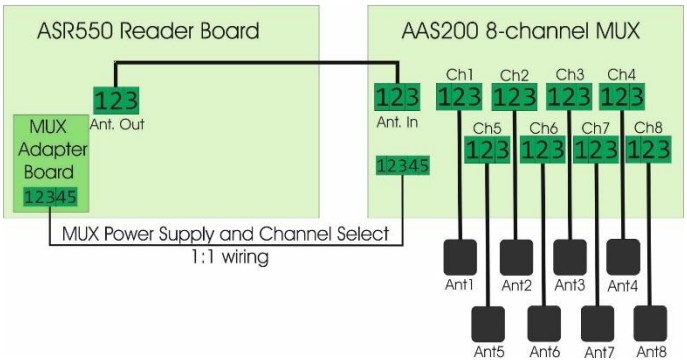


The power supply and the control lines for the multiplexer are connected 1:1.

Pin Number	Function
1	Power supply for MUX
2	Control line A
3	Control line B
4	Control line C
5	GND

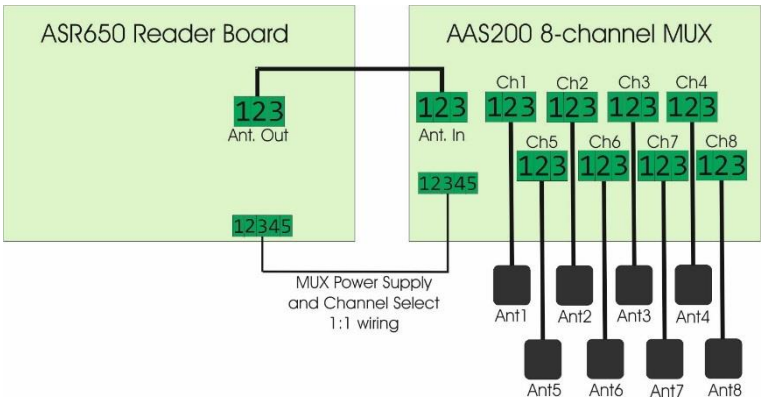
8-channel MUX:



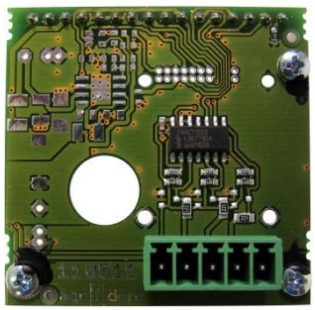


The 8-channel MUX works similar to the 4 channel MUX. It has the same form factor but more components assembled than the 4-channel version. Up to eight antennas can be connected. The ‘AAS200’ has the part number 4505.

For the ASR650, the AAS-Adapter is not required here either:



AAS-Adapter:



The AAS-Adapter (p/n 4506) is necessary in order to connect the 4-channel and 8-channel MUX to an ASR550. This part has to be ordered separately. It is not required when using an ASR650.

The Adapter is connected to ST1 of the ASR550. Then a 5-wire connection (1:1) has to be made between adapter board and MUX. The cable lengths between MUX and reader should not exceed 30cm. So, the multiplexers should be located quite close to the reader board; ideally inside the same housing – but it is also possible to put the MUX into a separate housing close to the reader housing.

Socket for Wired-Sync. Module:

Although the ASR contains means of 'Wireless Synchronization', there might be applications where wired synchronization is the better choice. Depending on background noise and some other factors, the wireless synchronization might lose the sync from time to time which could lead to a decreased reading performance. For such applications, where 100 percent reliable sync. is required, it is recommended to use the wired sync. module. Please note that the wired synchronization of the ASR550 and ASR650 is NOT compatible to the sync. method of previous Agrident Stationary Readers (ASR-400/500/600/700).

The ASY100 (p/n 4501) has to be connected to ST2 of the ASR550 (ST4 for ASR650). It contains two RS485 busses which ensure the exact synchronization of all connected readers.

The wiring between the different sync. modules is 1:1 where 'A' and 'B' of each RS485 bus should be connected to a twisted pair. CAT5 Ethernet cable (or similar) should be used. The maximum recommended cable length is 100m and the maximum number of nodes is 32.

Depending on the selected sync. method, the system has no dedicated master or slave. After start-up, all readers listen to the bus. If there was no other reader detected, the 'fastest' reader will be the sync master. If this reader fails, another reader will take over the master role quickly.

Connector for external LED board:

If the reader is mounted into a customized housing, it makes sense to see the general reader status also outside the housing. Therefore Agrident provides an external LED board. This board contains three status LEDs, a buzzer and a pushbutton.

The indicator board AIB002 (p/n 15000) contains LEDs for indicating the reader status, a buzzer for audible indication of a successful tag read and a switch for starting an Autotuning procedure manually (ASR550 only). It is connected using a standard RJ45 connector.

The Agrident-supplied housings contain this board already.

Agrident also supplies cables in two different lengths for connecting the indicator board to the ASR:

ACW002, RJ45 cable for AIB002, 20cm - P/N 321 010

ACW003, RJ45 cable for AIB002, 38cm - P/N 321 022

Connector for DC power supply and RS232 / RS485 interface:

Connector ST5 (ASR550) or ST2 (ASR650) is used for supplying the reader with power and for connecting the standard interfaces RS232 and RS485.

The power supply for the ASR550 and ASR650 can be chosen from 12.0V DC to 24.0V DC (+/- 10 percent). The reader will disable its transmitter below input voltages of 10.8V in order to prevent the deep discharge of lead acid batteries.

Both standard interfaces, RS232 and RS485, can be used simultaneously. The maximum cable length for RS232 should not exceed 15m and for RS485 1200m. The interfaces can be configured to baud rates between 9600 baud and 115200 baud. The higher the baud rate, the more critical the cable length is. For RS485, shielded twisted pair cable should be used.

Connector for antenna:

The connector ST6 (ASR550) or ST7 (ASR650) is used for connecting the reader's antenna. In case of using an antenna MUX, this antenna output needs to be connected to the antenna input of the multiplexer.

The antenna cable length should not exceed 10 meter in order to avoid losses in reading performance. There are particular requirements concerning the antenna cable. You should use shielded twisted pair cable with a cross section of at least 0.5mm². The cable should have a low capacitance and the correct impedance, otherwise the reading performance might suffer. Agrident provides two different types of antenna cables in different versions. The standard 'Twinax' cable is the cheaper solution but should not be used in applications where the antenna cable can be moved. The reason is that this cable is not very flexible. The more expensive 'Chainflex' cable is very flexible – even at low temperatures – but it is also more expensive. On the antenna side, the Agrident provided cables always have a 4-pin M12 connector. This allows changing defective antenna cables very easy and also to connect cables of different lengths without exchanging the complete antenna. On the reader side, the cables are either open-ended or they have a snap-in plug for connecting the cable to an ASG566 housing with plug&read connectors.

Antenna cables:

AAC002, 2m antenna cable Chainflex for APA20X to ASG566 - P/N 5451

AAC102, 2m antenna cable Twinax for APA20X to ASG566 – P/N 5461

AAC202, 2m antenna cable Twinax for APA20X to ASG466 – P/N 5471

AAC302, 2m antenna cable Chainflex for APA20X to ASG466 - P/N 5481

The above listed cables are the standard cables provided by Agrident. The length is always 2 meter. Cables for connecting to an 'ASG566' have the snap-in plug on the reader side. Cables for the 'ASG466' have open ends for the direct connection to screw terminals (ASG466 uses cable glands instead of connectors). Other cables lengths are possible on request.

Twinax cable for ASG566 version

Chainflex cable for ASG566 version

Antennas:

There are three different standard antenna sizes available, the APA203, the APA206 and the APA160. The APA203 has a size of 30cmx30cm (p/n 5615), the APA206 measures 50cmx60cm (p/n 5614) and the APA160 is 100cmx60cm (p/n 5618). All have a 4-pin M12 connector for easily exchanging the antenna cable. The panels are casted with special potting compound in order to ensure the water tightness of the antennas. Please note that the antennas for the ASR550 and ASR650 are NOT compatible with the antennas for previous Agrident Stationary Readers (ASR-400/500/600/700).

APA203 30cmx30cm antenna for ASR550

APA206 50cmx60cm antenna for ASR550

Customized antenna coils are possible on request. Agrident is happy to help customers designing their own antennas. The antenna size should not exceed 100x60cm for the ASR550, for the ASR650 larger antennas are possible because of the higher transmitter power.

Double-Antenna Box:

The Double-Antenna Box ASB200 (p/n 4044) allows connecting two single antenna panels to the ASR550 or ASR650 as one double antenna. The two panels are normally set up in parallel, i.e. they face each other, but other arrangements are possible as well. If set up in parallel, the reading range can almost be doubled compared to a single antenna panel. The ASB200 acts as kind of 'splitter' in this case. Unlike for the multiplexers, both antennas are active at the same time but for the reader they 'appear' as only one antenna. This is achieved using a special 'matching component'. Please do not just connect two panels in parallel or in series – this would not work and the reader might get damaged. Since the double antenna is representing ONE antenna for the reader, it is not possible to read different tags of the same type in each antenna. This would lead to data collision.

The picture on the left shows the ASB200. You need 2 panels and 3 antenna cables in this setup. The two panels are connected to the ASB200 and the box is connected to the readers antenna output. Depending on antenna phasing, different field patterns can be achieved.

Single turn antennas:

So called ‘single turn antennas’ can also be adapted to the ASR550 or ASR650. These antennas would have one turn only, not several turns like usually. It is also possible to use already existing metal constructions as antenna. In order to allow such an antenna to work with the reader, a special matching electronic is required. Since each metal loop has its own inductance resp. impedance, the development needs to be customized. Please contact Agrident for further information.

Housings for the ASR550 / ASR650:

Agrident also provides complete housings for the ASR550 or ASR650. Generally, there are two versions available, the ASG566 (p/n 2133) with color-coded plug&read connectors and the ASG466 (p/n 2110), using cable glands. The ASG566 allows very easy and convenient installation, the ASG466 has a lower price and is good enough for permanent installations – but requires technical staff for the installation. Both versions offer IP66 water protection, which is sufficient for most agricultural applications.

ASG566 with plug&read connectors

This version of the ASG566 is equipped with 5 connectors: Antenna, Power Supply, RS232 and RS485 interface, wired sync-in and wired sync-out (from the left to the right). The standard version does not have the 2 connectors for wired synchronization.

ASG466 with cable glands

The ASG466 contains 5 cable glands, one M16 gland for the antenna cable and 4 M12 glands for power-, interface- and synchronization cables. Unused cable glands should be closed using sealing plugs.

There is also another version of the ASG566 available, which allows connecting two antennas in case the reader should be used with the AAS050 antenna MUX:

ASG566, IP66 housing version for ASR550 and AAS050 – p/n 2134

This version does not offer plugs for connecting wired synchronization.

At the moment Agrident does not offer a housing for implementing the AAS100 or AAS200 together with the reader.

For further details about possible customized housings, please contact Agrident.

Power supplies for Agrident Stationary Readers:

Agrident offers power supplies for the ASR550 as well. These contain especially selected power supply units (PSU). The power supply units are built into IP66 protected enclosures. There are two versions available:

AZE154 – IP66 PSU with open-ended cable

The open-ended version (p/n 3500) should be used in case of connecting to a reader mounted into a housing equipped with cable glands. The AC power cord has to be customer supplied.

AZE156 – IP66 PSU with plug&read connector

The AZE156 (p/n 3502) is intended to be used in conjunction with a reader mounted inside an ASG566 housing. The AC power cord has to be customer supplied.

In both cases the same PSU is used. It is adjusted to 13.0V and can deliver a maximum current of 2.1Amps. Although this power supply is a switch-mode type, it does not have a negative influence on the reading performance via the DC supply cable. Anyway, power supplies also transmit 'noise' via the air – they are 'unintentional radiators' – hence it should NOT be mounted directly beside the reader board.

Some general remarks concerning power supplies:

Even though the negative impact of electrical noise on the ASR550 and ASR650 is significantly smaller than for other readers, the wrong power supply can decrease the reading performance. A safe way is the use of a linear regulated, stabilized power supply. However, in countries with very instable mains, a switch-mode PSU might be the better choice. Furthermore, linear regulated PSUs are harder to buy nowadays and if they are available, they are more expensive.

If you have to use a switch-mode PSU, you should ensure that the power supply does not harm the reading performance. This can be quite difficult because most modern PSUs change their switching frequency depending on load and input voltage. Even if particular power supplies are using fixed frequencies, they can still interfere with the reader if the frequency is too close to the readers signals.

The Integrated Diagnosis Function (IDF) of the Agrident readers is very helpful for evaluating the influence of the power supply concerning noise. If you need technical support regarding the correct choice for a PSU, Agrident is happy to help.

The ASR550 and ASR650 need at least 10.8V input voltage – below the transmitter will not work. The PSU should be able to deliver 1.5Amp at 12V continuously for the ASR550 and 3A for the ASR650. The input current depends on the input voltage, the selected power level (ASR650 only) and the antenna impedance. When antennas with a low impedance are used (or there is too much metal – which results in a lower impedance), the input current increases. When the antenna is mistuned, the current increases as well. This also happens during an Autotuning procedure.