Electrical & Control Systems

HIT SRL

83 procedures · 155 maintenance tips (pillole)

Technical Reference Document

Procedures

Lighting

What is the correct sequence to replace a pole-mounted rotating beacon?

1. Put the machine in service position.
2. Undo the wing nut which fixes the rotating beacon to the pole.
3. Lift the rotating warning beacon off.
4. Install the new rotating beacon.
5. Tighten the wing nut.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-a-pole-mounted-rotat

What is the correct sequence to replace a roof-mounted rotating beacon?

1. Put the machine in service position.
2. Turn the lamp dome counter-clockwise.
3. Remove the screws securing the lamp base.
4. Unplug the connector.
5. Replace the beacon.
6. Fit in reverse order.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-a-roof-mounted-rotat

What is the correct sequence to replace the front headlight (low/high beam) bulb?

1. Unscrew the fastening screws and pull out the headlight unit.
2. Unscrew the cover.
3. Remove the bulb holder's retaining clips and pull the assembly out of the headlight unit.
4. Remove the connector plug.
5. Replace the halogen bulb.
6. Reinsert the connector plug.
7. Reinsert the assembly into the headlight unit and refit the bulb holder's retaining clip.
8. Refit the cover, screwing it back on.
9. Refit the headlight unit and re-tighten the fastening screws.

Note: *Avoid direct contact with hands when fitting a halogen bulb, since this impairs its performance.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-front-headlight

What is the correct sequence to replace the front position light and front direction indicator bulbs?

1. Unscrew the fastening screws and remove the lens.
2. Replace the position light's spherical bulb.
3. Replace the front direction indicator's spherical bulb.
4. Refit the lens and re-tighten the fastening screws.

Note: *Do not overtighten the lens fastening screws, to avoid breaking it.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-front-position-l

What is the correct sequence to replace the side direction indicator bulb?

1. Unscrew the lens fastening screws and remove it.
2. Replace the spherical bulb.
3. Refit the lens and re-tighten the fastening screws.

Note: *Do not overtighten the lens fastening screws, to avoid breaking it.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-side-direction-i

What is the correct sequence to aim the front headlights after a full dismount?

1. Park the machine, with tyres at the prescribed pressure, on level ground facing a light-coloured wall.
2. Mark two crosses on the wall corresponding to the centres of the two headlights.
3. Move the machine back 10 metres and switch on the low beams; the distance between the crosses and the reference points should equal 10% of the height between the crosses' centre and the ground.
4. Adjust the beam using the headlight's adjustment screws if needed.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-aim-the-front-headlights-aft

What is the correct sequence to replace the rear LED light's bulbs?

1. Unscrew the lens fastening screws and remove it.
2. Replace whichever bulb(s) need it, if present.
3. Refit the lens and re-tighten the fastening screws.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-rear-led-light-s

What is the correct sequence to replace the reversing light bulb?

1. Remove the lens's rubber protector.
2. Unscrew the lens fastening screw and lower it.
3. Replace the halogen bulb.
4. Reposition the lens, re-tighten the fastening screw, and refit the rubber protector.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-reversing-light

What is the correct sequence to replace the rear side direction indicator bulb?

1. Unscrew the lens fastening screws and remove it.
2. Replace the spherical bulb.
3. Refit the lens and re-tighten the fastening screws.

Note: *Do not overtighten the lens fastening screws, to avoid breaking it.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-rear-side-direct

What is the correct sequence to replace the 20'-40' work light bulb?

1. Remove the lens by inserting a screwdriver between the edge of the rubber protector and the lens itself, then levering it out.
2. Replace the bulb.
3. Refit the lens into the rubber protector.

Note: *Do not force the lens excessively with the screwdriver while levering it out, to avoid breaking it.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-20-40-work-light

What is the correct sequence to replace the left cargo body light bulb?

1. Remove the lens by inserting a screwdriver between the edge of the rubber protector and the lens, then levering it out.
2. Replace the bulb.
3. Refit the lens into the rubber protector.

Note: *Do not force the lens excessively with the screwdriver while levering it out, to avoid breaking it.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-left-cargo-body

What is the correct sequence to replace the right cargo body light bulb?

1. Remove the lens by inserting a screwdriver (or similar tool) between the edge of the plastic protector and the lens, then levering it out.
2. Replace the bayonet-type bulb.
3. Refit the lens into the plastic protector, pressing it into place.

Note: *Do not force the lens excessively with the screwdriver while levering it out, to avoid breaking it.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-right-cargo-body

What is the correct sequence to replace the auxiliary work light bulb?

1. Remove the lens by inserting a screwdriver between the edge of the rubber protector and the lens, then levering it out.
2. Replace the halogen bulb.
3. Refit the lens into the rubber protector.

- Do not force the lens excessively with the screwdriver while levering it out, to avoid breaking it.
- Avoid direct contact with hands when fitting a halogen bulb, since this impairs its performance.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-auxiliary-work-l

What is the correct sequence to remove a light fixture (headlights, strobe light, or working lights) for lamp replacement?

1. Remove the bolts and cover at the fixture's mounting point.
2. Replace the lamp if necessary.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-remove-a-light-fixture-headl

What lighting-circuit and bypass-switch operations are checked during the 500-hour Type A preventive maintenance service?

1. Check the condition and rating of the fuses.
2. Check the light-switch stalk's operation.
3. Check the direction indicators and hazard lights' operation.
4. Check the front/rear/stop lights' operation.
5. Check the boom lights' operation.
6. Check the reversing lights' operation.
7. Check the rotating beacon's operation.

Note: *Maintenance must be carried out only by qualified, authorised personnel, working in conditions of maximum safety.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-lighting-circuit-and-bypass-switch-operations-are-check

Batteries

What is the correct sequence to check the start battery?

1. Check the battery voltage from the operating menu for the electrical system: with the engine off it should be 23-25 V, and with the engine at max speed (2000 rpm) it should be 27-29 V.
2. Turn off the engine and the main electric power.
3. Check that the battery terminals are free from dirt, greasing them with terminal grease if needed.
4. Check the fluid level in the battery cells, topping up with distilled battery water if needed (the electrolyte level should be 10 mm above the cells).

Note: *Battery electrolyte contains corrosive sulphuric acid; remove any electrolyte from skin immediately and wash with soap and plenty of water, and if it splashes into the eyes, rinse immediately with plenty of water and seek immediate medical attention.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-check-the-start-battery

What is the correct sequence to check the electrolyte level of the batteries?

1. Check the electrolyte level, which should be about 10 mm above the cells.
2. Top up with de-ionized water as necessary.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-check-the-electrolyte-level

What is the correct sequence to start the machine from another battery?

1. Make sure the auxiliary batteries are connected in series, so that the correct system voltage will be supplied.
2. Connect the red (+) jumper cable to the auxiliary battery.
3. Connect the other end of the red (+) jumper cable to the machine's battery.
4. Connect the black (-) jumper cable to the auxiliary battery.
5. Connect the other end of the black (-) jumper cable to a location some distance away from the machine's battery, such as the negative cable connection on the chassis.
6. Start the engine.
7. Disconnect the jumper cables in exactly the reverse order.

    - Batteries emit oxyhydrogen, an explosive gas; a spark, for example from incorrectly connected starting cables, could cause a battery to explode and result in serious injury and damage.
    - Do not disturb the jumper cables while starting, as sparks may otherwise be caused, and do not lean over either battery.
    - Do not disconnect the machine's own battery cables.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-start-the-machine-from-anoth

What is the correct sequence to check the start battery?

1. Check the battery voltage from the operating menu for the electrical system: with the engine off it should be 23-25 V, and with the engine at max speed (2000 rpm) it should be 27-29 V.
2. Turn off the engine and turn off the system voltage.
3. Check that the batteries are clean on top, to prevent leakage currents between cells that reduce capacity, wiping clean with a cloth and clean warm water without detergent.
4. Check that the battery terminals are free from dirt, lubricating them with terminal grease if needed.
5. Check the fluid level in the battery cells, topping up with distilled battery water if needed (the electrolyte level should be 10 mm above the cells).

Note: *Battery electrolyte contains corrosive sulphuric acid; use protective safety goggles and gloves, remove any electrolyte from skin immediately and wash with soap and plenty of water, and if it splashes into the eyes, rinse immediately with plenty of water and contact a doctor immediately.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-check-the-start-battery-2

What battery cables must be checked for correct clamping, rubbing risk and damage on a diesel-powered machine?

1. Check the plus cable between the battery and the battery disconnector.
2. Check the plus cable between the battery disconnector and the starter motor.
3. Check the plus cable between the starter motor and the alternator.
4. Check the plus cable between the battery disconnector and the main fuses.
5. Check the plus cable between the starter motor and the preheating relay.
6. Check the plus cable between the preheating relay and the preheating coil.
7. Check the ground cable between the battery and the frame.
8. Check the ground cable between the engine and the frame.

Note: *Incorrectly clamped or damaged battery cables are a fire hazard and personal injury risk; repair or replace damaged clamps and change any battery cable showing signs of damage.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-battery-cables-must-be-checked-for-correct-clamping-rub

What is the correct sequence to clean and check unsealed batteries?

1. Thoroughly clean the batteries, cables and compartment, removing carbon oxide and dirt that can cause voltage drops.
2. Check through the plugs that the electrolyte level in each cell is about 10-12 mm above the top edge of the plate.
3. If necessary, top up using only distilled water, with the batteries cold and settled, through the filler holes.
    - Do not smoke while checking the battery fluid level; the battery produces flammable gas.
    - The electrolyte is an acid solution hazardous to skin and eyes.
    - When checking battery charge, use a voltmeter or hydrometer, and never place any metal object between the terminals, since sparks can cause an explosion.
    - If the electrolyte is frozen, the battery may explode if you attempt to charge it or start the engine; keep the battery charged to prevent the electrolyte from freezing.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-clean-and-check-unsealed-bat

What is the correct sequence to jump-start the engine using another machine's battery?

1. Make sure the two machines do not touch each other.
2. Make sure both ignitions are off with the key removed.
3. Connect one end of the positive auxiliary cable to the positive terminal of the discharged battery.
4. Connect the other end of the positive auxiliary cable to the positive terminal of the charged battery.
5. Connect the negative auxiliary cable to the negative terminal of the charged battery.
6. Connect the other end of the negative auxiliary cable to the engine block of the assisted machine, away from its battery.
7. Start the assisted machine's engine, without holding the starter engaged for more than 5 seconds.
8. Disconnect the cables in reverse order, starting with the negative cable from the engine block.

Note: *Do not hold the starter engaged for more than 5 seconds.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-jump-start-the-engine-using

What is the correct sequence to maintain the batteries in serviceable condition?

1. Check the electrolyte level regularly, adding distilled water if necessary to bring it to 3/8 inch above the separator plates, without overfilling.
2. Keep the tops of the batteries, terminals and cable clamps clean, washing them when necessary with a baking soda and water solution and rinsing with clear water.
3. Inspect the cables, clamps and hold-down brackets regularly, replacing any damaged parts and re-applying a light coating of grease to the terminals and cable clamps when necessary.
4. Check the electrical system if the batteries become discharged repeatedly, using the charging circuit conditions (fully charged/low battery combined with the observed charging rate) as an indication of which component may be faulty.
    - Overfilling with water can cause poor performance or early battery failure.
    - Do not allow the baking soda and water cleaning solution to enter the battery cells.
    - A high charging rate on fully charged batteries will damage the batteries and other electrical components.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-maintain-the-batteries-in-se

Diagnostics

What is the correct sequence to access the diagnostics menus on the control system display?

1. Navigate to the service menu using the arrow keys.
2. Select the service menu using the function key.
3. At the safety menu, enter the code to access the diagnosis menus (11111).
4. Select diagnostics.
5. Choose which control unit to investigate using the function keys and confirm (only control units actually present on the machine are shown); use the arrow keys to choose the next diagnosis menu within the selected control unit.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-access-the-diagnostics-menus

What is the correct sequence to read out and respond to an error code?

1. Stop the machine and identify the error code level and specific error code number.
2. If the alarm level is Stop, stop the engine; if it is Warning or Information, the engine may keep running.
3. Read off the error code and carry out the actions listed in the error code table for that code.
    - Stop alarms indicate a malfunction that may affect operator safety or cause a breakdown; stop work with the machine and contact service immediately.
    - Warning and information alarms indicate malfunctions that do not require stopping work immediately, though machine capacity may be limited; carry out the actions in the error code table as soon as possible.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-read-out-and-respond-to-an-e

What is the correct general troubleshooting procedure?

1. Check that battery voltage is available: the battery disconnect switch must be in position 1, battery voltage should be 22-30V, and fuses must be intact.
2. Check that all oil and fluid levels are normal (fuel, engine oil, transmission oil, brake system oil, hydraulic oil, coolant, washer fluid).
3. Check whether there are error codes.
4. If there are error codes, use the error code lists as a guide for recommended actions.
5. If there is no error code, or the problem remains, use the function description for the function in question to identify the components involved and the conditions required to activate the function.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-general-troubleshooting-procedure

What is the correct sequence to troubleshoot a malfunction that has no associated error code?

1. Choose the appropriate function group to find the function and sub-function that caused the symptom.
2. Read the function description for the function in question to understand which components are affected and how they interact.
3. Use the function description and check the signals for the function in question to find where in the function chain the signal or reaction is incorrect.
4. Since the fault is probably between the two units where the signal fails, start by checking the component that should send the signal.
5. If the sending component seems correct, check transmission of the signal (electric wiring or hydraulic hoses).
6. If the leads or hoses between the components seem in order, check the component that receives the signal.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-troubleshoot-a-malfunction-t

What is the correct sequence to troubleshoot a malfunction using an error code?

1. Read out the error code from the display.
2. Look up the error code in the error code lists.
3. Follow the instructions in the 'Action' field.
4. Use diagnostic menus and circuit diagrams to determine whether the input signal to the control unit is correct.
5. Use the function group for more information if needed, including work instructions for how components are checked, cleaned, or adjusted.
6. If possible, eliminate the component as the fault source by testing it individually: electric components can sometimes be checked with resistance measurements using a multimeter; hydraulic components are often checked by measuring pressure, and valves can sometimes be activated mechanically to determine whether the malfunction is electric or hydraulic.
7. If the component's measured values are correct, continue by troubleshooting the electric cabling and hydraulic hoses.
8. If the cable is not defective, turn off the main electric power with the battery disconnector before reconnecting the lead to the control unit.
9. Disconnect the cable harness from the component in question.
10. Turn on the main electric power with the battery disconnector.
11. Turn the ignition key to the operating position.
12. Check that voltage reaches the component.

Note: *The main electric power must be turned off with the battery disconnector before disconnecting the cable harness from the component.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-troubleshoot-a-malfunction-u

What is the correct sequence to troubleshoot a suspected cable harness fault?

1. Study the relevant circuit diagram, checking where the suspected cable is connected and, if applicable, where it is spliced.
2. Turn off the main electric power with the battery disconnector.
3. Unplug the connector at the control unit or component in question.
4. Check for an open circuit: measure the resistance between the connections for the component in the connector at the control unit or component, and confirm the resistance corresponds to the component; otherwise there may be an open circuit or short circuit in the cable harness and/or component.
5. Check for a short circuit to the frame: unplug the connector at both the control unit and the component, measure the resistance of one lead at a time between the lead and a frame-connected part of the machine, and confirm the multimeter shows endless resistance.
    - Perform troubleshooting for all cables in the same way to avoid damage to control units, components, or measuring equipment.
    - Some components cannot be checked without power supplied to them.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-troubleshoot-a-suspected-cab

Battery

What is the correct sequence to replace the battery disconnector?

1. Put the machine in service position.
2. Open the cover concealing the battery.
3. Disconnect the negative cable and then the positive cable from the battery.
4. Thread off the rubber protectors on the battery disconnector.
5. Remove the two nuts and release the cables from the battery disconnector.
6. Remove the two screws which hold the main battery disconnector in the bracket.
7. Replace the battery disconnector.
8. Fit in reverse order.
    - Never turn off the voltage with the battery disconnector while the engine is running, or the alternator may be damaged.
    - The battery disconnector cannot be used as an emergency stop.
    - Keep the positive and negative cables apart to avoid short-circuiting.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-battery-disconne

What is the correct sequence to replace the starter batteries?

1. Put the machine in service position.
2. Disconnect the cables from the battery terminals, disconnecting the negative cable first.
3. Replace the batteries.
4. Connect the cables to the battery terminals, connecting the negative cable last.
    - Battery electrolyte contains corrosive sulphuric acid; remove electrolyte from skin immediately with soap and water, and seek medical attention if it splashes into the eyes.
    - Hydrogen gas forms at the batteries and can be ignited by welding sparks, causing a powerful explosion; disconnect the battery with the battery disconnector before welding.
    - Never connect the battery terminals to each other or to ground, as this short-circuits the battery with risk of explosion, fire, or personal injury.
    - Exercise care when reconnecting the cables to avoid a short circuit.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-starter-batterie

What is the correct sequence to replace the auxiliary start connector?

1. Put the machine in service position.
2. Disconnect the cables from the battery terminals, disconnecting the negative cable first.
3. Undo the two cables, undo the four fixing screws, and remove the auxiliary start connector.
4. Fit in reverse order.

Note: *Exercise care when reconnecting the cables to avoid a short circuit.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-auxiliary-start

What is the correct sequence to start the engine using booster batteries or a starting generator?

1. Make sure the parking brake is applied and all electrical controls are off.
2. Connect one jumper cable to the positive terminal of the booster battery, and the opposite end of the same cable to the positive terminal of the machine's battery.
3. Connect the other cable to the negative terminal of the booster battery, and the opposite end to a good ground connection on the machine's frame, away from the battery.
4. Start the engine in the normal manner.
5. After the engine has started, first disconnect the negative booster cable from the frame, then remove the positive booster cable.

- Booster batteries should only be connected by personnel trained in their proper use; connecting them incorrectly can cause severe injury or equipment damage.
- Battery electrolyte contains sulfuric acid; avoid contact with skin, eyes or clothing, flush with water for at least 15 minutes if it contacts eyes, drink large quantities of water (do not induce vomiting) if swallowed, and call a physician immediately.
- Batteries produce explosive gases when charging or discharging; always wear eye protection when using booster batteries or starting generators.
- Do not try to start the engine by towing or pushing.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-start-the-engine-using-boost

What checks and maintenance should be performed on the batteries?

1. Check that the batteries are correctly fastened, clean, and dry; if humidity is found, identify and eliminate the cause.
2. Check the battery charge condition through the special spy cap.
3. Check the electrolyte level in each cell by loosening the covers and making sure the elements are covered with liquid; top up with distilled water if the level is too low.
4. Clean and properly tighten the battery terminals, protecting the connections with vaseline.

- Disengage the battery disconnecting switch before starting work.
- Do not rest objects or tools on the batteries, due to short-circuit danger.
- Do not smoke or use flames while checking the battery electrolyte, since acid vapours are flammable.
- Electrolyte is dangerous for skin and eyes; wear protective clothing (gloves, eyewear, helmet) during inspection and maintenance.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-checks-and-maintenance-should-be-performed-on-the-batte

What battery and start-circuit operations are checked during the 500-hour Type A preventive maintenance service?

1. Check the battery charge.
2. Check the condition of the battery cables.
3. Check the battery fluid level.
4. Clean the battery terminals and connections.
5. Apply protective grease to the battery terminals and connections.
6. Check the start anti-repeat device's operation.
7. Check the battery disconnector's operation.
8. Check the anti-repeat device's wiring.
9. Check the declutch device's operation.

Note: *Maintenance must be carried out only by qualified, authorised personnel, working in conditions of maximum safety.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-battery-and-start-circuit-operations-are-checked-during

Setting up a focus I infrakey receiver on a crane radio control system

1. Connect the focus I infrakey receiver to the radio receiver.
2. Insert a charged battery into the battery compartment of the transmitter.
3. Release the STOP pushbutton on the transmitter if locked, and turn on the transmitter.
4. Press the set-up pushbutton on the focus I infrakey receiver until its LED blinks, then release the button.
5. Press the (Crane) On pushbutton on the transmitter until the LED on the focus I infrakey receiver blinks rapidly; release the pushbutton and the LED will go off.
6. Affix the INFRAKEY OK sticker above the set-up pushbutton. The focus I infrakey receiver can now recognize the transmitter's exclusive security telegram.

Note: *Follow these steps when replacing a focus I infrakey receiver, or upgrading an existing radio system with focus I.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#setting-up-a-focus-i-infrakey-receiver-on-a-crane-radio

Alternator

What is the correct sequence to check the alternator's brushes?

1. Thoroughly clean the slip rings.
2. Check the wear and contact condition of the brushes.
3. If necessary, replace the complete brush holder with one of the same type.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-check-the-alternator-s-brush

What precautions must be observed when working on or around the alternator?

1. Do not ground the output wires or field wires between the alternator and the regulator, and never run an alternator on an open circuit.
2. Do not accidentally reverse the battery connections; if a booster battery is used, connect positive to positive and negative to a chassis ground.
3. Never disconnect the batteries while the alternator is operating, since the resulting voltage spike will damage the diodes.

Note: *Grounding the alternator's output or field wires, or reversing battery polarity, will destroy the diodes.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-precautions-must-be-observed-when-working-on-or-around

What is the correct sequence to adjust the alternator drive belt tension?

1. Loosen the adjusting screw.
2. Loosen the adjustment link locking capscrew.
3. Loosen the pivot capscrew and nut.
4. Use a belt tension gauge to measure belt tension.
5. Turn the alternator adjusting screw clockwise to tighten the belt to the correct tension.
6. Tighten the adjusting screw locknut against the retainer.
7. Tighten the adjustment link locking capscrew to the specified torque (80 Nm).
8. Tighten the pivot capscrew and nut to the specified torque (47 Nm).

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-adjust-the-alternator-drive

What is the correct sequence to remove the alternator drive belt?

1. Loosen the adjusting screw locknut.
2. Loosen the adjustment link locking capscrew.
3. Loosen the alternator mounting capscrew.
4. Turn the adjusting screw counterclockwise to release tension.
5. Remove the alternator belt.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-remove-the-alternator-drive

What is the correct sequence to install the alternator drive belt?

1. Install a new belt on the alternator pulley.
2. Turn the adjusting screw clockwise to increase belt tension, or counterclockwise to decrease it, following the belt tension adjustment procedure.
    - To prevent damage, do not roll or pry a belt over the pulley.
    - Too tight a drive belt is destructive to the bearings of the driven part, while a belt that is too loose will slip.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-install-the-alternator-drive

Power & charging

What is the correct sequence to connect booster batteries or a starting generator to start the engine?

1. Make sure the parking brake is applied and all electrical controls are OFF.
2. Connect one jumper cable to the positive (+) terminal of the booster battery, and the opposite end to the positive (+) terminal of the battery on the machine.
3. Connect the other cable to the negative (-) terminal of the booster battery, and the opposite end to a good ground connection on the machine's frame, away from the battery.
4. Start the engine in the normal manner.
5. After the engine has started, first disconnect the negative (-) booster cable from the frame, then remove the positive (+) booster cable.
    - Do not try to start the engine by towing or pushing.
    - Booster batteries should only be connected by personnel specifically trained in their proper use.
    - Batteries contain sulfuric acid which can cause severe burns; avoid contact with skin, eyes, or clothing.
    - Batteries produce explosive gasses when being charged or discharged; always wear eye protection when using booster batteries or starting generators.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-connect-booster-batteries-or

What safety precautions and checks apply to the machine's starting batteries?

1. Before starting work, disengage the battery disconnecting switch.
2. Sight check: make sure the batteries are correctly fastened, clean and dry.
3. Battery charge check: view the condition of the charge through the special spy cap.
4. Electrolyte level check: loosen the covers and make sure the elements are covered with liquid; if the level is too low, top up with distilled water.
5. Cleaning: clean and tighten the battery terminals properly, and protect the connections with vaseline.
    - Do not rest objects or tools on the batteries (short-circuit hazard).
    - Do not smoke or use flames while checking the battery electrolyte, since the acid vapours are inflammable.
    - Electrolyte is dangerous for skin and eyes; always wear protective clothing (gloves, eyewear, helmet) during inspection and maintenance.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-safety-precautions-and-checks-apply-to-the-machine-s-st

What first aid should be given for caustic burns from battery acid or oil/diesel fuel?

1. For skin causticisation from battery acid: remove the clothing, then wash with running water, taking care not to affect healthy parts.
2. For eye causticisation from battery acid, lubricating oil or diesel fuel: wash the eye with water for at least 20 minutes, keeping the eyelids open so water runs over the eye's edge, moving the eye in all directions.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-first-aid-should-be-given-for-caustic-burns-from-batter

Fuses

What is the correct sequence to check and replace the main fuses?

1. Turn off the main electric power with the battery disconnector.
2. Remove the plastic cover.
3. Check and replace fuses as needed (rated at 25 A).
4. Turn on the electric power again.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-check-and-replace-the-main-f

What is the correct sequence to check and replace the circuit fuses?

1. Turn off the main electric power with the battery disconnector.
2. Remove the cover over the electrical distribution box in the cab.
3. Remove the cover from the fuse holder.
4. Check that the fuses are intact and replace as needed, referring to the fuse chart for each fuse.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-check-and-replace-the-circui

What is the correct sequence to change a fuse?

1. Turn off the main electric power (battery disconnector).
2. Remove the cover from the fuse holder.
3. Check that fuses are intact and change any that are not.

Note: *Always use fuses with the correct ampere rating, to avoid risk of cable damage and fire in cable harnesses.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-change-a-fuse

Control Systems & can Bus

How often should limit switches and electrical controls be functionally checked?

1. Efficiency check of limit switches and their indicators: performed daily by the operator; any problems must be immediately notified to maintenance personnel.
2. Efficiency check of electrical controls (keyboard, joysticks, joystick switches) and their indicators: also performed daily by the operator.
3. Fastening check: check the integrity and fastening of switches/controls and their connections, cleaning as necessary.
    - Before starting inspection, make sure no one can start the machine, unless expressly asked to do so.
    - Limit switches are safety devices; if not in good operating condition, this could be hazardous for people and the machine.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#how-often-should-limit-switches-and-electrical-controls-be-f

What is the correct sequence to replace the transmission control unit (ECU793)?

1. Put the machine in service position.
2. Disconnect the connector(s) from the control unit.
3. Unscrew the screws that hold the control unit and lift it away.
4. Install the new control unit in reverse order.

Note: *Make sure the replacement control unit has the correct part number.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-transmission-con

Checking the generator mounting on a rubber tyred gantry crane

1. Remove the protective net.
2. Tighten the flex plate mounting screws to a tightening torque of 80 N.m.
3. Tighten the generator mounting screws.
4. Install the net back in place.
5. Check the condition of the vibration dampers.

Note: *The electric systems must be serviced and repaired by trained personnel, due to the high voltage involved.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#checking-the-generator-mounting-on-a-rubber-tyred-gantry

Diagnosing a CAN bus communication fault on a mobile harbour crane's electronic control system

1. Identify which unit, keyboard, joystick or encoder the alarm message names as not responding (for example 'Unit x is not responding', 'Cabin keyboard not responding', or 'Right/Left joystick not responding').
2. Check that the named unit is connected correctly to its connector on the machinery room panel (or, for the keyboard or joystick, to its dedicated cable connector), and that it is powered.
3. Check the integrity of its CAN cable.
4. Check that the CAN line is correctly terminated: the resistance between the high and low lines must read 120 Ohm at both ends (one termination resistor sits on the truck panel, the other on the top cabin's panel, or via the keyboard/joystick jumper).
5. For the cabin keyboard specifically, also check that the 4 switches on the light blue block behind the keyboard are all ON.
6. If none of these checks finds the fault, the unit, keyboard, joystick or encoder itself may be damaged and must be changed.

Note: *Before following these checks, first exclude the possibility that crane movements or solenoid valve ignition are blocked by the programming logic itself (check all conditions required to activate the logic). Most malfunctions of this kind are electrical problems or sensor trouble, and can be solved using the wiring diagrams as a guide.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#diagnosing-a-can-bus-communication-fault-on-a-mobile

Wiring & connectors

What is the correct sequence to replace the ignition switch?

1. Put the machine in service position.
2. Remove the steering wheel and steering panel covers.
3. Unplug the connector from the ignition switch.
4. Replace the ignition switch.
5. Refit in the reverse order.

Note: *Torque the nut in the centre of the steering wheel to 40 Nm (±5 Nm).*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-ignition-switch

What general wiring and connections are checked during the 500-hour Type A preventive maintenance service?

1. Check the condition of the electrical boxes and their components.
2. Check the VHF radio wiring.
3. Check the condition of electrical and electronic plugs and connections.
4. Check the data radio terminal's wiring.
5. Check the VHF radio and microphone's operation.
6. Check the data radio terminal's operation.
7. Check the machine's general wiring.
8. Check the condition of plugs and connections.
9. Check the condition of the junction boxes.

Note: *Maintenance must be carried out only by qualified, authorised personnel, working in conditions of maximum safety.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-general-wiring-and-connections-are-checked-during-the-5

Dashboard Switches

What is the correct sequence to replace a dashboard switch?

1. Put the machine in service position.
2. Remove the screws securing the instrument panel and lift up the panel.
3. Disconnect the pin terminal from the switch and any bulb socket.
4. Remove the bulb socket using pliers.
5. Replace the switch.
6. Fit in reverse order.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-a-dashboard-switch

What is the correct sequence to replace a dashboard indicator lamp?

1. Put the machine in service position.
2. Remove the screws securing the instrument panel and lift up the panel.
3. Disconnect the bulb socket pin terminal.
4. Open the bulb holder using pliers.
5. Replace the bulb.
6. Fit in reverse order.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-a-dashboard-indicato

Calibrating the load weighing system on a mobile harbour crane

1. Select the gain corresponding to the load cells used, via the dip switches on the amplifier cards (on models with two loading cells, the amplifier cards must be the same type).
2. Adjust the card trimmers so that, at no load, on the I/O test masks, the currents of the two inputs (or of the single input on smaller models) read between 17 and 19 mA and have identical values.
3. Access the weight calibration mask and store the currents and the minimum weight.
4. Hoist a certified load, set the weight, and store the currents detected in the weight calibration mask.
5. Check that, with the weight raised, the current obtained at maximum load is at least 4 mA per cell; if the estimated current at maximum load is below 4 mA, the gain set is wrong and the procedure must be repeated from the gain selection step.

Note: *Perform this calibration with the boom and winch in an intermediate position and no weight attached.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#calibrating-the-load-weighing-system-on-a-mobile-harbour

Multi Function Lever

What is the correct sequence to replace the multi-function lever?

1. Put the machine in service position.
2. Remove the steering wheel: remove the centre cover and unscrew the nut securing the steering wheel, then remove the steering wheel, tapping carefully with a mandrel the same diameter as the steering column if it is firmly fixed, while lifting the steering wheel at the same time; on an early model, if this does not loosen the steering wheel, fabricate and use a withdrawing tool — drill two holes in the steering wheel hub using a washer as a template, cut M6 threads in the holes, place the withdrawing tool over the steering wheel hub and fix it with two screws, then screw in the centre screw and tighten it until the steering wheel comes loose, and remove the steering wheel.
3. Remove the lower steering panel cover (six screws).
4. Remove the upper steering panel cover (two screws).
5. Remove the Allen screws securing both levers.
6. Remove the covers from the steering column (seven screws).
7. Thread the lever through the lower cover.
8. Remove the nine clips holding the instrument panel by pressing in the centre pin on each clip, then raise the instrument panel slightly.
9. Cut the cable ties securing the cable harness.
10. Unplug the connector for the multi-function lever in question.
11. Withdraw the cables and multi-function lever.
12. Replace the multi-function lever.
13. Fit in reverse order.
    - Torque the socket cap screws that hold the multi-function lever to the steering column to 2.5-3.0 Nm.
    - Torque the nut in the centre of the steering wheel to 40 Nm (±5 Nm).
    - Reuse the instrument panel clips by re-inserting the centre pin and pressing it flush with the head on fitting.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-multi-function-l

What joystick operations are checked during the 500-hour Type A preventive maintenance service?

1. Check the joystick's wiring.
2. Check the condition of the joystick.
3. Check for oil leaks from the joystick's pipes, fittings and components.
4. Check the joystick's electrical manoeuvre functions.
5. Check the joystick's mechanical operation.

Note: *Maintenance must be carried out only by qualified, authorised personnel, working in conditions of maximum safety.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-joystick-operations-are-checked-during-the-500-hour-typ

Programming minimum and maximum joystick function speeds with the tele-teach-in battery on a crane radio transmitter

1. Switch off the transmitter.
2. Insert a charged tele-teach-in battery into the battery compartment of the transmitter.
3. Press the programming pushbuttons "+" and "-" on the tele-teach-in battery simultaneously and switch on the transmitter; keep them depressed until the transmitter's dual-colour LED starts flashing quickly green.
4. When the green LED on the receiver illuminates, press the Start or (Crane) On pushbutton if equipped, then press both programming pushbuttons again to enter tele-teach-in operating mode.
5. To set the minimum speed: push the joystick toward the desired function, not moving it beyond 50%, then adjust the minimum speed with the "+" and "-" pushbuttons by finding the point where the hydraulic valve begins to react.
6. To set the maximum speed: push the joystick to its end position for the desired function, then adjust the maximum speed with the "+" and "-" pushbuttons by finding the point where the hydraulic valve reaches its maximum travel, without over-actuating the pushbuttons afterward.
7. Repeat the minimum/maximum speed steps for each further joystick function.
8. To finish, press both programming pushbuttons simultaneously, release them, and switch the transmitter off and on again to return to normal operating mode. On systems with a speed switch, all functions must be reprogrammed at each corresponding speed.

Note: *This function is relevant only for distributors who program equipment with manufacturer- or machine-specific unit data. Read the full instructions carefully before beginning. Only one function can be programmed at a time; if the crane movements are executed too fast or in a jerky manner and this is not being corrected by qualified programming, contact the distributor or the manufacturer instead.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#programming-minimum-and-maximum-joystick-function-speeds

Entertainment

What is the correct sequence to replace the radio antenna?

1. Put the machine in service position.
2. Undo the screws which fix the roof panel and remove the roof panel.
3. Undo the antenna cable connector.
4. Undo the locknut which fixes the antenna to the roof panel and remove the antenna.
5. Replace the antenna.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-radio-antenna

What is the correct sequence to replace the 24/12V voltage converter?

1. Put the machine in service position.
2. Remove the cover from behind the operator's seat (five clips).
3. Detach the electrical cables to the converter.
4. Remove the converter from its bracket.
5. Replace the converter.

Note: *The voltage converter is available in two versions, one of which has fragile plastic brackets; be careful when changing it.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-24-12v-voltage-c

Overloading System

What is the correct sequence to check the overloading system?

1. Lift a load approximately 1 m.
2. Run out the boom and check that the overloading system is activated.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-check-the-overloading-system

What anti-tip system operations are checked during the 500-hour Type A preventive maintenance service?

1. Check the anti-tip system's operation (automatic control).
2. Check the anti-tip system's operation (manual control).
3. Check the anti-tip control unit's wiring (automatic control).
4. Check the anti-tip relay's wiring (manual control).
5. Check the anti-tip system's function.
6. Check the anti-tip system's wiring.
7. Check the anti-tip bypass's operation.
8. Check the telescopic extension bypass's operation.

Note: *Maintenance must be carried out only by qualified, authorised personnel, working in conditions of maximum safety.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-anti-tip-system-operations-are-checked-during-the-500-h

Camera Monitor

What is the correct sequence to remove and reinstall the closed circuit TV camera?

1. Disconnect the cable.
2. Remove the bolt and nut to release the camera.
3. Re-install the camera by reversing the removal procedure.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-remove-and-reinstall-the-clo

What is the correct sequence to remove and reinstall the CCTV monitor?

1. Disconnect the cable.
2. Remove the bolt to release the monitor with its support.
3. Remove the bolt and nut to release the monitor from the support.
4. Re-install the monitor by reversing the removal procedure.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-remove-and-reinstall-the-cct

Other Electrical & Control Systems procedures

What is the correct sequence to replace the accelerator pedal?

1. Put the machine in service position.
2. Remove the three screws that hold the accelerator to the floor.
3. Undo the accelerator pedal connector.
4. Remove the accelerator pedal.
5. Install in reverse order.

Note: *The accelerator pedal is factory calibrated, but may need to be recalibrated after replacement.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-accelerator-peda

What is the correct sequence to calibrate the electric load scales?

1. Operate the trolley up and down a few times to remove any mechanical tension.
2. Operate the machine for a few minutes before zero adjustment and weight calibration take place.
3. Navigate to the service menu to select the function to calibrate, then press Enter.
4. Enter the calibration code, obtained from the machine manufacturer's support (the code determines which service menu is activated: Diagnostics, Initiation or Calibration).
5. Select SCALE by scrolling with the arrow keys and confirm with Enter.
6. Unload, operate the trolley up and lower it slowly to about 1 metre above the ground, then reset to zero in menu 1(2).
7. Load with a known weight (preferably a frequently used loading weight or close to the machine's maximum load), adjust to the correct weight, lower the trolley slightly, and confirm the weight in menu 2(2); a value for maximum lift capacity must be set in setup for the weight to be adjustable.

Note: *The mast should be in a vertical position and the fork carriage centred for weighing, calibration and taring.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-calibrate-the-electric-load

What is the correct sequence to calibrate the electronic throttle control accelerator pedals?

1. Select calibration of the electronic throttle control from the setup menu (a service code is required for access).
2. Press the right front pedal down completely and confirm, then release the right front pedal completely and confirm.
3. If the machine has hydrostatic transmission or inching, press the left front pedal down completely and confirm, then release the left front pedal completely and confirm.
4. If the machine has a rotating or reversible driver's seat, press the right rear pedal down completely and confirm, then release the right rear pedal completely and confirm.
5. If the machine has hydrostatic transmission or inching and a rotating seat, press the left rear pedal down completely and confirm, then release the left rear pedal completely and confirm.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-calibrate-the-electronic-thr

What is the correct sequence to replace the reversing alarm?

1. Put the machine in service position.
2. Unplug the connector from the reversing alarm.
3. Remove the two Allen screws securing the reversing alarm.
4. Replace the reversing alarm.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-reversing-alarm

What is the correct sequence to replace the operating time gauge?

1. Put the machine in service position.
2. Remove the screws that hold the relevant panel(s) in place and remove the panel(s): on some cabs the rear right panel and then the instrument panel, on others the single panel covering the gauge.
3. Unplug the connector from the operating time gauge.
4. Remove the two screws on the rear piece of the operating time gauge.
5. Replace the operating time gauge.
6. Fit in reverse order.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-the-operating-time-g

What is the correct sequence to replace one of the machine's electronic control units (ECUs)?

1. Put the machine in service position.
2. Remove the covers needed to access the control unit (behind the driver's seat for the general/hydraulics/steering units, or the steering wheel centre cover and panel covers for the display terminal).
3. Upload the parameters from the existing control unit using the manufacturer's diagnostic software.
4. Unplug the connectors from the control unit.
5. Remove the two screws securing the control unit.
6. Replace the control unit.
7. Fit in reverse order.
8. Download the parameters and software to the new control unit using the manufacturer's diagnostic software.
    - Before removing the old control unit, upload its parameters using the manufacturer's diagnostic software.
    - After fitting the new control unit, download the correct program and all parameters (settings and calibrations) to it using the manufacturer's diagnostic software; contact the machine manufacturer for the correct program if needed.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-replace-one-of-the-machine-s

What is the correct sequence to reset the service indicator?

1. Put the machine in service position.
2. Navigate to the service menu and press Enter.
3. Enter the code for resetting the service indicator, obtained from the machine manufacturer's support.
4. Reset the service indication by pressing Enter; NEXT SERVICE changes to the given interval.
5. To change the length of the service interval, set the desired interval with the plus and minus keys.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-reset-the-service-indicator

What is the correct sequence to read out an error code from the display?

1. Turn the start key to position I.
2. Navigate to the service menu and press Enter.
3. When the safety menu is shown, hold Enter pressed in for at least two seconds.
4. Read the error code list shown on the display; scroll between error codes with the arrow keys.
5. Note the error code number to avoid forgetting it, along with the error code level, error cause symbol, and affected function symbol.
6. Use the error code tables to find more information about the error code.
7. After taking the recommended action, check that no active error codes remain for the function in question.

Note: *In case of error codes of level WARNING or STOP, serious machine damage may result if the engine is started; do not start the engine until the cause of the error code has been identified or repaired.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-read-out-an-error-code-from

What is the correct sequence to drive the machine to service by bypassing the transmission's neutral safety interlock in an emergency?

1. Release the load.
2. Activate the switch for bypassing.
3. Select the travel direction.
4. Drive the machine to service, limiting speed to 10 km/h.

Note: *Bypassing disengages the safety interlocks entirely; no safety system is engaged, so there is a risk of tipping and rolling over. Only use bypassing in emergency situations.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-drive-the-machine-to-service

What is the correct sequence to check the starter motor's brushes?

1. Thoroughly clean the commutator.
2. Check the wear and contact condition of the brushes.
3. If necessary, replace the complete brush holder with one of the same type.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-check-the-starter-motor-s-br

What is the correct sequence to remove a warning alarm (reverse or front)?

1. Disconnect the electrical leads.
2. Remove the nut and bolt.
3. Remove the other bolt, if present, to release the alarm from the chassis.

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-remove-a-warning-alarm-rever

What is the correct sequence to remove the main 100A disconnect breaker?

1. Kill the engine.
2. Remove all keys and remove the positive cable from the battery.
3. Remove the cover to release the two main disconnect breakers.

Note: *Electrocution hazard: all electrical components should be serviced only by qualified personnel, complying with all local and federal codes; ensure all electrical power sources are disconnected and locked/tagged out, the engine has stopped, all ignition keys are removed, and the positive cable is removed from the battery.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-is-the-correct-sequence-to-remove-the-main-100a-disconn

What instrument and warning-lamp operations are checked during the 500-hour Type A preventive maintenance service?

1. Check the tachometer's operation.
2. Check the hour meter's operation.
3. Tighten the indicator lamps and selector switches on the dashboard.
4. Check the fuel level indicator's operation.
5. Check the consent traffic-light's operation.
6. Check the consent traffic-light's wiring.
7. Check the alternator warning lamp.
8. Check the lights warning lamp.
9. Check the working lights warning lamp.
10. Check the reversing buzzer's operation.
11. Check the horn's operation.

Note: *Maintenance must be carried out only by qualified, authorised personnel, working in conditions of maximum safety.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#what-instrument-and-warning-lamp-operations-are-checked-duri

Checking a suspected cable during troubleshooting

1. Refer to the appropriate circuit diagram, and check the connections and any joints of the suspected cable.
2. Disconnect the connector from both the control unit and the component.
3. Connect the other end of the cable to a point on the frame structure where the cable touches the metal surface without a film of paint or coating.
4. Use a multimeter to measure the cable resistance between the cable and the machine frame.
5. The cable is intact if the multimeter shows constant resistance.

Note: *De-energise the electric system first, per the machine's safety instructions for electric systems.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#checking-a-suspected-cable-during-troubleshooting

Checking and cleaning the brake resistors and transformers on a rubber tyred gantry crane

1. Isolate the brake resistors and transformers from the power supply.
2. Open the covers of the brake resistors and transformers.
3. Remove dust from the components.
4. Check the electrical connections of the brake resistors for oxidation.
5. Clean the electrical connections of the brake resistors.
6. Check the tightness of the electrical connections of the brake resistors.
7. Check the insulation of the cables visually.
8. Close the covers of the brake resistors and transformers.

Note: *The electric systems must be serviced and repaired by trained service personnel; ensure the electric system is de-energized before commencing work. The components may be hot; wait for them to cool down before starting. The maintenance procedure releases dust from the surface of the components: use personal protective equipment such as gloves, safety goggles and a breathing mask. Brake resistors convert braking energy to heat, and are located, together with the transformers, on the roof of the electrical-equipment house.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#checking-and-cleaning-the-brake-resistors-and-transformers

Changing the grease in the secondary gearbox of a motor-driven cable reel

1. Remove the lubricating grease.
2. Clean the inside with a brush and grease solvent.
3. Refill the gearbox with new grease.
4. Re-assemble, using a new seal between the two flanges.

Note: *A replacement kit with grease, seals, screws and bolts must be available before starting. Access to the secondary gearbox requires first removing the perforated plate around the coupler and the motor-coupler unit (fixed with 2 bolts CHC M10 and 2 nuts HM10), or, on a different case type, the motor-coupler unit plus the secondary gearbox.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#changing-the-grease-in-the-secondary-gearbox-of-a-motor

Replacing the input gear set on a motor-driven cable reel's additional gearbox

1. Remove the snap ring.
2. Remove the pinion.
3. Replace the seals.
4. Carry out the operation in reverse to reassemble.

Note: *A replacement kit with grease, seals, screws and bolts must be available before starting. This procedure does not apply to type 55. Access to the interior of the additional gear unit is as for the grease change procedure.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#replacing-the-input-gear-set-on-a-motor-driven-cable-reel-s

Inspecting and maintaining the slip ring assembly of a motor-driven cable reel

1. Remove the slip ring cover.
2. Check the connections.
3. Check that the screws and threaded rods of the slip ring are well tightened.
4. Check that the hub slip ring is well tightened on the driving shaft.
5. If the rings are marked, slightly pitted, or have a large carbon deposit, polish them with 320-grade emery cloth.
6. Clean the insulators.
7. Remove dust from the assembly.
8. Check the brush wear (replace if less than 2 mm), the quality of brush-to-ring contact, and the position of the brushes on the rings.
9. Refit the cover and its seal, changing the joints if they show signs of wear, and tighten to 7 N.m.

Note: *Before opening the cover, be sure that the slip ring is de-energized.*

Source: https://www.hitsrl.it/technical-resources/procedures/electrical-and-control/#inspecting-and-maintaining-the-slip-ring-assembly-of-a

Maintenance Tips

Control Systems & CAN-Bus

What does maintaining control system logic in modern mobile lifting equipment involve?

Control systems in mobile lifting equipment coordinate hydraulic, mechanical, and electrical functions to ensure safe and efficient operation. These systems use sensors — parts HIT Srl supplies — valves, and logic controllers to manage movement, monitor load conditions, and prevent unsafe actions.

Sensors provide real-time data on pressure, position, speed, and load. This data is used to adjust hydraulic flow, limit movement, and trigger alarms. Position sensors on the boom, a component HIT Srl stocks, and stabilizers ensure that the machine operates within safe limits. Load sensors monitor the weight being lifted and prevent overloads.

Logic controllers process sensor data and execute control algorithms. These algorithms determine how the machine responds to operator inputs. For example, if the load approaches the maximum safe limit, the controller may reduce lifting speed or prevent further extension of the boom.

Hydraulic valves play a critical role in control system logic. Proportional valves allow fine control of movement by adjusting flow based on electrical signals. Safety valves prevent excessive pressure by diverting fluid when limits are reached. Directional valves route fluid to the appropriate actuators.

Control systems also include safety interlocks. These interlocks prevent the machine from performing unsafe actions, such as lifting with the stabilizers retracted or traveling with the boom raised. Interlocks may disable certain functions until the machine is in a safe configuration.

User interfaces provide operators with information about machine status. Displays show load charts, pressure readings, and warning messages. Control levers and joysticks allow operators to command movement. The interface must be intuitive and responsive to ensure safe operation.

Understanding control system logic helps operators use the machine safely and efficiently. It also helps technicians diagnose issues related to sensors, valves, and controllers. Proper maintenance of control system components is essential for long-term reliability.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-does-maintaining-control-system-logic-in-modern-mobile

What does maintaining integrated safety philosophy in mobile lifting systems involve?

Safety in mobile lifting systems is achieved through a combination of engineering design, control system logic, operational procedures, and human awareness. An integrated safety philosophy ensures that all aspects of the machine work together to prevent accidents.

Engineering design incorporates safety margins into structural components, hydraulic systems, and control logic. Load charts specify safe operating limits. Safety valves — parts HIT Srl supplies — prevent excessive pressure. Interlocks prevent unsafe actions.

Control systems monitor machine status and respond to unsafe conditions. Sensors, components HIT Srl stocks, detect overloads, excessive tilt, and hydraulic failures. Controllers adjust movement or stop the machine to prevent accidents.

Operational procedures provide guidelines for safe use. Operators must follow proper setup procedures, assess ground conditions, and use stabilizers correctly. They must also monitor weather

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-does-maintaining-integrated-safety-philosophy-in-mobile

How do you maintain reachstacker electronic control units and can-bus networks to prevent failure?

Electronic control units (ECUs) and CAN-bus networks coordinate engine performance, hydraulic functions, safety systems, and operator controls. These systems must remain accurate despite exposure to vibration, dust, and temperature fluctuations.

ECU housings must be inspected for dust accumulation, moisture ingress, and overheating. Control cabinet heaters must be tested to ensure proper humidity control.

CAN-bus connectors — parts HIT Srl supplies — must be inspected for corrosion, abrasion, and correct seating. Salt exposure accelerates oxidation, increasing resistance and causing intermittent faults.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage. Crane movement and vibration can damage insulation.

Sensor inputs must be verified for accuracy. Any sensor showing drift or intermittent response must be recalibrated or replaced.

Environmental conditions significantly influence electronic system behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining ECUs and CAN-bus networks requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-do-you-maintain-reachstacker-electronic-control-units-an

What should be checked when inspecting electronic control system architecture, redundancy verification, and safety logic integrity?

Modern container-handling machines rely on complex electronic control architectures that integrate cabin controls, hydraulic systems, safety interlocks, anti-collision systems, and load-handling logic. STS and RMG cranes use distributed PLC networks with redundant communication paths. Straddle carriers rely on multi-node control systems for steering, hoisting, and stability. Reachstackers and empty handlers use integrated control modules for boom, spreader — a part HIT Srl supplies — and chassis functions. Forklifts and terminal tractors use simplified but highly stressed control electronics.

Maintenance begins with verifying the integrity of the control architecture. PLCs, ECUs, and I/O modules must be inspected for mounting stability, connector integrity, and environmental sealing. Marine cranes require corrosion-resistant housings and climate-controlled cabinets. Yard machines require dust-proof enclosures.

Redundancy systems must be tested regularly. STS cranes rely on redundant encoders, limit switches, and communication paths to ensure safe hoisting. Straddle carriers require redundant steering sensors, components HIT Srl stocks, and anti-tip logic. Maintenance teams must simulate failure scenarios to verify that backup systems engage correctly.

Safety logic must be validated through functional testing. Interlocks for overload protection, anti-two-block systems, twistlock engagement verification, and boom angle limits must be tested under controlled conditions. Any deviation from expected behavior indicates sensor drift, wiring faults, or PLC logic corruption.

In summary, control system maintenance ensures safe, predictable machine behavior and prevents catastrophic failures.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-electronic-control-sy

What should be checked when inspecting control system and connectors?

Electronic control systems in modern port-handling machinery have evolved into highly integrated, multi-layered architectures that coordinate every operational function of the machine. These systems are far more complex than those found in typical industrial equipment because they must manage high-risk operations such as hoisting, load handling, anti-collision, steering, braking, and structural monitoring. Machines like reachstackers, empty handlers, forklifts, and terminal tractors rely on compact but highly stressed electronic control modules. Straddle carriers and RMG cranes use distributed control networks with multiple nodes communicating over CAN-Bus, Ethernet, or fiber-optic links. MHC cranes use hybrid architectures combining PLCs, safety relays, and hydraulic controllers. STS cranes, the most complex of all, use multi-redundant PLC systems, safety-certified logic controllers, and long-distance communication networks that span the entire crane structure.

A comprehensive maintenance program begins with understanding the architecture itself. Each machine type uses a different control topology. Reachstackers and empty handlers typically use a central ECU or VCU (Vehicle Control Unit) that manages boom functions, spreader control, hydraulic flow, and safety interlocks. Straddle carriers use multiple distributed ECUs: one for steering, one for hoisting, one for drive control, and one for stability monitoring. RMG cranes use PLC-based systems with remote I/O modules mounted along the gantry, trolley, and hoist assemblies. STS cranes use redundant PLCs located in climate-controlled cabinets, with safety-certified logic processors handling anti-two-block, overload protection, gantry travel limits, and trolley positioning.

Maintenance begins with verifying the physical integrity of all control modules. Electronic cabinets must be inspected for temperature stability, humidity control, and cleanliness. Dust accumulation in yard machines causes overheating and electrical noise. Salt exposure in marine cranes corrodes terminals, PCB traces, and connectors — parts HIT Srl supplies. STS cranes require dehumidifiers and positive-pressure ventilation systems to prevent condensation inside control cabinets. Technicians must check cabinet seals, cooling fans, filters, and cable glands to ensure environmental protection.

Redundancy management is a critical part of control system maintenance. Many machines use redundant sensors, components HIT Srl stocks, redundant communication paths, or redundant PLC processors to ensure safe operation even if one component fails. STS cranes, for example, use dual encoders on hoist drums, redundant limit switches, and dual safety PLCs. Straddle carriers use redundant steering angle sensors and load-balance sensors. Maintenance teams must test redundancy by simulating failures under controlled conditions. If a primary sensor is disconnected, the system must seamlessly switch to the backup without triggering unsafe behavior. If a communication path is interrupted, the system must reroute traffic through the redundant channel. Failure to test redundancy regularly leads to situations where backup systems silently degrade without being noticed.

Safety logic integrity is another essential aspect. Safety functions such as overload protection, anti-two-block, twistlock engagement verification, boom angle limits, anti-collision systems, and emergency stop circuits must be validated through functional testing. For example, on reachstackers and empty handlers, the boom must not extend or lift beyond safe angles unless the load is within limits. On straddle carriers, the machine must prevent travel if the spreader is not locked onto the container. On RMG and STS cranes, the hoist must stop immediately if the anti-two-block switch is triggered. Maintenance teams must test these functions using controlled simulations, not just rely on sensor readings.

Communication integrity is a major factor in control system reliability. CAN-Bus networks must be checked for error frames, bus load, and termination resistor integrity. Ethernet networks must be checked for packet loss, cable damage, and switch performance. Fiber-optic networks on STS and RMG cranes must be inspected for connector cleanliness, signal attenuation, and mechanical stress. Any degradation in communication quality leads to delayed commands, false alarms, or system shutdowns.

Software integrity must also be maintained. PLC programs, ECU firmware, and safety logic must be kept up to date and protected from corruption. Unauthorized modifications or outdated firmware can cause unpredictable behavior. Maintenance teams must verify checksums, compare program versions with approved baselines,

and ensure that backup copies are stored securely. After major repairs or component replacements, technicians must verify that the correct software is loaded and that all parameters match the machine’s configuration.

Diagnostic tools play a central role in maintaining control system health. Technicians must use manufacturer-approved diagnostic software to monitor real-time data, check error logs, and verify sensor and actuator performance. On STS cranes, advanced diagnostic systems monitor thousands of parameters simultaneously, including hoist torque, trolley speed, sway angles, and structural loads. On mobile equipment, diagnostic tools monitor hydraulic pressures, boom angles, spreader status, and drive system performance.

Finally, documentation and traceability are essential. Control system schematics, wiring diagrams, PLC logic charts, and parameter lists must be kept up to date. Any modification—whether replacing a sensor, updating software, or rerouting a cable—must be documented. Without accurate documentation, troubleshooting becomes slow and error-prone, especially on complex machines like STS cranes.

In summary, maintaining electronic control system architecture in heavy port machinery requires a disciplined approach that includes environmental protection, redundancy testing, safety logic validation, communication integrity, software management, and thorough documentation. These systems are the nervous system of the machine, and their reliability directly determines operational safety and efficiency.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-control-system-and-co

Why does a redundant CAN bus keep working if one segment fails?

A redundant CAN bus doesn't mean a second, separate network running in parallel as a backup — it means every control unit on the machine has two connections for communication rather than one, with the bus wired in series between control units along both paths. That specific topology is what lets the system tolerate losing an entire segment: if one connection or one length of cable fails, the affected control units can still reach the rest of the network through their second connection, rather than the whole bus going silent because of a single break point.

This matters directly for diagnosing a real fault, because the failure symptom is specific and worth recognising for what it is: no messages being received on a given CAN buffer means error codes from other control units on that segment can no longer be displayed, even though those other control units may be working perfectly fine — the fault is in the communication path, not necessarily in the units that have gone silent from the display's point of view. Checking the CAN bus itself through the diagnostic menu, rather than assuming every silent control unit has failed individually, is the correct first step when this symptom appears.

Recognising the difference between "a control unit has failed" and "a control unit can't be heard from" is what keeps a communication fault from turning into an unnecessary hunt through multiple individually-healthy components.

HIT Srl supplies CAN bus connectors and terminating resistors as tested replacement parts.

Field note — HIT Srl, Reggio Emilia (Italy). Last updated: August 2026.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#why-redundant-can-bus-survives-segment-loss

What technical standard does this machine's CAN bus actually run on?

Communication between the machine's control units runs on a CAN bus (Controller Area Network) built to the ISO 11898 standard, using CAN specification 2.0B.

The driveline-specific segment of the bus has its own documented technical specification: an 11-bit identity field, a data rate of 125 kbit/s, and termination resistors of 120 Ohm fitted inside the ECUs themselves rather than as external components.

The bus is deliberately built as a simple, low-frequency, high-reliability serial system rather than a faster but more fragile alternative.

HIT Srl supplies 120 Ohm terminating resistors matched to this specification.

Field note — HIT Srl, Reggio Emilia (Italy). Last updated: August 2026.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#can-bus-technical-specification

What causes the collision prevention laser scanner optics cover to attract dust, and how should it be cleaned?

Static charges cause dust particles to be attracted to the optics cover of the gantry collision prevention laser scanners. Use a clean, soft brush to remove the dust regularly, and wipe with a damp clean cloth. Do not use aggressive detergents or abrasive cleaning agents on the optics cover: strong chemicals and abrasive materials can cloud up or scratch the plastic.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-causes-the-collision-prevention-laser-scanner-optics

What roller-link faults can occur on the energy chain, and how are they corrected?

Check the function of the rollers on the roller chain links. If a roller does not turn freely, replace the roller; if necessary, replace the chain link as well. If the inside cover plate is missing, this is also a fault requiring correction.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-roller-link-faults-can-occur-on-the-energy-chain-and

What trough faults can occur on the energy chain system, and how is each corrected?

For the energy chain troughs: bent channel segments should be straightened or replaced as necessary; loose or missing screws, or a bent bracket, should be replaced or tightened to the torque specification; a trough width out of specification should be adjusted to the internal width and the mounting brackets tightened with a torque wrench; and misaligned troughs or reference pins, or loose or bent parts, should be adjusted, replaced or tightened as required.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-trough-faults-can-occur-on-the-energy-chain-system-and

How does moisture affect the electronic control box of a powershift transmission, based on a documented field case?

In a documented case, a loader was cleaned with water during maintenance; afterward, the vehicle could not shift gears or start. Inspection found the electric control system's circuit was normal with no mechanical fault; the electronic control box had been affected by damp during cleaning. After drying it, the vehicle operated normally again. Waterproof protection of the control box and gearshift handle must be observed during cleaning and maintenance.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-does-moisture-affect-the-electronic-control-box-of-a

What is the discard/diagnostic criterion for the output speed sensor of a powershift transmission, based on its resistance value?

The output speed sensor, which records the rotation frequency of the output gear for the electronic control box's gearshift decisions, has a nominal resistance value of 1020 ohms plus or minus 100 ohms. If the measured resistance value is 0 or infinite, this indicates the sensor has a short circuit or open circuit and must be replaced.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-is-the-discard-diagnostic-criterion-for-the-output

How is an "Encoder Y does not respond" CAN-bus fault diagnosed and resolved?

Encoders (slewing encoder, winch 1 and winch 2 encoders, boom angle encoder) are connected on the secondary CAN line. Check that the encoder is connected to the right unit, that the blue cable is not broken and is properly connected to the CAN line, and that the CAN line termination is correct (120 ohms). If none of these explain the fault, the encoder may be damaged and must be replaced.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-is-an-encoder-y-does-not-respond-can-bus-fault

How is a non-responding keyboard or joystick diagnosed on a crane's CAN-bus control system?

Variables related to the keyboard or joysticks do not change value when buttons are pressed or the joystick moved. Check that the keyboard and joystick are properly connected to the power supply (the keyboard must be lit and must buzz if alarms are present and no bypass buzzer code has been entered); power and CAN both come through the 9-pin connector. Check that the CAN cable is not broken and is properly terminated (120 ohms, via a resistance in the electric panel and a jumper on the keyboard). For the keyboard specifically, check that the 4 switches on the blue block on the back of the keyboard are set to ON. If the problem persists, the keyboard or joystick must be replaced.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-is-a-non-responding-keyboard-or-joystick-diagnosed-on-a

What protection mode does a crane's remote control enter after being idle, and what precaution avoids accidental movements?

When the remote control receives no command for 10 minutes, it switches to a protection mode in which every movement is treated as an emergency stop, to avoid accidental movements. If the remote control cannot receive an enable signal from the receiver, turn it off and on again, keeping the key in the start position for some seconds.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-protection-mode-does-a-crane-s-remote-control-enter

How does the crane's electronic system detect that an analog sensor has become disconnected?

Each analog sensor has a calibration range and a validity range. When the current or voltage value falls outside the validity range, the system considers the sensor disconnected and gives an alarm; in the test I/O control panel, the affected input is marked with a red exclamation mark, showing Overflow or Underflow depending on the sensor type.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-does-the-crane-s-electronic-system-detect-that-an

How should a disconnected analog sensor be diagnosed on a crane's electronic system?

Check that the cable connecting the unit and the sensor is not broken, and check the sensor itself for damage. It can help to disconnect the sensor and check whether the system control panels change accordingly.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-should-a-disconnected-analog-sensor-be-diagnosed-on-a

How does the crane's electronic system verify the correct connection of digital outputs, and what is a limitation of this check?

Not every output can be checked for proper connection: the system only controls the state of an output while it is actively being driven, and 5 seconds after it stops driving the output, the alarm is reset. Since the cause of the alarm may still be present, the circuit must be checked and the actuator may need to be replaced even if the alarm has cleared.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-does-the-crane-s-electronic-system-verify-the-correct

What is the expected supply voltage on a spreader control system node, and what should be checked if the node's display shows no text after power-on?

If a node won't start and no text appears in the display after power-on, measure the main supply: the voltage should exceed 17V AC or DC, and the green and all red LEDs in the display should be lit.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-is-the-expected-supply-voltage-on-a-spreader-control

How is an RS-232 or CAN communication fault diagnosed on a spreader control system node?

If the monitoring system cannot communicate with a node over RS-232, probe the TxD and RxD lines with an oscilloscope: the data lines should show square waves between -10V and +10V relative to the ground pin. If a node cannot communicate with other nodes over CAN, probe the bus lines: CAN high should show square waves pointing downward, and CAN low should show square waves pointing upward.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-is-an-rs-232-or-can-communication-fault-diagnosed-on-a

How should a digital input or output signal fault be diagnosed on a spreader control system I/O module?

For an input signal fault, check whether the LED indicator on the I/O module responds to the sensor signal (it should light when current flows through the module), and check the common connection for correct supply. For an output signal fault, check whether the LED indicator responds to the command (it should light when the circuit is closed), check the load for proper connection and grounding, check for a broken fuse on the I/O module, and check the common connection; the load should be connected between the module's output pin and ground, at the supply voltage appropriate to the load type (220V, 110V, 24V or other).

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-should-a-digital-input-or-output-signal-fault-be

What does it mean if a spreader control system node stops at start-up displaying its Node ID, and how is this diagnosed?

Measure the voltage of all ID pins: 5V represents a one and 0V represents a zero, and the measured pattern should indicate the expected ID. This condition can indicate that the node has the wrong ID strapped, telling it to participate in the system with the wrong role.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-does-it-mean-if-a-spreader-control-system-node-stops

How is an analogue input signal fault diagnosed on a spreader control system node, and why does chassis grounding matter?

Check the reference voltage relative to ground: there should be exactly 10V difference between them. Also check that the node chassis is properly grounded to the spreader; this is very important in an AC-driven system.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-is-an-analogue-input-signal-fault-diagnosed-on-a

What system-level error occurs if the address key setting on a spreader control system node does not match the software configuration, and what is the corrective action?

If the address key doesn't match the software configuration of addresses, the system is brought into failsafe mode. Check that all nodes are keyed correctly, then reboot.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-system-level-error-occurs-if-the-address-key-setting

What happens if a spreader control system slave node does not respond when the system initialises, and what is the corrective action?

If there is no response from a slave node when initialising the system, the system is brought into failsafe mode. Ensure all slaves are powered up and correctly addressed.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-happens-if-a-spreader-control-system-slave-node-does

What happens on a spreader control system if the application program object instances fail, and what is the recommended action?

If application program object instances fail, the system is brought into failsafe mode. Check the application program; if the problem persists, contact the manufacturer.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-happens-on-a-spreader-control-system-if-the

What voltage thresholds trigger a warning versus a system error on the sensor, internal logic and PWM supply voltages of a spreader control system node?

For each of the sensor supply (P1), internal logic supply (P2) and PWM supply (P3) voltage monitors: a warning is generated if the voltage falls below 21V; an error is generated if the voltage falls below the permissive voltage of the system, at which point the system is taken down into idle mode (it wakes again if the voltage recovers, otherwise it prepares to shut down). In all cases, check the power supplies.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-voltage-thresholds-trigger-a-warning-versus-a-system

What happens on a spreader control system if two nodes are found with the same ID/address?

If two nodes within the system have the same ID/address, the system is brought into failsafe mode. Check and correct the address key on the duplicated node.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-happens-on-a-spreader-control-system-if-two-nodes-are

What are the two warning voltage thresholds on the sensor, internal logic and PWM power monitors of a spreader control system, and what happens at the second, lower threshold?

A first warning is generated if the sensor, internal logic or PWM supply voltage falls below 21V. A second, more severe warning is generated if the same voltage falls below 17V; at this second threshold, the analogue inputs (AI) can start to flicker. In both cases, check the power supplies.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-are-the-two-warning-voltage-thresholds-on-the-sensor

What is the trip speed setting for the main hoist and boom hoist over-speed switches on a quayside container crane?

The theoretical trip speed setting for the over-speed switch on both the main hoist drum and the boom hoist drum is 110% of the motor's maximum speed. Actuation of the switch initiates an emergency stop, and the switch must be manually reset from its back before crane operation can resume.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-is-the-trip-speed-setting-for-the-main-hoist-and-boom

What causes a mobile harbour crane's radio control to accept no commands while turned on, and why might the diesel engine switch off when a joystick is moved?

If the receiver has not enabled the radio control, no command is given even though the radio control is on, and the diesel engine may switch off if a joystick is moved. To fix this, turn the radio control off and on, making sure the key is turned fully and held for a few seconds. If the radio control stays on without giving commands, a safety device triggers after a default 10-minute timeout, interpreting each joystick movement as if the emergency mushroom-headed push button had been pressed.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-causes-a-mobile-harbour-crane-s-radio-control-to

How does a mobile harbour crane's electronic control system detect a failed analog sensor, and how can a technician tell whether the sensor is really faulty or just disconnected?

Each analog sensor has a calibration range and a wider validity range; if the current or voltage reading falls below the bottom validity threshold or above the top validity threshold, the software generates an 'Analog input name failed' alarm. To diagnose it, access the display's inputs/outputs test page: for a current sensor, an alarm condition shows an 'Underflow' reading; for a voltage sensor, both 'Underflow' and 'Overflow' conditions can be distinguished. In both cases, check the integrity of the cable from the sensor to the unit; if the cable is fine, the sensor is likely damaged and must be replaced. To confirm whether a sensor is simply disconnected rather than faulty, disconnect it on purpose and check whether the reading on the test mask changes accordingly.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-does-a-mobile-harbour-crane-s-electronic-control-system

When can a mobile harbour crane's control system detect that an output circuit is disconnected, and what happens if piloting of that output is interrupted?

Checking for disconnection and the corresponding alarm generation for an output is only possible while the output is actively being piloted. If piloting is interrupted, the alarm resets after 5 seconds set in the logic — but this does not mean the cause of the alarm has disappeared; the integrity of the output circuit that generated the alarm must still be checked. If the fault is confirmed, the piloting solenoid valve could be damaged and must be changed.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#when-can-a-mobile-harbour-crane-s-control-system-detect

Which physical values become unavailable on a mobile harbour crane's display if one of its three position encoders stops communicating, and how is this diagnosed?

The crane uses three encoders on the secondary CAN bus: one on the Motor unit reads the turret/centre plate rotation angle, one on the Cabin unit reads the boom angle, and one on the Winch1/Winch2 units reads the winch rope length. If an encoder stops communicating with its unit, the corresponding 'Encoder ... not responding' alarm is generated and the value shown on the display drops to 0. To diagnose it, check that the encoder is connected to the correct unit, and check the integrity and 120 Ohm termination of the CAN cable between the unit and the encoder; if neither check finds the fault, the encoder is likely damaged and must be replaced.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#which-physical-values-become-unavailable-on-a-mobile

LMI & Safety Instrumentation

What does maintaining load moment limiting systems involve?

Load moment limiting systems prevent overloads by monitoring the load moment and limiting machine movement. Understanding the engineering logic behind these systems is essential for safe and efficient operation.

Load moment is the product of the load weight and the load radius. As the load radius increases, the load moment increases. Load moment limiting systems monitor the load moment and prevent the machine from exceeding safe limits.

Sensors — parts HIT Srl supplies — measure boom angle, boom length, and load weight. The control system calculates the load moment based on this data. If the load moment approaches the maximum safe limit, the control system limits movement.

Understanding the engineering logic behind load moment limiting systems helps operators use the machine safely and technicians maintain it properly. Proper maintenance and awareness of load behavior are essential for long-term reliability.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-does-maintaining-load-moment-limiting-systems-involve

How do you maintain MHC load moment limitation (LMI) systems to prevent failure?

The Load Moment Limitation (LMI) system is the primary safety mechanism that prevents overload conditions in Mobile Harbour Cranes. It continuously monitors boom angle, boom length, load weight, and slew position to calculate the real-time load moment. Inaccurate LMI readings can lead to dangerous overload situations. Boom angle sensors, components HIT Srl stocks, must be inspected for corrosion, loose mounting, and cable damage. Salt exposure accelerates oxidation on sensor housings and connectors. Technicians should clean contacts and apply protective coatings.

Redundant encoders must be tested for synchronization. Any discrepancy between primary and secondary readings indicates mechanical play or sensor drift. Calibration must be performed according to manufacturer procedures.

Load pins — parts HIT Srl supplies — must be inspected for strain gauge integrity. Moisture ingress can cause signal drift. Technicians should verify load pin readings under known test loads.

The LMI control unit must be inspected for moisture ingress, dust accumulation, and connector corrosion. Control cabinet heaters must be tested to ensure proper humidity control.

Software calibration must be performed regularly. Outdated firmware can cause incorrect load charts or miscalculated load moments.

In summary, maintaining the LMI system requires precise calibration, environmental conditioning, and rigorous sensor inspection.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-do-you-maintain-mhc-load-moment-limitation-lmi-systems-t

Sensors & Signals

What should be checked when inspecting multi-stage load monitoring and sensor integration?

Modern mobile lifting systems rely on multi-stage load monitoring and sensor integration to ensure safe and efficient operation. These systems provide real-time data on load weight, boom angle, extension, slewing position, and hydraulic pressure. Understanding the engineering logic behind sensor integration is essential for maintaining control and preventing overload conditions.

Load monitoring systems use sensors to measure load weight and distribution. Engineers design these systems with multiple sensors to ensure redundancy and accuracy. Load cells measure tension in the wire rope — a part HIT Srl supplies — while pressure sensors measure hydraulic pressure in the hoisting circuit. Angle sensors measure boom angle, while extension sensors measure boom length. These sensors provide data to the control system, which calculates the load moment and compares it to the crane's capacity.

Sensor integration requires precise calibration. Incorrect calibration can cause inaccurate readings, leading to unsafe operation. Engineers use calibration procedures to ensure that sensors provide accurate data. Regular maintenance is essential to ensure that sensors remain in optimal condition.

Control systems use sensor data to prevent overload conditions. If the load moment approaches the crane's capacity, the control system may limit movement or alert the operator. Engineers design control systems with multiple layers of protection to ensure safety. Redundant sensors provide backup data in case of sensor failure.

Environmental conditions influence sensor behavior. Temperature affects sensor accuracy, while dust and debris can contaminate sensor surfaces. Moisture can cause corrosion, weakening sensor components. Operators must monitor environmental conditions and adjust operations accordingly.

Understanding the engineering logic behind multi-stage load monitoring and sensor integration helps operators use the machine safely and technicians maintain it properly. Proper maintenance, smooth operation, and awareness of sensor behavior are essential for long-term reliability.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-multi-stage-load-moni

What should be checked when inspecting load moment and connectors?

Boom angle sensors — parts HIT Srl supplies — and redundant encoders provide critical feedback for load moment limitation (LMI) systems. Their accuracy is essential for safe lifting operations, especially in variable boom configurations.

Angle sensors, components HIT Srl stocks, must be inspected for corrosion, loose mounting, and cable damage. Salt exposure accelerates oxidation on sensor housings and connectors. Technicians should clean contacts and apply protective coatings.

Redundant encoders must be tested for synchronization. Any discrepancy between primary and secondary readings indicates mechanical play or sensor drift. Calibration must be performed according to manufacturer procedures.

Sensor brackets must be checked for structural integrity. Vibration and shock loads can loosen brackets, causing inaccurate readings.

Understanding sensor behavior ensures reliable LMI performance and prevents overload conditions.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-load-moment-and-conne

How do you maintain MHC electrical sensor networks to prevent failure?

Electrical sensor networks in Mobile Harbour Cranes provide critical feedback for hoisting, luffing, slewing, and travel functions. These sensors — parts HIT Srl supplies — must remain accurate despite exposure to salt, vibration, and temperature fluctuations.

Angle sensors, components HIT Srl stocks, must be inspected for corrosion, loose mounting, and cable damage. Salt exposure accelerates oxidation on sensor housings and connectors. Technicians should clean contacts and apply protective coatings.

Load sensors must be tested for accuracy. Moisture ingress can cause signal drift. Technicians should verify sensor readings under known test loads and recalibrate as necessary.

Proximity sensors must be inspected for alignment and contamination. Dust from bulk cargo can interfere with sensor operation. Technicians should clean sensor surfaces and verify detection ranges.

Cable routing must be inspected for abrasion and UV degradation. Marine sunlight and crane movement can damage insulation. Technicians should replace cables showing cracks or stiffness.

Environmental conditions significantly influence sensor behavior. High humidity causes condensation, while salt exposure accelerates corrosion. Control cabinet heaters must be tested to ensure proper humidity control.

In summary, maintaining electrical sensor networks requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-do-you-maintain-mhc-electrical-sensor-networks-to-preven

How do you maintain MHC boom angle limitation systems to prevent failure?

Boom angle limitation systems prevent the boom from exceeding safe operating angles. These systems include mechanical stops, hydraulic limiters, and electronic sensors, components HIT Srl stocks. Ensuring their reliability requires meticulous inspection of structural components, hydraulic circuits, and sensor networks.

Mechanical stops must be inspected for wear, deformation, and corrosion. Repetitive contact during luffing cycles generates impact loads that stress stop surfaces. Any deformation must be addressed immediately.

Hydraulic limiters must be inspected for pressure stability and response time. Any delay in limiter engagement indicates internal leakage or valve malfunction. Technicians should perform controlled pressure tests to verify limiter performance.

Angle sensors — parts HIT Srl supplies — must be inspected for corrosion, loose mounting, and cable damage. Salt exposure accelerates oxidation on sensor housings and connectors. Technicians should clean contacts and apply protective coatings.

Environmental conditions significantly influence angle limitation behavior. Wind loads introduce lateral forces that increase stress on mechanical stops. Temperature fluctuations affect hydraulic fluid viscosity and sensor accuracy.

In summary, maintaining boom angle limitation systems requires rigorous inspection, hydraulic testing, sensor calibration, and environmental conditioning.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-do-you-maintain-mhc-boom-angle-limitation-systems-to-pre

What should be checked when inspecting reachstacker electronic safety and load monitoring systems?

Electronic safety and load monitoring systems ensure safe container handling by controlling overload protection, boom angle limits, and stability parameters. These systems must remain accurate despite exposure to vibration, dust, and temperature fluctuations.

Load sensors — parts HIT Srl supplies — must be inspected for calibration accuracy. Moisture ingress can cause signal drift. Technicians should verify sensor readings under known test loads.

Angle sensors, components HIT Srl stocks, must be inspected for corrosion, loose mounting, and cable damage. Salt exposure accelerates oxidation on sensor housings and connectors.

CAN-bus wiring must be inspected for abrasion, connector corrosion, and signal integrity. Dust and vibration can loosen connectors, causing intermittent faults.

Control units must be inspected for dust accumulation, moisture ingress, and overheating. Control cabinet heaters must be tested to ensure proper humidity control.

Environmental conditions significantly influence electronic system behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining electronic safety and load monitoring systems requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-reachstacker-electron

What should be checked when inspecting reachstacker electronic load monitoring and stability control systems?

Electronic load monitoring and stability control systems ensure safe container handling by controlling overload protection, boom angle limits, and stability parameters. These systems must remain accurate despite exposure to vibration, dust, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of sensors — parts HIT Srl supplies — wiring, control units, and calibration routines.

Load sensors, components HIT Srl stocks, must be inspected for calibration accuracy. Moisture ingress can cause signal drift. Technicians should verify sensor readings under known test loads.

Angle sensors must be inspected for corrosion, loose mounting, and cable damage. Salt exposure accelerates oxidation on sensor housings and connectors.

CAN-bus wiring must be inspected for abrasion, connector corrosion, and signal integrity. Dust and vibration can loosen connectors, causing intermittent faults.

Control units must be inspected for dust accumulation, moisture ingress, and overheating. Control cabinet heaters must be tested to ensure proper humidity control.

Environmental conditions significantly influence electronic system behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining electronic load monitoring and stability control systems requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-reachstacker-electron-2

Why does reachstacker electrical sensor networks occur on this equipment?

Electrical sensor networks provide critical data for engine control, hydraulic regulation, safety systems, and operator displays. These networks must maintain stable performance despite exposure to vibration, dust, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of wiring, connectors, components HIT Srl stocks, sensors, and grounding points.

Sensors — parts HIT Srl supplies — must be inspected for alignment, contamination, and correct response. Dust from bulk cargo interferes with sensor operation. Technicians should clean sensor surfaces and verify signal output using diagnostic tools.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage. Crane movement and vibration damage insulation. Any harness showing exposed conductors must be replaced.

Connectors must be inspected for corrosion, loose pins, and correct seating. Salt exposure accelerates oxidation on connector surfaces.

Grounding points must be inspected for corrosion and correct torque. Poor grounding causes unstable sensor readings and intermittent faults.

Environmental conditions significantly influence sensor network behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining electrical sensor networks requires rigorous inspection, torque verification, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#why-does-reachstacker-electrical-sensor-networks-occur-on-th

How do you maintain reachstacker electronic throttle control and engine response systems to prevent failure?

Electronic throttle control systems regulate engine response during lifting, travel, and acceleration. These systems must maintain stable performance despite exposure to vibration, dust, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of sensors — parts HIT Srl supplies — actuators, wiring, and control units.

Throttle position sensors, components HIT Srl stocks, must be inspected for contamination and correct signal output. Dust from bulk cargo interferes with sensor operation.

Electronic actuators must be inspected for smooth movement, correct response, and contamination. Any actuator showing delayed response must be recalibrated or replaced.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage. Crane movement and vibration damage insulation.

Control units must be inspected for dust accumulation, moisture ingress, and overheating.

Environmental conditions significantly influence throttle behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining electronic throttle control systems requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-do-you-maintain-reachstacker-electronic-throttle-control

What should be checked when inspecting connectors and steering?

Electronic steering angle sensors — parts HIT Srl supplies — and CAN-bus steering control systems ensure precise steering response. These systems must maintain stable performance despite exposure to vibration, dust, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of sensors, wiring, connectors, and control units.

Steering angle sensors, components HIT Srl stocks, must be inspected for alignment, contamination, and correct signal output. Dust from bulk cargo interferes with sensor operation.

CAN-bus wiring must be inspected for abrasion, UV degradation, and mechanical damage. Crane movement and vibration damage insulation.

Connectors must be inspected for corrosion, loose pins, and correct seating. Salt exposure accelerates oxidation.

Control units must be inspected for dust accumulation, moisture ingress, and overheating.

Environmental conditions significantly influence steering electronics. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining steering angle sensors and CAN-bus systems requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-connectors-and-steeri

What should be checked when inspecting reachstacker electronic load-moment indicators (LMI) and stability monitoring systems?

Load-moment indicators (LMI) and stability monitoring systems ensure safe container handling by controlling overload protection, boom angle limits, and stability parameters. These systems must remain accurate despite exposure to vibration, dust, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of sensors — parts HIT Srl supplies — wiring, control units, and calibration routines.

Load sensors, components HIT Srl stocks, must be inspected for calibration accuracy. Moisture ingress can cause signal drift.

Angle sensors must be inspected for corrosion, loose mounting, and cable damage.

CAN-bus wiring must be inspected for abrasion, connector corrosion, and signal integrity.

Control units must be inspected for dust accumulation, moisture ingress, and overheating.

Environmental conditions significantly influence electronic system behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining LMI and stability systems requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-reachstacker-electron-3

How do you maintain reachstacker spreader electrical rotation and telescopic position sensors to prevent failure?

Position sensors provide critical feedback for rotation angle, telescopic extension, and twistlock status. These sensors — parts HIT Srl supplies — must maintain precise signal accuracy despite exposure to vibration, dust, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of sensor housings, wiring, connectors, and calibration routines.

Rotation encoders must be inspected for alignment, contamination, and correct signal output. Dust from bulk cargo interferes with encoder optics.

Telescopic position sensors, components HIT Srl stocks, must be inspected for smooth travel, correct mounting, and cable integrity.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage.

Environmental conditions significantly influence sensor behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining spreader position sensors requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-do-you-maintain-reachstacker-spreader-electrical-rotatio

What should be checked when inspecting reachstacker spreader hydraulic pressure sensors and load-monitoring circuits?

Hydraulic pressure sensors — parts HIT Srl supplies — and load-monitoring circuits ensure safe lifting by providing real-time feedback on twistlock engagement, telescopic load distribution, and rotation torque. These systems must remain accurate despite exposure to vibration, dust, and temperature fluctuations.

Pressure sensors, components HIT Srl stocks, must be inspected for contamination, corrosion, and correct signal output. Dust from bulk cargo interferes with sensor diaphragms.

Load-monitoring circuits must be tested for correct calibration. Any drift in sensor output compromises safety.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage.

Environmental conditions significantly influence sensor behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining hydraulic pressure sensors and load-monitoring circuits requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-reachstacker-spreader

What should be checked when inspecting twistlock and sensors?

Load-sensing and anti-drop systems prevent accidental container release by monitoring twistlock engagement and load distribution. These systems must maintain precise signal accuracy despite exposure to vibration, dust, and temperature fluctuations.

Load sensors — parts HIT Srl supplies — must be inspected for calibration accuracy. Moisture ingress can cause signal drift.

Anti-drop sensors, components HIT Srl stocks, must be inspected for alignment, contamination, and correct signal output.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage.

Environmental conditions significantly influence sensor behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining load-sensing and anti-drop systems requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-twistlock-and-sensors

What should be checked when inspecting reachstacker spreader twistlock position sensors and lock verification systems?

Twistlock position sensors ensure that the twistlocks, components HIT Srl stocks, are fully engaged before lifting. These sensors must maintain precise signal accuracy despite exposure to vibration, dust, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of sensor housings, wiring, connectors, and calibration routines.

Position sensors — parts HIT Srl supplies — must be inspected for alignment, contamination, and correct signal output. Dust interferes with sensor operation.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage.

Connectors must be inspected for corrosion, loose pins, and correct seating.

Environmental conditions significantly influence sensor behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining twistlock position sensors requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-reachstacker-spreader-2

How do you maintain cabin climate control electronics, sensors, and thermal management to prevent failure?

Climate control electronics regulate temperature, humidity, and airflow. STS and MHC cranes face extreme temperature swings and salt exposure. Yard machines face dust, vibration, and humidity.

Temperature sensors — parts HIT Srl supplies — must be inspected for calibration accuracy and contamination. Incorrect readings compromise HVAC performance.

Humidity sensors, components HIT Srl stocks, must be inspected for moisture saturation and drift. High humidity affects sensor accuracy.

Control modules must be inspected for heat damage, connector corrosion, and vibration-induced faults. Marine cranes require sealed enclosures with heaters.

Thermal insulation must be inspected for compression, contamination, and fire-retardant integrity.

In summary, climate control electronics maintenance ensures operator comfort, visibility, and system reliability.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-do-you-maintain-cabin-climate-control-electronics-sensor

What does maintaining sensor network integrity, calibration stability, and environmental protection involve?

Modern diesel engines rely on a dense network of sensors to monitor temperature, pressure, position, airflow, and emissions. In heavy machinery, these sensors — parts HIT Srl supplies — operate in harsh environments: vibration, dust, humidity, salt, and thermal cycling. Reachstackers and empty handlers generate strong vibration. Forklifts and terminal tractors operate in dusty yards. Straddle carriers and RMGs face continuous oscillation. MHC and STS cranes face salt exposure and long-duration thermal stress.

Critical sensors include crankshaft and camshaft position sensors, components HIT Srl stocks, boost pressure sensors, fuel pressure sensors, coolant temperature sensors, intake air temperature sensors, exhaust gas temperature sensors, and NOx sensors. Each must be inspected for calibration drift, connector integrity, and contamination.

Position sensors must be checked for mounting stability and air gap. Any movement causes timing errors. Pressure sensors must be checked for contamination, especially in dusty environments. Temperature sensors must be checked for drift, which affects ECU compensation strategies.

Marine cranes require sensors with corrosion-resistant housings. Yard machines require dust-sealed sensors. STS cranes require sensors capable of withstanding long-duration heat soak.

In summary, sensor network maintenance ensures accurate ECU decisions, stable combustion, and reliable engine performance.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-does-maintaining-sensor-network-integrity-calibration-s

What should be checked when inspecting sensor network and twistlock?

Beyond engine sensors, components HIT Srl stocks, heavy machinery relies on a wide array of sensors for operational control: boom angle sensors, load cells, twistlock sensors, steering angle sensors, wheel speed sensors, anti-collision radar, laser scanners, and encoder systems. STS and RMG cranes use long-travel encoders and anti-sway sensors. Straddle carriers use height sensors, steering encoders, and load-balance sensors. Reachstackers and empty handlers rely on boom position sensors and spreader feedback. Forklifts and terminal tractors use steering and mast sensors.

Maintenance begins with cleaning and inspecting sensor housings. Dust, salt, and oil contamination degrade sensor accuracy. Marine cranes require corrosion-resistant sensors — parts HIT Srl supplies. Yard machines require dust-sealed sensors.

Calibration must be performed at regular intervals. Boom angle sensors must be checked against physical reference points. Load cells must be calibrated with certified test weights. Encoders must be checked for drift and signal noise.

Wiring to sensors must be inspected for abrasion, connector corrosion, and strain. Sensors mounted on moving structures require flexible, vibration-resistant wiring.

In summary, sensor network maintenance ensures accurate machine positioning, safe load handling, and reliable automation.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-sensor-network-and-tw

What should be checked when inspecting sensor network and connectors?

Sensor networks are the nervous system of modern port-handling machinery. They provide the real-time data required for safe, precise, and efficient operation. Unlike automotive or industrial sensors, components HIT Srl stocks, those used in reachstackers, empty handlers, straddle carriers, forklifts, terminal tractors, MHC cranes, RMG cranes, and STS cranes operate in some of the harshest environments imaginable: dust, salt, vibration, shock loads, electromagnetic interference, and extreme temperature swings. A failure in a single sensor can compromise load stability, disable safety interlocks, or cause the machine to enter limp mode. For this reason, maintaining the sensor network is a critical engineering discipline.

A complete maintenance program begins with understanding the categories of sensors used across these machines. Position sensors include boom angle sensors — parts HIT Srl supplies — telescopic extension sensors, steering angle encoders, wheel speed sensors, and spreader position sensors. Load-related sensors include load cells, pressure transducers, twistlock engagement sensors, and anti-two-block switches. Environmental sensors include wind sensors, sway sensors, anti-collision radar, lidar, and ultrasonic proximity sensors. Structural sensors include strain gauges, trolley position encoders, and gantry travel encoders. STS and RMG cranes rely heavily on long-travel encoders and anti-sway sensors to maintain precise control over hoisting and trolley movement. Straddle carriers use height sensors and load-balance sensors to prevent tipping. Reachstackers and empty handlers rely on boom angle sensors and spreader feedback to ensure safe lifting. Forklifts and terminal tractors use mast sensors, steering sensors, and stability sensors.

Maintenance begins with physical inspection. Sensor housings must be checked for cracks, corrosion, and contamination. Dust, oil, and salt deposits degrade sensor accuracy and cause signal drift. Marine cranes require corrosion-resistant housings and sealed connectors. Yard machines require dust-proof sensors with IP-rated enclosures. Sensors mounted on moving structures—such as booms, spreaders, and steering linkages—must be inspected for mechanical stress, cable fatigue, and connector strain.

Calibration is a critical part of sensor maintenance. Boom angle sensors must be calibrated using physical reference points or inclinometer tools. Load cells must be calibrated with certified test weights or hydraulic pressure references. Encoders must be checked for drift by comparing actual travel distance with encoder output. Anti-sway sensors on STS and RMG cranes must be calibrated to ensure accurate sway detection during hoisting. Steering angle sensors on straddle carriers must be calibrated to ensure precise wheel alignment and stable travel. Failure to calibrate sensors regularly leads to cumulative errors that compromise safety and performance.

Wiring and connectors are often the weakest link in the sensor network. Vibration, heat, and environmental exposure degrade insulation and cause intermittent faults. Maintenance teams must inspect wiring for abrasion, cracked insulation, and loose connectors. Connectors must be cleaned, tightened, and protected with dielectric grease or corrosion inhibitors. On STS cranes, long cable runs must be inspected for mechanical stress, water ingress, and UV degradation. On mobile equipment, wiring routed through articulation points must be checked for fatigue and proper strain relief.

Signal integrity must be verified using diagnostic tools. Technicians must monitor sensor output in real time, checking for noise, dropouts, or erratic behavior. CAN-Bus sensors must be checked for error frames and communication delays. Ethernet-based sensors on STS and RMG cranes must be checked for packet loss and signal attenuation. Analog sensors must be checked for voltage stability and correct scaling. Any deviation from expected values indicates sensor drift, wiring issues, or internal component degradation.

Environmental sensors require special attention. Anti-collision radar and lidar systems must be cleaned regularly and tested for detection accuracy. Wind sensors on STS cranes must be checked for mechanical wear, bearing condition, and calibration accuracy. Proximity sensors on straddle carriers and reachstackers must be tested for correct detection range and response time. Cameras used for operator assistance or automated systems must be cleaned, aligned, and tested for image clarity.

Safety sensors must be tested under controlled conditions. Anti-two-block switches must be tested by simulating block contact. Twistlock sensors must be tested by locking and unlocking the spreader under load. Overload sensors must be tested using calibrated loads. Emergency stop circuits must be tested for correct

response and redundancy.
Documentation is essential. Calibration values, sensor replacements, wiring repairs, and diagnostic results must be recorded. STS and RMG cranes require detailed sensor logs due to the complexity of their control systems. Mobile equipment requires maintenance logs to track sensor drift and identify recurring issues.
In summary, maintaining the sensor network in heavy port machinery requires a disciplined approach that includes physical inspection, calibration, wiring maintenance, signal integrity verification, environmental protection, and safety testing. These sensors are the foundation of safe and efficient machine operation, and their reliability directly determines the performance of every lifting, steering, braking, and positioning function.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-sensor-network-and-co

What should be checked when inspecting torque converter and wiring harness?

Modern automatic transmissions in port machinery rely heavily on electronic control units (TCUs) to regulate shifting, clutch pressure, torque converter lockup, and diagnostic functions. This type of transmission, components HIT Srl stocks, uses sophisticated control algorithms that adapt to load, temperature, and operator behavior. Proper maintenance of TCUs, sensors, and wiring harnesses is essential for reliable operation.
The first pillar is TCU health monitoring. TCUs must be inspected for correct power supply, grounding, and communication. Voltage drops cause erratic shifting and false fault codes. Technicians must inspect connectors for corrosion, loose pins — parts HIT Srl supplies — and water ingress. In reachstackers, TCUs are often exposed to vibration and heat. In forklifts, TCUs suffer from dust contamination.
The second pillar is sensor calibration. Transmission sensors include speed sensors, temperature sensors, pressure sensors, and position sensors. Incorrect sensor readings cause incorrect shift timing, slipping, and overheating. Technicians must verify sensor calibration using diagnostic tools. Depending on transmission design, speed sensor drift is a common issue, or pressure sensor failure often causes harsh shifting.
The third pillar is adaptive shift logic. Modern TCUs adjust shift timing based on load, temperature, and clutch wear. If adaptive values drift too far, shifting becomes harsh or delayed. Technicians must reset adaptive values after clutch replacement or major repairs.
The fourth pillar is wiring harness inspection. Wiring harnesses must be inspected for abrasion, corrosion, and broken wires. In straddle carriers, long harness runs are vulnerable to vibration. In forklifts, harnesses are exposed to heat and dust.
The fifth pillar is solenoid control. TCUs regulate solenoid current to control clutch pressure. Faulty solenoid drivers cause slipping or harsh engagement. Technicians must test solenoid current and response time.
The sixth pillar is software updates. Manufacturers release software updates to improve shift logic and reliability. Technicians must ensure TCUs run the latest approved software.
The seventh pillar is fault code interpretation. TCUs store fault codes that indicate sensor failure, pressure issues, or clutch problems. Technicians must interpret codes correctly and avoid replacing components unnecessarily.
The eighth pillar is environmental protection. TCUs must be protected from heat, moisture, and vibration. Proper mounting and sealing are essential.
Maintaining TCUs, sensors, and adaptive logic ensures smooth shifting, correct pressure regulation, and long transmission life.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-torque-converter-and-5

What should be checked when inspecting transmission and alternator?

Terminal tractors operate in harsh environments with dust, moisture, vibration, and salt exposure. Electrical reliability is critical for safe operation.

The first pillar is connector corrosion. Salt and moisture corrode connectors — parts HIT Srl supplies. Technicians must inspect and apply dielectric grease.

The second pillar is harness routing. Harnesses must be routed away from pinch points and heat sources.

The third pillar is sensor accuracy. Sensors monitor steering, braking, transmission, a component HIT Srl stocks, and engine performance. Faulty sensors cause erratic behavior.

The fourth pillar is grounding integrity. Poor grounding causes intermittent faults and CANbus errors.

The fifth pillar is battery health. Weak batteries cause starting issues and voltage drops.

The sixth pillar is alternator performance. Alternators must supply stable voltage under heavy electrical load.

The seventh pillar is vibration protection. Electrical components must be mounted securely to prevent vibration damage.

The eighth pillar is diagnostic discipline. Technicians must use proper diagnostic tools to isolate faults.

Proper electrical maintenance ensures reliable machine operation.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-transmission-and-alte

What should be checked when inspecting bearing and sensors?

Modern machines are equipped with sensors — parts HIT Srl supplies — and monitoring systems that provide early warnings of developing issues. Using these systems effectively is essential for maximizing uptime.

The first pillar is temperature monitoring. High temperatures in engines, hydraulics, or transmissions, components HIT Srl stocks, indicate imminent failure.

The second pillar is pressure monitoring. Drops in hydraulic or brake pressure signal leaks or pump issues.

The third pillar is vibration analysis. Abnormal vibration reveals bearing wear, misalignment, or imbalance.

The fourth pillar is CANbus diagnostics. Fault codes provide precise information about electrical or sensor issues.

The fifth pillar is overload alarms. Ignoring overload warnings leads to structural damage and downtime.

The sixth pillar is brake wear sensors. These prevent unexpected brake failure during operation.

The seventh pillar is tire pressure monitoring. Correct pressure reduces heat, wear, and blowout risk.

The eighth pillar is operator response. Alerts only help if operators react immediately and correctly.

Real-time monitoring prevents small issues from becoming major failures.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-should-be-checked-when-inspecting-bearing-and-sensors

What does maintaining twistlock inductive sensor adjustment involve?

The machine needs to know if the twistlocks are locked or unlocked. This is monitored by inductive proximity sensors. It is obvious that a false signal can lead to dropping a container or lifting a truck chassis by mistake. Inspect the gap between the sensor face and the metal target (flag). It should usually be 2mm to 4mm. If the gap is too wide, the signal drops out. If it is too close, the sensor gets smashed by vibration. Check the LED indicator on the sensor body. It should light up clearly when the target is present. Inspect the sensor cable for damage. It moves every time the twistlock turns, making it prone to internal wire fatigue. HIT Srl supplies high-quality inductive sensors (PNP/NPN, 2-wire or 3-wire) compatible with IFM, Turck, and Balluff standards used on spreaders. Clean the sensor face. Grease and metal filings can stick to it, causing false readings. Test the safety interlock. The boom should not lift unless all sensors agree that the locks are either fully locked or fully unlocked. Sensor faults are the #1 cause of spreader downtime. Keep a stock of HIT Srl sensors to ensure continuous operation.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-does-maintaining-twistlock-inductive-sensor-adjustment

What does maintaining diesel exhaust fluid (adblue) dosing module involve?

Modern Tier 4 Final and Stage V engines use SCR technology to reduce emissions. This requires AdBlue (DEF) injection. It is obvious that if this system fails, the ECU puts the machine into "Limp Mode," reducing power to a crawl. Inspect the AdBlue dosing nozzle (injector) in the exhaust pipe. White crystal buildup (urea crystallization) often blocks the nozzle. Check the AdBlue pump filter. It is often located under the machine and neglected. A blocked filter starves the pump. Inspect the electrical connector on the NOx sensor. These sensors are extremely sensitive to vibration and moisture. A failed sensor triggers a fault code immediately. HIT Srl supplies NOx sensors, AdBlue dosing pumps, and injectors for this class of diesel engine. We help you stay compliant and out of limp mode. Check the AdBlue tank cap. Dirt entering here is fatal for the pump. Ensure the heating lines are working. AdBlue freezes at -11°C. If the heaters fail, the system blocks in winter. Emission faults are frustrating. Solve them quickly with components from HIT Srl.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-does-maintaining-diesel-exhaust-fluid-adblue-dosing-mod

What does maintaining twistlock safety interlock (seat/landed) involve?

Safety regulations demand that twistlocks cannot open if a load is suspended. This logic relies on the "Landed" signal and "Seat" signal. It is obvious that bypassing these safeties is strictly forbidden. Test the "mid-air" lockout. Lift a container 1 meter. Try to unlock. The system must physically prevent the hydraulic valve from shifting. If it unlocks, the interlock is broken. Check the "seated" interlock. The machine should prevent unlocking if the sensors detect the container is not fully seated on a truck or ground (depending on logic). Inspect the wiring to the twistlock solenoids. A short circuit to positive (+24V) could bypass the ECU protection and open the lock unintentionally. HIT Srl supplies safety relays, interlock modules, and wiring harnesses. We help you maintain compliance with ISO safety standards. Check the mechanical flag sensors on the spreader. If they are bent, they send false signals to the safety computer. Never allow operators to use "override keys" for normal operation. Fix the sensor fault. Safety systems must be fail-safe. Ensure reliability with HIT Srl electronic components.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-does-maintaining-twistlock-safety-interlock-seatlanded

What does maintaining hydraulic oil temperature sensor accuracy involve?

Modern reachstackers monitor hydraulic oil temperature to control cooling fan speeds and to protect the pumps from overheating. The ECU uses this data to de-rate the machine performance if the oil gets too hot. It is obvious that a sensor reading incorrectly can either cook your hydraulic system or cause nuisance shutdowns when the machine is actually cool. Verify the sensor reading by using an infrared thermometer on the hydraulic tank or the sensor body and comparing it with the dashboard display. A large discrepancy (more than 5°C) indicates the sensor's internal resistance has drifted. Inspect the wiring connector. Oil often wicks down the wire insulation from other leaks, filling the connector and changing the resistance value sent to the ECU. Clean the plug with contact cleaner. If the sensor reports -40°C, the circuit is open (broken wire). If it reports +150°C instantly, the circuit is shorted to ground. HIT Srl supplies precision temperature sensors, thermal switches, and sender units compatible with standard electronic controllers. We ensure your machine knows its true operating temperature. Check the sensor mounting O-ring. Leaks here are common as the rubber hardens from heat cycling. A false high-temperature reading kills productivity by forcing the machine into "Limp Mode." Solve electronic sensing issues with parts from HIT Srl.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-does-maintaining-hydraulic-oil-temperature-sensor-accur

What does maintaining spreader height indication system (boom angle) involve?

The machine needs to know the height of the spreader to calculate the safe load moment and to enable safety slowdowns (e.g., limiting speed when the load is high). This is usually calculated via a boom angle sensor and extension length. It is obvious that incorrect height data compromises safety. Calibrate the height system annually. Lower the boom to the ground and verify the display reads 0 meters. Lift to max height and verify the reading matches the manual. Inspect the angle sensor mounted on the boom pivot. It is a potentiometer or inclinometer. Ensure it is tightly mounted. If it is loose, it sends erratic signals. Check the wiring harness to the sensor. It flexes constantly. Look for cracks in the insulation near the connector. HIT Srl supplies boom angle sensors, length transducers, and display monitors. We ensure your LMI system matches reality. If the "High Lift" slow-down mode activates when the load is near the ground, the angle sensor is likely faulty or misadjusted. Don't rely on guesswork; verify your safety instrumentation with components from HIT Srl.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-does-maintaining-spreader-height-indication-system-boom

What does maintaining twistlock sensor target (flag) alignment involve?

The sensors on the spreader detect the position of a metal "flag" or target attached to the twistlock. It is obvious that if the flag is bent, the sensor sees nothing. Inspect the metal target bolted to the twistlock. Is it straight? Is it tight? Check the gap to the sensor. It must be consistent as the lock rotates. Look for rubbing marks. If the target hits the sensor, both are destroyed. HIT Srl supplies sensor targets, mounting brackets, and inductive sensors. We ensure accurate position feedback. Adjust the target, not just the sensor. A bent flag causes constant "Twistlock Fault" errors. Fix it with parts from HIT Srl.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-does-maintaining-twistlock-sensor-target-flag-alignment

When does a machine's load-weighing indicator need to be recalibrated?

The standard verification is simple: park the machine on level ground without a load, centre the attachment, then lift a known reference weight and read what the indicator reports.

The indicator should show the correct weight within about ±0.5 ton of the true figure. Inside that band, no action is needed. Outside it, the indicator has to be recalibrated using the reference load itself as the correction input. On attachments with a mechanical weight or capacity indicator rather than only an electronic one, a properly functioning indicator should show a deviation of no more than about 0.5 ton even with nothing on the hook.

HIT Srl supplies the load cell and its connecting linkage as separate service parts.

Field note — HIT Srl, Reggio Emilia (Italy). Last updated: August 2026.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#load-weighing-indicator-calibration-check

What happens to the low oil pressure warning if the sensor circuit itself fails?

If the oil pressure sensor's circuit goes to an open circuit or short-circuits to ground, the control system doesn't just misread the pressure — it stops issuing the low oil pressure warning altogether.

The warning this sensor feeds is triggered when oil pressure drops below the limit specified for the current engine speed. If the warning doesn't behave as expected, check the sensor's function and change it if necessary.

HIT Srl stocks the oil pressure sensor for this class of engine.

Field note — HIT Srl, Reggio Emilia (Italy). Last updated: August 2026.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#oil-pressure-warning-lost-on-sensor-circuit-fault

How does the operator know a twistlock is correctly positioned before locking it?

Special position sensors are fitted on each twistlock and send signals to the electronic control system to confirm that the twistlock has been correctly positioned in the container corner hook-on housing.
If that condition is satisfied, the yellow indicator light comes on and the twistlock fast-locking action can start.
HIT Srl supplies position sensors for twistlocks on this class of spreader.
Field note — HIT Srl, Reggio Emilia (Italy). Last updated: August 2026.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#twistlock-position-sensor-confirmation-signal

How often should the condition of the starting batteries be checked on a rubber tyred gantry crane, including the auxiliary diesel's batteries?

Check the condition of the starting batteries, and the condition of the starting batteries of the auxiliary diesel, every 500 operating hours.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-often-should-the-condition-of-the-starting-batteries-be

How often should the endpoints and strain reliefs of the energy chain be checked?

Check the condition of the endpoints of the energy chain, and the strain reliefs of the energy chain, every 500 operating hours.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-often-should-the-endpoints-and-strain-reliefs-of-the

How often should the residual current devices (RCD) functionality be checked, and how is this done?

Check the functionality of the residual current devices (RCD) every 4000 operating hours, by pressing the test buttons.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-often-should-the-residual-current-devices-rcd

What are the typical operating parameters of a single-speed generator on a rubber tyred gantry crane?

A diesel engine runs a single-speed generator at a constant speed of 1500/1800 rpm. The generator generates three-phase alternating current (400/440 VAC) with a frequency of 50/60 Hz, used to run the electric drive motors.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-are-the-typical-operating-parameters-of-a-single-speed

How does a variable speed generator (VSG) differ from a single-speed generator in the voltage and frequency it supplies?

With a variable speed generator, the generator output voltage and frequency vary depending on the diesel engine rpm. Regardless of engine rpm, the voltage and frequency supplied for auxiliary loads (for example, lighting and air conditioning) are kept constant. Typically the engine speed varies between 900 and 1800 rpm, while the auxiliary loads' voltage is 400/440 VAC with a frequency of 50/60 Hz.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-does-a-variable-speed-generator-vsg-differ-from-a

How often should the cat-whisker anti-collision switches be lubricated, and how?

Lubricate the cat-whiskers using aerosol spray every 2000 operating hours, or at least every 4 months. Turn the cat-whiskers left and right a couple of times.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-often-should-the-cat-whisker-anti-collision-switches-be

How should energy chain wear be diagnosed and corrected, based on which side is more worn?

Visually inspect the energy chain link surfaces on the inner radius, where the chains slide over each other. If one side of the chain is worn more than the other, adjust the guiding trough width. If the crossbars are worn, the chain is worn out and must be replaced.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-should-energy-chain-wear-be-diagnosed-and-corrected

What obstructions should be checked for in the energy chain and troughs, and what is the corrective action?

Visually inspect the energy chain and troughs for foreign material and mechanical obstructions: ice, snow, dirt, forgotten tools, or other foreign material. Remove any such material before continuing operation, and install guards, shrouds or protective grills as necessary.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-obstructions-should-be-checked-for-in-the-energy-chain

What gap is required between the guiding trough and the energy chain, and what happens if it is wrong in either direction?

There must be a gap on both sides between the guiding trough and the energy chain. Too small a gap causes wearing on the chain links; too large a gap causes wearing on both the chain links and the crossbars.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#what-gap-is-required-between-the-guiding-trough-and-the

How is the guiding trough width adjusted when one side of the energy chain is worn more than the other?

Use the spacer tool to measure the inner width of the trough. Loosen the adjusting screws on both sides of the trough, then move the trough horizontally. When the gap on both sides is correct, tighten the adjusting screws.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-is-the-guiding-trough-width-adjusted-when-one-side-of

How often should the CPU cooling kit of the crane's onboard computer system be replaced?

It is recommended to change the cooling kit (heat sink and fan) of the crane's onboard computer system at 16,000 operating hours or every 4 years, whichever comes first. Replacement should be performed by the computer system's manufacturer's authorized personnel only; if the cooling kit is not properly installed and the system is turned on, permanent damage to the CPU, motherboard and other electronic components may result. Do not wipe off the layer of thermal paste on the bottom of the heat sink.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/sensors-and-signals/#how-often-should-the-cpu-cooling-kit-of-the-crane-s-onboard

Wiring & Connectors

What does maintaining electrical system architecture in mobile lifting machines involve?

Electrical systems in mobile lifting machines provide power for control systems, lighting, sensors — parts HIT Srl supplies — and auxiliary functions. Understanding electrical system architecture is essential for safe and efficient operation.

The electrical system consists of a power source, wiring, control modules, sensors, components HIT Srl stocks, and actuators. The power source provides electrical energy. Wiring distributes this energy to the various components. Control modules process sensor data and execute control algorithms. Sensors monitor machine status. Actuators perform mechanical actions.

Electrical system architecture must be designed to handle the harsh operating conditions of mobile lifting machines. This includes vibration, temperature extremes, and exposure to dust and moisture. Engineers use protective enclosures, sealed connectors, and reinforced wiring to ensure reliability.

Control modules must be designed to handle the computational load of processing sensor data and executing control algorithms. They must also be designed to handle electrical noise and voltage fluctuations.

Electrical failure modes include wiring damage, connector corrosion, sensor failure, and control module failure. Regular maintenance helps prevent these failures. This includes inspecting wiring, checking connectors, and monitoring sensor performance.

Understanding electrical system architecture helps operators use the machine safely and technicians maintain it properly. Proper maintenance and awareness of electrical behavior are essential for long-term reliability.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-does-maintaining-electrical-system-architecture-in-mobi

What does maintaining electrical system reliability in high-humidity marine terminals involve?

Electrical systems in MHC cranes operate in high-humidity environments where condensation, salt, and temperature fluctuations can degrade components. Ensuring electrical reliability is essential for safe crane operation and preventing unexpected shutdowns.

Control cabinets must be inspected for moisture ingress. Technicians should verify gasket integrity and ensure that cabinet heaters are functioning. Condensation can cause short circuits, corrosion, and sensor malfunction.

Terminal blocks and connectors, components HIT Srl stocks, must be checked for oxidation. Salt exposure accelerates corrosion, increasing resistance and causing intermittent faults. Contact cleaner and protective coatings should be applied during routine maintenance.

Cable routing must be inspected for abrasion and UV degradation. Marine sunlight and crane movement can damage insulation. Technicians should replace cables showing cracks or stiffness.

Sensors — parts HIT Srl supplies — and encoders must be tested for accuracy. Moisture can cause drift or signal loss. Redundant sensors should be calibrated to ensure consistent readings.

Understanding electrical system behavior in marine terminals ensures reliable crane performance and reduces downtime caused by environmental degradation.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-does-maintaining-electrical-system-reliability-in-high

What should be checked when inspecting connectors and sensors?

MHC cranes rely on anti-collision systems, radar sensors — parts HIT Srl supplies — and proximity detectors to operate safely in congested port terminals. These systems must remain fully functional despite dust, salt, and vibration.

Radar sensors, components HIT Srl stocks, must be cleaned regularly to remove salt deposits and dust. Contaminated lenses reduce detection accuracy. Technicians should verify sensor alignment and test detection ranges.

Cabling and connectors must be inspected for corrosion and insulation damage. Salt exposure accelerates oxidation, causing intermittent faults. Protective coatings and sealed connectors improve reliability.

Control software must be updated according to manufacturer recommendations. Outdated firmware can cause false alarms or reduced detection sensitivity.

Understanding anti-collision system behavior ensures safe crane operation in busy port environments.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-should-be-checked-when-inspecting-connectors-and-sensor

What should be checked when inspecting power distribution and connectors?

Electrical power distribution systems in Mobile Harbour Cranes must remain reliable despite exposure to salt, humidity, vibration, and temperature fluctuations. These systems supply power to motors, control units, sensors, components HIT Srl stocks, and safety systems. Control cabinets must be inspected for moisture ingress. Technicians should verify gasket integrity and ensure that cabinet heaters are functioning. Condensation can cause short circuits, corrosion, and sensor malfunction.

Terminal blocks and connectors — parts HIT Srl supplies — must be checked for oxidation. Salt exposure accelerates corrosion, increasing resistance and causing intermittent faults. Contact cleaner and protective coatings should be applied during routine maintenance.

Power cables must be inspected for insulation damage. Marine sunlight and crane movement can degrade insulation. Technicians should replace cables showing cracks or stiffness.

Circuit breakers and fuses must be tested for correct response. Overloaded circuits can cause overheating and equipment damage. Technicians should verify that protective devices match system specifications.

Transformers and power converters must be inspected for overheating, vibration, and insulation degradation. Salt exposure accelerates corrosion on windings and terminals.

In summary, maintaining electrical power distribution systems requires rigorous inspection, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-should-be-checked-when-inspecting-power-distribution-an

How do you maintain high-performance maintenance of MHC hoisting motors to prevent failure?

Hoisting motors in Mobile Harbour Cranes operate under extreme thermal and mechanical stress, especially during continuous container handling. These motors must deliver high torque, maintain stable speed control, and withstand rapid load changes. Ensuring motor reliability requires a deep understanding of electrical, mechanical, and thermal behavior.

Motor windings must be inspected for insulation degradation. Salt exposure accelerates corrosion on winding surfaces, while thermal cycling causes insulation to become brittle. Technicians should perform insulation resistance tests and compare results with baseline values. Any significant drop indicates moisture ingress or insulation breakdown.

Bearings — parts HIT Srl supplies — must be monitored for temperature rise and vibration. High-speed hoisting generates heat that can degrade lubrication. Vibration analysis tools can detect early signs of bearing fatigue, misalignment, or imbalance. Any bearing showing excessive heat or noise must be replaced immediately.

Cooling systems must be inspected for airflow and temperature stability. Blocked ducts, failing fans, or corroded heat exchangers reduce cooling efficiency, increasing thermal stress on motor components. Technicians should verify that cooling pathways are clear and that temperature sensors, components HIT Srl stocks, are calibrated.

Electrical connectors must be inspected for corrosion and tightness. Salt exposure accelerates oxidation, increasing resistance and causing intermittent faults. Technicians should clean connectors and apply protective coatings.

Motor control units must be inspected for dust accumulation, moisture ingress, and connector corrosion. Control cabinet heaters must be tested to ensure proper humidity control. Software parameters must be verified to ensure correct torque and speed control.

Environmental conditions significantly influence motor behavior. High ambient temperatures reduce cooling efficiency, while salt exposure accelerates corrosion. Technicians should apply protective coatings and ensure proper ventilation.

In summary, maintaining hoisting motors requires rigorous inspection, thermal management, vibration analysis, and environmental conditioning.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-do-you-maintain-high-performance-maintenance-of-mhc-hois

How do you maintain MHC electrical power conversion units to prevent failure?

Electrical power conversion units in Mobile Harbour Cranes supply energy to motors, control systems, and safety circuits. These units must maintain stable voltage, current, and frequency despite exposure to salt, vibration, and temperature fluctuations. Ensuring their reliability requires meticulous inspection of transformers, converters, and cooling systems.

Transformers must be inspected for overheating, vibration, and insulation degradation. Salt exposure accelerates corrosion on windings and terminals. Technicians should perform thermal imaging to detect hotspots.

Power converters must be inspected for dust accumulation, moisture ingress, and connector corrosion. Control cabinet heaters must be tested to ensure proper humidity control. Cooling fans — parts HIT Srl supplies — must be checked for speed consistency and vibration.

Electrical connectors, components HIT Srl stocks, must be inspected for corrosion and tightness. Salt exposure accelerates oxidation, increasing resistance and causing intermittent faults. Technicians should clean connectors and apply protective coatings.

Environmental conditions significantly influence power conversion behavior. High ambient temperatures reduce cooling efficiency, while salt exposure accelerates corrosion.

In summary, maintaining electrical power conversion units requires rigorous inspection, thermal management, vibration analysis, and environmental conditioning.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-do-you-maintain-mhc-electrical-power-conversion-units-to

How do you maintain reachstacker transmission electronic control modules to prevent failure?

Transmission electronic control modules (ECMs) regulate gear shifting, torque converter lockup, and clutch engagement. These modules must maintain stable performance despite exposure to vibration, dust, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of wiring, sensors, connectors, components HIT Srl stocks, and calibration routines.

ECM housings must be inspected for dust accumulation, moisture ingress, and overheating. Control cabinet heaters must be tested to ensure proper humidity control. Any ECM showing condensation or corrosion must be removed and inspected internally.

Transmission speed sensors — parts HIT Srl supplies — must be inspected for alignment, contamination, and correct response. Dust from bulk cargo can interfere with sensor operation. Technicians should clean sensor surfaces and verify signal output using diagnostic tools.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage. Crane movement and vibration can damage insulation. Any harness showing exposed conductors must be replaced.

Connectors must be inspected for corrosion, loose pins, and correct seating. Salt exposure accelerates oxidation on connector surfaces, increasing resistance and causing intermittent faults.

Environmental conditions significantly influence ECM behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining transmission ECMs requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-do-you-maintain-reachstacker-transmission-electronic-con

How do you maintain reachstacker electrical power distribution systems to prevent failure?

Electrical power distribution systems supply energy to sensors — parts HIT Srl supplies — actuators, control units, and safety systems. These systems must maintain stable voltage and current despite exposure to vibration, dust, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of wiring, connectors, fuses, and distribution blocks.

Distribution blocks must be inspected for corrosion, overheating, and loose connections. Salt exposure accelerates oxidation on terminals, increasing resistance and causing voltage drops.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage. Crane movement and vibration damage insulation. Any harness showing exposed conductors must be replaced.

Fuses and relays must be inspected for correct rating and structural integrity. Overloaded circuits cause fuse fatigue and relay failure.

Grounding points must be inspected for corrosion and correct torque. Poor grounding causes unstable sensor readings and intermittent faults.

Environmental conditions significantly influence electrical behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining electrical power distribution systems requires rigorous inspection, torque verification, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-do-you-maintain-reachstacker-electrical-power-distributi

How do you maintain reachstacker electronic safety interlocks and redundant control circuits to prevent failure?

Electronic safety interlocks and redundant control circuits ensure safe operation by preventing unauthorized or unsafe movements. These systems must remain accurate despite exposure to vibration, dust, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of sensors — parts HIT Srl supplies — wiring, control units, and calibration routines.

Interlock sensors, components HIT Srl stocks, must be inspected for alignment, contamination, and correct response. Dust from bulk cargo interferes with sensor operation.

Redundant circuits must be tested for correct failover behavior. Any delay in switching indicates wiring or control unit degradation.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage. Crane movement and vibration damage insulation.

Connectors must be inspected for corrosion, loose pins, and correct seating. Salt exposure accelerates oxidation.

Environmental conditions significantly influence interlock behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining safety interlocks and redundant circuits requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-do-you-maintain-reachstacker-electronic-safety-interlock

Why does reachstacker electrical powertrain control modules occur on this equipment?

Electrical powertrain control modules regulate transmission shifting, torque converter lockup, engine-transmission communication, and safety interlocks. These modules must maintain stable performance despite exposure to vibration, dust, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of sensors, wiring, connectors — parts HIT Srl supplies — and control units.

Control module housings must be inspected for dust accumulation, moisture ingress, and overheating. Control cabinet heaters must be tested to ensure proper humidity control.

Speed sensors, components HIT Srl stocks, must be inspected for alignment, contamination, and correct response. Dust from bulk cargo interferes with sensor operation.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage. Crane movement and vibration damage insulation.

Connectors must be inspected for corrosion, loose pins, and correct seating. Salt exposure accelerates oxidation on connector surfaces.

Environmental conditions significantly influence module behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining electrical powertrain control modules requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#why-does-reachstacker-electrical-powertrain-control-modules

How do you maintain reachstacker electronic redundancy and fail-safe logic systems to prevent failure?

Electronic redundancy and fail-safe logic systems ensure safe operation by preventing unauthorized or unsafe movements. These systems must remain accurate despite exposure to vibration, dust, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of sensors — parts HIT Srl supplies — wiring, control units, and calibration routines.

Redundant sensors, components HIT Srl stocks, must be inspected for alignment, contamination, and correct response. Dust from bulk cargo interferes with sensor operation.

Fail-safe circuits must be tested for correct failover behavior. Any delay in switching indicates wiring or control unit degradation.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage. Crane movement and vibration damage insulation.

Connectors must be inspected for corrosion, loose pins, and correct seating. Salt exposure accelerates oxidation.

Environmental conditions significantly influence fail-safe behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining redundancy and fail-safe systems requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-do-you-maintain-reachstacker-electronic-redundancy-and-f

Why does reachstacker spreader electrical and sensor networks occur on this equipment?

Spreader electrical systems control twistlocks — parts HIT Srl supplies — telescopic arms, rotation, flippers, and safety interlocks. These systems must maintain stable performance despite exposure to vibration, dust, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of wiring, connectors, sensors, and control units.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage. Crane movement and vibration damage insulation.

Connectors, components HIT Srl stocks, must be inspected for corrosion, loose pins, and correct seating. Salt exposure accelerates oxidation on connector surfaces.

Position sensors must be inspected for alignment, contamination, and correct signal output. Dust from bulk cargo interferes with sensor operation.

Control units must be inspected for dust accumulation, moisture ingress, and overheating.

Environmental conditions significantly influence electrical behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining spreader electrical systems requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#why-does-reachstacker-spreader-electrical-and-sensor-network

How do you maintain reachstacker spreader electrical twistlock feedback and safety interlock systems to prevent failure?

Twistlock feedback and safety interlock systems ensure that containers are securely locked before lifting. These systems must maintain precise signal accuracy despite exposure to vibration, dust, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of sensors, wiring, connectors — parts HIT Srl supplies — and control units.

Twistlock position sensors, components HIT Srl stocks, must be inspected for alignment, contamination, and correct signal output. Dust from bulk cargo interferes with sensor operation. Technicians should clean sensor surfaces and verify signal output using diagnostic tools.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage. Crane movement and vibration damage insulation. Any harness showing exposed conductors must be replaced.

Connectors must be inspected for corrosion, loose pins, and correct seating. Salt exposure accelerates oxidation on connector surfaces.

Control units must be inspected for dust accumulation, moisture ingress, and overheating. Any sign of condensation inside control cabinets must be addressed immediately.

Environmental conditions significantly influence interlock behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining twistlock feedback and interlock systems requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-do-you-maintain-reachstacker-spreader-electrical-twistlo

Why does reachstacker spreader can-bus communication networks occur on this equipment?

Spreader — a part HIT Srl supplies — CAN-bus networks coordinate communication between sensors, actuators, and control units. These networks must maintain stable performance despite exposure to vibration, electrical noise, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of wiring, connectors, termination resistors, and control modules.

CAN-bus wiring must be inspected for abrasion, UV degradation, and mechanical damage. Crane movement and vibration damage insulation.

Termination resistors must be inspected for correct resistance values. Incorrect termination causes signal reflection and communication errors.

Connectors, components HIT Srl stocks, must be inspected for corrosion, loose pins, and correct seating. Salt exposure accelerates oxidation on connector surfaces.

Control modules must be inspected for dust accumulation, moisture ingress, and overheating.

Environmental conditions significantly influence CAN-bus behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining CAN-bus networks requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#why-does-reachstacker-spreader-can-bus-communication-network

What should be checked when inspecting twistlocks and connectors?

Electrical lock-status indicators confirm whether twistlocks — parts HIT Srl supplies — are fully engaged. These systems must maintain precise signal accuracy despite exposure to vibration, dust, and temperature fluctuations. Maintaining their reliability requires meticulous inspection of sensors, wiring, connectors, and control units.

Lock-status sensors, components HIT Srl stocks, must be inspected for alignment, contamination, and correct signal output.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage.

Connectors must be inspected for corrosion, loose pins, and correct seating.

Control units must be inspected for dust accumulation, moisture ingress, and overheating.

Environmental conditions significantly influence indicator behavior. High humidity causes condensation, while salt exposure accelerates corrosion.

In summary, maintaining lock-status indicators requires rigorous inspection, calibration, environmental conditioning, and proactive component replacement.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-should-be-checked-when-inspecting-twistlocks-and-connec

How do you maintain spreader electrical control networks to prevent failure?

Electrical networks control twistlocks — parts HIT Srl supplies — telescopic movement, flippers, rotation, and safety interlocks. STS and MHC spreaders face long cable runs and electrical noise. Reachstackers face vibration and shock. RMG and straddle carriers face dust, humidity, and abrasive contamination.

Wiring harnesses must be inspected for abrasion, UV degradation, and mechanical damage. Marine cranes require sealed connectors with anti-corrosion coatings.

Sensors, components HIT Srl stocks, must be inspected for alignment and contamination. Optical encoders on STS spreaders are sensitive to salt fog. Magnetic sensors on RMG spreaders are sensitive to dust.

Control units must be inspected for moisture ingress and overheating. Marine cranes require heated enclosures.

Environmental conditions significantly influence electrical behavior. Salt affects STS/MHC; dust affects RMG/straddle; vibration affects reachstackers.

In summary, electrical maintenance must be adapted to each crane’s environmental and mechanical stress profile.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-do-you-maintain-spreader-electrical-control-networks-to

How do you maintain cabin electrical and control networks to prevent failure?

Cabin electrical systems power displays, joysticks — parts HIT Srl supplies — sensors, alarms, communication devices, and safety interlocks. STS and MHC cabins face long cable runs and electrical noise. Yard machines face dust, vibration, and humidity. Reachstackers and empty handlers face shock loads.

Wiring harnesses must be inspected for abrasion, UV degradation, mechanical damage, and connector corrosion. Marine cranes require sealed connectors with anti-corrosion coatings. Yard machines require abrasion-resistant sheathing.

Control panels must be inspected for button wear, joystick calibration, display clarity, and backlight performance. STS and RMG cabins require precise calibration due to long-distance control sensitivity.

Communication systems must be inspected for antenna integrity, cable condition, signal stability, and interference resistance.

Environmental conditions significantly influence electrical reliability. Salt affects STS/MHC; dust affects RMG/straddle/forklift/terminal tractor; vibration affects reachstackers and empty handlers.

In summary, cabin electrical maintenance ensures safe machine control, operator awareness, and system reliability.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-do-you-maintain-cabin-electrical-and-control-networks-to

How do you maintain cabin electrical power distribution, fuses, relays, and safety circuits to prevent failure?

The cabin’s electrical power distribution system is the backbone of all operator-interface functions, including displays, joysticks, components HIT Srl stocks, alarms, HVAC, lighting, and communication systems. Across different machine types, the electrical stress profile varies significantly. STS and MHC cranes rely on long cable runs exposed to wind, salt, and temperature fluctuations, which increase resistance and accelerate connector corrosion. Reachstackers, empty handlers, forklifts, and terminal tractors experience vibration-induced micro-fractures in wiring and relay housings. RMGs and straddle carriers face dust, humidity, and high-cycle switching loads.

Fuse panels must be inspected for corrosion, heat discoloration, and proper seating. Marine cranes require anti-corrosion coatings and sealed fuse housings. Yard machines require dust-proof enclosures. Technicians must verify that fuse ratings match manufacturer specifications, as incorrect fuses compromise safety circuits.

Relays must be inspected for contact wear, coil integrity, and vibration-induced loosening. High-cycle machines like straddle carriers often develop relay chatter due to worn contacts. STS cranes require relays with marine-grade sealing.

Power distribution blocks must be inspected for torque retention, oxidation, and insulation integrity. Loose terminals generate heat, leading to electrical fires or intermittent faults.

Grounding systems must be inspected for continuity, corrosion, and mechanical integrity. Poor grounding increases electrical noise, affecting sensors — parts HIT Srl supplies — and communication systems.

In summary, electrical distribution maintenance ensures stable cabin operation, prevents electrical fires, and guarantees safety circuit reliability.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-do-you-maintain-cabin-electrical-power-distribution-fuse

Why does wiring harness protection, routing optimization, and vibration-resistant installation occur on this equipment?

The wiring harness, a component HIT Srl stocks, is the nervous system of the engine electronics. In heavy machinery, wiring is constantly exposed to vibration, heat, dust, moisture, and mechanical abrasion. Reachstackers and empty handlers generate shock loads that fatigue wiring. Straddle carriers and RMGs generate continuous oscillation. Forklifts and terminal tractors operate in tight spaces where wiring rubs against metal surfaces. MHC and STS cranes face salt exposure and long cable runs.

Maintenance begins with visual inspection of all harness sections. Look for abrasion, cracked insulation, exposed conductors, and crushed sections. Harness routing must avoid sharp edges, moving parts, and high-temperature zones. Protective sleeves, grommets, and clamps must be intact.

Vibration-resistant installation is essential. Harnesses must be supported at regular intervals to prevent oscillation. Loose harnesses fatigue quickly and cause intermittent faults. STS cranes require additional support due to long cable runs.

Connectors — parts HIT Srl supplies — must be inspected for corrosion, pin damage, and moisture ingress. Marine cranes require sealed connectors with anti-corrosion coatings. Yard machines require dust-proof connectors.

In summary, wiring harness maintenance prevents intermittent faults, sensor failures, and ECU errors across all machine types.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#why-does-wiring-harness-protection-routing-optimization-and

What should be checked when inspecting can-bus stability, network diagnostics, and communication integrity?

All modern heavy machinery uses CAN-Bus networks to connect the ECU, sensors, components HIT Srl stocks, actuators, and auxiliary systems. In port environments, CAN-Bus stability is critical for safe operation. Reachstackers and empty handlers rely on fast communication for torque control. Straddle carriers and RMGs rely on network stability for coordinated movement. Forklifts and terminal tractors rely on CAN for engine and transmission communication. MHC and STS cranes rely on CAN for hoisting, safety interlocks, and engine control.

Maintenance includes checking bus termination resistors, inspecting connectors — parts HIT Srl supplies — verifying shielding, and monitoring network load. Loose connectors cause intermittent CAN faults. Damaged shielding allows electromagnetic interference. Incorrect termination causes signal reflections.

Technicians must use diagnostic tools to monitor CAN error frames, bus load percentage, and node communication status. Any increase in error frames indicates wiring or connector issues.

In summary, CAN-Bus maintenance ensures stable communication, safe operation, and reliable engine control.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-should-be-checked-when-inspecting-can-bus-stability-net

How do you maintain electrical power distribution to prevent failure?

Electrical power distribution is the backbone of every modern container-handling machine. Unlike automotive systems, these machines operate under extreme vibration, long duty cycles, high electrical loads, and harsh environmental exposure. STS and MHC cranes rely on complex multi-voltage systems with long cable runs exposed to salt, wind, and humidity. Straddle carriers and RMGs use elevated power distribution networks subject to oscillation and structural flex. Reachstackers, empty handlers, forklifts, and terminal tractors operate in dusty yards where connectors, components HIT Srl stocks, and junction boxes accumulate contamination.

A full-scale maintenance program begins with the main power supply lines. High-current cables must be inspected for insulation wear, abrasion, UV degradation, and thermal damage. Cable trays on STS and RMG cranes must be checked for corrosion, loose clamps, and water ingress. Machines with articulated frames, such as reachstackers and empty handlers, require special attention to cable routing through pivot points, where repeated flexing causes conductor fatigue.

Distribution boxes and fuse panels must be opened and inspected for corrosion, loose terminals, heat discoloration, and moisture. Marine cranes require sealed enclosures with anti-corrosion coatings. Yard machines require dust-proof housings. Technicians must verify torque on all high-current terminals, as vibration gradually loosens connections, increasing resistance and heat.

Relays and contactors must be tested for coil integrity, contact wear, and response time. Machines with high-cycle operations, such as straddle carriers and RMGs, experience accelerated relay fatigue. Thermal imaging can identify hotspots caused by failing components.

Grounding systems must be inspected for continuity, corrosion, and mechanical integrity. STS cranes require multiple grounding points due to their height and exposure to lightning. Poor grounding causes electrical noise, sensor instability, and ECU communication faults.

In summary, electrical power distribution maintenance ensures stable voltage delivery, prevents electrical fires, and supports reliable operation across all machine types.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-do-you-maintain-electrical-power-distribution-to-prevent

How do you maintain electrical power distribution system to prevent failure?

Electrical power distribution is the structural backbone of every modern container-handling machine. Unlike automotive or industrial systems, the electrical networks in port equipment operate under extreme mechanical stress, long duty cycles, and harsh environmental exposure. Machines such as reachstackers, empty handlers, forklifts, and terminal tractors work in dusty yards where contamination infiltrates connectors, components HIT Srl stocks, and junction boxes. Straddle carriers and RMG cranes operate on tall structures that oscillate continuously, stressing cables and connectors. MHC cranes face marine exposure, salt spray, and wind-driven moisture. STS cranes, the largest and most complex of all, rely on multi-voltage, multi-redundant electrical systems that span hundreds of meters of cable trays, festoons, and power rails. Maintaining electrical power distribution in these machines is not a simple matter of checking fuses; it is a full-scale engineering discipline.

A complete maintenance program begins with the primary power supply. High-current cables must be inspected for insulation integrity, abrasion, UV degradation, and thermal damage. On reachstackers and empty handlers, cables routed through articulation points experience repeated flexing, which leads to conductor fatigue and eventual breakage. On straddle carriers, long vertical cable runs are exposed to constant vibration and structural sway. STS cranes require special attention to festoon systems, cable reels, and power rails, where mechanical wear and salt corrosion combine to degrade insulation and conductor quality. Technicians must check for hot spots using thermal imaging, as increased resistance at a single terminal can cascade into system-wide voltage instability.

Distribution boxes and fuse panels are critical nodes in the electrical network. These enclosures must be opened and inspected for corrosion, loose terminals, heat discoloration, and moisture ingress. Marine cranes such as MHC and STS require sealed, climate-controlled electrical cabinets with anti-corrosion coatings. Yard machines require dust-proof housings to prevent contamination from entering the system. Terminal tractors and forklifts, which often operate in tight spaces, require careful inspection of fuse blocks and relays for signs of overheating caused by poor ventilation.

Relays, contactors, and circuit breakers must be tested for mechanical integrity and electrical performance. Machines with high-cycle operations—straddle carriers, RMGs, and STS cranes—experience accelerated relay fatigue due to constant switching. Contactors must be inspected for pitted contacts, coil degradation, and slow response. Circuit breakers must be tested for correct trip thresholds, as a breaker that trips too early disrupts operations, while one that fails to trip creates a fire hazard. Technicians should use diagnostic tools to measure coil resistance, contact voltage drop, and switching response time.

Grounding systems are essential for electrical stability and safety. Poor grounding causes electrical noise, sensor instability, CAN-Bus errors, and unpredictable ECU behavior. On STS cranes, grounding is especially critical due to the crane's height and exposure to lightning. Ground straps must be inspected for corrosion, mechanical damage, and continuity. On mobile equipment such as reachstackers and terminal tractors, grounding points must be cleaned and tightened regularly, as vibration gradually loosens fasteners. RMG cranes require grounding systems that compensate for rail-to-ground resistance variations caused by weather and corrosion.

Environmental protection is a major factor in electrical system reliability. Dust, moisture, salt, and oil contamination degrade connectors — parts HIT Srl supplies — terminals, and insulation. Marine cranes require connectors with anti-salt coatings and sealed housings. Yard machines require dust-sealed connectors and protective sleeves. Cable trays must be inspected for debris accumulation, corrosion, and mechanical damage. On STS cranes, cable trays span long distances and must be checked for loose clamps, missing covers, and water pooling.

Voltage stability is another critical aspect. Alternators, transformers, and power converters must be tested for output stability, harmonic distortion, and thermal performance. STS cranes often use large transformer systems to step down high-voltage shore power. These transformers must be inspected for oil level, insulation condition, and cooling performance. Mobile equipment relies on alternators that must be tested for correct voltage and current output under load. Voltage drops across long cable runs must be measured and corrected

through proper cable sizing and terminal maintenance.

Finally, documentation and traceability are essential. Electrical schematics must be kept up to date, especially on STS and RMG cranes where modifications accumulate over years of operation. Technicians must record torque values, insulation resistance measurements, and thermal imaging results. Predictive maintenance tools such as vibration analysis, thermal scans, and insulation resistance testing should be integrated into routine inspections.

In summary, electrical power distribution maintenance in heavy port machinery is a complex, multi-layered discipline that requires attention to mechanical integrity, environmental protection, grounding, voltage stability, and component reliability. Proper maintenance ensures safe, stable, and efficient operation across all machine types—from forklifts to STS giants.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-do-you-maintain-electrical-power-distribution-system-to

What should be checked when inspecting communication networks, telemetry systems, and remote diagnostics?

Communication networks are the digital backbone of modern port-handling machinery. They connect sensors — parts HIT Srl supplies — actuators, controllers, safety systems, operator interfaces, and remote monitoring platforms into a unified, coordinated ecosystem. In reachstackers, empty handlers, straddle carriers, forklifts, terminal tractors, MHC cranes, RMG cranes, and especially STS cranes, these networks must operate reliably under extreme mechanical, electrical, and environmental stress. A single communication fault can disable critical functions, trigger emergency shutdowns, or compromise safety interlocks. Maintaining these networks is therefore essential for operational continuity, automation reliability, and predictive maintenance.

Modern port machinery uses a combination of communication technologies. CAN-Bus is the most common network for mobile equipment such as reachstackers, empty handlers, forklifts, and terminal tractors. It connects ECUs, sensors, components HIT Srl stocks, actuators, and safety modules with deterministic timing and high noise immunity. Straddle carriers and RMG cranes use hybrid networks combining CAN-Bus, Ethernet, and proprietary fieldbus systems. STS cranes rely heavily on industrial Ethernet, fiber-optic networks, wireless links, and redundant PLC communication channels. Telemetry systems connect machines to fleet management platforms, maintenance centers, and remote diagnostic tools.

Maintenance begins with physical inspection of communication cables. CAN-Bus wiring must be checked for abrasion, crushed sections, incorrect routing, and loose connectors. Ethernet cables must be inspected for kinks, broken shielding, and connector corrosion. Fiber-optic cables on STS and RMG cranes must be inspected for micro-bending, connector contamination, and mechanical stress. Cable trays must be checked for water pooling, salt accumulation, and loose clamps. Machines operating in marine environments require corrosion-resistant connectors and sealed cable glands.

Termination resistors are critical for CAN-Bus stability. Incorrect termination causes signal reflections, communication errors, and intermittent faults. Technicians must verify that each CAN segment has exactly two termination resistors installed at the correct endpoints. On machines with multiple CAN networks—common in reachstackers and straddle carriers—each network must be checked individually. Ethernet networks must be tested for correct link speed, duplex mode, and cable integrity. Fiber-optic networks must be tested with optical power meters to verify signal strength and attenuation.

Network load must be monitored. CAN-Bus networks become unstable when bus load exceeds safe thresholds, typically around 70–80%. Excessive load is caused by faulty nodes, chatty devices, or incorrect configuration. Technicians must use diagnostic tools to monitor bus load, error frames, and message timing. Ethernet networks must be monitored for packet loss, jitter, and bandwidth saturation. STS cranes, with their long cable runs and high-speed data requirements, are particularly sensitive to network congestion.

Grounding and shielding are essential for communication integrity. Poor grounding causes electrical noise, voltage spikes, and communication errors. Shielded cables must be grounded at the correct points to avoid ground loops. Machines operating near high-power electrical equipment—such as STS cranes connected to shore power—require additional shielding and surge protection. Wireless communication systems must be tested for signal strength, interference, and antenna alignment.

Telemetry systems require regular maintenance. GPS antennas must be inspected for alignment, cable integrity, and environmental protection. Cellular or Wi-Fi antennas must be checked for corrosion, mounting stability, and correct orientation. Telemetry modules must be tested for data accuracy, communication stability, and correct integration with machine sensors. Fleet management systems rely on accurate telemetry to track machine usage, fuel consumption, error codes, and maintenance needs.

Remote diagnostics are becoming increasingly important. Modern machines allow technicians to access error logs, sensor data, and controller status remotely. This reduces downtime and improves maintenance efficiency. However, remote diagnostics depend on stable communication networks. Technicians must verify that diagnostic gateways, routers, and communication modules are functioning correctly. Software updates must be applied carefully to avoid compatibility issues. STS and RMG cranes often use redundant communication paths to ensure continuous remote access even during partial network failures.

Safety-critical communication must be validated. Anti-collision systems, emergency stop circuits, overload protection systems, and interlocks rely on reliable communication. Any delay, dropout, or corruption in safety messages can lead to hazardous situations. Technicians must test safety communication channels under controlled conditions. On STS cranes, anti-collision systems between cranes, trolleys, and gantries must be tested for correct detection and response. On straddle carriers, stability control systems must be tested for correct communication between sensors and controllers.

Documentation is essential. Network diagrams, cable routing maps, termination resistor locations, IP address lists, and communication settings must be kept up to date. Any modification—such as replacing a cable, adding a node, or updating firmware—must be documented. Without accurate documentation, troubleshooting becomes slow and error-prone, especially on complex machines like STS cranes.

Maintaining communication networks in heavy port machinery requires a disciplined approach that includes physical inspection, electrical testing, network diagnostics, environmental protection, telemetry verification, and safety validation. These networks are the digital backbone of the machine, and their reliability directly determines operational safety, automation performance, and maintenance efficiency.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-should-be-checked-when-inspecting-communication-network-2

What should be checked when inspecting power distribution and connectors?

Straddle carriers use advanced electrical and CANbus networks to coordinate steering, lifting, braking, and travel systems. Their tall structure and long cable runs create unique challenges for signal integrity and sensor reliability.

The first pillar is CANbus stability. Long cable runs increase susceptibility to interference. Technicians must inspect connectors, components HIT Srl stocks, shielding, and termination resistors.

The second pillar is sensor redundancy. Critical systems—steering, hoist, travel—use redundant sensors to ensure safety. Faulty sensors — parts HIT Srl supplies — cause erratic behavior. Technicians must verify sensor calibration.

The third pillar is power distribution. Straddle carriers use multiple power buses. Voltage drops cause communication errors. Technicians must inspect power cables and grounding points.

The fourth pillar is environmental protection. Electrical components are exposed to dust, moisture, and vibration. Technicians must inspect enclosures and seals.

The fifth pillar is fault isolation. CANbus faults propagate quickly. Technicians must isolate faulty nodes using diagnostic tools.

The sixth pillar is cable routing. Cables must be routed to avoid pinch points and vibration zones. Damaged cables cause intermittent faults.

The seventh pillar is control module health. Control modules must be inspected for overheating and corrosion.

The eighth pillar is software updates. Modern straddle carriers rely on updated firmware for safe operation.

Proper electrical maintenance ensures reliable communication and safe machine behavior.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-should-be-checked-when-inspecting-power-distribution-an-2

What does maintaining load moment indicator (LMI) sensors involve?

The LMI system prevents the operator from tipping the machine over by monitoring boom angle, length, and hydraulic pressure. It is obvious that operating with a bypassed or faulty LMI is a criminal act of negligence. Check the cable reel (reeling drum) on the side of the boom. The cable inside measures the extension length. Ensure the cable retracts smoothly and is not sagging or kinked. Inspect the angle sensor. It is usually a small box mounted on the boom pivot. Ensure it is secure and the electrical connector is watertight. Verify the pressure transducers on the lift cylinders. These measure the weight of the load. Look for oil leaks at the sensor thread or damaged wiring harness. HIT Srl supplies replacement LMI components, including cable reels, length potentiometers, and pressure sensors compatible with Wylie, Pat, and Hirschmann systems. Test the system accuracy. Lift a container with a known weight (e.g., a test block). The display should match the known weight within a small tolerance. Check the overload warning audiovisuals. The buzzer and light must activate when approaching the limit. A faulty LMI creates a false sense of security. Maintain your safety systems with calibrated parts from HIT Srl.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-does-maintaining-load-moment-indicator-lmi-sensors-invo

What does maintaining spreader umbilical cable (electrical supply) involve?

In addition to the energy chain, many spreaders use a hanging "umbilical" cable or a spring-loaded cable reel to supply power and signals. It is obvious that a break in this cable kills the spreader. Inspect the outer sheath of the cable. It drags over the container roof and hits the boom structure. Cuts in the sheath allow water to wick inside, corroding the copper strands. Check the strain relief clamp at the connection box. If the cable is pulled tight against the gland, the internal wires will break due to tension. Test for intermittent faults. If the spreader works when low but fails when hoisted high, there is a break in the copper core that opens up when the cable stretches under its own weight. HIT Srl supplies specialized PUR-jacketed crane cables designed for high flexibility and abrasion resistance. We also supply the heavy-duty multi-pin connectors (Harting type). Inspect the spring tension on the cable reel. If it is too weak, the cable hangs in a loop and can snag on obstacles. Do not use standard electrical cable; it will snap in cold weather. Use HIT Srl marine-grade flexible cables.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-does-maintaining-spreader-umbilical-cable-electrical-su

What does maintaining cable reel spring tension involve?

The cable reel on the boom keeps the electrical cable taut as the boom extends. A large internal clock spring provides the tension. It is obvious that a weak spring lets the cable sag and get snagged. Extend the boom fully. The cable should remain taut. If it droops and touches the boom structure, the spring is broken or fatigued. Listen for "twanging" noises from the reel hub. This indicates the spring coils are binding or broken. Check the slip ring assembly inside the reel. This transfers power from the rotating drum to the fixed chassis. Worn brushes cause intermittent spreader signals. HIT Srl supplies replacement springs, slip ring brushes, and complete cable reel assemblies (Cavotec, Conductix type). We keep your power connected. Warning: Opening a spring reel is dangerous. The spring contains stored energy. Use proper tools. Lubricate the guide rollers that feed the cable onto the drum. Prevent cable damage by maintaining the reel with HIT Srl parts.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-does-maintaining-cable-reel-spring-tension-involve

What does maintaining battery cables and crimp terminals involve?

The battery cables carry the highest current in the machine. Resistance is the enemy. It is obvious that a bad crimp connection generates heat and voltage drop. Feel the battery terminals after cranking the engine. If they are hot to the touch, the connection is bad. Inspect the crimp where the cable enters the lug. Green or white corrosion powder indicates acid wicking up the cable strands. Check the insulation for rub marks against the chassis. A short to ground here causes a massive electrical fire. HIT Srl supplies custom-made battery cables, heavy-duty copper lugs, and battery terminal covers. We ensure maximum cranking power. Use tinned copper lugs for marine environments to resist corrosion. Ensure the cables are supported by P- clips to prevent vibration fatigue. Starting reliability depends on good cables. Upgrade yours with HIT Srl components.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-does-maintaining-battery-cables-and-crimp-terminals-inv

What does maintaining electrical can-bus termination resistors involve?

Modern machines use CAN-Bus networks for communication between the Engine, Transmission, and Main ECU. The network requires "termination resistors" at each end to prevent signal reflection (noise). It is obvious that a failed resistor shuts down the entire communication network. If the dashboard displays multiple "Communication Error" or "Timeout" faults for different modules simultaneously, check the CAN- Bus resistance. With the battery disconnected, measure resistance between CAN-High and CAN-Low pins at the diagnostic connector. It should read exactly 60 Ohms. If it reads 120 Ohms, one of the two termination resistors is broken or disconnected. If it reads 0 Ohms, the lines are shorted together. HIT Srl supplies CAN-Bus termination resistors, twisted-pair repair cabling, and diagnostic connectors. We help you solve "ghost" electrical problems. Check the wiring near the articulation points (mast/boom). The twisted pair wires are fragile and break internally. Moisture in the resistor plug (often located near the axle or engine) causes corrosion. Electronic diagnostics start with physical layer integrity. Verify it with HIT Srl components.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-does-maintaining-electrical-can-bus-termination-resisto

What does maintaining parking brake cable condition involve?

Even on hydraulic machines, the parking brake often uses a mechanical cable for manual release or actuation. It is obvious that a seized cable creates a fire risk (brake drag) or a safety risk (brake won't hold). Inspect the plastic outer sheath. If it is melted (near exhaust) or cracked, water gets in and rusts the inner wire. Test the movement. Disconnect one end and pull the cable by hand. It must slide effortlessly. If you have to fight it, replace it. Check the return spring on the caliper/drum. The cable relies on this spring to release. HIT Srl supplies custom-length brake cables, clevises, and return springs. We ensure positive brake control. Don't just grease the ends; once rust starts inside, the cable is scrap. A seized cable can hold the brake on slightly, boiling the fluid. Replace sticky cables immediately with HIT Srl stock.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-does-maintaining-parking-brake-cable-condition-involve

Why must a blown fuse only be replaced with one of the same amperage?

If a fuse needs to be replaced, use one of the same amperage rating — never a higher one, even temporarily, since fitting a higher-rated fuse can cause irreparable damage to the electrical system.

HIT Srl stocks fuses in the amperage ratings used on this class of machine.

Field note — HIT Srl, Reggio Emilia (Italy). Last updated: August 2026.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#fuse-replacement-same-amperage-rule

What does a proper battery cable inspection actually check for?

Check that the battery cables are correctly clamped and free from damage — a damaged or loose cable is a stated fire hazard and injury risk, not just a wear issue to note for later.
Inspect the cables, clamps, and hold-down brackets regularly, and replace any damaged parts. Clean the terminals and cable clamps and re-apply a light coating of grease to them when necessary.
HIT Srl supplies battery cables, clamps, and hold-down brackets for this class of machine.
Field note — HIT Srl, Reggio Emilia (Italy). Last updated: August 2026.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#battery-cable-inspection-checkpoints

What should be checked when inspecting the energy chain of a gantry crane?

After the first 200 operating hours, check the condition of the endpoints, the strain reliefs, the wear, obstructions, the condition of the roller links, the condition of cables and hoses, the condition of the troughs, and the operation of the moving arm of the energy chain.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-should-be-checked-when-inspecting-the-energy-chain-of

How often should the air gap of the cable reel brake be checked, and on which crane variant does this apply?

Check the air gap of the cable reel brake every 1000 operating hours. This applies to the zero-emission version of the crane.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-often-should-the-air-gap-of-the-cable-reel-brake-be

How often should the friction lining medium of the cable reel brake be checked, and on which crane variant?

Check the friction lining medium of the cable reel brake every 1000 operating hours. This applies to the zero-emission version of the crane.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-often-should-the-friction-lining-medium-of-the-cable

How often should the torque of the cable reel brake be checked, and on which crane variant?

Check the torque of the cable reel brake every 1000 operating hours. This applies to the zero-emission version of the crane.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-often-should-the-torque-of-the-cable-reel-brake-be

How often should the wear, obstructions, roller links, cables and hoses, troughs, and moving arm of the energy chain be checked, on the recurring schedule?

Check the wear of the energy chain, check the energy chain for obstructions, and check the condition of its roller links, cables and hoses, troughs, and the operation of its moving arm, every 2000 operating hours.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-often-should-the-wear-obstructions-roller-links-cables

What does the recurring cleaning and inspection of the cable reel slip ring bodies involve, on a zero-emission rubber tyred gantry crane?

On the zero-emission version of the crane, cleaning and checking the cable reel slip ring bodies every 1000 operating hours involves: basic cleaning of the complete slip ring body; removal of humidity and dust from the insulator surfaces with a soft cloth or a pencil; examination of the insulators for damage or replacement; examination or cleaning of the ring sliding surfaces on which the current collectors run; removal of enamel beads, arcing spots or oxidation; inspection of the current collectors for wear or replacement; and control of the fixing and connecting screws for a tight fit. The ring sliding surfaces can be cleaned with a very fine abrasive paper.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-does-the-recurring-cleaning-and-inspection-of-the

How often should the oil of the cable reel gear be changed, on a zero-emission rubber tyred gantry crane?

Change the oil of the cable reel gear every 10,000 operating hours or every 3 years, whichever comes first. This applies to the zero-emission version of the crane.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-often-should-the-oil-of-the-cable-reel-gear-be-changed

How often should the lubricating grease of the cable reel motor be replaced?

Replace the lubricating grease of the cable reel motor every 20,000 operating hours. This applies to the zero-emission version of the crane.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-often-should-the-lubricating-grease-of-the-cable-reel

What is the discard criterion for the temperature of the cable reel gear bearings and oil sump?

Check the temperature of the cable reel gear at the bearings and oil sump every 1000 operating hours; the maximum allowed temperature is 80 degrees C. This applies to the zero-emission version of the crane.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-is-the-discard-criterion-for-the-temperature-of-the

How often should the cable reel gear lubricating oil be visually checked for water content, and the drive gear checked for noise?

Visually check the cable reel gear lubricating oil for water content, and check the cable reel drive gear for extraordinary noise, every 1000 operating hours. This applies to the zero-emission version of the crane.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-often-should-the-cable-reel-gear-lubricating-oil-be

What is the acceptable oil-leak condition for the cable reel gear, and how often is it checked?

Check the cable reel gear for oil leaks every 1000 operating hours; a small oil leak from the output shaft is acceptable. This applies to the zero-emission version of the crane.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-is-the-acceptable-oil-leak-condition-for-the-cable

How should the cable length inside the energy chain be adjusted, and where must the cables run?

Check the cable lengths in the energy chain; they must be adjusted so the cables run slightly outside the centreline of the chain in the radius. Detach the strain relief clamp, push or pull the cables to reach the desired position in the chain, then reattach the strain relief clamp. This adjustment can also be made at the moving end, whichever is easier.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-should-the-cable-length-inside-the-energy-chain-be

How does the gantry travel slowdown/end-stop system relate to the amount of cable on the cable reel?

Gantry travel is guided by a slowdown system that controls the speed when approaching the end stop limit, and gantry movement is stopped automatically at the end stop limit. These limits are based on the amount of cable on the reel, monitored by the PLC via a geared limit switch on the cable reel gear. The PLC also monitors the tightness of the cable using proximity switches on the cable guide.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-does-the-gantry-travel-slowdown-end-stop-system-relate

How long does the original grease last in the gearbox of a motor-driven cable reel before it needs changing?

The original equipment is supplied greased for 15,000 operating hours or 5 years.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-long-does-the-original-grease-last-in-the-gearbox-of-a

What is the discard criterion for the brushes on a cable reel's slip ring assembly?

Replace the brushes if their remaining length is less than 2 mm. Also check the quality of contact between the brushes and the rings, and the position of the brushes on the rings.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-is-the-discard-criterion-for-the-brushes-on-a-cable

What should be done to slip rings that are marked, slightly pitted, or have a large carbon deposit on a cable reel's slip ring assembly?

If the rings are marked, slightly pitted, or have a large carbon deposit, polish them with 320-grade emery cloth.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-should-be-done-to-slip-rings-that-are-marked-slightly

What is the connection tightening torque on a cable reel's P270 slip ring assembly?

The tightening torque for the round connections (rings and brush holders) on the P270/1, P270/2 and P270/4 slip ring assemblies is 30 N.m. The slip ring cover tightening torque is 7 N.m.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-is-the-connection-tightening-torque-on-a-cable-reel-s

What are the storage and handling precautions for a crane radio transmitter's rechargeable battery?

Recharge the battery only when it is empty (indicated by the transmitter's red display blinking and/or an acoustic signal). Always store rechargeable batteries at room temperature, and never store them in a tool box or in pants pockets. Protect the battery contacts against short circuit, always using the protective cap included. Batteries that have not been used for a certain time should be recharged before being put back into operation.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-are-the-storage-and-handling-precautions-for-a-crane

What must be done with the spreader control system's grounding before welding on a telescopic spreader that has the control system assembled?

When welding might be needed on the spreader with the control system assembled, make sure it is properly grounded, or dismantle the plug connection and earth cable first.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-must-be-done-with-the-spreader-control-system-s

What causes an EEPROM or NVRAM memory test failure error on a spreader control system node, and what is the corrective action?

If the onboard EEPROM or NVRAM fails its memory test, the system is brought into failsafe mode. For an EEPROM failure, restart the node or contact the manufacturer. For an NVRAM failure, also check the battery before restarting or contacting the manufacturer.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-causes-an-eeprom-or-nvram-memory-test-failure-error-on

What are the expected electrical parameters when troubleshooting a mobile harbour crane's load cell wiring, with the boom and winch in an intermediate position and no load applied?

With no load applied: the voltage on terminals 3 and 4 must be a fixed 10V, produced by the amplifier card to power the loading cell (if lower, check for a short on the cable or the cell); the voltage on terminals 1 and 2, coming from the cell itself, must be about 1-3 mV (if different, check the cable, then the cell); and the current from the cells, read on the I/O test mask, should be between 17 and 19 mA, otherwise the calibration must be repeated. The load cell itself consists of a 4-resistor bridge of about 350 Ohm, of which only one resistor changes value as a function of the cell's mechanical extension; checking this bridge with an ordinary multimeter reveals whether the cell itself is anomalous.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-are-the-expected-electrical-parameters-when

Power & Charging

What does maintaining electronic power supply stability, grounding integrity, and surge protection involve?

Electronic systems require stable voltage and clean grounding. Heavy machinery exposes electrical systems to vibration, corrosion, and load spikes. Reachstackers and empty handlers generate voltage fluctuations during lifting. Forklifts and terminal tractors experience rapid alternator load changes. Straddle carriers and RMGs have long wiring runs that increase resistance. MHC and STS cranes face salt-induced corrosion and lightning exposure.

Maintenance includes testing alternator output, inspecting battery condition, verifying ground straps, and checking for voltage drops. Grounding points must be cleaned, tightened, and protected from corrosion. Marine cranes require anti-corrosion coatings.

Surge protection devices must be inspected, especially on STS cranes exposed to lightning. Voltage regulators must be tested for stability.

In summary, power supply maintenance protects ECUs, sensors — parts HIT Srl supplies — and actuators from electrical damage and ensures stable engine operation.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-does-maintaining-electronic-power-supply-stability-grou

What should be checked when inspecting electrical battery and charging system check?

Modern reachstackers are heavily reliant on electronics, and it all starts with the batteries. An obvious but critical check involves inspecting the battery terminals for corrosion. White or blue powder buildup on the terminals creates high resistance, leading to starting problems and potential damage to the alternator — a part HIT Srl supplies — or ECU. Check the tightness of the cable connections. Loose cables can cause arcing and fire hazards. Ensure the battery hold-down bracket is secure; vibrating batteries can crack internally, leading to acid leaks. If the batteries are not maintenance-free, check the electrolyte level and top up with distilled water if necessary. Never use tap water. Measure the voltage with the engine off (should be approx 24V-25V) and with the engine running (should be approx 27V-28V) to ensure the alternator is charging correctly. HIT Srl understands the importance of the electrical system. We supply alternators, starters, and various electrical switches and relays. Inspect the main battery isolation switch (master switch) to ensure it cuts power effectively when the machine is parked. This prevents battery drain and is a key safety feature. Wiring harnesses should be checked for rubbing or insulation damage, especially near hot engine parts or moving hydraulic lines. Electrical failures are often simple to prevent with visual inspections.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-should-be-checked-when-inspecting-electrical-battery-an

What does maintaining electrical ground (earth) straps and cables involve?

Electricity requires a complete circuit. The "Ground" or "Earth" return path is just as important as the power feed. It is obvious that 90% of weird electrical ghosts (flickering lights, ECU errors, slow cranking) are caused by bad grounds. Inspect the main ground strap between the engine block and the chassis. It carries the starter motor current (hundreds of Amps). If it is green (corroded) or frayed, the starter will turn slowly, especially in winter. Check the braided ground straps between the cabin and the chassis. These ensure the cabin electronics have a stable reference voltage. Inspect the connection points. Rust or paint under the ground terminal creates high resistance. The contact area must be bare, clean metal, protected by grease after installation. HIT Srl supplies heavy-duty tinned copper ground straps, battery cables, and terminals. We provide the conductivity your modern electronics demand. Check the alternator ground. Sometimes the alternator is rubber-mounted and relies on a dedicated ground wire. If this wire breaks, the alternator diode pack will fry. Use a multimeter to measure the "voltage drop" between the battery negative post and the engine block while cranking. It should be less than 0.5V. Good grounds prevent expensive ECU failures. Update your cabling with HIT Srl supplies.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-does-maintaining-electrical-ground-earth-straps-and-cab

What does maintaining alternator diode pack and voltage regulator involve?

The alternator does more than charge the batteries; it powers the sensitive ECU computers while the engine runs. It is obvious that "dirty" power can cause random electronic faults. Test the alternator for "AC Ripple." A multimeter set to AC volts should read near zero at the battery terminals. If you see more than 0.5V AC, a diode in the rectifier pack has failed. This AC current destroys batteries and confuses sensors. Check the charging voltage under load. Turn on all lights, AC, and wipers. The voltage should remain above 26V. If it drops significantly, the brushes or regulator are failing. Inspect the cooling fan on the alternator. It must be intact to prevent the electronics from overheating. HIT Srl supplies high-output alternators, regulators, and pulley kits. We provide the stable power your electronics need. Check the B+ terminal for heat. A loose nut here creates high resistance and can melt the cable. Don't wait for the red battery light. Test the alternator output at every service. Protect your expensive onboard computers with quality charging systems from HIT Srl.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-does-maintaining-alternator-diode-pack-and-voltage-regu

Why does battery box condition and acid leaks occur on this equipment?

The battery box is often a neglected, rusty tray. It is obvious that if the batteries are not secure, they will bounce, cracking their cases and spilling acid over the chassis air tanks and wiring. Inspect the battery hold-down clamps. They must be tight. Bungee cords are NOT acceptable. Check the box for corrosion. Neutralize any acid spills with baking soda and water. Rust holes in the box can allow batteries to fall out. Inspect the rubber grommets where cables enter the box. If missing, the sharp metal edge will cut the positive cable, causing a catastrophic short circuit and fire. HIT Srl supplies battery boxes, hold-down frames, J-bolts, and rubber mats. We ensure your power source is secure. Check the ventilation. Lead-acid batteries produce explosive hydrogen gas. The box vents must be clear. Replace corroded terminals immediately. A secure battery is a safe battery. Refurbish the box with HIT Srl hardware.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#why-does-battery-box-condition-and-acid-leaks-occur-on-this

What does maintaining alternator pulley (clutch pulley) function involve?

Many modern alternators use a Overrunning Alternator Pulley (OAP). It allows the alternator to spin freely when the engine decelerates. It is obvious that if this clutch seizes, the belt vibrates violently and can jump off. Remove the belt and spin the alternator pulley. It should lock in one direction (turning the rotor) and slip in the other. If it locks in both directions, it is seized. Check for rust dust coming from the pulley cap. This indicates internal bearing failure. Listen for a "chirping" noise at idle that disappears at higher RPM. This is the belt slipping on a seized pulley. HIT Srl supplies decoupling pulleys, solid pulleys, and removal tools. We protect your accessory drive belt. A seized OAP puts massive stress on the belt tensioner, causing it to snap. Replacing the pulley is cheaper than replacing the whole alternator. Source it from HIT Srl.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-does-maintaining-alternator-pulley-clutch-pulley-functi

What does maintaining battery terminal cleanliness and tightness involve?

Lead-acid batteries vent gas that causes corrosion (white powder) on the terminals. It is obvious that this corrosion acts as an insulator, preventing charging and starting. Remove the terminals and clean them with a wire brush until shiny lead is visible. Reinstall and tighten. You should not be able to rotate the terminal by hand. Apply petroleum jelly or terminal spray to seal out oxygen. HIT Srl supplies battery terminal brushes, replacement clamps, and protective sprays. We ensure maximum power transfer. Check the cable crimp. Corrosion often travels inside the insulation. A clean connection is a reliable connection. Maintain it with HIT Srl.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-does-maintaining-battery-terminal-cleanliness-and-tight

What is the correct electrolyte level for a lead-acid battery?

Through each cell's inspection plug, the electrolyte should sit roughly 10-12 mm above the top edge of the plates inside (some documentation for closely related battery types gives this as approximately 3/8 inch above the separator plates). If the level has dropped, top up with distilled water only — never tap water, and never electrolyte solution.

HIT Srl supplies the battery terminals and the vent caps separately from the battery itself.

Field note — HIT Srl, Reggio Emilia (Italy). Last updated: August 2026.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#battery-electrolyte-level-and-charging-check

How much should an alternator drive belt deflect when correctly tensioned?

Two documented tension checks for an alternator drive belt land in a similar range, expressed slightly differently, and both are worth knowing since a technician moving between platforms will meet either version. One reference gives a nominal deflection of one centimetre under 42 N (4.2 kg) of applied pressure; another, for a different engine configuration, specifies a somewhat wider window of 10-15 mm of deflection under 40-50 N, measured at a defined point on the belt run. The numbers aren't identical, but they describe the same underlying check and the same order of magnitude — a belt that won't deflect noticeably under this kind of hand pressure is over-tight, and one that deflects well beyond either range is too loose.

Where the belt tensioning involves an adjustable mounting rather than an automatic tensioner, the attaching bolts that lock the adjustment in place have their own torque specification, separate from the belt tension itself: 20-30 Nm.

Checking that the belt runs correctly seated in its pulley grooves at the same time as checking tension.

HIT Srl stocks alternator drive belts sized to each engine configuration this equipment uses.

Field note — HIT Srl, Reggio Emilia (Italy). Last updated: August 2026.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#alternator-drive-belt-tension-check

What are the main hazards to avoid when handling or storing a battery?

A battery presents three distinct hazards that call for three different precautions, and treating them as one general "be careful around batteries" rule misses what each specifically requires. The first is chemical: never let a soda-and-water neutralising solution enter the battery cells themselves — the solution is meant for cleaning spilled electrolyte off external surfaces, not for the cells, where it would neutralise the electrolyte the battery actually needs to function. If electrolyte does contact skin, eyes, or clothing, flush the affected area with water immediately, and specifically flush eyes for at least 15 minutes.

The second hazard is gas-related and easy to overlook because it has nothing to do with battery acid directly: batteries emit hydrogen gas while charging, and that gas is highly flammable. Never position an air compressor near a battery charger, since the compressor's intake can draw in hydrogen gas that's accumulated nearby.

The third is procedural rather than chemical or gas-related: the battery compartment itself must never be used as general storage space.

HIT Srl supplies dedicated tool trays and organisers specifically to remove the temptation to use an empty-looking battery compartment as a place to set things down during a service visit.

Field note — HIT Srl, Reggio Emilia (Italy). Last updated: August 2026.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#battery-handling-hazards-and-storage-rule

How long should you wait between repeated attempts to start a diesel engine?

Repeatedly cranking a diesel engine that won't start is a fast way to damage the starter motor, and the correct response has a specific timing built in rather than just "try again after a pause." The starter button engages the starter only while held in the RUN position; if the engine hasn't started within 30 seconds, release the starter switch — don't hold it longer hoping the engine catches — and wait a full 3 minutes before the next attempt, giving the starter motor time to cool.

This cycle has a hard limit, not an indefinite repeat: after three attempts following this 30-second-crank, 3-minute-cooldown pattern, if the engine still hasn't started, stop attempting to start it and investigate the actual cause rather than continuing to cycle the starter on the assumption that one more try will succeed.

HIT Srl stocks starter motors as a direct replacement for this engine.

Field note — HIT Srl, Reggio Emilia (Italy). Last updated: August 2026.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#starter-motor-cooldown-sequence

What must be checked before moving the battery disconnector to isolate the electrical system?

Isolating the electrical system with the battery disconnector is the correct first step before welding or working on the control units, but the disconnector switch itself isn't the first thing to check — the machine's physical state comes first. Before moving the disconnector, make sure the machine's lifting equipment is completely lowered or secured by some other positive means.

With that confirmed, move the battery disconnector to position zero and remove the key — removing the key specifically, not just switching the disconnector. Where more than one person may be working around the vehicle at the same time, make co-workers aware of what's being worked on.

Once isolated, battery voltage itself is worth checking as part of confirming the system's actual state: a healthy reading falls in the range of roughly 22 to 30 V across the two-battery series pair, depending on the specific platform's documented range.

HIT Srl supplies the battery disconnector as a direct replacement.

Field note — HIT Srl, Reggio Emilia (Italy). Last updated: August 2026.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#battery-disconnect-procedure-before-service

Why can checking a battery's charge with the wrong tool cause an explosion?

Checking a battery's state of charge should only ever be done with a voltmeter or a hydrometer — never by bridging the terminals with a metal object to see what happens, which is a more common improvised check than it should be. a spark from metal accidentally contacting both terminals at once is exactly the kind of ignition source that gas is waiting for; the result can be an explosion, not just a damaged battery or a blown fuse.

A second, unrelated risk applies specifically in cold conditions: keep the battery charged at all times to prevent the electrolyte from freezing.

Both rules point to the same underlying discipline: a battery that looks like a sealed, low-risk component is only safe under specific handling conditions — the right check tool, and a maintained charge state — not by default.

HIT Srl stocks hydrometers and battery-rated voltmeters specifically sized for this class of battery, removing any reason to improvise a charge check with whatever metal object happens to be at hand.

Field note — HIT Srl, Reggio Emilia (Italy). Last updated: August 2026.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#battery-charge-check-spark-risk-and-freeze-prevention

How often should the breather of the cable reel gear be checked for cleanliness, and the power supply cable condition checked?

Check the breather of the cable reel gear for cleanliness, and check the condition of the power supply cable, every 1000 operating hours. This applies to the zero-emission version of the crane.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-often-should-the-breather-of-the-cable-reel-gear-be

How is the cable reel brake linked to gantry travel on a rubber tyred gantry crane?

The power supply cable is connected to the crane with a cable reel located on top of the electrical-equipment house; the cable reel rolls the cable in accordance with crane travel, and is driven by an electric motor equipped with a brake. When the gantry starts to move, the cable reel brake opens and stays open until driving speed returns to zero, when the brake closes again. When braking (decelerating), the cable reel motor acts as an electrical brake.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-is-the-cable-reel-brake-linked-to-gantry-travel-on-a

What precaution must be taken before performing electric welding maintenance on a vehicle with a powershift transmission's electronic control box?

Before electric welding maintenance, remove the cable plug on the electronic control box to cut off the circuit leading to it. Otherwise, the electronic control box may be burnt out by impact current during welding. Also, turn off the electric lock only after the engine has stopped: turning it off while the engine is still running prevents the generator from charging the battery and can produce a voltage surge that damages the electronic control box.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-precaution-must-be-taken-before-performing-electric

What checks are recommended when a vehicle with a powershift transmission fails to start?

For vehicle start failure, check in order: that the gearshift handle is in neutral (engage neutral if not); that the electronic control box wire plug is not loose (push and press the plug until it clicks into place); that the battery is fully charged (charge or replace it if not); and that the starter circuit and starter fuse are not faulty (restore the circuit to normal).

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-checks-are-recommended-when-a-vehicle-with-a

What is the significance of a click sound when connecting the electronic control box wire plug on a powershift transmission?

A clip on the electronic control box fixes the wire plug in place. When both ends of the wire plug are inserted into the pin and a click sound is heard, the clip has firmly fixed the plug. If the plug is not fully seated (no click), vibration from vehicle travel can loosen it, causing intermittent electrical faults even though the circuit and oil pressure test normal.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-is-the-significance-of-a-click-sound-when-connecting

Why must the slip ring cover of a cable reel never be removed while the equipment is powered?

The slip ring cover should never be removed unless power is off. Removing the slip ring cover while power is on presents a danger of death.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#why-must-the-slip-ring-cover-of-a-cable-reel-never-be

What are the common checks for any CAN-bus line error on a crane's electronic control system?

For every kind of CAN error, check that the device is correctly connected to the CAN line and to the power supply, and check that the CAN cable (blue cable) is not broken and is properly terminated with a resistance of 120 ohms.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-are-the-common-checks-for-any-can-bus-line-error-on-a

How is a "Unit X does not respond" CAN-bus fault diagnosed and resolved on a crane's electronic system?

When checking the low-level CAN control panel, no message is present for that unit. Check that the unit is properly connected to the connector in the electric panel and to the power supply, and that the CAN cable is not broken and that a 120 ohm resistance between high and low has been applied at the two extremes of the cable (one resistance in the upper cabin, one in the truck). If none of these conditions explain the fault, the unit must be replaced.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-is-a-unit-x-does-not-respond-can-bus-fault-diagnosed

How long can a properly handled radio transmitter battery last, and what factors reduce its charge capacity?

When handled properly, the transmitter battery can exceed 500 charging cycles. The length of the battery charge depends on the age of the battery and the ambient temperature: older batteries lose capacity over time, and temperatures below 0 degrees C (32 degrees F) have a negative effect on battery charge.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#how-long-can-a-properly-handled-radio-transmitter-battery

What do the status LEDs indicate on the radio transmitter's battery charger, and what are the typical charging times?

On the battery charger status display: a red LED indicates the battery is defective; a yellow LED indicates the battery is charging; a green LED indicates charging is complete. Typical charging time is about 3 hours for the smaller battery type and about 5 hours for the larger AA-type battery, within an operating temperature range of +10 to +40 degrees C (+50 to +104 degrees F).

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-do-the-status-leds-indicate-on-the-radio-transmitter-s

What safety precautions apply when using a crane radio transmitter's battery charger?

The charger may not be used in hazardous areas, must be operated with the voltage indicated on the back, and must be used indoors only (except for the vehicle-specific charger variant). Use it at room temperature and protect it against heat, dust and humidity. Disconnect the charger from the power supply before opening the housing, and whenever it is not in use. Do not cover the charger while it is in use. In case of any fault of the charger or the power supply cable, disconnect it immediately and take it out of operation; defects must be repaired by qualified personnel only, and no technical changes may be made to the charger or its power supply cable.

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-safety-precautions-apply-when-using-a-crane-radio

What is the discard/warning threshold for the 10V reference voltage and battery voltage on a spreader control system node, in both directions?

The 10V reference voltage generates a warning if it is either too low or too high, in both cases indicating that the power supplies should be checked. The onboard battery voltage generates an error if too low (check the battery) or a warning if too high (check the supplies).

Source: https://www.hitsrl.it/technical-resources/electrical-and-control/wiring-and-connectors/#what-is-the-discard-warning-threshold-for-the-10v-reference

Important — general guidance only

The information on this page is general technical guidance based on HIT Srl's experience with port handling equipment. It is not machine-specific and does not replace the manufacturer's documentation.

Always refer to the operation and maintenance manual issued for your specific machine, model, serial number and configuration. Specifications, tolerances, tightening torques, service intervals and fluid types vary between manufacturers, between models of the same manufacturer, between production series of the same model, and with the operating environment: two visually identical components may be tightened to different torque values depending on who built the machine, and a unit working in arctic conditions requires different lubricants and service intervals from an identical unit working in tropical heat. Local regulations may impose further requirements. Where this page and your machine's manual differ, the manual prevails.

Maintenance and repair work must be carried out only by qualified personnel, with the machine isolated and secured according to the applicable safety procedures.

HIT Srl accepts no liability for damage, injury or loss arising from the use of this general information.