Wireless Target System (WTS)

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1 General

1.1 Preface

This manual describes the use of the Wireless Target System (WTS) for vehicles and objects.

The manual is intended for instructors, who take part in the simulation exercise. The equipment is distributed by Saab Training Systems.

1.2 Safety Instructions

Attentions called WARNING! or CAUTION! are included in all procedures which can cause injury to personnel or damage to the equipment. The attention called NOTE! is only a statement with information that makes the procedure easier.

The attentions are described before the procedure or before the actual step during the procedure.

All personnel who will handle or operate the simulator equipment must read the complete manual for a thorough overview of all safety instructions.

1.2.1 Attentions general

The attentions included in the manual are divided into the following groups:

WARNING!

A Warning shows a hazard which can cause injury.

CAUTION!

A Caution shows a danger which can cause damage to the equipment.

Note!

A Note is a statement with information that makes the procedure easier.

1.2.2 Laser safety

The laser used in the simulation equipment is classified as laser class 1 (eye safe), according to IEC 60825-1.

It is possible to observe the laser at zero distance, without and with optics (binoculars) without any risk of injury.

1.2.3 Battery safety

WARNING!

Prevent Batteries from:

- **Damage**
- **Short circuit**
- **Exposure to temperatures above 70°C (158°F)**
- **Being dismantled**
- **Immersion in liquids**

For more information how to handle Lithium Batteries in a safe way, see SAAB document Safety Handling Instructions with part no 8875 809-470.

1.2.4 General

WARNING!

Do not ignore the discomfort and intentionally stare into the lamp from a short distance.

CAUTION!

Make sure that the cables not will be damaged during installation.

CAUTION!

Make sure the cables are properly secured before transportation.

1.3 Abbreviations

BIT	Built-In-Test
CGUN	Control Gun
DAN	Distribution and Acquisition Network
IBU	Infrared Beacon Unit (same as VAD)
IR	Infrared
LED	Light Emitting Diode
MSA	Miniaturized Smart Antenna
OID	Operators ID
PDD	Personnel Detection Device
PSID	Player Set ID
VAD	Vehicle Association Device (same as IBU)
WCU	Wireless Central Unit
WDU	Wireless Detector Unit
WLN	Wireless Local Network
WTS	Wireless Target System

2 Introduction

2.1 Training modes

Gunnery mode: The WTS is automatically reactivated 10 seconds after being killed.

Combat mode: The WTS is **not** automatically reactivated after being killed. Tampering kill after startup.

Combat alive mode: The WTS is **not** automatically reactivated after being killed. No tampering kill after startup.

2.2 Hit effects on the target

The following effects are possible when a vehicle is hit. All of these events are stored for AAR.

- Hit, No effect
- Total kill
- Near miss
- Tampering kill

Hit, No effect

The vehicle is hit, but there is no effect on the vehicle.

Total kill

The vehicle can not be used after a total kill.

Near miss

The vehicle registers a near miss. There is no effect on the vehicle, but the vehicle occupants are alerted to the incoming fire by hearing a warning sound through the intercom or SU.

Tampering kill

The vehicle can not be used anymore, because the simulation system has been tampered with. A CGUN can reset a tampering kill.

2.3 Target indications

2.3.1 LED indications WCU

The LED on top of the WCU indicates the WCU status.

Fig 1. WCU status

Table 1. LED indications WCU

LED indication	Status
Green	System OK
Red	Total Kill / Tampering Kill / Temporary Kill
Yellow	BIT Error
Yellow	Low battery

Note!

Push the power button on the WCU to get an audio message of the system status, as a complement to the LED indications.

2.3.2 LED indications WDU

The LEDs on the vehicle symbol on the WDU indicate the WDU status.

Fig 2. Low battery WDU

Table 2. LED indications WDU

LED indication	Status
Four red LEDs	Low battery
One red LED	WDU placement on vehicle
Centre green LED	System OK

2.3.3 Strobe light indications WDU

The strobe light on the WDU indicate the target events.

Table 3. Strobe light indications WDU

Strobe light indication	**Event**
No indication	Near miss
5 seconds of flashing	Hit no effect
Continuous flashing for 2 minutes	Kill
Continuous flashing for 2 minutes	Tampering kill
5 seconds of flashing	NC contamination
No indication	NC clean
1-2 seconds of flashing	CGUN test (not EXCON test)
Flashing stops	Reset
Flashing stops	Reactivate
Flashing stops	Auto reactivate

2.3.4 Audio messages and sound effects

The audio messages and sound effects are given at the detection of the event. The status of the player is also repeated 20 seconds after the event.

Table 4. Audio messages

Status	Audio message	Sound effects
Near miss	No	Yes
Hit no effect	No	Yes
Kill	Yes	Yes
Tampering kill	Yes	Yes
NC contamination	Yes	No
NC clean	Yes	No
Reset	Yes	No
Reactivate	Yes	No

2.4 WTS description

The WTS system consists of a Wireless Central Unit (WCU) and Wireless Detector Units (WDU). Inside the WCU there is a Computer Unit and a Power Unit. Each WDU has 1 detector and 1 strobe hit indicator. The WDU can also be equipped with 2 reflectors.
The WTS is powered by standard PDD batteries.

Fig 3. WTS overview

1a	WDU with reflectors	6	DAN antenna
1b	WDU without reflectors	7	MSA (GPS receiver)
2	WCU	8	Battery 1-cell / 2-cell
3	Loudspeaker	9	IBU/VAD
4	WLN antenna		(Power cable)
5	WLN splitter		(Power adapter cable)

Note!

See the Table of Contents in the storage box for the exact contents of the WTS kit.

When a vehicle is hit, the strobe on the WDU will flash. Soldiers inside a vehicle wearing Personnel Detection Devices (PDD) will be affected through Wireless Local Network (WLN) radio when the vehicle is hit and damaged.

The vulnerability type is set in the system by using a Control Gun (CGUN), see 5.5 Change protection level. The WTS has three protection levels:

- Low
- Medium
- High

2.4.1 WCU description

The WCU is the system master in the WTS. It contains data for the application, evaluates the hits and decides how the target system is affected.

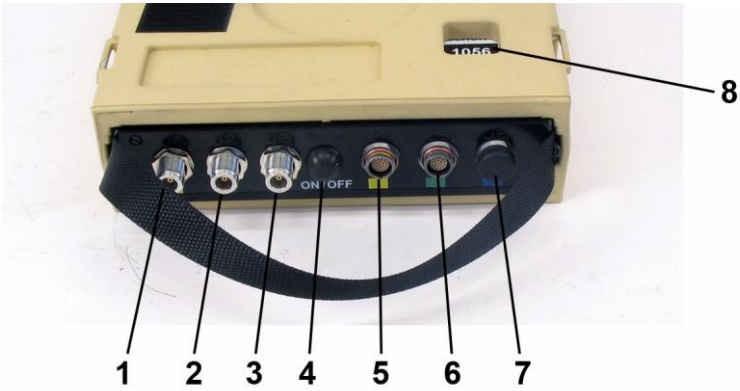

Fig 4. WCU overview

1	DAN antenna connector (optional)	5	MSA connector (optional)
2	WLN antenna connector	6	Loudspeaker connector
3	Not used	7	Power connector (optional)
4	Power button	8	IR window and LED

2.4.2 WDU description

The WDU is slave to the WCU in the WTS. It is used for detection of laser from firing systems.

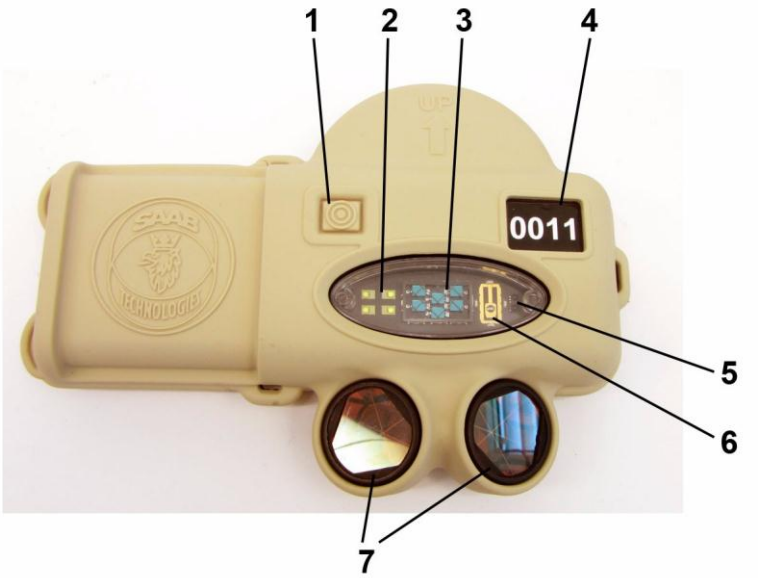

Fig 5. WDU overview, with reflectors

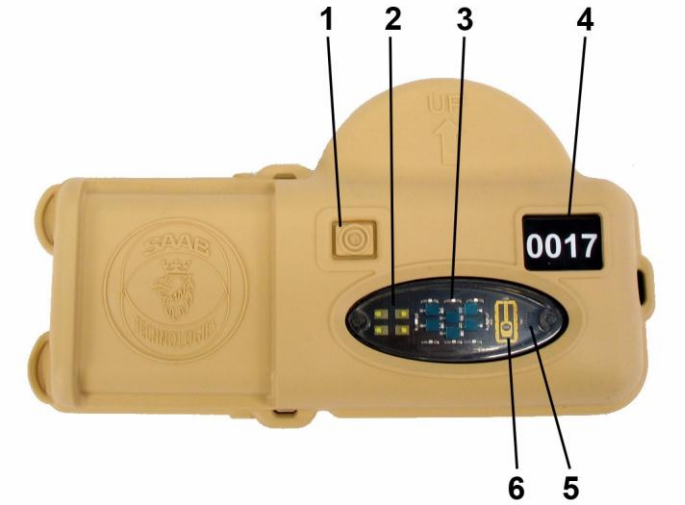

Fig 6. WDU overview, without reflectors

1	Power button	5	IR window
2	Strobe hit indicator	6	Vehicle symbol with LEDs
3	Detector	7	Reflectors
4	ID number		

2.4.3 Loudspeaker overview

The loudspeaker gives the players in the target sound effects and informative messages about status, hit events and errors.

Fig 7. Loudspeaker

2.4.4 DAN description

This network is used to distribute messages between EXCON and the players in the field. The information that is sent over the DAN includes these data:

- AWES event data
- Player and exercise control messages
- Differential corrections for the MSA
- Network management messages.

The DAN is also used to collect these data from the players:

- Event data
- Built-In Test (BIT) and reports, like the ammunition report.
- Player status
- Player position data.

2.4.5 MSA description

The Miniaturized Smart Antenna (MSA) is a GPS antenna enclosed in a plastic housing. It receives the time and position data from the GPS, which is used to determine the position of the vehicle.

Fig 8. Miniaturized Smart Antenna (MSA)

2.4.6 IBU/VAD description

The IBU/VAD is installed inside the vehicle. The IBU/VAD is powered by a internal battery.

Fig 9. IBU/VAD

The IBU/VAD sends IR signals to the soldiers with PDDs inside the vehicle. The result is that the PDDs start the communication with the WTS on the vehicle. The WTS then sends a message to EXCON that there are PDDs in the vehicle.

If the vehicle is hit, the target system calculates the effect for the vehicle and send the result to the PDDs. Each PDD will then calculate the effect in the PDD.

2.4.7 Power system description

The WTS requires 1- or 2-cell batteries or a 12 VDC power from the host vehicle via a vehicle power outlet.

Note!

When the power cable is connected, the batteries in the WCU will be charged.

3 Technical Data

3.1 Environmental Conditions

Table 5. Environmental Conditions

Variable	Value
Humidity	Rainproof
Operating temperature	-25°C to +40°C (-13°F to +104°F)
Storage temperature	-34°C to +62°C (-29°F to +143°F)

3.2 Weights and dimensions

Table 6. Weights and dimensions

Unit	Length mm (inches)	Width mm (inches)	Height mm (inches)	Weight kg (lb)
Battery 1-cell	70 (2.8)	60 (2.4)	20 (0.8)	0.19 (0.42)
Battery 2-cell	145 (5.7)	60 (2.4)	20 (0.8)	0.30 (0.66)
IBU/VAD	95 (3.7)	55 (2.2)	30 (1.2)	0.2 (0.44)
Loudspeaker	140 (5.5)	80 (3.2)	60 (2.4)	0.35 (0.77)
MSA	30 (1.2)	ø 90 (2.5)	-	0.40 (0.88)
DAN antenna	220 (8.7)	ø 70 (2.8)	-	0.55 (1.21)
WCU with battery	253 (10.0)	252 (9.9)	70 (2.8)	4.05 (8.93)
WDU with reflectors	147 (5.8)	207 (8.2)	34 (1.4)	0.58 (1.28)
WDU without reflectors	117 (4.6)	207 (8.2)	34 (1.4)	0.33 (0.73)

3.3 Batteries

Table 7. Operational time WCU

Battery	With DAN	Without DAN
WCU 1 cell battery	1 day	1,5 days
WCU 2 cell battery	2 days	3 days

Table 8. Operational time WDU

WDU	About 1 month

Table 9. Power cable (optional)

Power consumtion	22 W (WTS in use and two batteries charging)
	1,5 W (WTS in use and batteries fully charged)
Charging time for 1 cell battery	up to 4,5 hours
Charging time for 2 cell battery	up to 9 hours

Note!

When the power cable is connected, the batteries in the WCU will be charged.

4 Installation

4.1 WCU installation

4.1.1

Open the WCU. Position two 1 cell batteries or one 2 cell battery in the holder. Push them down until they are locked in the holder (click).

Fig 10. Battery installation WCU

Close the WCU.

4.1.2

Install the WCU. There are two alternatives for placement of the WCU:

External installation (centralized antenna installation)

1 Place the WCU on the roof of the vehicle.
2 Secure the unit with ratchet belts.

Internal installation (spread out antenna installation)

1 Place the WCU in a convenient position inside the vehicle.
2 Secure the unit with ratchet belts.

4.2 Antenna installation

There are two alternatives for installation of the antennas.

- **Centralized installation** for when the WCU has been installed externally.
- **Spread out installation** for when the WCU has been installed internally.

Centralized installation

1 Place the antennas on the magnetic area on top of the WCU.
2 Connect the cables to the WCU, see 4.5 Cable installation.
3 Strap any excess cable length to the ratchet belts that hold the WCU in place.

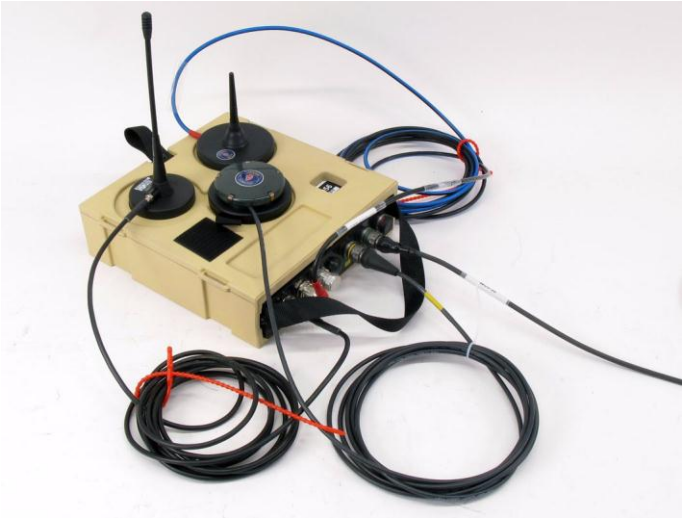

Fig 11. Example of a centralized antenna installation

Spread out installation

1 Place the antennas according to the picture below.
2 Route the cables inside the vehicle to the WCU.
3 Secure the cables with straps.
4 Connect the cables to the WCU inside the vehicle, see 4.5 Cable installation.

Fig 12. Install antennas

1. MSA	3. DAN antenna
2. WLN antenna (inside vehicle)	4. WLN antenna

CAUTION!

Make sure the cables will not be damaged during installation.

CAUTION!

Make sure the cables are properly secured before transportation.

Note!

A large or armoured vehicle may require both WLN antennas on the outside of the vehicle.

4.3 WDU installation

1. Lift the rubber cover on the WDU and push down the battery.

Fig 13. Battery installation WDU

2. Put the rubber cover back on. Make sure it seals tight on the back of the WDU.
3. A green LED indicates that the battery is OK.
4. Push the button and check the vehicle symbol on the WDU. A red LED will indicate where on the vehicle the WDU should be installed - front, rear, left or right.

Fig 14. WDU installation LED

5. Install the WDUs with Velcro on a clean, flat surface on each side of the vehicle.

Fig 15. Install WDUs

Fig 16. Install WDUs, truck

CAUTION!

If the Velcro becomes clogged with mud, clean the Velcro as soon as possible. The WDU may become detached from the Velcro.

Note!

The WDUs and the antennas send signals back and forth. In order for this to work, the path between the WDUs and the antennas must not be blocked and they must be in reach of each other. Move the WDUs higher up on the vehicle if necessary.

Note!

A maximum of 10 WDUs can be installed on each vehicle or target (i.e. max 10 WDU can be associated to a WCU).

6. Secure the WDUs with straps.

Fig 17. Secure WDUs

4.3.1 Change WDU battery

1. Lift the rubber cover on the WDU and lift the battery out.

Fig 18. Remove battery WDU

Note!

Make sure to push on both corners of the battery, not in the middle.

2. Replace the battery and put the rubber cover back on. Make sure it seals tight on the back of the WDU.
3. A green LED indicates that the battery is OK.

4.3.2 Regulatory Statement

Note!
The following Statement and Information refers to the WDU ONLY.

FCC Certification

The United States Federal Communication Commission (FCC) has established certain rules governing the use of electronic equipment.

Part15, Class B

1. This device is FCC Certified **FCC ID: R4AWDU24A**
2. This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:
   a) This device may not cause harmful interference, and
   b) This device must accept any interference received, including interference that may cause undesired operation. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules.

4.3.3 User Informatiom

Caution

Any changes or modifications not expressly approved by the party responsible for compliance, namely SAAB Training USA LLC, could void the user's authority to operate the Equipment.

4.4 IBU/VAD and loudspeaker installation

1. Install the IBU/VAD and the loudspeaker with Velcro.

Fig 19. IBU/VAD and loudspeaker installation

Note!

Make sure the IBUs/VADs can send IR light to the PDDs inside the vehicle.

Note!

Because of different design of the vehicles the inside might look different.

4.5 Cable installation

1. Connect the cables to the WCU.

Fig 20. Install cables WCU

Connector	Cable
J1	DAN antenna
J2	WLN antenna / WLN splitter
J3	Not used
J4	MSA
J5	Loudspeaker
J6	Power cable (optional)

2. Make sure to tighten the cable connectors until the red mark on the connector is not visible.

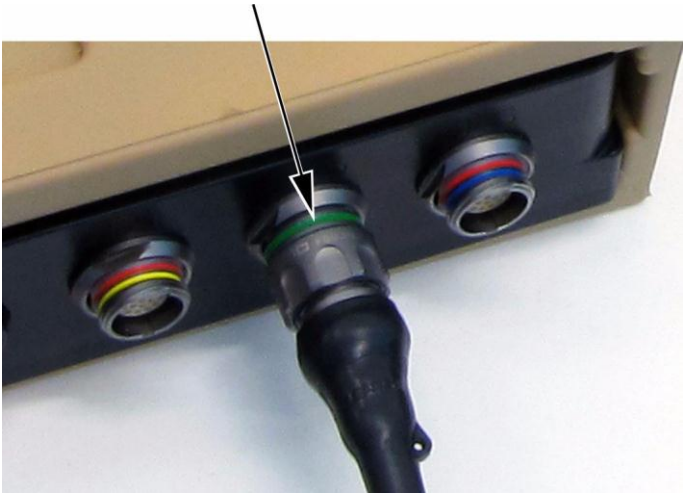

Fig 21. Red mark not visible

3. Connect the power cable to the vehicle power outlet (optional).

Fig 22. Power outlet

Note!

There are several options for power supply depending on vehicle type.

When the power cable is connected, the batteries in the WCU will be charged.

5 Operation

5.1 Start up

1. Push the power button on the WCU and hold for 2 seconds. A green LED will indicate that the WCU is turned on.

Note!

*If the system is in Tampering Kill mode after power up, select the command **RESET** on the CGUN. Aim at a WDU and fire the CGUN to reset the system.*

5.1.1 First time procedure

The very first time the system is used, you may want to make sure the WDUs are properly associated to the WCU.

1 Select the command **TEST** on the CGUN and fire at the WDU.

2 The system will generate the audio message ASSOCIATED + ID NUMBER.

5.2 Target engagement

5.2.1 Ballistic (BT46) simulation

The hit area is 3 x 3 meters. The defined origin is in the center of the WDU.

A hit is detected when the point of impact is within the hit area, the effect will be Kill or Hit No Effect.

If a hit is detected outside the hit area the effect will be Near miss.

5.2.2 MILES/One-way simulation

When one-way simulation is used, no hit coordinates are presented. The soldier will only see the effect on the target - Kill, Hit No Effect or Near miss.

5.3 WDU association

Note!

This procedure is only necessary if a WDU has been removed from the system or if extra WDUs need to be added to the system. A maximum of 10 WDUs can be used on one vehicle.

1 Push in the center of the button on the WDU and hold until a red LED is lit next to the vehicle symbol.

Fig 23. Push the WDU button

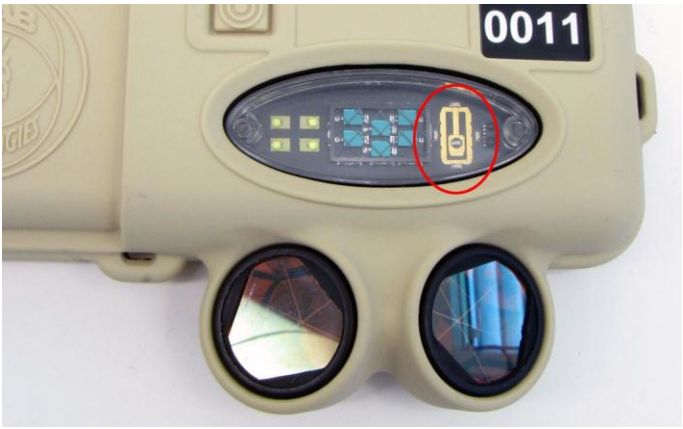

Fig 24. Vehicle symbol

2 Push the button to move the LED around the vehicle symbol to select where the WDU is installed.

3 When a WDU position is selected, wait until the LEDs are turned off to save the selection.

4 Hold the WDU above the WCU and push the button on the WDU once. Make sure the WDU can send IR light to the WCU.

Fig 25. WDU association

5 The system will generate the audio message ASSOCIATED + ID NUMBER.

6 Repeat for each WDU.

7 To verify which WDUs are associated to the WCU, select the command **TEST** on the CGUN. Aim at a WDU and fire the CGUN. A sound message of all associated WDUs will be generated.

5.4 Test

1. Push the button once on the WCU to test the system. Make sure the system generates the audio message SYSTEM OK.

   Note!

   *It is also possible to select the command **TEST** on the CGUN and fire to test the system.*

   It is possible to change the protection level, see 5.5 Change protection level for more information.
2. Push the button twice on the WCU to get information about the ID for the system, armor level (e.g. ID 11, high, System OK), OID, PSID and if the system is connected to EXCON.

5.5 Change protection level

1. Select the command **ACCESS or CTRL** on the CGUN and fire to enter the protection setup mode.

OSAG code CGUN	Standard MILES CGUN
ACCESS	CTRL
DUG IN	RESURR
W.WALK	KILL

2. Select the command **DUG IN or RESURR** on the CGUN and fire to increase the armor from LOW to MEDIUM or MEDIUM to HIGH. Select the command **W. WALK (wounded walking) or KILL** on the CGUN and fire to decrease the armor from HIGH to MEDIUM or MEDIUM to LOW.

   The three protection levels are similar to the following type of vehicles:
   - Low protection = civilian car
   - Medium protection = jeep/truck
   - High protection = armored vehicles

   Note!

   *After 20 seconds the system automatically returns to normal mode. Select the command **ACCESS or CTRL** on the CGUN and fire to enter the protection setup mode.*

5.6 Power down

1. Push and hold the power button on the WCU for 3 seconds. The audio message SYSTEM POWER DOWN will be heard. **Or** open the WCU, remove the batteries and close the WCU.

6 Removal

6.1 Remove WDU from system

1. Hold the WDU above the WCU and push the button on the WDU once. Make sure the WDU can send IR light to the WCU.

Fig 26. WDU removal

6.2 Remove all WDUs from system

1. **For OSAG:** Select the commands **ACCESS** + **ACCESS** + **RESET** on the CGUN. Aim at the target system and fire the CGUN to remove all WDUs from the system.
2. **For MILES:** Select the commands **CTRL** + **CTRL** + **RESET** on the CGUN. Aim at the target system and fire the CGUN to remove all WDUs from the system.

7 Troubleshooting

7.1 Troubleshooting

Check that all cables are connected properly.

Push the button on the WCU to test the system. Listen for error messages from the loudspeaker.

Table 10. Troubleshooting

Symptom	Cause	Corrective action
WDU missing.	Battery empty.	Change battery.
	WDU not associated to WCU.	Associate the WDU to the WCU.
	WDU in "sleep mode".	Push the power button on the WDU.
WDU does not function.	Low battery.	Change battery.
	Antennas out of reach.	Make sure all antennas are properly installed.
		Move the WDU higher up on the vehicle.
	WDU not associated to WCU.	Associate the WDU to the WCU.
WCU does not function.	System powered down.	Push and hold the button on the WCU for 2 seconds to start the system.
	Battery disconnected.	Install battery.
	Low battery.	Change battery.
	Cable disconnected.	Make sure all cables are properly installed.
MSA does not function.	Cable disconnected.	Make sure the MSA cable is connected to the WCU.

Symptom	Cause	Corrective action
Yellow LED lit on the WCU.	BIT error.	Push the power button on the WCU to play a BIT error audio message.
	Low battery.	Push the power button on the WCU to play an audio message about which WDU needs a new battery.

8 Maintenance

8.1 Cleaning

1. Remove mud and dust with a nylon brush.
2. Clean all exterior parts with a wet sponge.
3. Clean all optical surfaces with lens cleaning paper. If necessary use detergent without citric acid e.g. windshield wiper fluid. Clean the glass smoothly with circular movements from the centre to the edge.
4. Dry all equipment with a dry cloth.

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