

ADS

Antenna-Disconnect-Switch

To protect your radio equipment from damage due to surge voltages

Assembly and Operation Manual

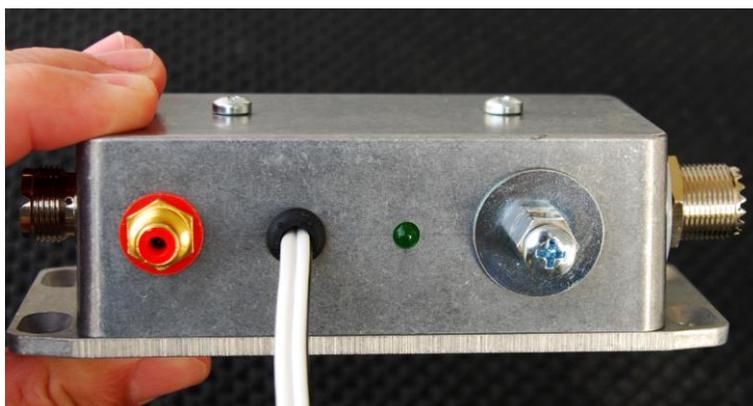


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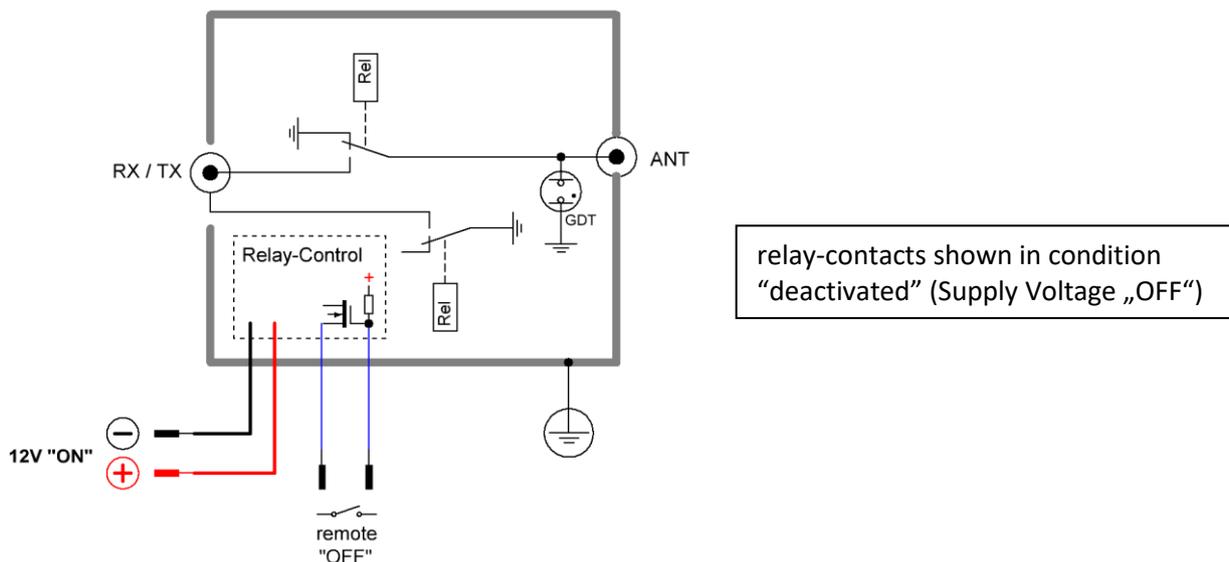
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Introduction

The ADS is a remote controlled switch, that completely disconnects the antenna from your radio and grounds the antenna. It is designed to prevent transient overvoltage due to lightning and atmospheric surge effects damaging your radio equipment. The Antenna Disconnect Switch is installed at the output from your transceiver, power amplifier, or antenna tuner in line with the antenna's coaxial feedline. When the Power is turned OFF, the antenna's coax signal wire and shield are shorted together and grounded, and both the coax center and coax shield are disconnected from the radio. When the ADS gets powered ON, it re-connects the antenna for normal operating. It can handle 1.5 kW RF Peak Power up to 50 MHz. With reduced power it is possible to use the ADS even at higher frequencies.

Important notice: For maximum protection a good earth ground connection is essential. See chapter "ground earth connection" for details.

Functional diagram



Electrical characteristics

- Supply/activation voltage DC 10-18 Volt
- Operating current typ. 75 mA when activated/connected (at 12V Supply voltage)
- RF-Connectors: female SO239/UHF coaxial socket
- Antenna Socket fully isolated against case, RX/TX socket - braid connected to case
- Supply connector: 2-pole screw terminal, twin core flexible lead
- Case -aluminum diecast, dimension: 112 x 60 x 42 mm
- Earth ground connection through a ground screw connected with the metal enclosure, or
- Earth ground connection via the box flange-cover mounted on a metal plate connected to Earth
- Transmission loss <0.05 dB up to 30 MHz, <0.12 dB up to 70 MHz, return-loss > 26dB
- Max. Power: 1,5 KW PEP (up to 30 MHz, 50% Duty Cycle, Load SWR <2)
- Antenna through-connection is activated when Power applied
- Remote controlled "OFF", activated by manual or open collector switching
- Connected/Activated condition is indicated by a green LED
- Gas-Discharge Tube to provide supplementary surge protection during operation

FUNCTIONAL DESCRIPTION AND OPERATING GUIDELINES

With Power turned OFF the ADS is in protection mode, the antenna's coax signal and shield are shorted together and the antenna is connected to ground. The antenna line is completely disconnected from the radio equipment. With Power turned ON, the "TO ANTENNA" connector is connected to the "TO RADIO" jack and ready for operation.

Power for the ADS antenna switch comes either from the transceiver's external accessory output or directly from a power supply. In case the ADS is powered via the transceiver accessory output, the ADS disconnects, when the transceiver is switched OFF. When the transceiver is powered ON, the ADS re-connects the antenna's coax for normal operating.

The ADS needs a supply voltage in the range between 10V und 18V. A green LED indicates when the ADS is activated and the antenna is connected to the radio.

The "Remote OFF" Input is an additional feature of the ADS that allows to disconnect the antenna remotely despite power is applied. With a manual switch or an open collector connected to the "Remote OFF" RCA/Cinch jack an "active low" level deactivates the ADS and the antenna becomes disconnected from the radio.

Operating conditions:

ON – Connected	Antenna is connected to the radio equipment, green LED is illuminated.
OFF – Protection	ADS is in protection mode. Coaxial Line to Radio equipment is disconnected. Feedline from Antenna is connected to the grounded metal case. Green LED display ist off.

Learn more about the various operating conditions in Chapter „**Activation Methods**“.

Transmit operation: Under specific conditions with highly mismatched antennas and high VSWR, standing wave voltage maxima could be high enough to trigger the Gas-Discharge-Tube. This may occur only when using high power and non-resonant antennas with extreme VSWR.

Power Supply

The Relays in the ADS are operated with a smoothed or stabilized DC supply voltage in the range of 10 to 18V. The relays need a current of 60 mA for safe switching. At 12V, the typical operating current is 70 mA, at 13.8 V the current is 85 mA. The operating power can be taken out of a DC-Power Supply or from the external accessories output of the radio. When the radio is turned ON, 12 volts appears on this output and the actuator is switched ON. Most radios use an RCA/Cinch plug. Wire the red wire of the twin core flat litz to plus and the black wire to minus. A Plus and Minus sign is printed on the pcb at the screw-terminal inside the ADS box.

“REMOTE OFF” Input

The "Remote OFF" Input is intended to remotely disconnect the antenna despite power is applied to the ADS. With zero voltage contacts or an open collector Transistor switch connected to the "Remote OFF" RCA/Cinch jack, a "low" level deactivates the ADS and the antenna becomes disconnected from the radio. The "Remote Off" Input ist a RCA/Cinch Socket internally wired to a 2-pole Pin Header (K4) on the PCB. If you shortcut the inner conductor of the RCA socket with the outer conductor, a MOSFET brakes the supply of the relays and the ADS disconnects. The Voltage at the inner conductor of the jack is

positive and the same as the supply voltage. The internal pullup resistor is 47kΩ. The “Remote OFF” socket is isolated from the aluminum case.

„Remote OFF“ can be used to activate/deactivate the ADS for example by CAT Interfaces (e.g. Stationmaster or similar)

Installation

The ADS is placed at the output of the receiver, transceiver, amplifier, or the antenna tuner. The device may be placed close to the radio or outside the shack. Best protection is achieved when installed and properly earthed before the feedline from the Antenna enters the building. Note that the ADS box is not waterproof and need to get housed in a waterproof enclosure.

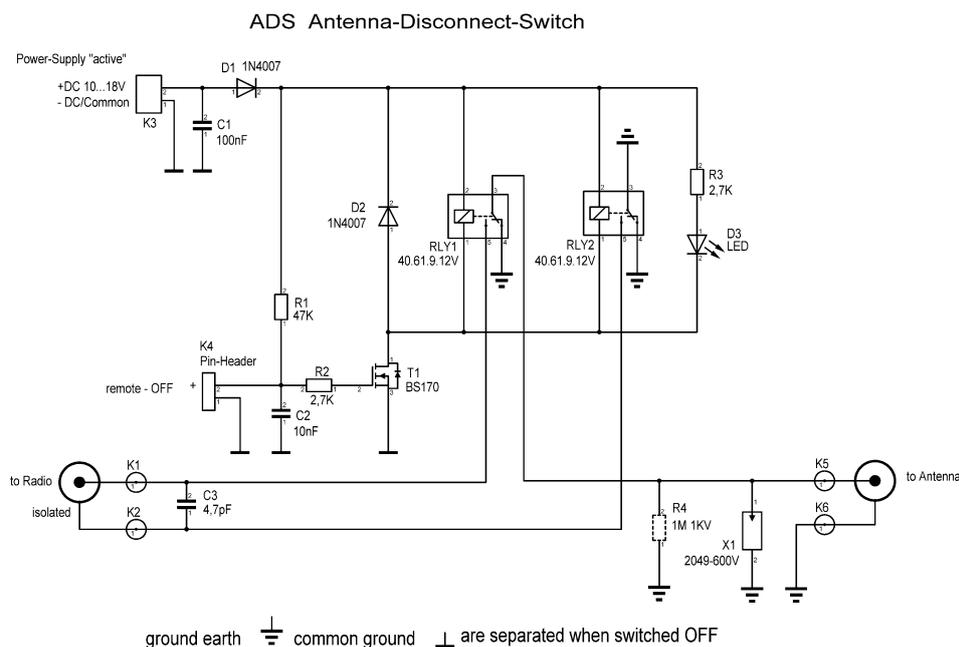
- **Note:** If a remote power supply over the coaxial cable is used to supply e.g. an active antenna or masthead amplifiers, make sure that the ADS ist installed in the DC-free leg between Radio and Bias-Tee and not between Antenna and Bias-Tee, else the remote supply voltage will be short circuited to ground.

Earth ground connection

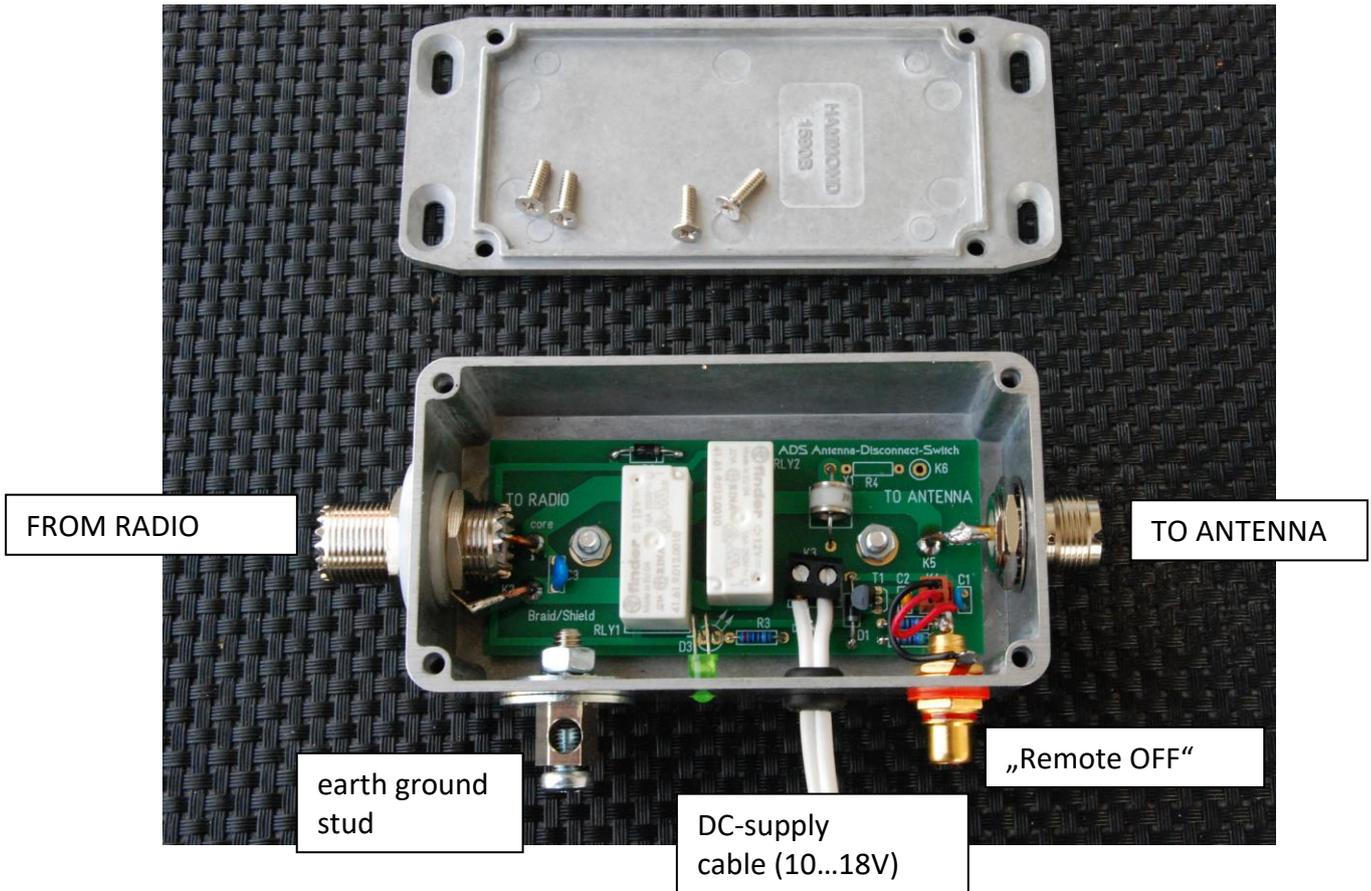
To provide effective protection the ADS requires a direct conduction path with sufficient diameter to an suitable earth ground point. Earth ground is tied either to the ground-stud of the ADS or via the flange cover of the box mounted on a thick metal plate, which needs to be wired to the ground earth system. An effective station ground bonds the chassis of all equipment together with low impedance conductors and ties into a good earth ground. Use a heavy conductor (copper, diameter 4mm, AWG #6) and connect as short and as direct as possible.

The coaxial braid of the feedline, metal-water pipes or the protection earth of the domestic power distribution are not adequate as earth ground connection for an antenna. Minimum requirement for an earth ground point is one or more ground rods at least 1,5m (8 inch) long driven into the earth. The ground rod should be solid copper or clad steel with 20mm (3/8 inch) in diameter. Earth Ground must be in accordance to the national electrical codes and standards for antennas applicable in your country.

Circuit Diagram

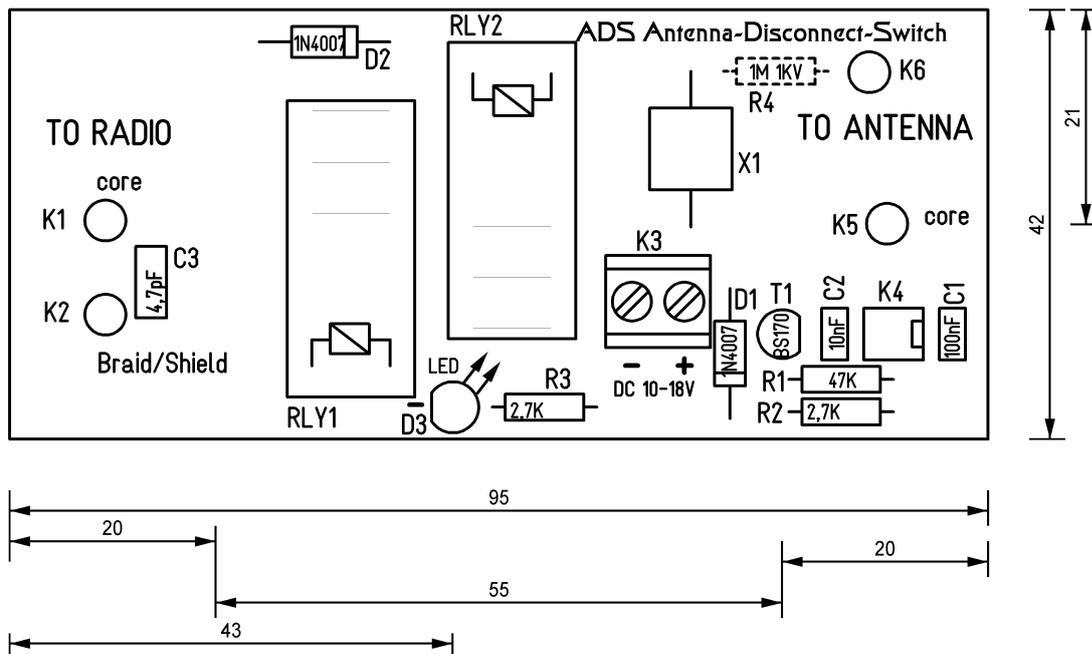


Connections



ASSEMBLY INSTRUCTIONS

Component layout diagram



Distances given in mm (25,4 mm = 1 inch)

Mounting of the pcb in the aluminum box



Note: The SO259 bulkhead socket „TO ANTENNA“ and the RCA Phono Plug “REMOTE OFF” must be mounted completely isolated against the metal box. For this purpose a specific set of isolation washer and busher is needed.

Resistor R4 (1M Ω /1KV) is optional and no part of the bill of material. If necessary, it may be retrofitted in order to discharge static electricity from wire antennas. The resistor must be able to handle high voltages (>1kV).

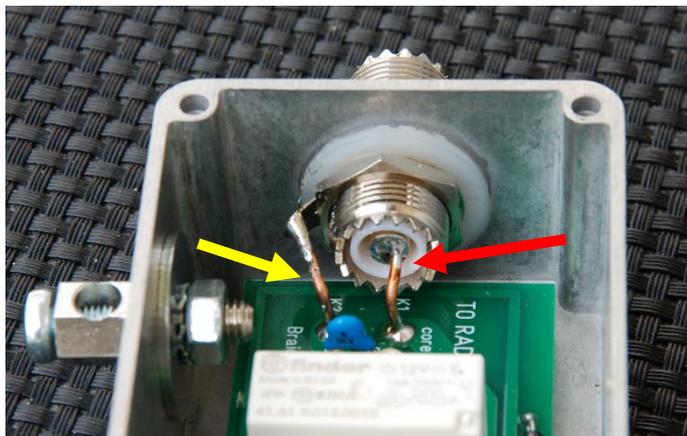
First step is to mount the fitted printed circuit board into the previously drilled aluminum enclosure and fix it with two 2mm/AWG #16 bolts and nuts. Use two 6mm (3/16 inch) long metallic spacer sleeves suited for the screws to provide sufficient clearance between pcb and the bottom of the metal box. The nuts and bolt connection builds the main conductive path between the ground layer of the printed circuit board and the grounded aluminum case.

Wiring of the connectors

To wire the rf-connectors to the corresponding pads on the pcb use bare or silver plated copper wire with a diameter of 1,4mm (AWG #16).

The „TO RADIO“ rf-socket must completely be isolated against the metal box. Use the isolation washers and the soldering tag to assemble the bulkhead connector in the box. Wire and solder the soldering tag of the outer conductor with the corresponding pad K2 on the pcb (yellow arrow).

Next step: wire and solder the core conductor with K1 (red arrow). Put the

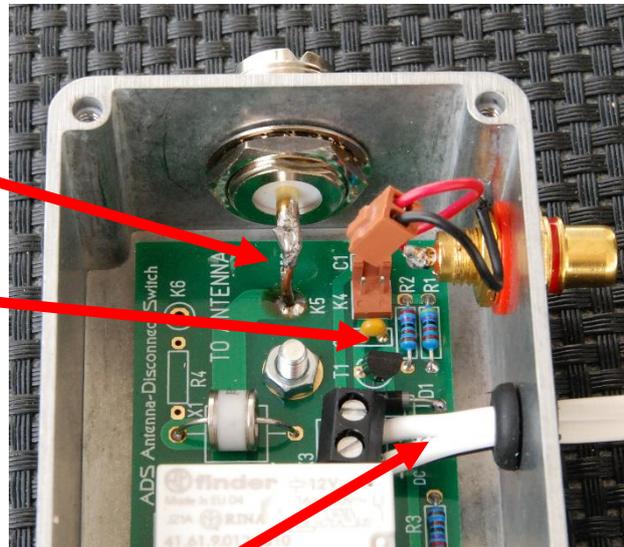


wire from K1 in the opening of the rf-bulkhead socket's core conductor. Fill the hole with solder.
Hint: Screw a PL259 Plug at the outside to avoid deformation of the socket's insulation caused by the soldering heat.

Attention: when inserting and soldering the wires into the the pcb pad make sure to avoid a shortcut of the wire ends with the bottom of the metal box.

The outer conductor of the „TO ANTENNA“ SO259 Socket is firmly screwed and connected with the metal box. Wire and solder the core conductor of the SO259 jack with Pad K5 on the pcb.

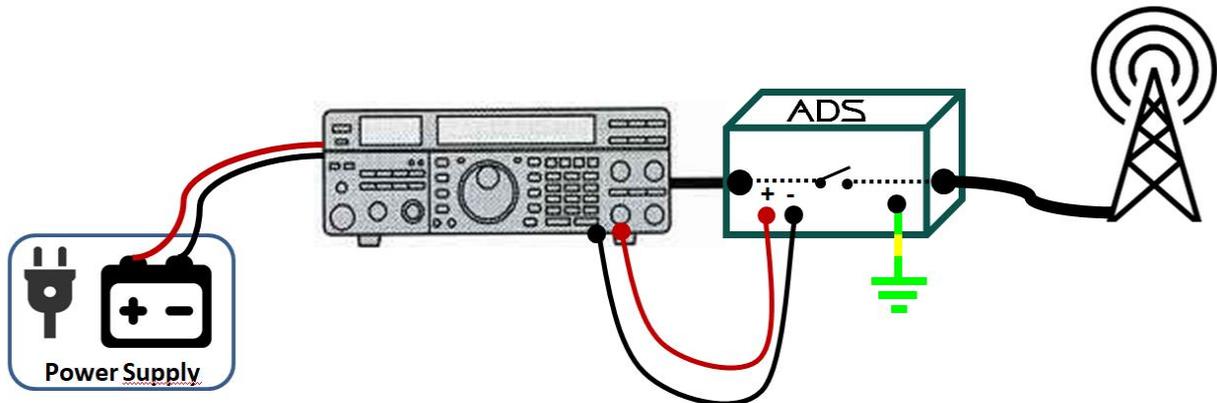
The connection between the isolated „Remote OFF“ RCA Phono-Plug and the pcb is done by a 2-pole pin header (K4). Use short pieces of red/black litz wire to connect the RCA Socket with the 2-pole female connector and plug it to the pin header (K4). Take care of the correct polarity: plus (red) should connect to the inner conductor and minus (black) must connect to the braid/outer conductor.



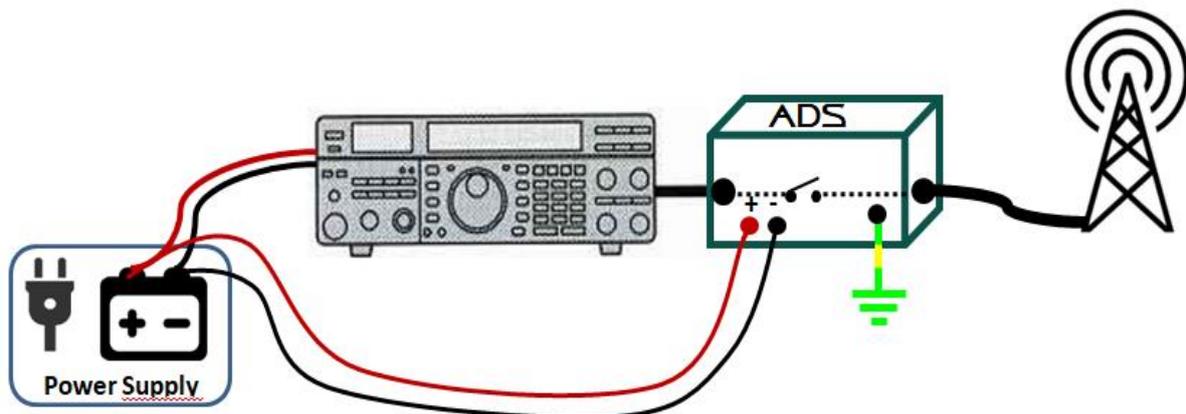
For the DC supply cable you are best advised to use red/black colored twin strand wire. Feed the cable through the rubber bushing. Connect the cable with the 2-pole screw terminal (K3). Take care of the correct polarity: connect the red wire of the cable with the Plus clamp and the black wire with the minus clamp. DC supply voltage is 12V nominal (10V – 18V possible).

Activation Methods

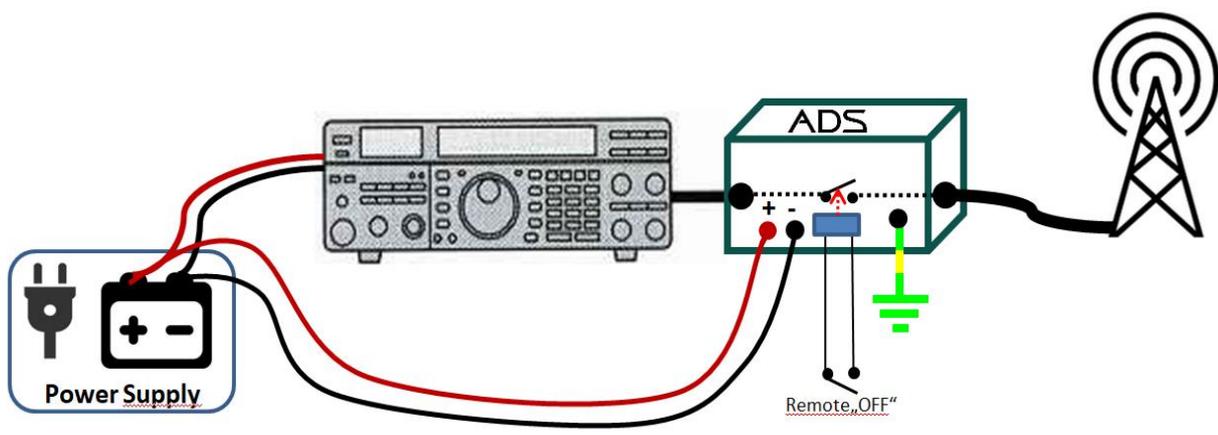
For radios that have a supply output for external accessories, connect the supply cable from the ADS to this output. When the radio turned ON, supply voltage appears on this output, and the ADS gets switched ON. Wire the RED wire to plus, and the BLACK to common.



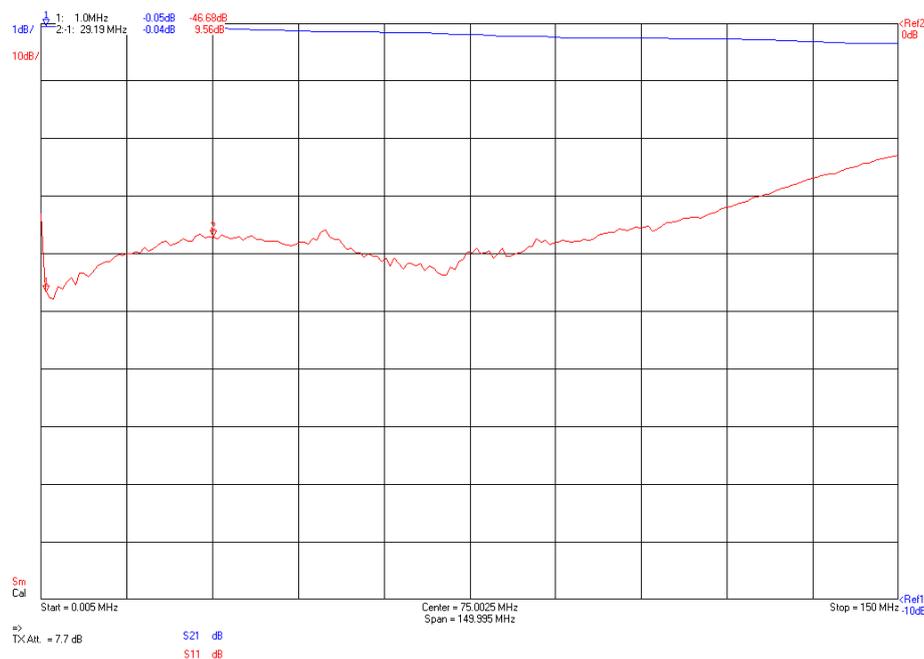
For radios that do not have an accessory supply output, connect the ADS Supply cable directly to the power supply. When the Power Supply is turned ON the ADS connects the antenna to the radio equipment



The „Remote OFF” switching input remotely deactivates the ADS despite during DC-supply is powered. The function can triggered manually or by an automated device. Closing contact at the Input disconnects the ADS, opening - reconnects.



Measurements undertaken – Transmission loss and Reflexion loss



Scale: Transmission (blue) – 1dB/Div
 Reflexion (red) 10dB/Div
 Frequency (horizontal Axis) 5kHz to 150MHz, 15MHz/Div

Disclaimer

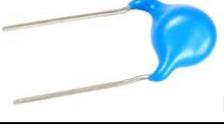
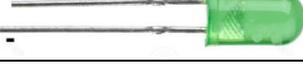
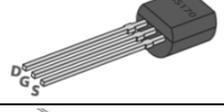


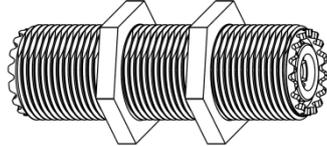
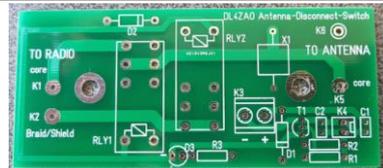
The ADS Antenna-Disconnect-Switch is a supplementary protection device to protect the station against high-voltage events that are induced by nearby lightning strikes. It may not be sufficient to act as a lightning arrester during a direct lightning strike. It does not replace a professional antenna lightning protection system as required in the national electrical codes and standards applicable in your country. Each operator or owner of a station is fully responsible on its own to comply with his country specific rules for antenna lightning protection and safety earth. Any liability in this context is explicit excluded.

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Parts List

Pos.	qty	component nr.	value / type	description
1	1	C1	100nF, ceramic capacitor	 labelled as 104
2	1	C2	10nF, ceramic capacitor	 labelled as 103
3	1	C3	4,7 pF ceramic capacitor high voltage type, 3KV, RM5mm	 labelled as 4.7pF 3KV
4	2	D1,D2	Diode 1N4007	
5	1	D3	LED, green 5mm	
6	4	K1,K2,K5,K6	Solder-Pad on PCB	No component, pad on pcb
7	1	K3	Screw terminal 2-pol	 Pitch 5mm
8	1	K4	2-pol Pin-Header set with plug and cable	
9	1	R1	47K	
10	1	R2	2,7K	
11	1	R3	2,7K	
12	2	RLY1,RLY2	Relay 12V Finder 41.61.9.12V	
13	1	T1	MOSFET BS170	
14	1	X1	Gas discharge tube, GDT Bourns 2049-600	

15	1	Coaxial socket	SO239 female socket	
16	1	Bulkhead connector	SO239 Bulkhead connector with ground soldering tag	
17	1	Rubber grommet	5mm	
18	1m	Power Cable	Twin core flexible lead red - black	
19	1	Buchse „Remote OFF“	RCA/Cinch for isolated assembly	
20		Miscellaneous mechanical parts	Screws and washers M4 (USA: #8 UNC) 6mm distance sleeves	
21		Antenna Socket Isolation Set	PE washer , bushing insulator	
22	1	Ground stud		
23	1	Through Hole Plated Printed Circuit Board		
24	1	Aluminum die-cast box, flanged	Hammond 1590BSFL	

