

User manual for ML2000

Installation

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2 Installation

2.1 Introduction

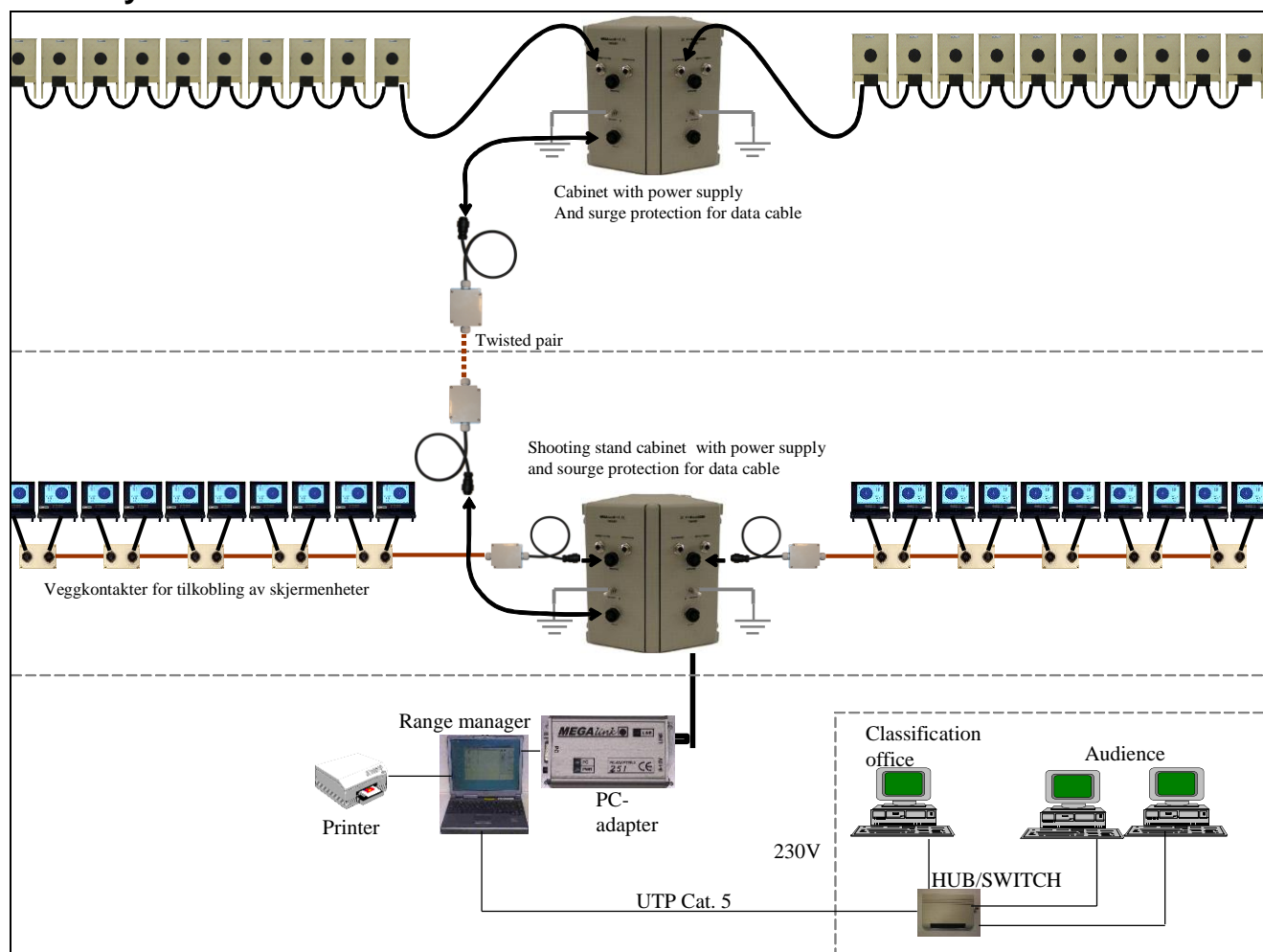
2.1.1 Different installation variants

This chapter describes how to install the ML2000 system. Due to the flexibility of ML2000 there is many different ways to connect the components into a system. We recommend following the guidelines in this document. This will ensure a successful installation and help in case of need for support. The following gives an overview of the installation categories:

| Category | Range | Comments an components |
|--------------------------|----------------------------------|---|
| Standard permanent range | 10m 15m 50m, 100m-300m | Range with 10 targets for each segment: <ul style="list-style-type: none"> • Display units for shooters (DU) • Surge protection at shooting stand (not used for indoor ranges) • Power supply and PC-connection • Cable between shooting stand and target pit • Target connection cabinet • Target cables • Target units (4K300, 4K187, 3U490, 3U545, 3U650) |
| Running target | 50m, 100m | Communication between shooting stand and target through radio modem: <ul style="list-style-type: none"> • Display unit for shooter (DU) • Power supply and PC-connection • Pair of radio modems • Target connection cabinet for wagon • Target unit 3U650E • End switches for counting number of runs |
| Pistol | 25m, 50m | Permanent installation with 5 targets for each segment: <ul style="list-style-type: none"> • Mainly similar to standard • Red and green LED lamps for targets |
| Personal target | 10m, 15m, 50m 100m-300m | Mobile components only: <ul style="list-style-type: none"> • Display unit for shooter (DU) • Portable battery with connectors • Long target cable or pair of radio modem with additional battery • Target unit (usually 4K187 or 4K300, but possible with all target units) |
| PC-based | 10m, 15m, 50m | Intended for personal indoor range <ul style="list-style-type: none"> • PC • PC-adapter with power supply and cable set • Long target cable • Target unit (usually 4K187 or 4K300) |

Different schematic drawings for the connection of a system are included later in this chapter. Ensure that the right schematic is used for your system .

2.1.2 System overview



2.1.3 Surge protection

In case of lightning there could be generated high voltages in all cables with a certain length. There are different techniques to protect against this, depending on voltage levels and sensitivity of connected equipment.

Due to long cables and low signal levels, the data cables are most exposed in a ML2000 system. Therefore surge protection is placed close to the connected equipment in both ends of the cable. The surge protection is physically located in the target connection cabinet and a small box at the shooting range. The protection consists of a surge part and a repeater. The intention of the repeater is to avoid damage on connected equipment even if the surge part is not able to limit the voltage sufficiently. In this case the repeater will usually be damaged. The repeater will also prevent further damage in case of insufficient grounding of the surge protection.

All surge protection solutions require proper grounding. To avoid problems caused by failures in mains power supply or grounding errors, the guidelines for such installations have to be followed carefully. In short the ground potential should be equal and the same mains phases should be used at all locations in the system.

The electronics in the ML2000 system is equipped with surge protection at the power input. Regardless of this, we would recommend to install surge protection on the main power at the range (typically in connection with the 230V/110V inlet and/or fuse panel).

2.1.4 Cable between shooting stand and targets

A single twisted pair is used between the shooting stand and the targets, for each target segment. A segment consists of 10 regular targets or 5 pistol targets with red and green LED lamps. There are no special requirements for the cable with respect to twisting or conductivity. An ordinary telephone cable with twisted pairs is adequate for outdoor use (for example MXLE 0,6mm). Remove enough cable cover to ensure that the cable pairs are kept together. For indoor installation a regular TP cable (category 5 cable) is recommended, but note the poor mechanical characteristics of this cable.

It is important to connect 1A at one end of the cable with 1A at the other end of the cable with the same wire. Since the communication is polarity sensitive, the system will not operate at all if the pair is cross coupled.

It could be an advantage to use shielded data cable. In this case the shielding should be grounded as shown in the schematics in this chapter.

NB! For running targets a pair of radio modem is used instead of a cable. Use the special connecting cables for each of the modems. One modem is connected to the extra outlet on the target unit while the other modem is connected to the extra outlet in the connector box for the display unit. In case of faulty transmission, a cable could be used from the shooting stand to a location close to the parking area for the target wagon. This would ensure visibility between the modems. On the other hand a too close location (less than 6-10 m) must be avoided.

Locate the radio modems as close as possible to free air between the antennas. This can be achieved by following these guidelines:

- Both antennas should be placed in a vertical position.
- Locate the modem at the wagon as high as possible. Ideally the antenna should be above a secure height, while the modem should be located below the protection in front of the running target.
- Locate the modem at the end of the wagon that gives the best position when the wagon stops after a series.
- Locate the modem at the shooting stand as high as possible, while at the same time stretching the modem towards the target at the front of the shooting stand.
- The modes should not have electrical connection to the wagon or shooting stand. Ensure isolation in case of metal where the modem is located.
- The antennas should not be located close to large metal objects (metal roofs etc.). This could result in interference and reduced signal strength. An option could be to fit a roof antenna (for 433MHz) on a metal roof (with coax cable to the modem).

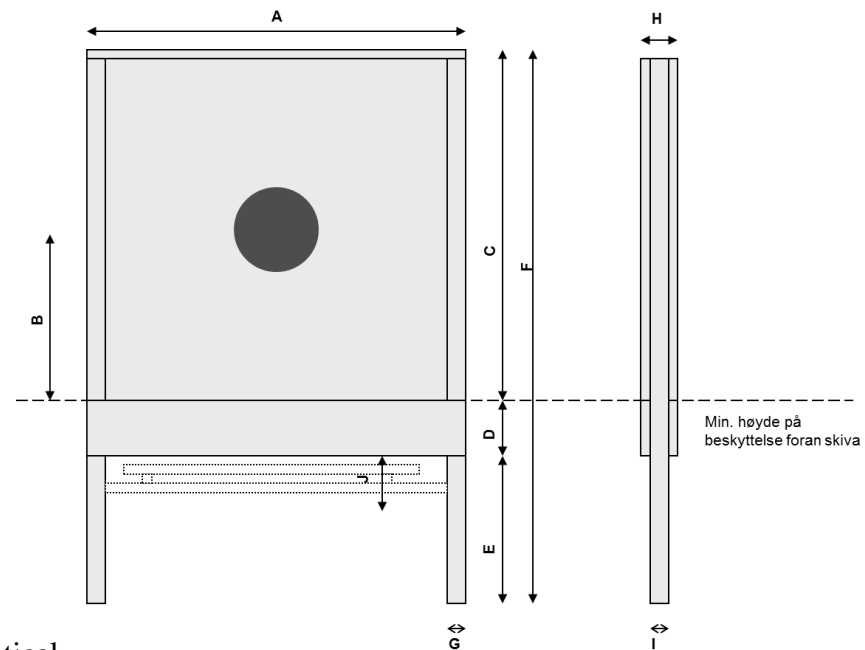
2.2 Targets

2.2.1 Target units for 100m-300m

2.2.1.1 External measurement for 3U490, 3U545 and 3U650

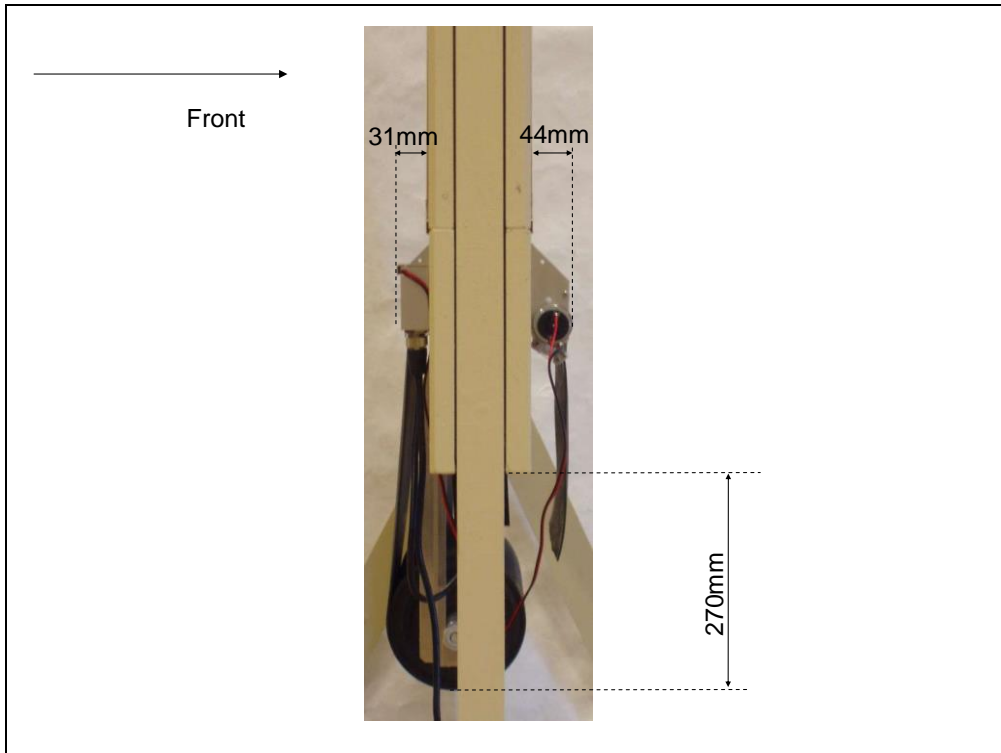
| Weight | 3U490 | 3U545 | 3U650 |
|---------------------|-------|-------|-------|
| Without rubber band | 29 kg | 34 kg | 40 kg |
| With rubber band | 32 kg | 38 Kg | 44 kg |

| | 3U490 | 3U545 | 3U650 |
|----------|--|-----------|------------|
| A | 1160 mm | 1300 mm | 1500 mm |
| B | 550 mm | mm | 800 mm |
| C | 1175 mm | 1308 mm | 1622 mm |
| D | 225 mm | 225 mm | 225 mm |
| E | Ca. 533 mm | Ca. 533mm | Ca. 533 mm |
| F | 1935 mm | 2015 mm | 2380 mm |
| G | 67 mm | 77 mm | 77 mm |
| H | 86 mm | 86 mm | 86 mm |
| I | 40 mm | 40 mm | 40 mm |
| J | 150 mm | 150 mm | 150 mm |
| A | Width | | |
| B | Height to center | | |
| C | Height detection area | | |
| D | Height front cover | | |
| E | Height legs | | |
| F | Total height | | |
| G | Width legs | | |
| H | Thickness target | | |
| I | Thickness legs | | |
| J | Necessary clearing for removing of target sensor | | |

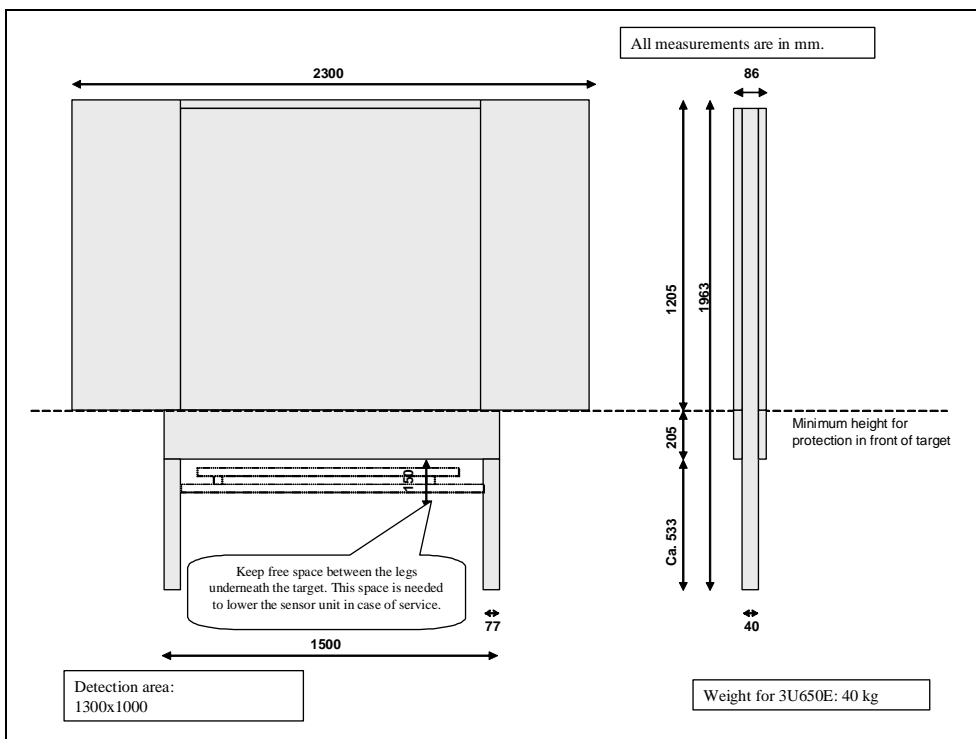


The front and back of the target are identical.

2.2.1.2 Extra for motor advance



2.2.1.3 External measurement for 3U650E



The target unit for running target has a front and a back side. The front side is equipped with thinner vertical plywood to allow the aiming plates to fit on each side.

2.2.1.4 Sensor unit

It is important that all the sensor units are mounted identically. **Correct mounting is when the cable outlet is on the right side when seen in the shooting direction.** Even if this normally is correct at delivery, it should be checked before use.

It is a good idea to mark each target with target number and direction (front/back) to ensure correct remounting if the targets are removed.

It is possible to secure the sensor bar with locking screws for the brackets (this should definitely be done for running targets).

2.2.1.5 Clips for front- and back targets

Plastic clips should be mounted to force the front and back targets towards the rubber sheet. By mounting the clips as shown in the picture, the clips can be rotated to release the front and back targets. For running targets we recommend two clips on each side for both front and back target (in total 8 clips). For other targets one clip on each side is sufficient (in total 4 clips per target unit).



2.2.1.6 Aiming plates for running targets

For large running targets the image can be extended on additional aiming plates mounted at each side of the main target unit. This is done for the Nordic running moose and running deer targets.

2.2.1.7 Rubber band

All targets in the ML2000 system use vertical rubber or paper (for air weapons) band. For big bore at outdoor targets (100m-300m), these bands can be mounted after some period of shooting. Refer to the maintenance chapter for details on this.

If small bore ammunition is to be used (for example calibre .22 LR), the bands should be mounted before using the targets. For some targets the main rubber sheet should also be cut before shooting. Refer to the maintenance chapter for details.

2.2.1.8 Installing external motor for band advance

The external motor for automatic band advance has to be installed after delivery to enable safe transportation.

The motor unit is located at the back of the target. This results in an upward advance of unused rubber band in front of the target and a downward advance of used rubber at the back of the target. Installing is done with the following procedure:

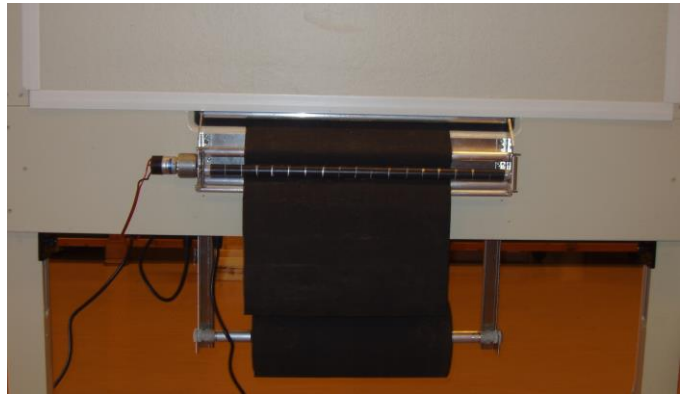
1. Start with the guiding rods at the front of the target.
 - a. Fix the mounting bracket with wood screws.
 - b. Fix the cover for the sensor box with wood screws.
2. Mount the motor unit at the back of the target with the rubber coated driving rod in center of the target.
3. Connect the motor cable in the sensor box



4. Mount the holder for the rubber roll. This holder is mounted centered at the most convenient side of the target.
5. Mount additional protection against dirt if needed.

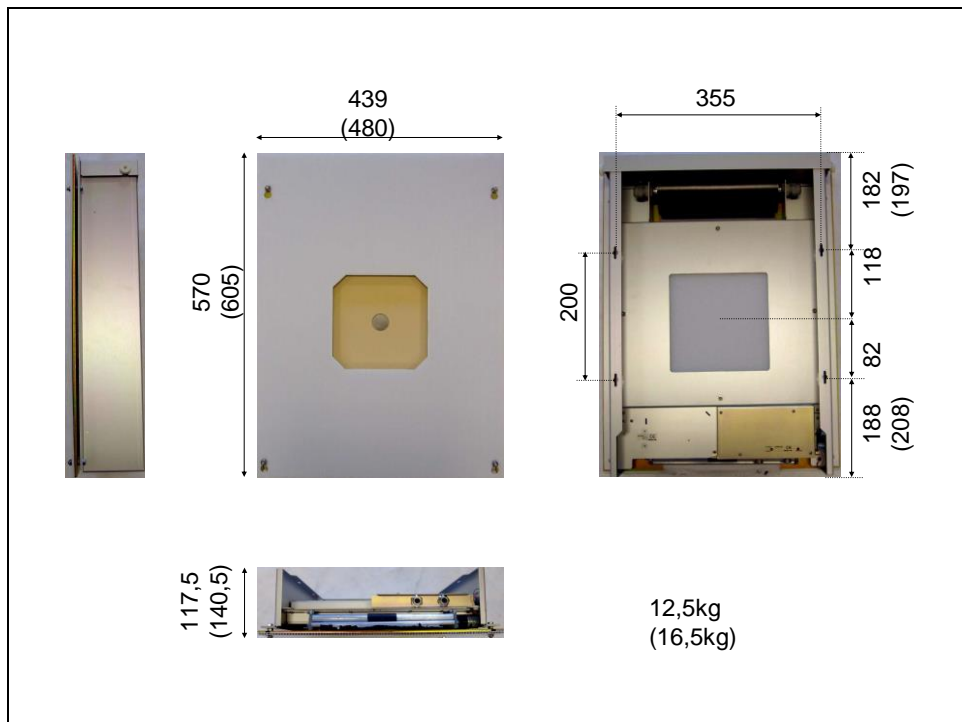
Normally there should be pre drilled holes in the frame for targets with external motor. If not, the enclosed template can be used to make 3mm holes in the correct positions.

Refer to the chapter for maintenance for instructions regarding installation of rubber band and adjustment of advance.



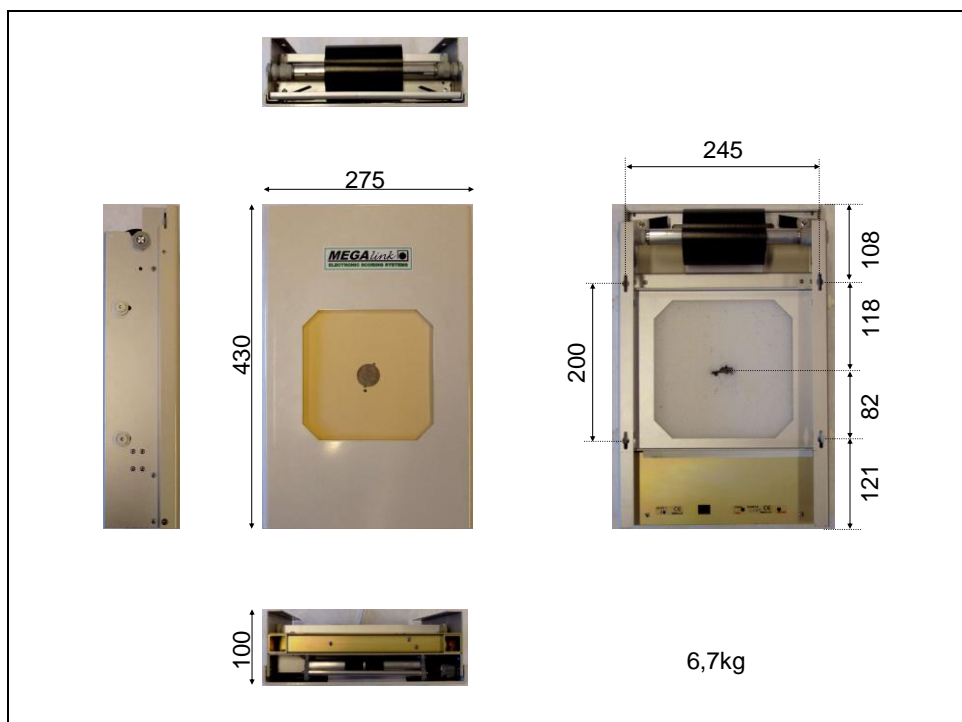
2.2.2 Target units for 10m-50m

2.2.2.1 External measurements for 4K300

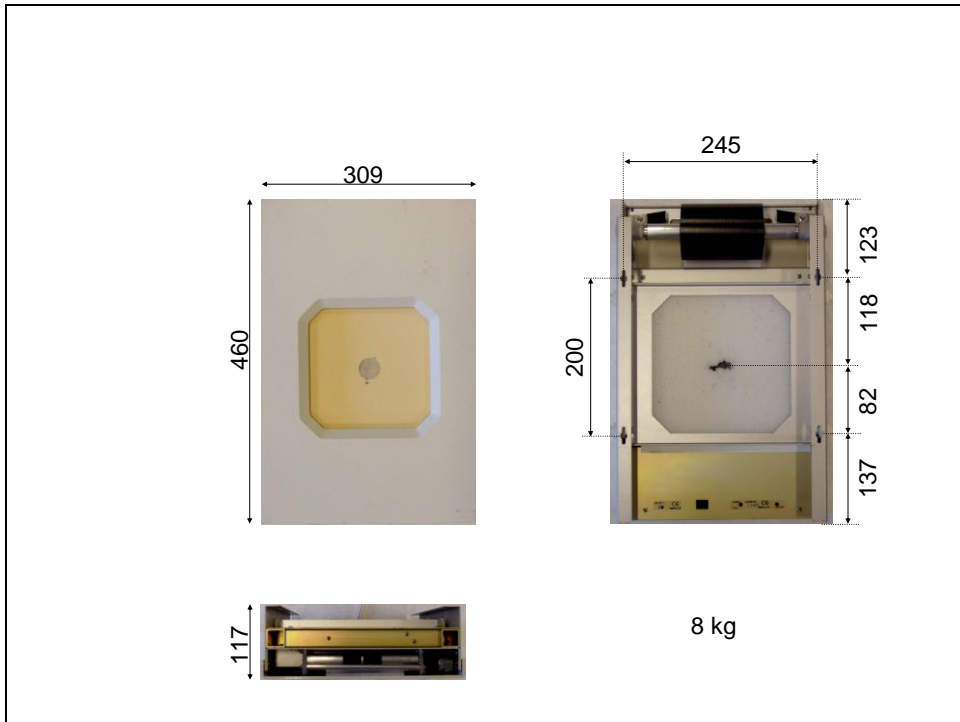


Measures with plywood protection is given in parenthesis.

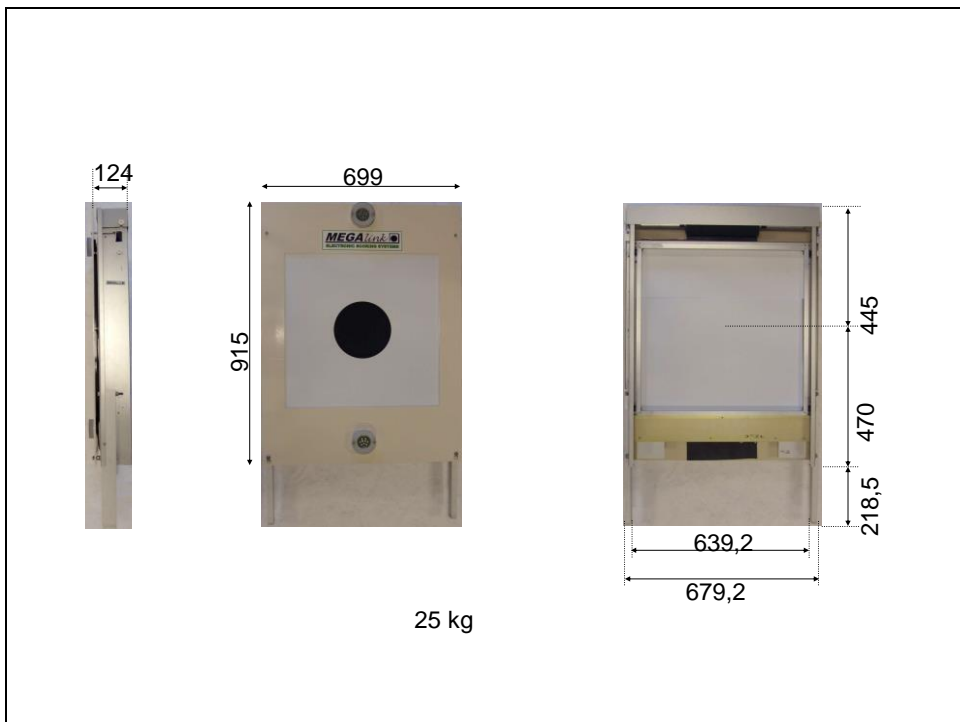
2.2.2.2 External measurements for 4K187



2.2.2.3 External measurements for 4K187 with plywood



2.2.2.4 External measurements for 4K560



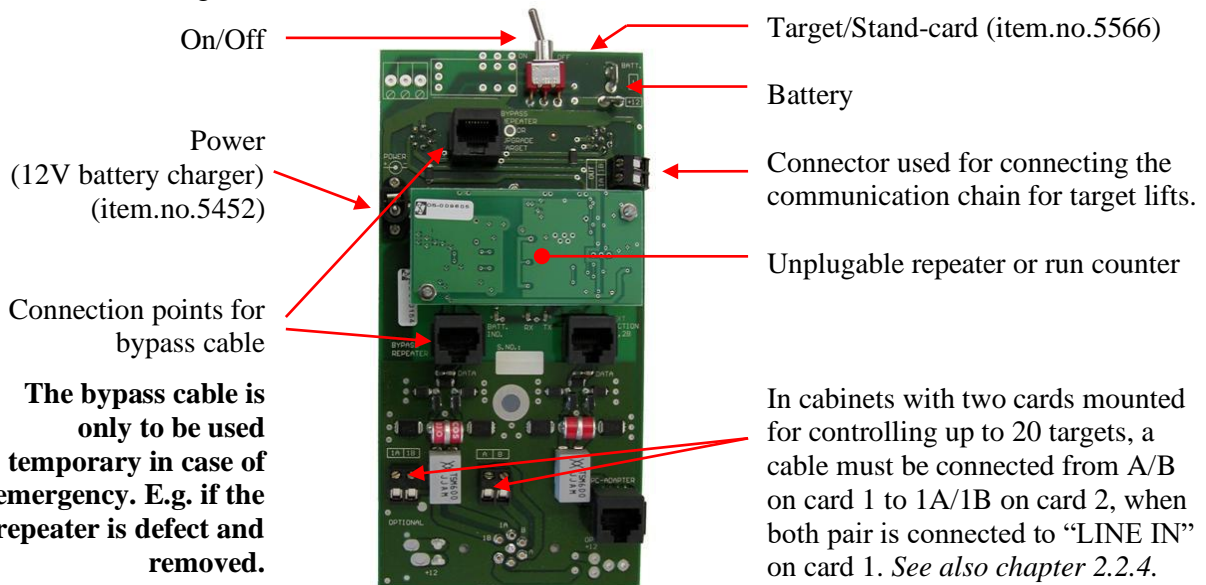
2.2.3 Target connection cabinet

The target connection cabinet will be fixed on a wall with screws for permanent ranges. For portable solutions there should be added a connector on the data cable.

The battery charger and the one of the battery electrodes are unconnected in the delivered cabinet. These must be connected before using the system.

In some cases there would be a need to connect each target individually to the connection cabinet. Since the maximum length of standard target cables are 10m, the connection cabinet must sometimes be mounted in the centre of a target segment.

Even if the cabinet and inside components are quite insensitive to humidity, the target connection cabinet should be mounted under a roof at outdoor ranges. Mount the cabinet on a wall or another suitable location. Remember to reserve space for contacts, cables and door. There must be 15cm free space on the left hand side of the cabinet to be able to connect and disconnect the target cable.



Target connection cabinet. For earlier versions see section 2.7.9.

Proper grounding has to be done if the surge protection should have the intended effect. Refer to more detailed description later in this chapter.

There should be a 230V/110V outlet close to the cabinet (within 0.5 meter from the cabinet). The system is designed for being connected to 230V/110V also when not in use, in order to ensure complete charging of the battery. The battery is charged even if the power switch is in position “OFF”.

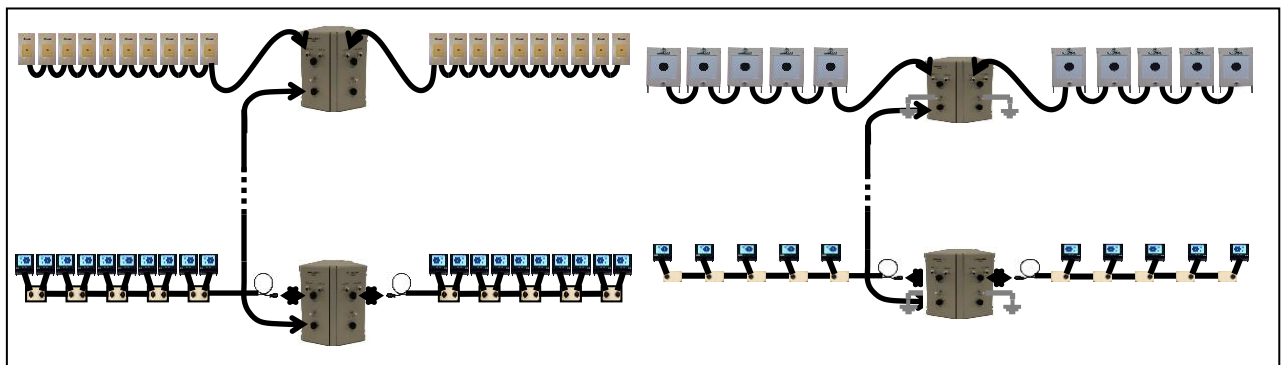
When the system is not in use set the power switch in position “OFF” and disconnect the “LINE IN” cable to prevent damage during lightening.

2.2.4 Double target connection cabinet

If the total amount of devices, monitors and targets, is above the limit of how many that can be connected to one segment, a double target connection cabinet is needed.

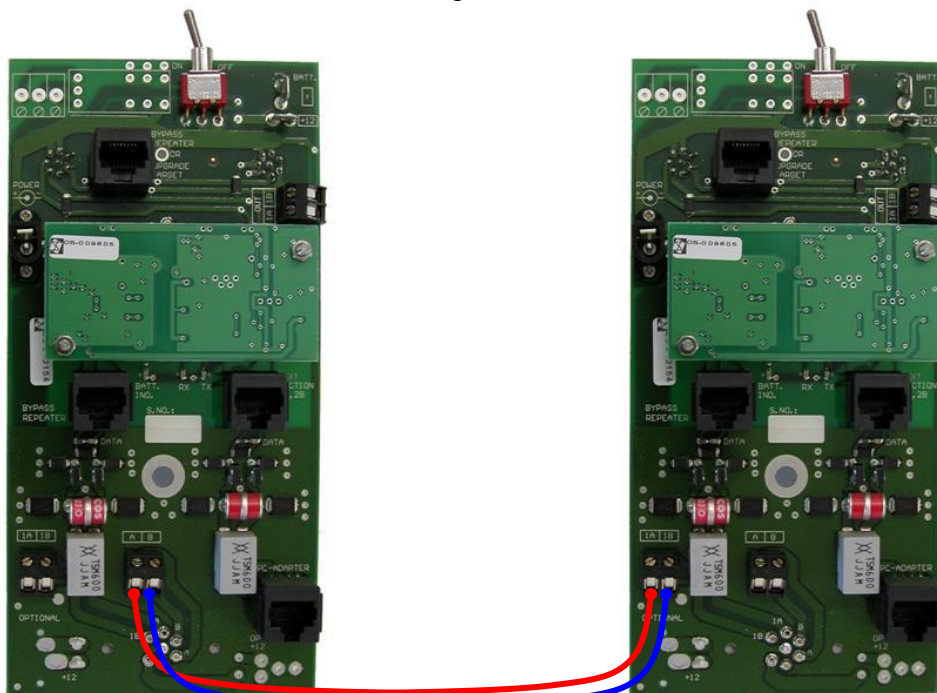
Maximum ten devices can be connected to one single segment. For a larger number of devices another segment must be added. This can be done by using a double target connection cabinet. With the double cabinet up to ten devices can be connected on each side. If more than two segments is needed, several cabinets can be connected in serial.

One single pistol target with light controls is counted as two devices. With that only five pistol targets can be connected to each segment.



Examples of installations where two segments is needed.

The cards inside the double shooting stand cabinet are connected like this:



Card 1, left side

Card 2, right side

See also chapter 2.2.3.

2.2.5 Cable between targets and shooting stand

There are two ways to connect the target connection cabinet and the shooting stand cabinet. For indoor use our special shooting-stand-cable can be used. A cable prepared for outdoor use must be used in greater facilities. This has to be connected using a connection box like the one in the figure. A single twisted pair is used between each target segment. One segment requires the connection of 1A/1B. Two segments requires the connection of both 1A/1B and 2A/2B. It is important to connect 1A at one end of the cable with 1A at the other end with the same wire, etc. The system will not operate at all if the pair is crossed.



2.2.6 Fiber cable between targets and shooting stand

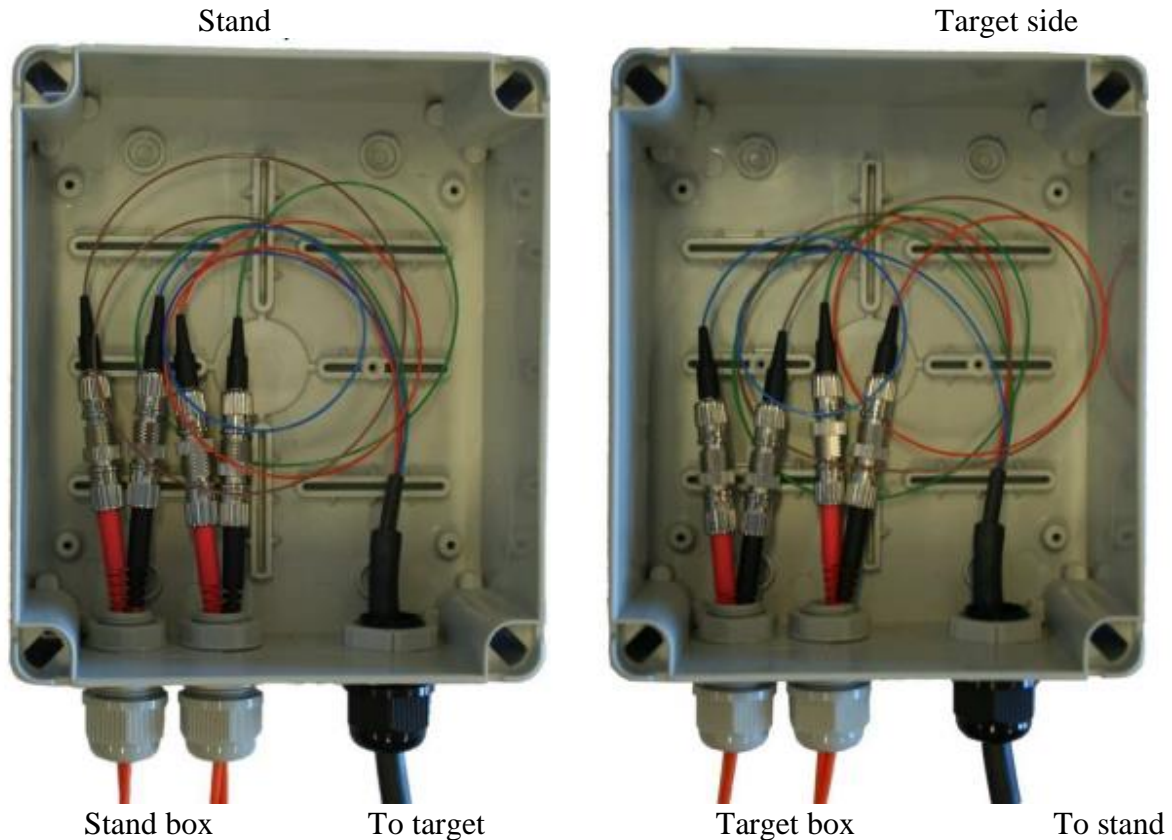
2.2.6.1 Fiber modem

The repeater cards in the stand and target cabinet must be replaced with fiber modem (Art. no. 6261). Plug in the contacts from the orange fiber connection cable (Art. no. 6266) before the modem is mounted in the cabinet.

| | |
|-----------------|-------------|
| Tx (Transmit): | Red cable |
| Rx (Reception): | Black cable |

2.2.6.2 Fiber cable

The fiber cable used between the stand and the target has (minimum) two pairs. This can replace the cat5 or similar cable. To connect this cable to the fiber modems, you install a junction box for patch cable between the junction box and the stand/target cabinet. Each fiber pair must be crossed so that Rx is connected to Tx.



| | | |
|-------------------------|----|-------|
| Net 1 (target 1-10) | TX | Brown |
| | RX | Blue |
| Net 2 (target 11-20) | TX | Red |
| | RX | Green |

| | | |
|-------------------------|----|-------|
| Net 1 (target 1-10) | TX | Blue |
| | RX | Brown |
| Net 2 (target 11-20) | TX | Green |
| | RX | Red |

NB! The fibres are very thin and fragile, make sure they don't break. Minimum diameter on bend is 50mm!

2.2.7 Grounding for surge protection

Use only one common grounding point at the shooting stand and one point for the target connection cabinets. These two grounding points must be at the same voltage level. Grounding can be established with bare copper in the physical ground. The resistance to ground must be less than 100 ohms. We recommend using a 35 mm² bare copper cable in the cable ditch between the shooting stand and the target pit. By connecting this cable to the grounding points in both ends, you will obtain an optimal grounding and at the same time ensuring equal voltage levels at both points. If the mains regulations in your area allow it, we would also recommend connecting the 230V/110V grounding to the same points.

It is important to use the same 230V/110V phase in both ends (shooting stand and target pit).

2.2.8 Connection of target units

The target units are connected through a standard target cable with a small female connector in both ends. The first target is connected to the outlet on the left hand side of the target connection cabinet. The remaining targets in the segment are chained together with target cables. The two connectors under the sensor unit are equal.

NB! Don't use force when inserting the connector. Check that the notch in the connector is entered correctly.

If the target numbers should be reconfigured, there is a need for connecting each target unit individually. In this case a long cable is used directly from the target connection cabinet to the target unit.

A standard delivery includes a 10m cable for the first target and either 2m or 5m cables between the remaining targets.

2.2.9 Alternative connection of 4K187 target units

Newer 4K187 target units can be connected in various ways. Either with RJ45 cable or with standard target cable.

Using RJ45 cable the target units must be connected through a cable splitter as shown in the picture. Use standard target cable from the target connection cabinet to the first splitter. If more than one splitter is used, the splitters are chained with more standard target cables.

Each target is connected to one of the five target outlets (RJ45 connectors). Use a straight RJ45 cable (standard LAN cable).

The connector (RJ45) located between the two chaining connectors can be used for connecting the communication chain for target lifts.



RJ45

Standard target cable

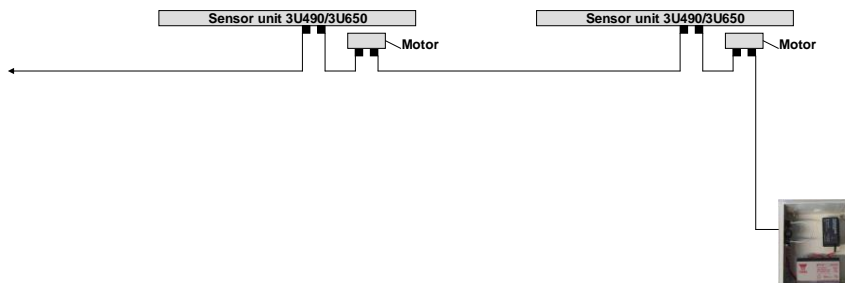


4K187 target unit

2.2.10 Connection of targets with external motor advance (3U490, 3U545, 3U650)

Targets with automatic band advance are connected in the standard way except for:

- No more than 5 targets are connected in one chain. The outlet from the target connection cabinet must be split to use more targets. In addition the cabinet should be mounted in centre of the segment to minimise the total length of the chains.
- The chain starts at the target connection cabinet and enters into the right connection (close to the target side) on the motor unit. A short cable is connected from the other outlet on the motor unit to one of the connectors on the controller unit in the sensor rod in the target. A regular target cable is used to connect from the other connector on the controller unit to the next unit (starting with the right connector on the motor unit etc.)

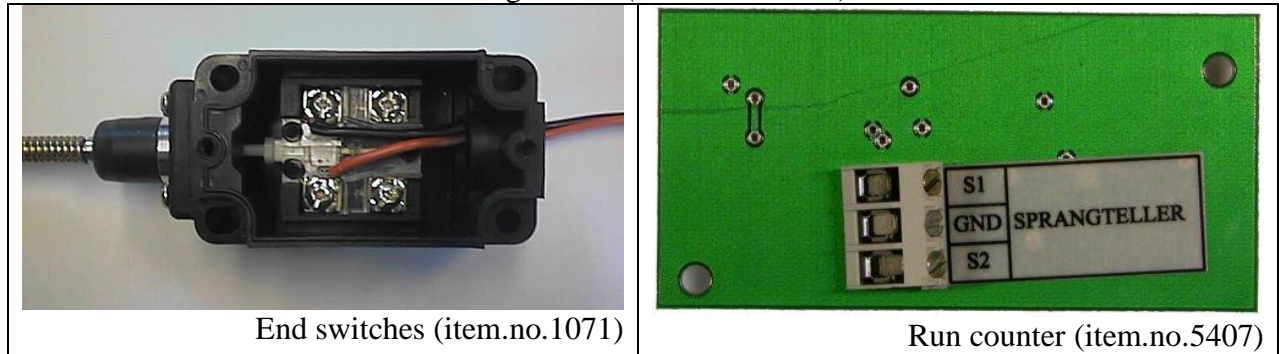


- The targets must be set up with the configuration option “**External motor = YES**”. This can be done in the **Target Config** menu on the display unit. (Press and hold the **B**-button while the display is switched on. Enter the value “**3**” in the password menu and select **Config**”. Confirm the selections by pressing “**Send data**”. Please see the section “**Sensor data**” in chapter 3 in the user manual for more information.)

2.2.11 Switch for run counting

End switches (item.no.1071) and run counter (item.no.5407) are delivered for running targets. This is used to detect for which run the shots are registered. The switches must be mounted on the wagon in a way that triggers one switch in one end of the run and the other switch in the other end of the run.

The run counter is mounted on the target card. (See section 2.2.3)



The two wires are connected at the terminals marked 3 and 4 inside the switch. The connection is polarity independent. The other ends of the wires are connected in the target connection cabinet as shown on the schematic wiring diagram at the end of this chapter.

The switch that is activated after the first run should be connected to:

- S1
- GND

The switch that is activated at the return from the first run (i.e. on the second run) should be connected to:

- S2
- GND

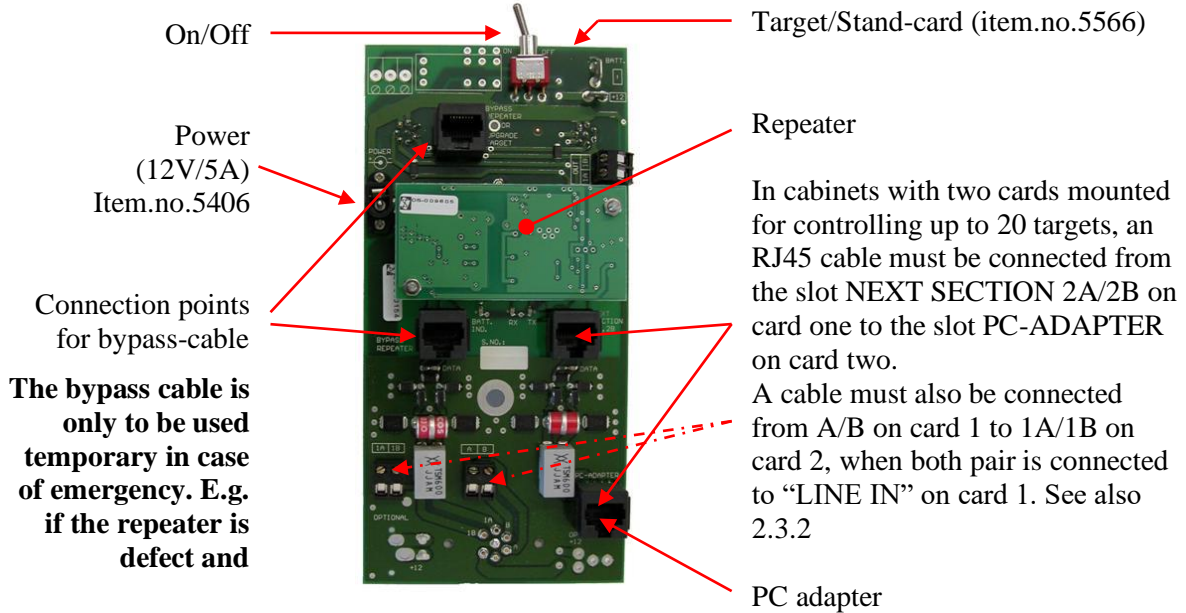
Remember to mount the bushing nipple in the cable inlet on the switch.

2.3 Permanent shooting stand

2.3.1 Shooting stand cabinet

This cabinet serves multiple purposes:

1. Connection box for cables from the target connection cabinet
2. Outlet for monitors
3. RJ45 outlets for connection of PC for software upgrading and range management.



The On/Off switch can always be in the ON position. When the system is not in use disconnect the 110V/230V power cable. Also disconnect the "LINE IN" and "MONITOR" cable to prevent damage during lightning.

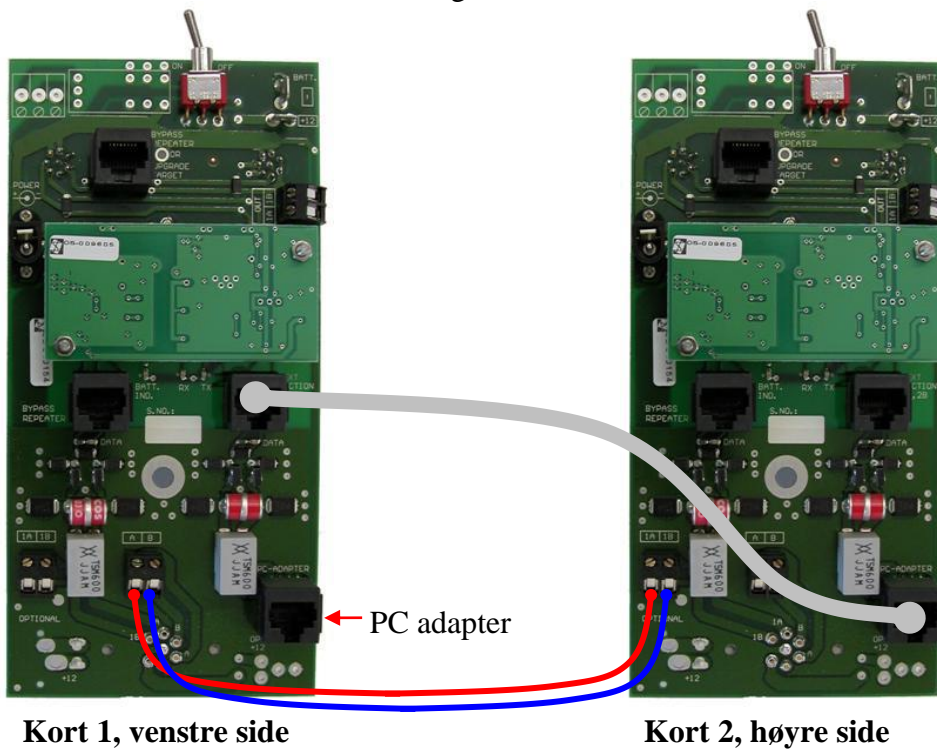
Further connections can be done as shown in the schematic drawings later in this chapter.

Connection between the shooting stand cabinet and the target cabinet, see section 2.2.4.

The power is not connected in the delivered cabinet. This must be connected before using the system.

2.3.2 Double shooting stand cabinet

The cards inside the double shooting stand cabinet are connected like this:



See also 2.3.1.

2.3.3 Display connector at the shooting stand

The connector boxes for the display units should be mounted at the front of the shooting stand close to the shooters. Even if the box is well protected, the location should be done carefully to reduce the risk of problems due to humidity, dust or malicious damage. One recommended way to mount the box is shown on the following picture:



If the solution above is used, we recommend mounting the bushing nipples at the bottom inside the box. Usually the box is mounted such that the bushing nipples should be mounted at the walls of the box. Make a hole with the correct size (usually 19mm – but please verify with the delivered nipples).

The connector boxes are wired in a chain as shown in the schematic diagrams.

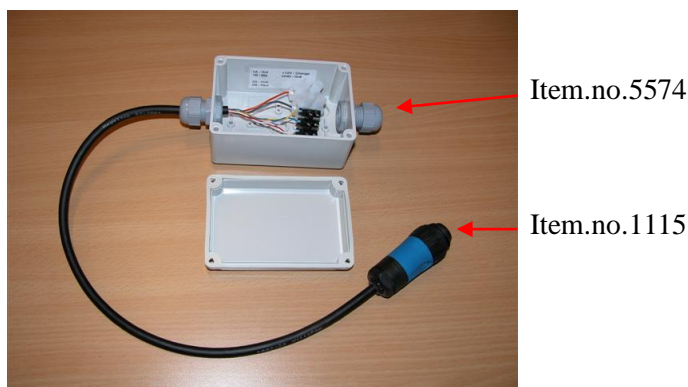
Protection covers for the connectors can be delivered to protect against rain and dust when the monitors are disconnected.

For mobile equipment a complete connection array can be delivered.



2.3.4 Cable between the shooting stand and the display connectors

A connection box (item.no.5574) must be used to connect the shooting stand cabinet with the display connectors. Usually there must be used separate data cable and power cable (12V) between the connection box and the surge protection at the front of the shooting stand. For short lengths (less than 7 meter) our special cable (Megalink 01-2004, item.no.1023) for connection between monitor connections can be used. In this case the contact (item.no.1115) can be connected directly to the cable. For greater distances a separate data cable (Cat 5) and power cable must be used.



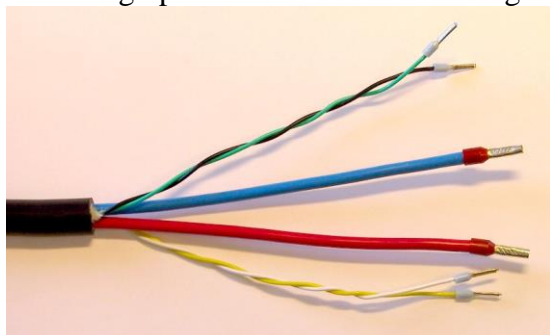
| Length from shooting stand cabinet to surge protection | Recommend cable dimension for 10 targets |
|--|--|
| 0-1 m | 2x 1.5 mm ² |
| Up to 8 m | 2x 2.5 mm ² |
| Up to 15 m | 2x 4 mm ² |
| Up to 25 m | 2x 6 mm ² |

| 7 pin cable contact (item.no.1115) | | |
|------------------------------------|---------------|--------------------|
| Pin no | Signal | Color (ML-01-2004) |
| 1 | 1B | White |
| 2 | 1A | Yellow |
| 3 | 2B | Black |
| 4 | 2A | Green |
| 5 | Not connected | |
| 6 | +12V | Red |
| 7 | Ground (DC) | Blue |

2.3.5 Cable between the display connectors

Our special cable for use between the display connectors is optimized for this purpose. In a standard delivery the cable **is not** intended for use between the shooting stand cabinet and the surge protection.

In a standard delivery it is calculated 0.5m cable between the surge protection and the first monitor connector. Between each extra monitor connector an additional 3.5m cable is added. It is not recommended to use long cables between the monitor connectors since this increases the risk of damages from high voltage generated in the cable during lightening. There are usually several possibilities to place the cable in the front of the shooting stand without need for traversing up and down from the ceiling.



- Remove approximately 10cm of the cable coating and strip 5-8mm of the isolation on each wire.
- The pair for the target network is connected as following:
 - Yellow is connected to 1A
 - White is connected to 1B.
- The pair for the stand network is connected as following:
 - Green is connected to 2A
 - Black is connected to 2B
- The thick wires are used for power supply:
 - Red is connected to +12V
 - Blue is connected to ground (GND)

2.3.6 Power supply for the displays

The power supply is usually mounted close to the PC-connection box (i.e. close to where a range management PC would be installed). Optionally the power supply could be located close to the surge protection at the front of the shooting stand, but this requires an additional power supply for the PC-connection box and PC-adapter.

The power supply emits heat and should not be covered. For a ten target segment it is recommended to mount the unit with free air passage on both sides or optionally on a heat conductor (aluminium or steel).



2.3.7 PC-adapter



A PC can be connected to the system through an adapter. The adapter is connected to the shooting stand cabinet with a cable with RJ45 jacks (ISDN connectors).

Two sort of adapter is available.

- PC-adapter (item.no.1142) for connection to the serial communication port (COM1-COM9) on the PC through a standard straight 9-pin serial cable.
- USB adapter (item.no.1299) for connection to the PC through an USB cable.



The PC-adapter can be connected to the system as follows:

| | |
|---|---|
| <p>-Ordinary range management during competition</p> <p>-Software upgrading for the display units</p> | <p>Software upgrading for the controller units(in the targets)</p> |
| <p>The cable from the adapter is plugged into the outlet at the lower right side of the card in the shooting stand cabinet (marked: PC-ADAPTER). An external power supply is not necessary.</p> | <p>The cable from the adapter is plugged into the outlet at the higher left side of the card (marked: BYPASS REPEATER OR UPGRADE TARGET). The monitors must be disconnected. An external power supply is not necessary.</p> |
|  |  |

2.3.8 Target number on display

The display units should be marked with the assigned target number to simplify the system setup before shooting. The supplied self adhesive tags should be cut and placed on the display units as shown on the picture. Be careful when removing the cover on the self adhesive tape (using a knife could help).



2.4 Mobile cabling for shooting stand

ML2000 can also be delivered with portable cabling for the shooting stand. This cabling solution consists of the same components as in a permanent range. Most components are mounted in a portable cabinet:

- Power supply for shooting stand
- PC-connection box
- Surge protection
- Connector for the chain of display connector boxes
- Connector for the cable to the target connection cabinet
- RJ45 connector for chaining the stand network between multiple target segments

The connector boxes for the displays are coupled together in a chain. The end of the chain is equipped with a connector plug that fits into the portable cabinet.

Usually a portable cable is used between the shooting stand cabinet and the target connection cabinet.

2.5 Starting the system

If the target units are marked with target numbers on delivery, they should be completely configured and ready for use. If the targets are mounted different to the marking or no target numbers are found, the target units has to be set up with individual target numbers. The process of configuring the sensor units are described in detail in a separate chapter, but a short version is included here.

- Assign target numbers (if necessary)
- Verify wiring
- Configure display units
- Test the system
- Upgrading of software (if necessary)

2.5.1 Assign target number

NB! This is only needed when installing the system and the target units are not properly set up at delivery!!

1. ***Ensure that no display units are connected at the shooting stand***
2. Bring one display unit to the target connection cabinet and plug the display cable into the connector inside the cabinet.
3. Press and hold the B-button on the display unit while the power is turned on. Enter password 3 and select the function Target ID in the next menu.

4. Connect one target unit
NB! There should never be more than one target unit connected when ID is set.
5. Change the target number to the value you want to assign to the connected target (use the Next or Setup functions)
6. Press the “Set ID” button. If the ID assignment succeeded, a response with key data will be displayed on the display
7. Repeat steps 4-6 for all targets that needs to be assigned a new ID

Refer to the chapter describing upgrading and configuration for further details.

2.5.2 Verify and test the wiring

If 12 Volt is connected to the data lines, the equipment could be damaged. We therefore recommend verifying the wiring before connecting the monitors at the shooting stand. This is best done by measuring the wiring. A simple procedure is as follows:

- Measure the resistance between all wires on each side of the surge protection at the shooting stand. There should be no connection between any wires (infinite resistance). Since the repeater has a small load on the data lines it would be a good idea to unplug the card during measurement.
- Connect power supply to the PC-connection box.
- Measure the voltage between GND and the other wires on both sides of the surge protection at the shooting stand. The following values must be found:
 - +12V should measure between 12 and 15 Volts
 - 1 a/b should be between 0 and 5Volts (usually close to 0 Volts)
 - 2 a/b should be between 0 and 5Volts (usually close to 0 Volts)
- Connect only one display unit and set it up as master (see next paragraph). Verify that communication is established with the target unit (ready indicator and temperature will be displayed)
- Move the display unit to the other connectors in the segment and verify that communication is established in all positions (don't change the setup of the monitor).

2.5.3 Configuration of display units

- Connect the display unit that should be MASTER (usually the display unit for target (group of targets connected through the same pair of wires). **Remember that there should be ONLY ONE master for each target segment**
- Press and hold the A-button while switching on the display unit.
- Set up the unit with the following values:
 - Master/Slave = MASTER (use Master A/B for pistol ranges)
 - Lane = 1 (possibly another target number)
 - :
 - First lane = 1 (first lane in the segment)
 - Last lane = 10 (last lane in the segment)
- Terminate the setup menu (use the exit function in the setup menu. Powering off the unit directly after changing the values could result in not storing the values.
- Connect the other display units and switch them on while the A-button is pressed
- Set up the display units with the following values:
 - Master/Slave = SLAVE
 - Lane = 2 (or another lane number)
 - ...repeat for all the other monitors...
- Exit the setup

2.5.4 System test

- Verify that all display units can establish contact with their target units. This can be seen on the indicator at the top centre of the screen. The indicator should be in READY state (and the temperature in the target chamber should be shown on the start-up screen). If the value is WAIT, the display unit has not established contact with the target unit.
- If all display units are in READY state, the targets can be tested with firing single shots at individual targets. Verify that the shots are marked on the correct display units.
If the display is not in READY state, there is no use in shooting until the problem is identified and solved.
- Further testing can be done according to the following procedure:
 - Verify that the centre is reasonable (+/- a few millimetres)
 - Verify that the sensors are mounted correctly (shots are marked on the correct side)
 - Verify that the sensor unit is configured correctly (by verifying that the scale of the target seems reasonable)

2.5.5 Upgrading software

Due to continuous work with software improvements, there could be situations where the software should be upgraded directly after installation. This would also be the case when an existing range is expanded. Information about need for software upgrading can usually be found on our internet pages (www.megalink.no). Remember to check your current versions before contacting Megalink.

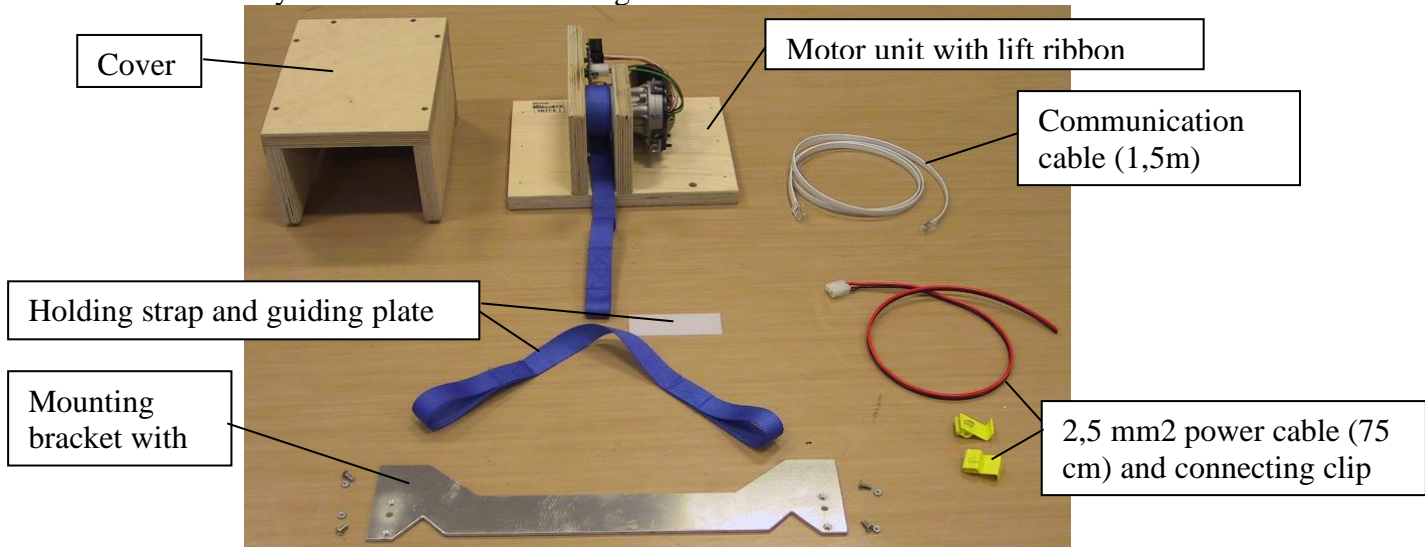
The process for upgrading the software is described in a separate chapter. The following issues have to be observed:

- Do not attempt to upgrade an unstable system (except in agreement with Megalink support personnel).
- The target units are upgraded through the target network. Connect the PC-adaptor in the lower left RJ45 connector at the PC-connector box.
- The display units are upgraded through the ordinary connector at the lower right side of the PC-connector box.
- Do not abort a software upgrade when more than half of the software has been sent to the equipment (call Megalink support personnel in case of such problems).
- Avoid upgrading a few days before a competition.

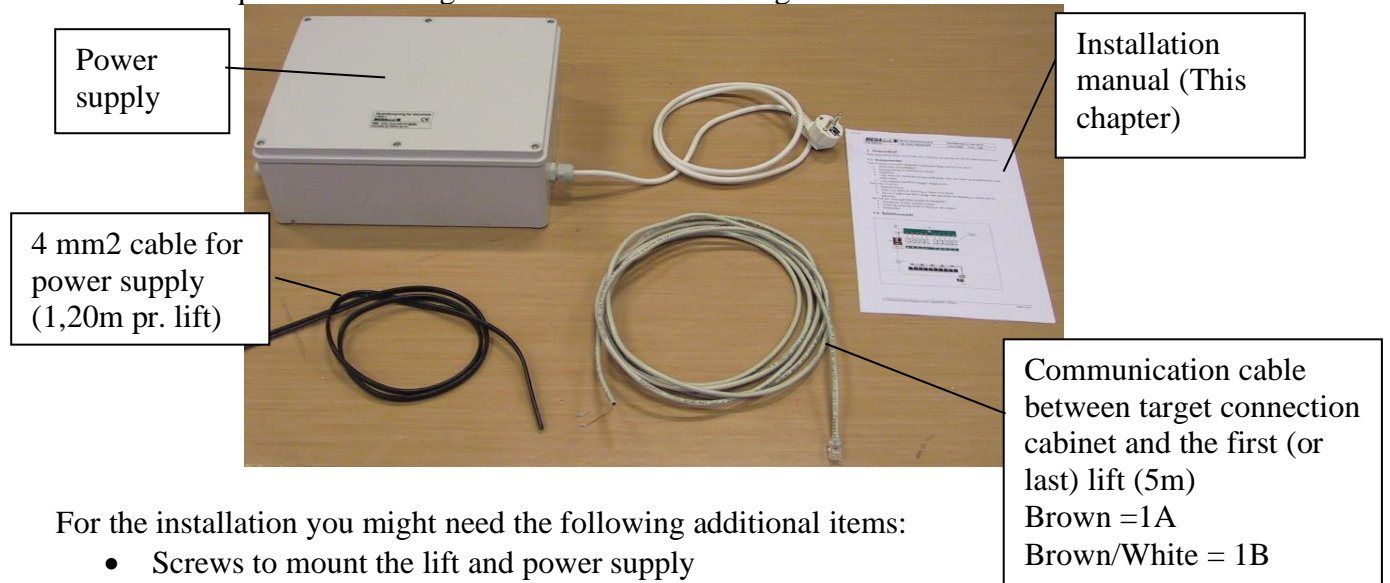
2.6 Target lift

2.6.1 Components

A normal delivery will contain the following items for each lift:



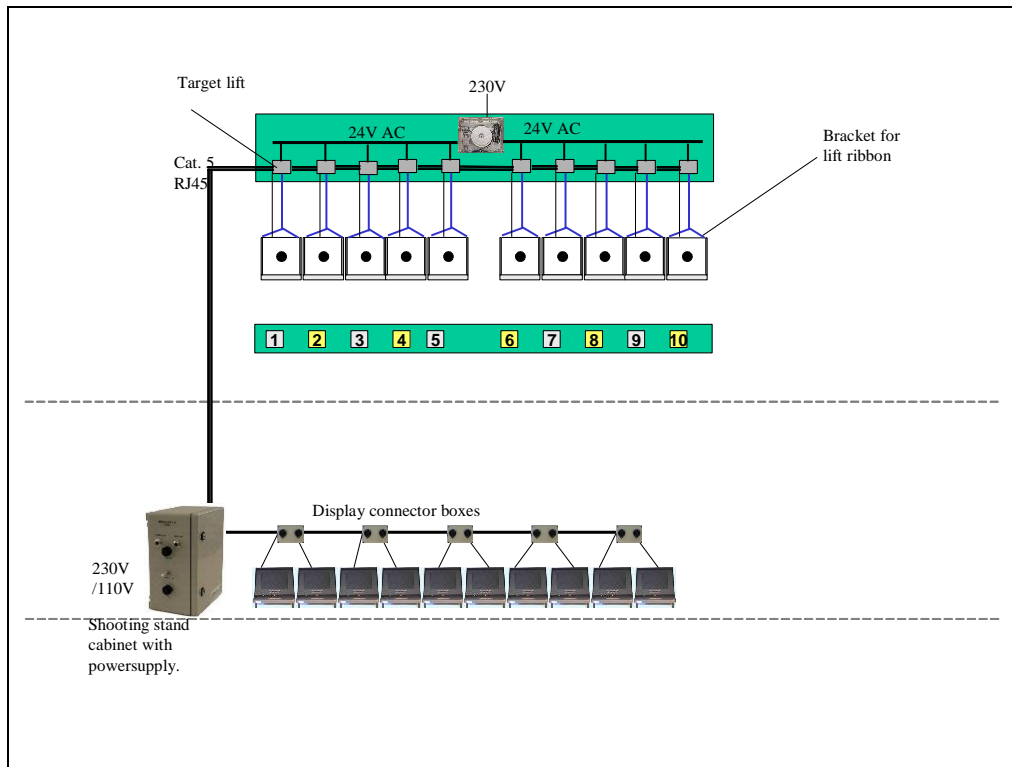
Common components for a segment of maximum 10 target lifts:



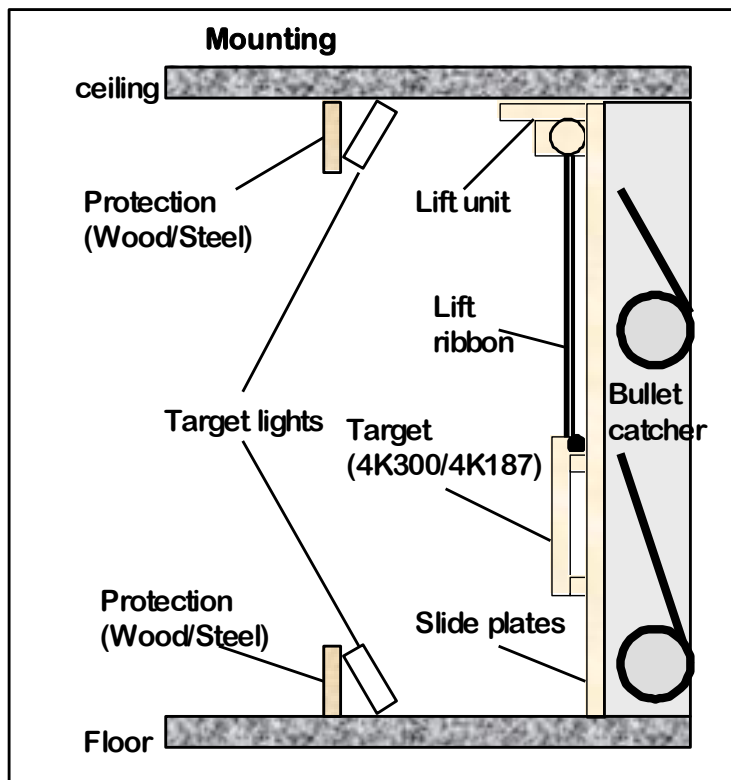
For the installation you might need the following additional items:

- Screws to mount the lift and power supply
- Clips for cables
- Guide for the target cable
- Steel protection for the lift and power supply

2.6.2 System overview



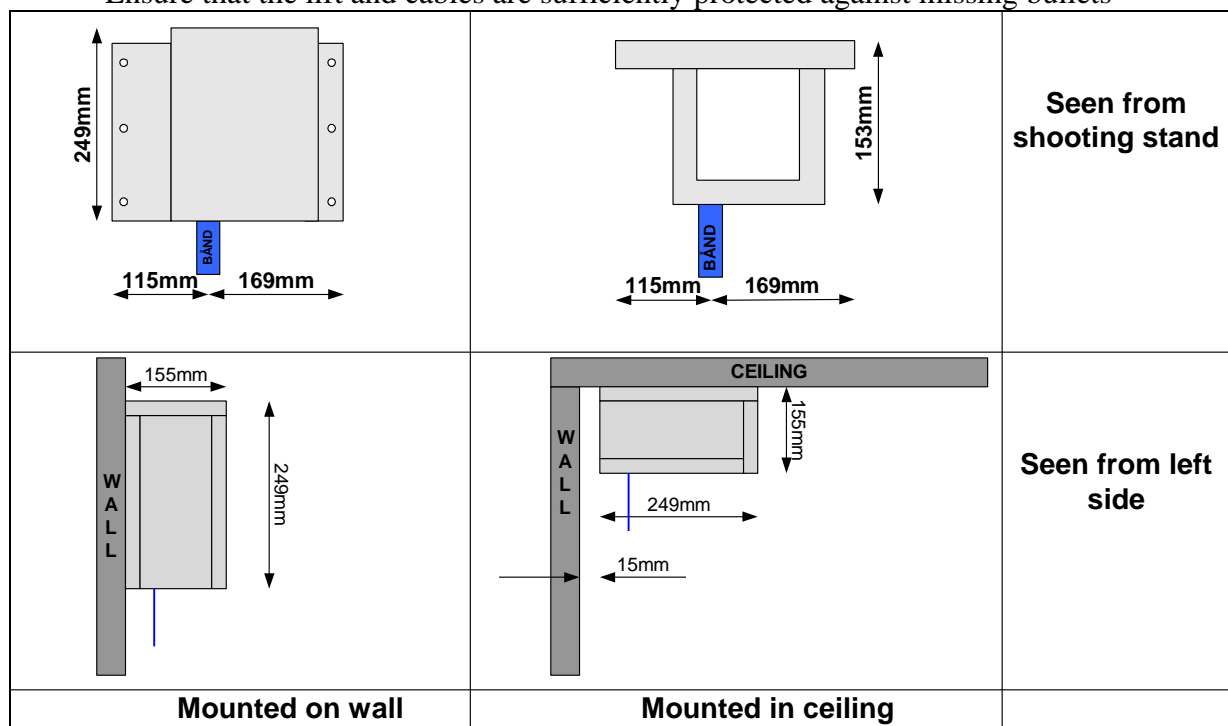
2.6.3 Mounting overview



2.6.4 Mounting the lift unit

The lift unit can be mounted on the wall or in the ceiling depending on local requirements. Please observe the following when deciding where to locate the lift:

- Use strong fastening screws. There is a significant load on the system.
- Ensure that the reel is centred (sideways) to where the target should be
- Ensure that the reel is level (horizontal)
- Ensure that the lift is mounted correct lengthwise (in shooting direction) for the target to hang correct. With our sliders the target should be mounted as follows:
 - Directly on the wall where the target will be sliding
 - In the ceiling the lift unit should be placed 15mm in front of the wall where the target will be sliding
- Ensure that the lift and cables are sufficiently protected against missing bullets



2.6.5 Target sliders and guide

The system is designed to let the target hang towards a wall or pair of pillars. When the lift moves up or down the target will slide on this surface.

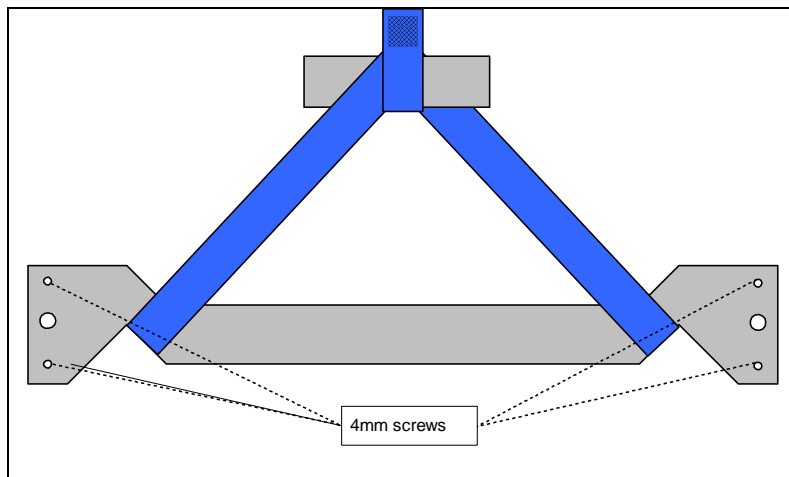
If there is no suitable wall there could be made simple pillars using plywood etc.

The delivered plywood sliders should be mounted on the back of the target through the holes in the target frame.

2.6.6 Lifting ribbon for 4K300

The ribbon should be fitted to the target with the included mounting bracket. The bracket is mounted on the target with 4 screws (where the upper bolts for the steel protection are located). Use the following procedure to assemble the mounting bracket and ribbon:

1. Insert the short holding strap through the loop at the end of the lifting ribbon from the lift unit
2. Twist the holding strap as shown on the drawing below. Insert the ends of the bracket into the loops of the holding strap.
3. Fasten the bracket with the four sunk head screws, spring washers and nuts (4mm)
4. Lift the target unit and insert the guiding plate to hold the ribbon as shown
5. Adjust the ribbon and guiding plate to ensure that the target is hanging straight



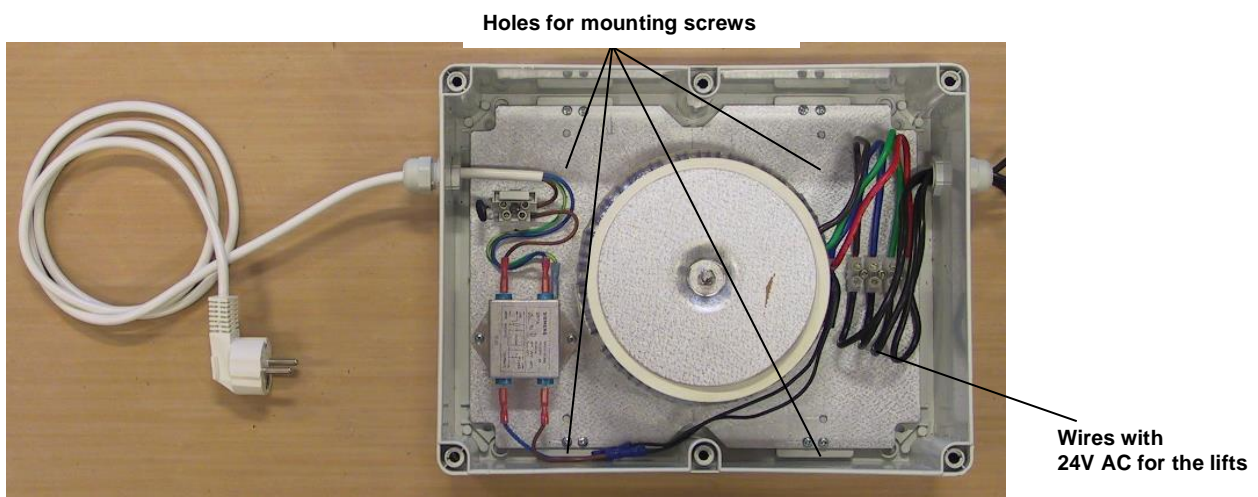
It might be necessary to add some distance between the ribbon and the steel protection to force the target to hand straight towards the wall. The bracket is designed to be used to hook up up a plywood protection in front of the steel protection.

2.6.7 Cable guide

It is recommended to guide the target cable to get some protection.

2.6.8 Power supply

The power supply should ideally be mounted in the ceiling in the middle of the target segment to avoid long supply cables. The power supply box should be mounted with strong screws. Use the holes indicated in the picture below. The measures of the box are 310x240x110mm (WxHxD). Wiring is described later.



2.6.9 Protection

The equipment should be protected according to local needs:

- The target lift can be equipped with steel plates behind the plywood.
- The power supply and 230V/110V supply **must** be well protected
- The cables to the target lifts should be mounted with protection
- The target cable should be protected if the risk for damage is high and replacement during shooting is not acceptable.

2.6.10 Wiring the power supply

Pull out the 4mm² cables to all targets. Each outlet from the power supply can handle up to 5 target lifts each. With less than 10 lifts, it would be a good idea to balance the load.

At each lift there will be used a short 2.5 mm² cable from the supply cable to the lift. Use the included clips to connect the short cable to the supply cable. The connector in the other end of the short cable fits into the controller card in the lift. The power supply is not polarity dependent. It is important to use at least 2.5 mm² cable for the included clips to get electrical contact.

Finally the power cable is connected in the terminal block in the power supply box. Use the following outlets:

- Outlet 1: Red and green
- Outlet 2: Blue and Brown

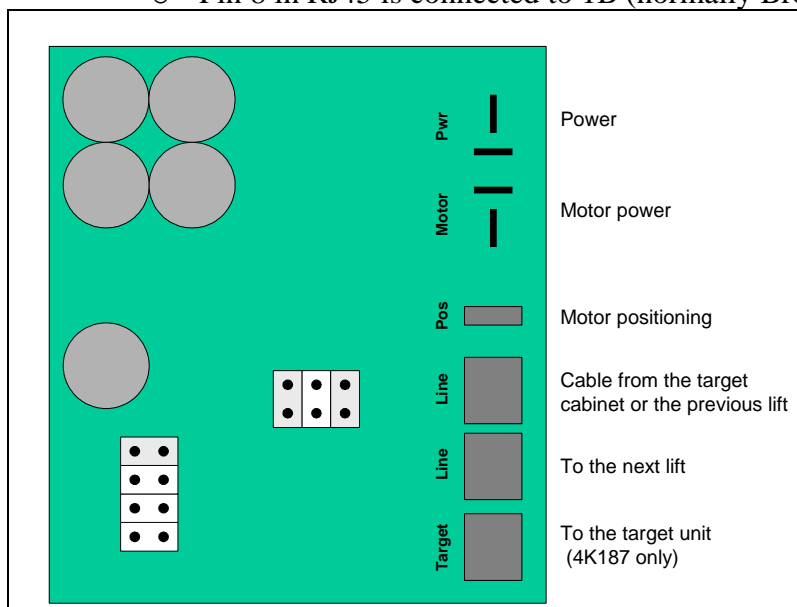
NB! Remember to disconnect 230V/110V when the lid is removed from the power supply box!

2.6.11 Communication cables

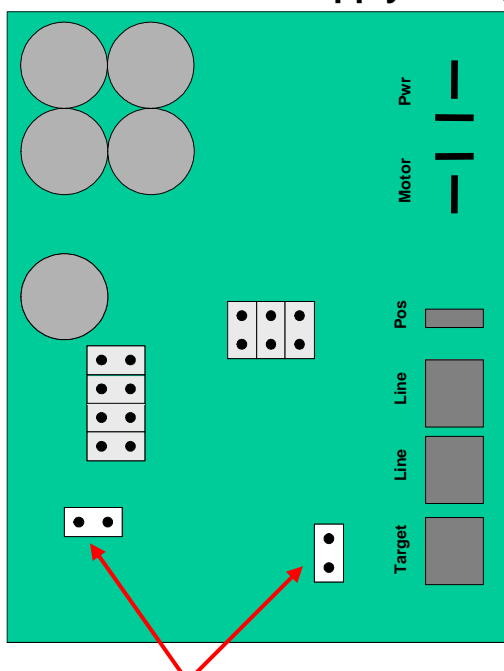
Use standard patch cables (included 1.5m RJ45 cable) between each lift.

First or last lift is connected to the target cabinet. This can be done in several ways:

- By using a cable splitter for the 4K187 targets
 - Connect the first or last lift to the outlet between the round target cable contacts.
- By connecting the first or last lift to the wall connector connected to LINE IN on the shooting stand cabinet.
- By connecting the first or last lift to the terminal block on the printed circuit board inside the target cabinet marked OUT 1A/1B.
 - Pin 7 in RJ45 is connected to 1A (normally Brown/White)
 - Pin 8 in RJ45 is connected to 1B (normally Brown)



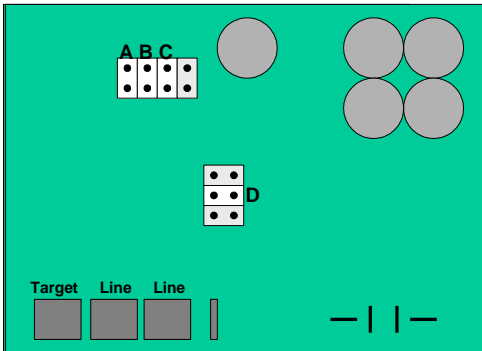
2.6.12 Power supply to target



If the target only use the target lift as power supply, two jumpers must be installed.

2.6.13 Setting target numbers

Each target lift is set up with a target number with jumpers. Usually this is set up on delivery and the units are marked accordingly. The following system is used:



| Nr | A | B | C | D |
|----|--------------------------|--------------------------|--------------------------|--------------------------|
| 1 | <input type="checkbox"/> | : | : | : |
| 2 | : | <input type="checkbox"/> | : | : |
| 3 | <input type="checkbox"/> | <input type="checkbox"/> | : | : |
| 4 | : | : | <input type="checkbox"/> | : |
| 5 | <input type="checkbox"/> | : | <input type="checkbox"/> | : |
| 6 | : | <input type="checkbox"/> | <input type="checkbox"/> | : |
| 7 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | : |
| 8 | : | : | : | <input type="checkbox"/> |
| 9 | <input type="checkbox"/> | : | : | <input type="checkbox"/> |
| 10 | : | <input type="checkbox"/> | : | <input type="checkbox"/> |

Jumper (connected)
 : No jumper (open)

With more than 10 lifts the lift for 11-20 is numbered 1-10 etc.

2.6.14 Configure lift positions

The four positions of the target must be configured. The process is as follows:

- Use the master monitor
- Ensure that the monitor is set up with Target lift as external equipment (A-button setup)
- Press and hold the C-button while the display unit is switched on. The lifts setup menu is entered.

- Select the lift number (lane number) with NEXT or PREVIOUS
- Select ADJUST
- Run the lift to wanted position with UP or DOWN. A short push will result in a small lift movement, while holding the button for more than one second will result in a continuous movement until the button is released.
- Push the SAVE button and select the position you want to set.
- When you are finished with one lift you can advance to the next and follow the same steps for this lift.
- Turn off the monitor when all lifts are configured.

The positions are permanently stored and might only have to be done during installation. On the other hand the process can be repeated whenever needed. Use the following procedure if only one position should be adjusted:

- Enter the setup menu and select the lift number
- Use the GOTO function and select the position you want to adjust
- Use the ADJUST function and press UP and DOWN to correct the position
- Save the new position with the SAVE function
- Turn off the monitor

We recommend the following positions for the aiming centre:

- Prone: 35cm
- Kneeling: 90cm
- Standing: 140cm (according to ISSF regulations)

Verify that the prone position allows the rubber or paper band to get out of the target unit. A too low position could also damage the target cable.

2.6.15 LED description

The two LED indicators have the following function:

- Start-up: Red Led in 0.5 sec.
- Normal operation: Slow green blinking
- Power down: Fast red blinking

NB! Both LED could actually be the same colour, please read the labels on the PCB for explanation.

2.6.16 Ordinary use

For single shot marking the lift can be run up and down from the ordinary menu for shooting. The lift position could also be decided according to the selected program (or modified program). Details about this is described in the chapter “Use of ML2000”.

To enter the parking position the following procedure should be used:

- Run to standing position
- Press shortly three times on the UP button and then hold the UP button until the lift moves.

To exit from the parking position:

- Press shortly three times on the DOWN button and then hold the DOWN button until the lift moves.

The lift can also be controlled from MLLeDer (range management program) on PC. The positions are decided by the range office for series and by the shooter for single shot shooting.

2.6.17 Security mechanisms

The system has several security mechanisms:

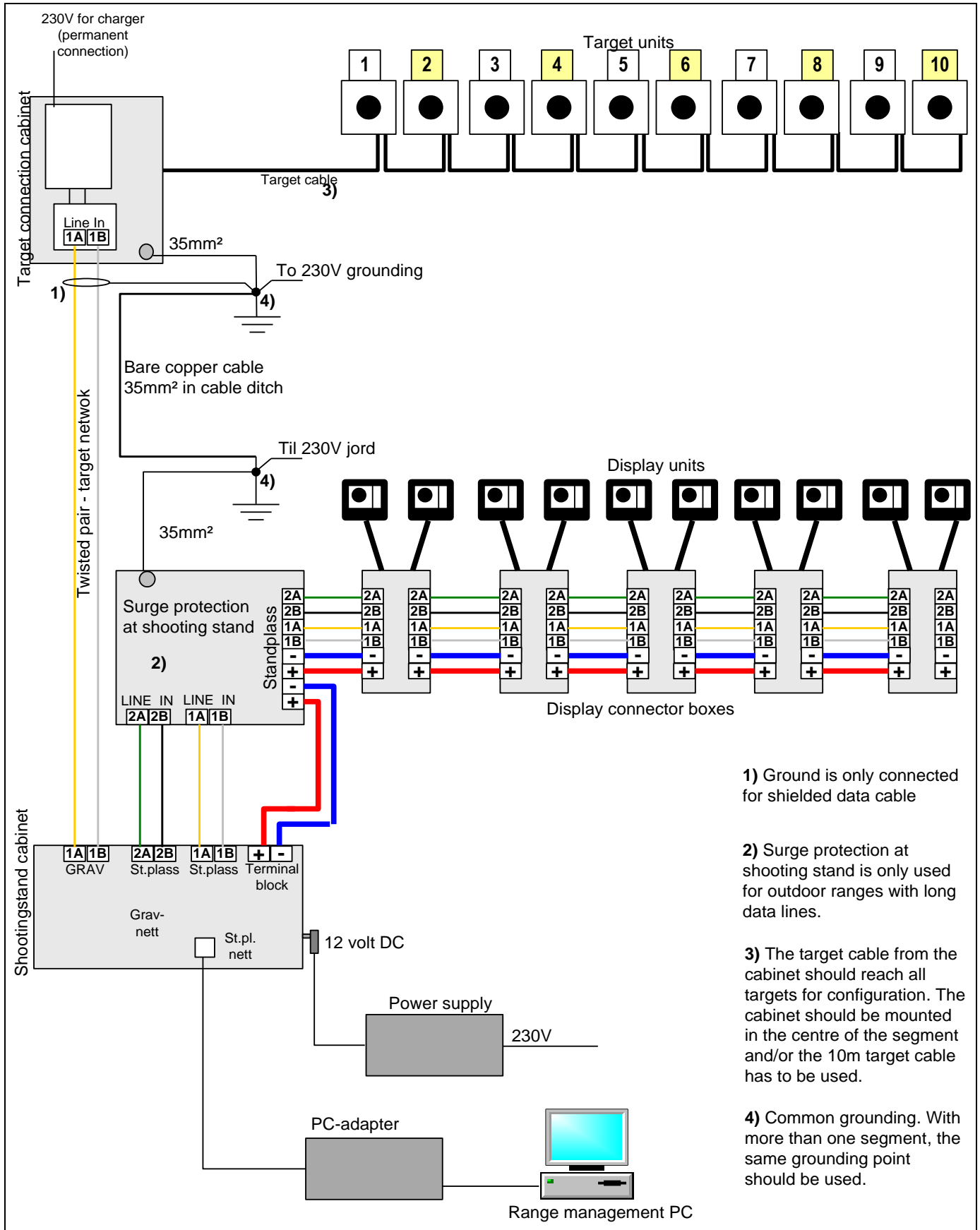
- If the impulses from the motor disappear or the lift is stuck, the motor will stop and all saved data will be deleted. Correct the fault and configure the lift again
- If the power is cut when the motor is running, the lift will stop immediately and the current position will be saved. When the power comes on, the system will restart, but the lift will never move after a reset. In this situation the lift is not positioned in any of the pre defined positions until the lift is given a new positioning command.

2.7 Schematic wiring diagrams

The next pages contain schematic wiring diagrams for ML2000 systems. Be sure to use the correct diagram for your installation.

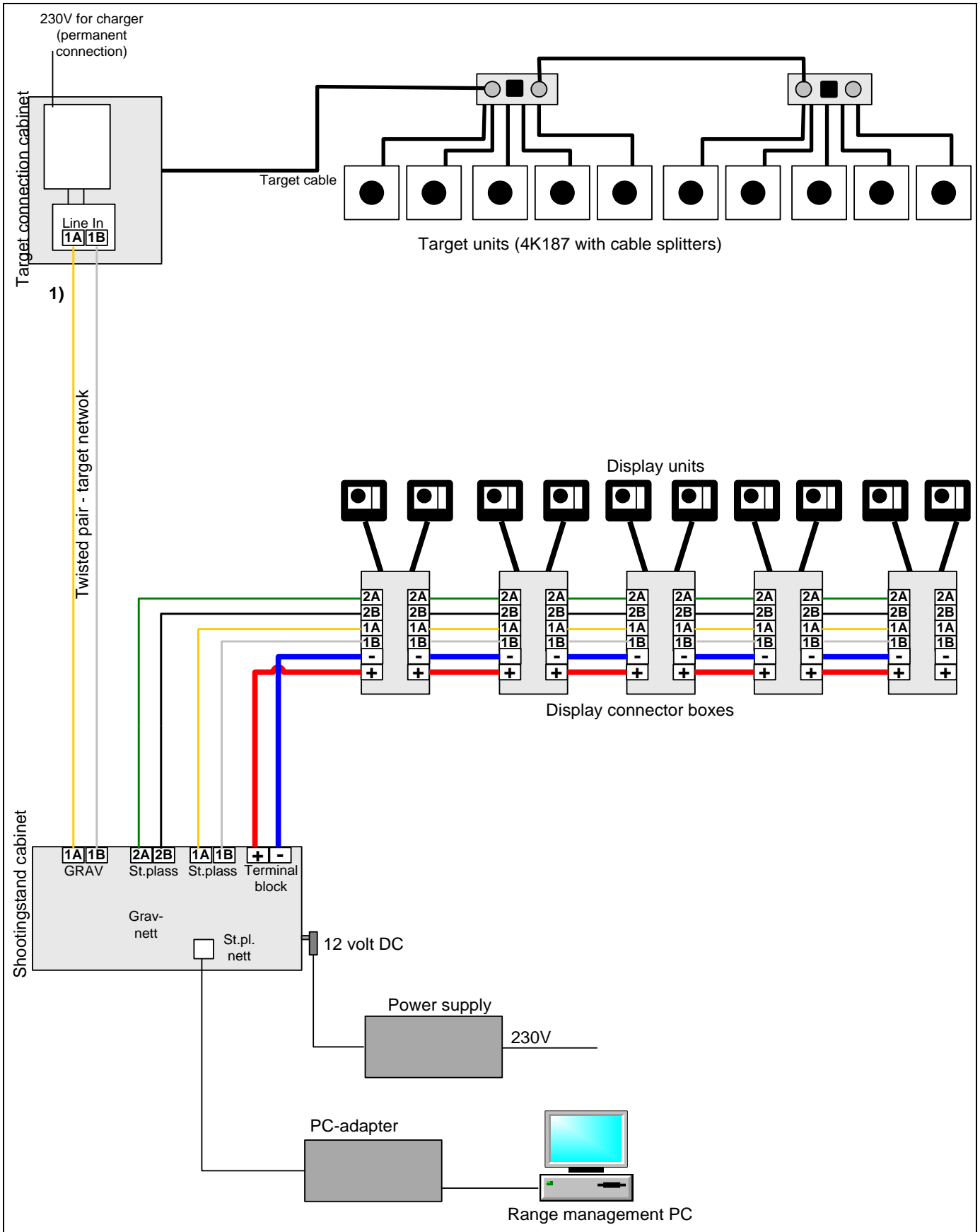
NB! The Schematic diagrams are electrical connection diagrams. For this reason the physical location of wiring terminals can deviate from the schematic diagram. Verify with the text on the printed circuit boards when you are wiring

2.7.1 Schematic diagram for permanent range (4K300, 3U490, 3U545, 3U650, 4K187)

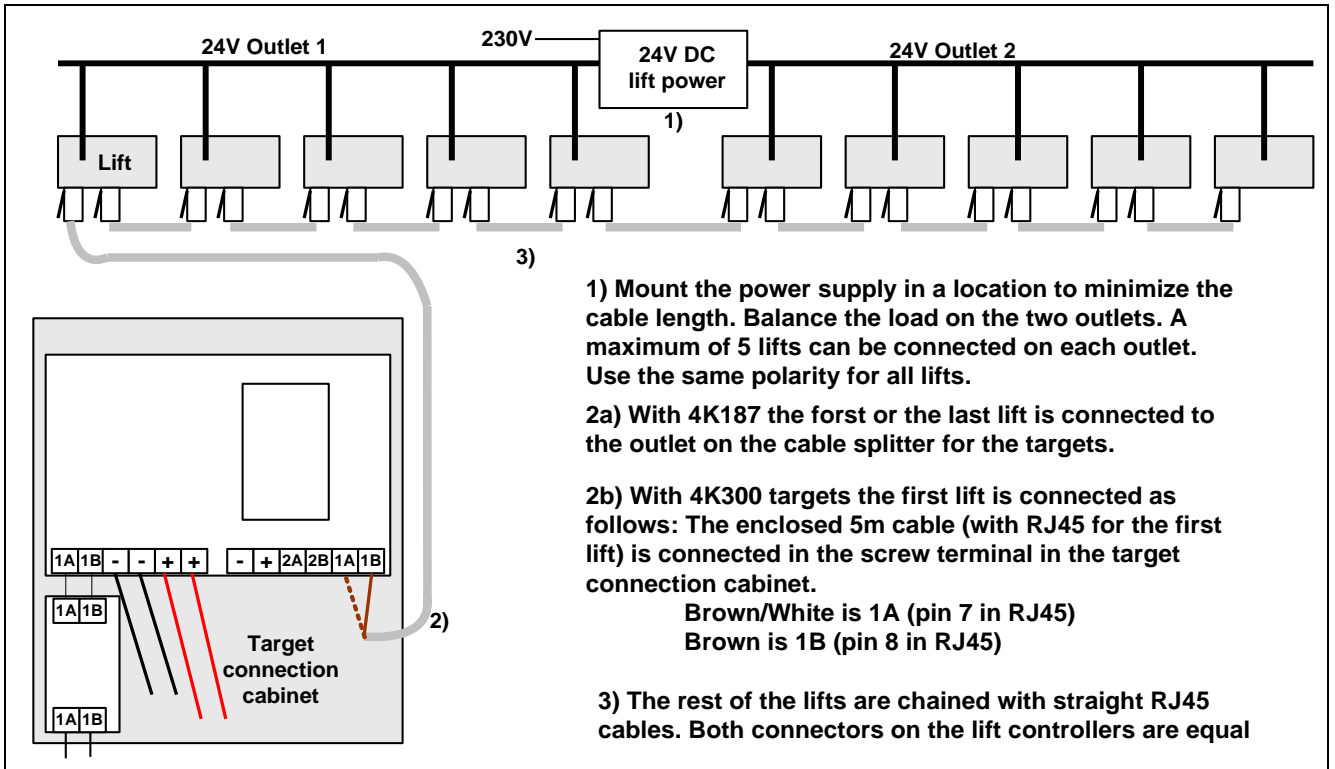


- 1) Ground is only connected for shielded data cable
- 2) Surge protection at shooting stand is only used for outdoor ranges with long data lines.
- 3) The target cable from the cabinet should reach all targets for configuration. The cabinet should be mounted in the centre of the segment and/or the 10m target cable has to be used.
- 4) Common grounding. With more than one segment, the same grounding point should be used.

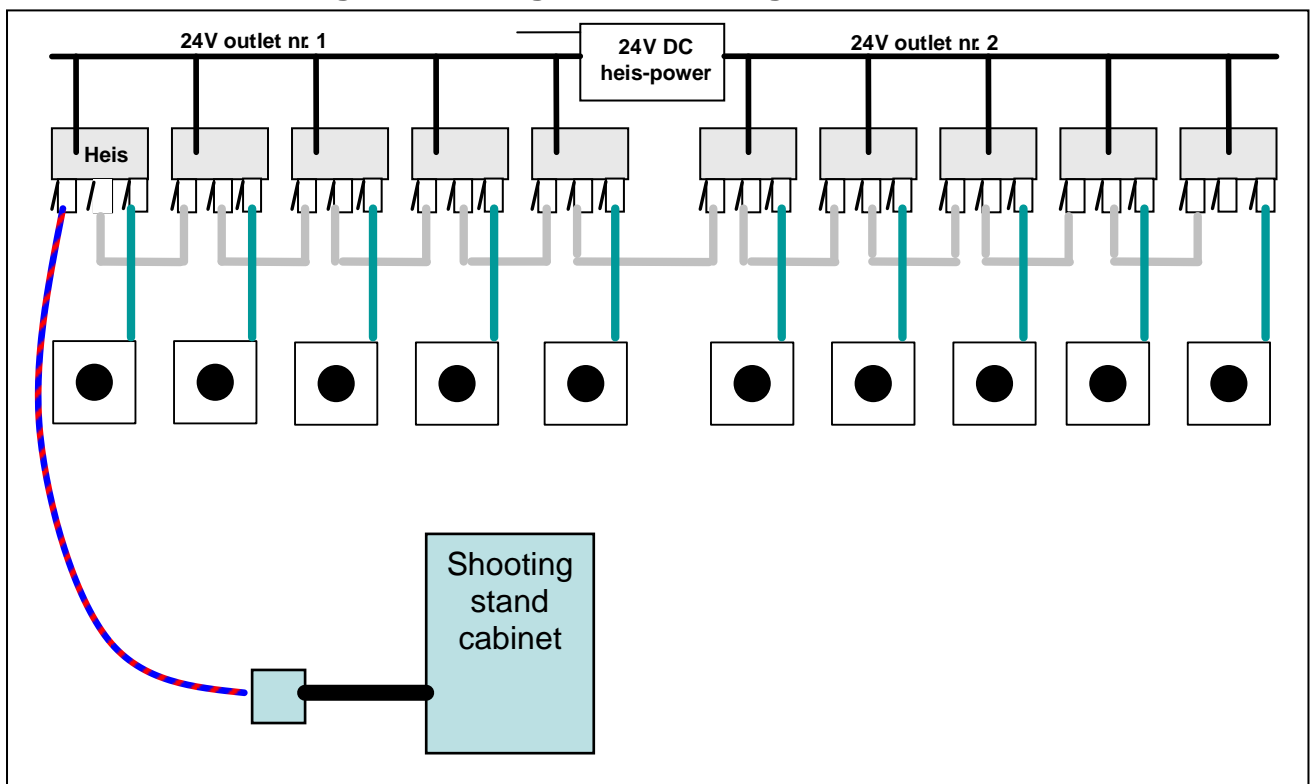
2.7.2 Schematic diagram for permanent range (4K187 without surge protection)



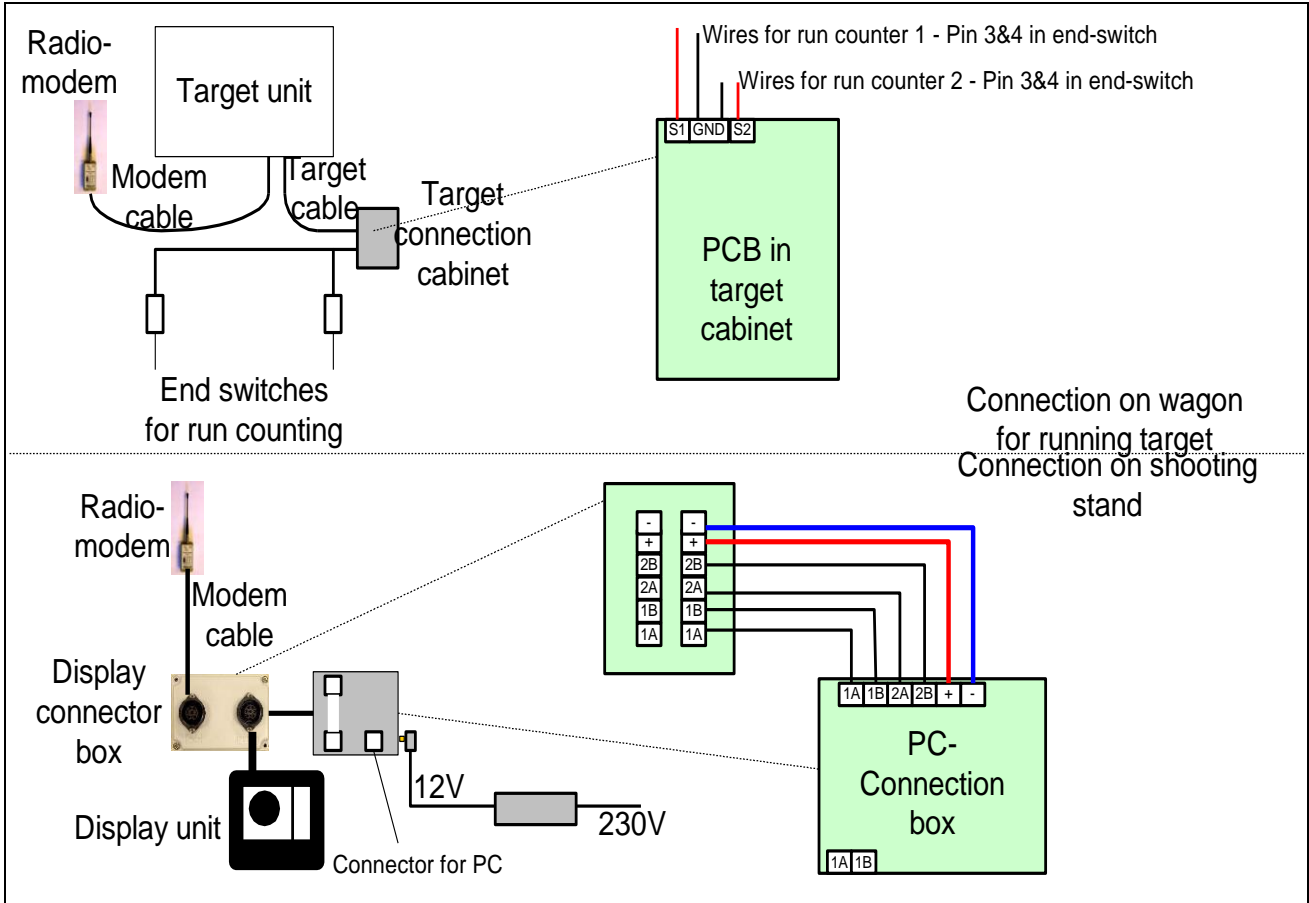
2.7.3 Schematic diagram for target lift



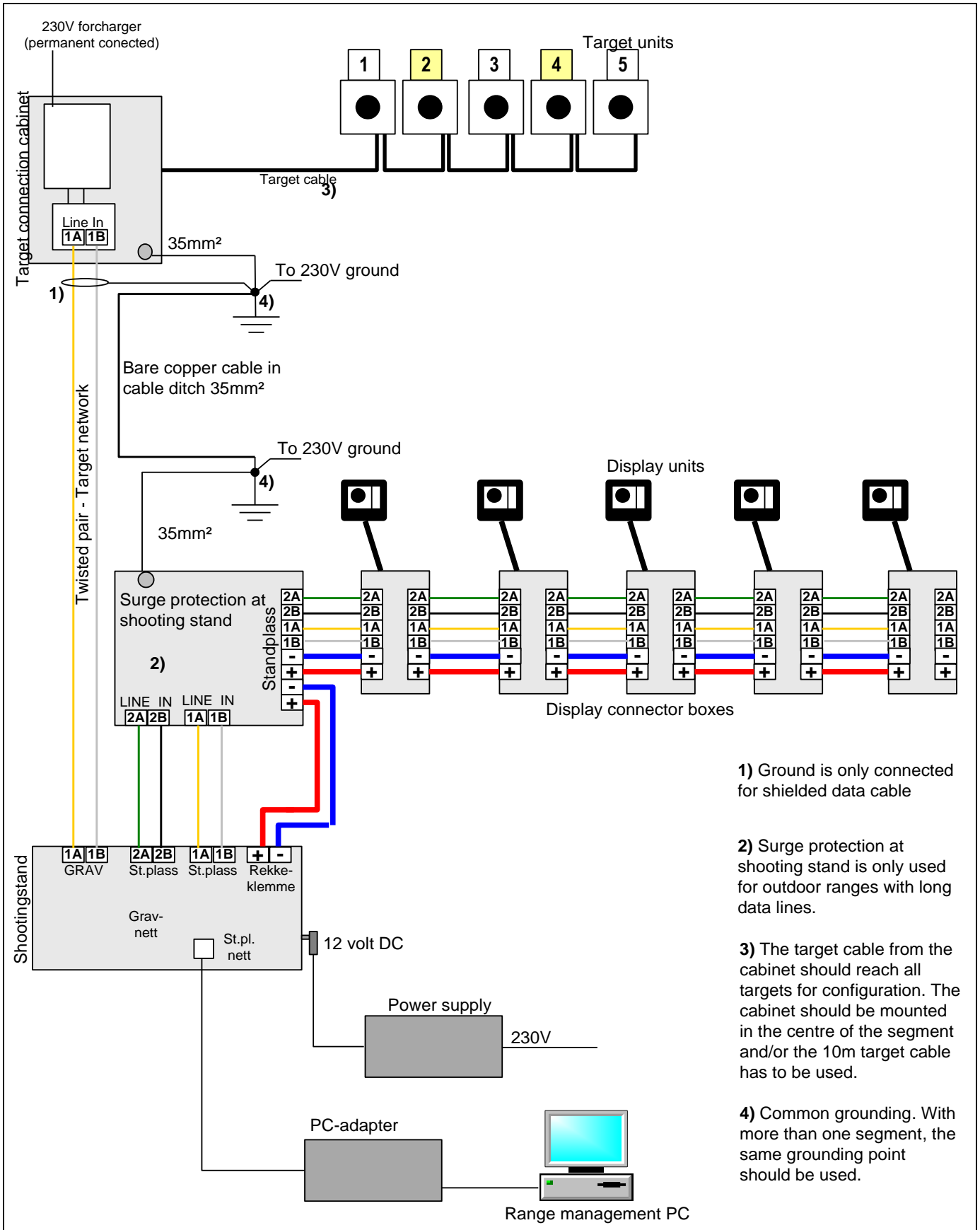
2.7.4 Schematic diagram for target lift with target unit 4K187



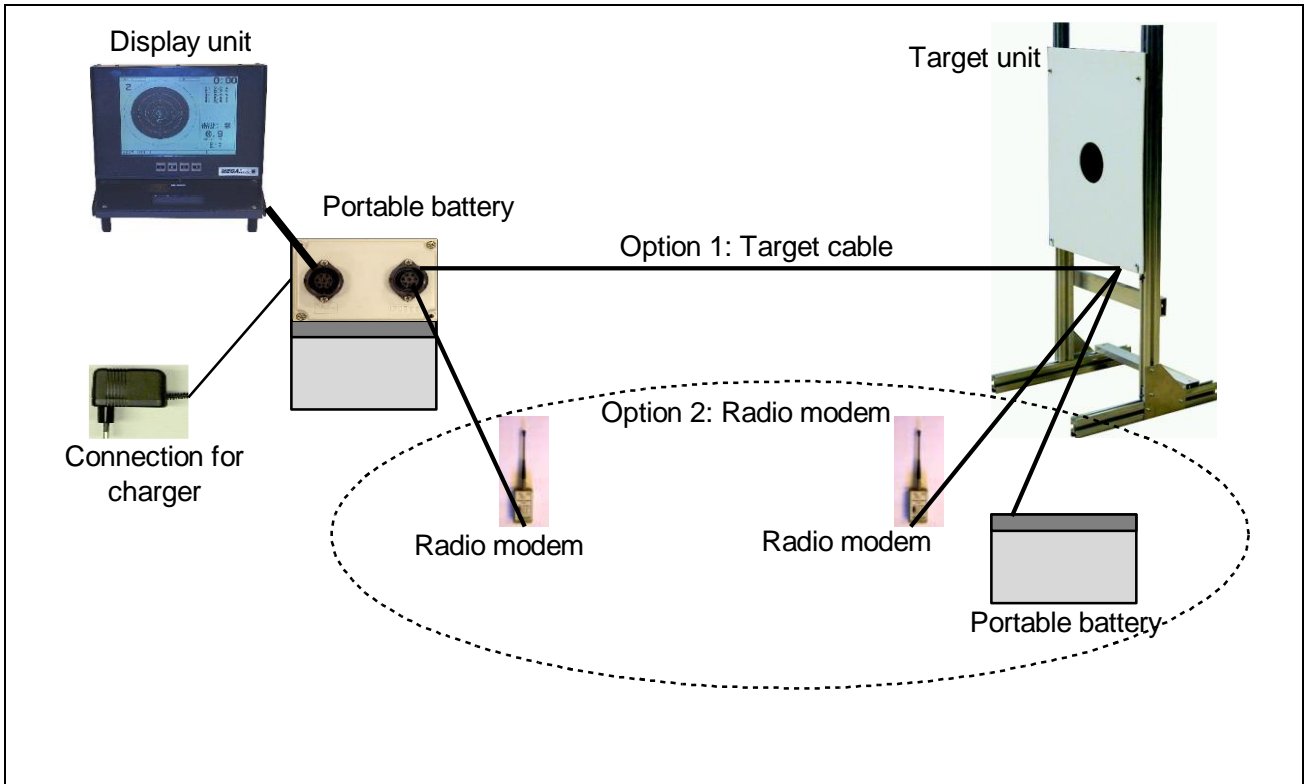
2.7.5 Schematic diagram for running target (3U650E) with radiomodem



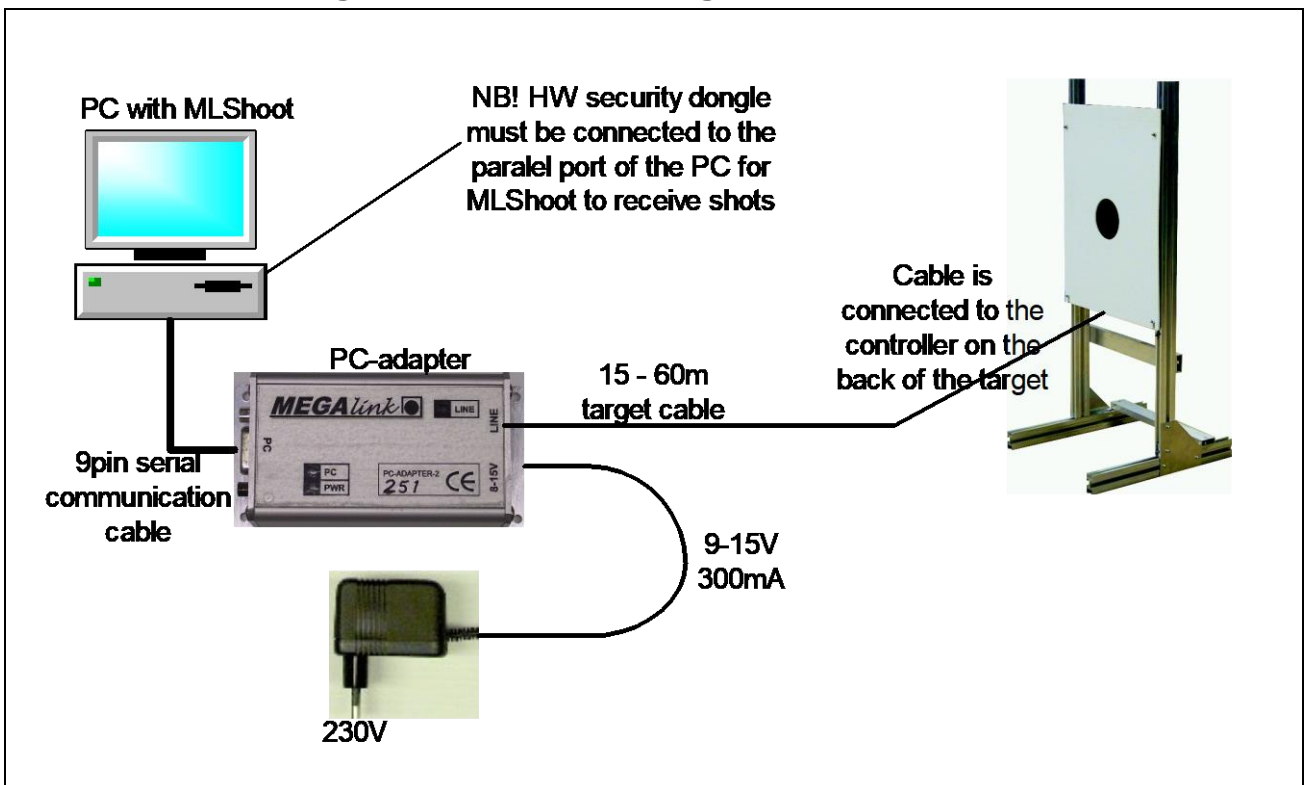
2.7.6 Schematic diagram for pistol ranges (4K560)



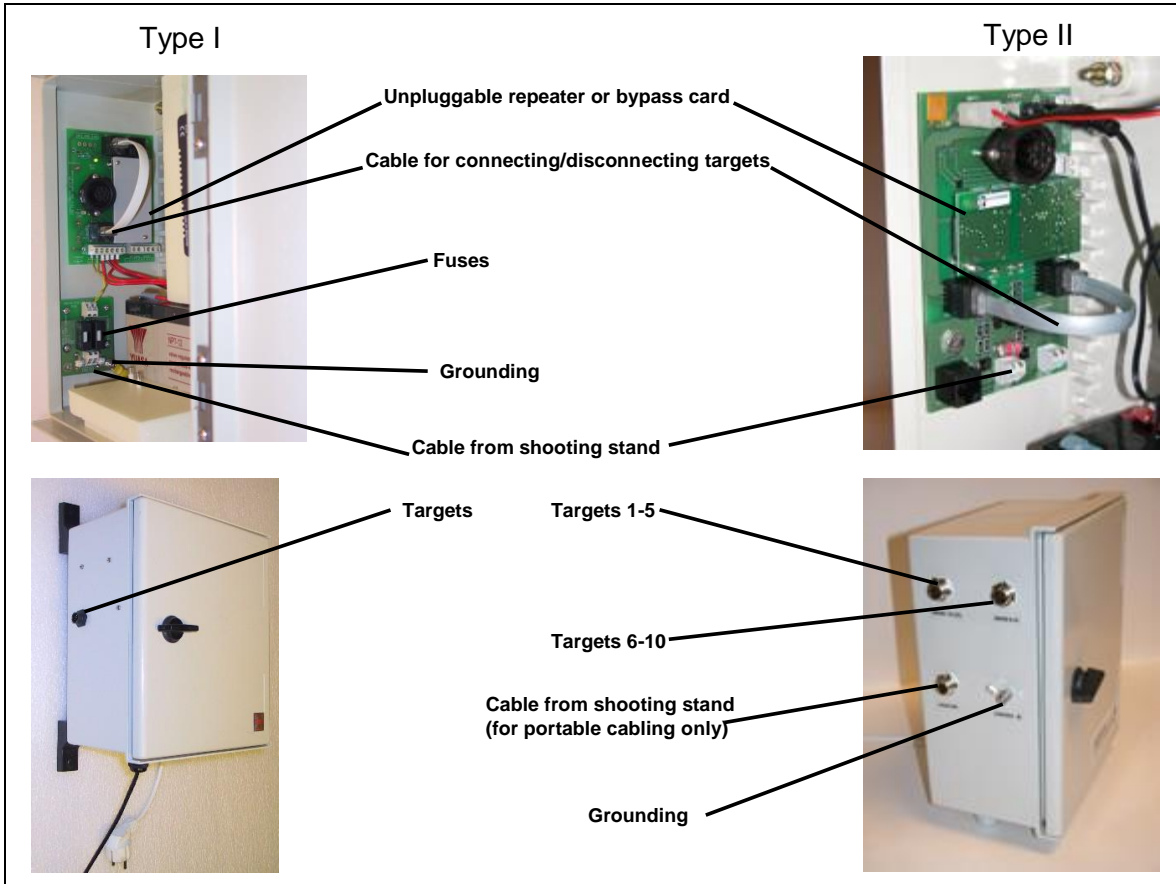
2.7.7 Schematic diagram for personal targets with display unit



2.7.8 Schematic diagram for PC-based target



2.7.9 Target connection cabinet, Type I and II



The cable from the shooting stand is led into the cabinet through the cable inlet at the bottom. The twisted pair should be connected on the terminal block marked **Line A** and **Line B** (on the lower small printed circuit board inside the type I cabinet).

The short white cable, which is connected to the RJ45 connectors in the connection cabinet, is used to switch the targets on or off. By disconnecting the cable from the lower connector, both the power supply and data line is completely disconnected. If the repeater (the small printed circuit board that is plugged into the larger board inside the cabinet), is damaged by high voltage, the white cable could be moved to the inner position at the top (marked "Bypass").