StorMax Cable and Interconnect Installation Instructions

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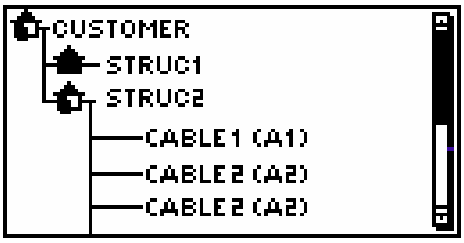
Welcome to the StorMax System

Thanks for your purchase, and welcome to StorMax family of products. You have invested in a technology that will grow with your evolving storage management needs. There are a couple of things you need to understand about the system, so please take a few minutes to read these instructions prior to installation.

Cable Addressing and Display Names

Every cable must be programmed to a different address. Cables can be re-programmed multiple times, with either the StorMax monitor or through the PC with the StorMaxPro system. The address enables the system to recognize the cable, so as to display and store data in the right place. There is a label stuck to the head of the cable with an “A” number, which by default is “A1”, unless pre-programmed otherwise. Once the cables have been programmed with addresses, the A# becomes a background part of the system.

Cables will then be associated by a “Display Name” such as Bin 26 Cable 3, which you program into the monitor only, and not the cable. In multi-cable applications, the display name of the center cable is typically “C1”. If no center cable, C1 is the north most cable in the inner ring of cables, or the first cable clockwise from the roof ladder, with the balance of cables following suit in a clockwise direction (refer to StorMax cables installation diagrams).

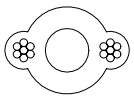
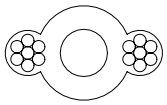
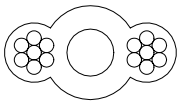


! Important:

A unique address must be programmed into each cable prior to connecting cables together. To learn more about programming, refer to the StorMax monitor instruction book.

Cable Type

OPI offers a range of cable types, depending on grain depth and application.
Be sure you have selected the appropriate cable for you application.

	Unit	MDR2	CDR2	HDR2	SE3
Cross Section (Actual Size)					
Size (LxW)	**inch** **mm**	**0.67 x 0.47** **17 x 12**	**0.79 x 0.47** **21 x 13**	**0.87 x 0.47** **23 x 13**	**0.20 Ø** **5.0 Ø**
Tube ID (min.)	**inch** **mm**	**0.28** **7.0**	**0.28** **7.0**	**0.28** **7.0**	**-**
Steel Construction	**inch**	**2 x 1/8**	**2 x 3/16**	**2 x 7/32**	**-**
Tensile Strength	**lb** **kg**	**3400** **1542**	**8400** **3800**	**11200** **5080**	**-**
Theoretical Load ***	**lb/ft** **kg/m**	**16.0** **23.8**	**18.5** **27.5**	**20.0** **29.7**	**-**
Maximum Tie-down	**lb** **kg**	**850** **385**	**2100** **950**	**2800** **1270**	**-**
Application Range	**feet** **m**	**0-50** **0-15**	**50-100** **15-30**	**> 100** **> 30**	**All XDR2 Tubes**

*****Important:**
Theoretical Load is the typical load per foot or meter of cable, based on dry, clean, flowable cereal grain. Loads will increase significantly due to tough, damp, dirty, frozen, bridged or high density grain, as well as cable location, anchoring mechanism, bin or unloading type and discharge rate. Read StorMax Instructions for proper cable installation and consult Bin Manufacturing Co. for cable support recommendations. **OPIsystems Inc. is in no way liable for damage caused by excessive loading and/or cable failure.**

Deciding on Uni or Multi-Cable Installation

OPI recommends one centre cable in bins diameters less than 24' (7.3m). Bins 24' and over require 3 or more cables/bin. Please refer to the Multi-Cable Recommendation brochure and Installation instructions for recommendations on number and placement of multi-cables.

Roof Loading

! Important:

MDR2 cables can generate loads exceeding 16lbs/ft (24kg/m) of depth. CDR2/HDR2 cables can generate loads exceeding 20lbs/ft (30kg/m) of depth. OPI will not be responsible for roof failure.

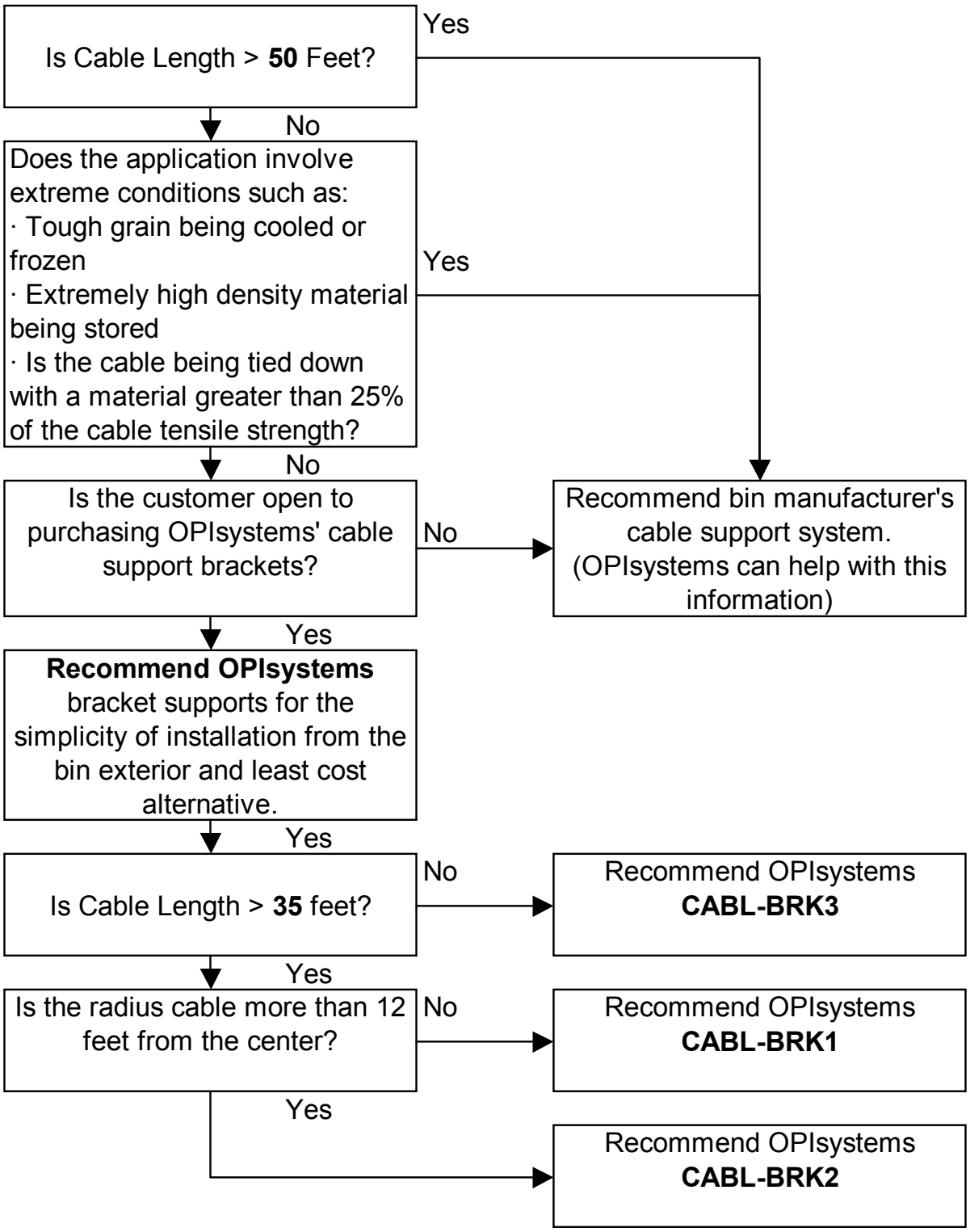
Consult your Bin Supplier to be sure the structure is designed to withstand the design load. Although grain bins are designed for peak loads, they cannot withstand any measurable load away from the peak or sidewall. These load estimations are based on normal applications, such as dry, flow-able small grains. Certain conditions, which may generate even higher cable loads, should be avoided. Examples include:

- Never secure cables with a tie-down material that is more than 25% of the cable breaking strength. This equates to;
    - 850 lbs (385 kgs) for the MDR2 series
    - 2100 lbs (950 kgs) for the CDR2 series
    - 2,800 lbs (1,270 kgs) for the HDR2 series.
- Do not freeze grain, particularly tough grain that can “ball-up” on the cable and generate extreme loads, especially during unloading. If grain temperatures are at or below freezing, be sure to re-warm prior to unloading.
- Outer radius cables in hopper-bottom bins can generate extreme loads, due to the unloading characteristics of hopper-bottomed bins. It is recommended to not extend outer radius cables into the hopper on larger diameter bins. This means using free weights, rather than tie-down, to secure the cable bottom.

OPI offers external cable support brackets that can be used with MDR2 Tubes to a maximum grain depth of 50’ (10m);

- CABL-BRK3 two-rib bracket up to 35’ maximum cable length
- CABL-BRK1 four-rib bracket for cables less than 12’ from centre, 35-50’ application
- CABL-BRK2 four-rib bracket for cables more than 12’ from centre, 35-50’ application

Refer to OPI Temperature Cable Support Spec Sheet.

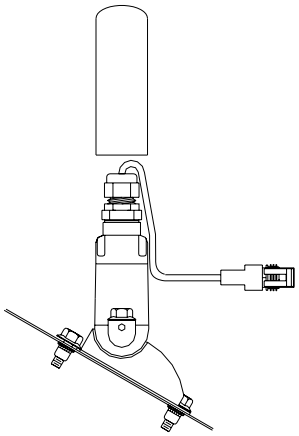


Suspension Type

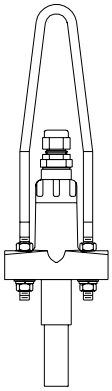
There are 3 possible methods of cable suspension;

- Angle Bases are used to a maximum cable length of 50’ (15 m) for MDR2; 100’ (30m) for CDR2. This is a simple installation, done from the outside of the bin. Application examples include centre cables drilled in through the roof-cap collar, or outer cables with

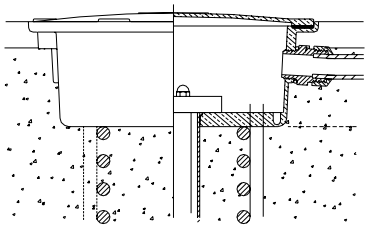
external cable support brackets. Angle bases “cradle” the suspension head, and pivot to the slope of the roof, allowing for installation from an angle of 0-45 degrees.



- Hanger Suspension, for all cable series. Used when hanging cable directly from a suspension structure, typically on the underside of the roof.



- Puck style base for HDR2 cables, whereby the suspension head rests atop a suspension structure, either inside a CABL-E01 (OPI supplied) cast enclosure, or other suitable suspension surface.



StorMax Cable Installation

For All Cable Installations

To avoid damage, cables must be free hanging and away from sharp surfaces. Keep in mind that grain movement will cause cables to drift, even if cables have been “anchored”. Cables should also be suspended out of the path of incoming grain to minimize wear. In bins with spreaders, adjust cable length according to where cables need to be installed to avoid mechanical interference and wear. Metal or heavy wall plastic tubing should also be placed over the cable along the zone of direct grain impact.

Cable Installation with “Angle Base” Style Suspension

1. Drill a 1-1/8” (29 mm) hole vertically at the point of suspension. If drilling through multiple layers, be sure to drill holes straight up and down to avoid damage caused by cables rubbing against sharp surfaces.
2. If using Angle suspension, be sure to drill far enough away from vertical edge to allow for sufficient clearance and position the angle base with the raised printing pointing away from centre. If the bin cap interferes with the angle base, the angle can be moved down the rib and secured to the flat surface.
3. Install the cable by slowly uncoiling. **Never** drop the cable into the bin.
4. Secure the angle base by drilling self-tapping screws through the bottom section into the roof sheet.
5. Use the supplied rubber gasket to seal off the hole. Use silicone to complete the seal if necessary.
6. Be sure the top suspension is well “seated” into the angle base.

Cable Installation with “Hanger” Style Suspension

1. For outer cable installation, make sure you have first read the “Roof Loading” section and consulted your bin supplier to be sure the suspension structure is of sufficient strength.
2. Select a suspension method that provides complete **360°** free movement of the hanger. Lack of free movement can result in hanger and/or cable failure.
3. Loop the Hanger “U” bolt through a suspension hole on the rafter or through an eyebolt. When using eyebolts, be sure that the eyebolt is rated in excess of the cable breaking strength and installed with the eye parallel to the roof sheet rib, not on an angle so as to cause potential eyebolt failure. Also be sure to completely tighten and double-nut the U-bolt nuts after installation.
4. Install the cable by manual uncoiling. **Never** drop the cable into the bin.

Cable Installation with “Puck” Style Suspension in HDR2 Cables

1. Be sure the suspension structure design exceeds the cable tensile strength.
2. Be sure the cable has free movement and is not rubbing against other surfaces.
3. Install the cable by manual uncoiling. **Never** drop the cable into the bin.
4. Bolt the puck to the base to eliminate movement.
5. Properly ground the cable head to a proven earth ground.

LEAD ROUTING

Options for Lead Routing

1. Uni-cable lead-out is the simplest application, whereby a single lead or interconnect cable is run to a StorMax hand-held monitor connection point.
2. Multi-cable with cable-cable-cable interconnect, whereby cables are joined by one common line in “series”. This method is used with a row of single-cable bins, or in flat stores.
3. Multi-cable to a central “hub”. This is the preferred method of routing, in that it is easier to perform diagnostics and service from one central access point. From here, interconnects can either be run to the interface, or to/from another bin.

CAP100 Rule

CAP100 refers to the maximum number of cables and leads or interconnects that can be joined per 2-Wire line, whether in series or to an INT2-XXLD “Hub”. The sum total of all devices “grouped” together onto a single 2-Wire line cannot exceed 100, based on;

- 1.33 per sensing cable
- 0.19 per sensor
- 0.12/foot (0.40/m) Retractable series sensing element (MDR2, CDR2,HDR2)
- 0.09/foot (0.30/m) lead or 2-Wire Interconnect cable
- 0.00 for INT2-XXLD.

If the 2-Wire line is to exceed 100, the line has to be terminated into 3-Wire line on an INT3-XXLE 3-Wire Line Expander.

CAP100 rules do not apply after the 2-Wire line has been switched into a 3-Wire line.

Lead and Interconnect Routing

Sensing cables can be ordered with lead attached and/or can be connected with INT2-XXXX 2-Wire Interconnect cable. Always run cables with the yellow tabbed “male” end pointing towards the next cable or interface device, whether an INT2-XXLD Line Divider, and INT3-XXLE Line Expander, RTU, or StorMax monitor. All interface devices are equipped with female “sockets” to receive more male “tabs”.

Lead Routing for “Uni” Cable applications

1. If the sensing cable comes equipped with both male and female connectors, plug the female “socket” with silicone.
2. Run the male yellow “tab” end to the side of the bin.
3. Use the clips and self-tapping screws every 3-4’ (1 m), to secure the lead.
4. Run the lead to a convenient location for plugging into the monitor.
5. An INT2-DOCK-SHORT “docking station” is required to protect the connector from weather and provide electrical protection to the cable assembly.

! Important

Cables must be plugged into docking station at all times when not in use.

Lead/Interconnect Routing for “Multi” Cables with INT2-XXLD “Hub” Termination

1. If the sensing cable comes equipped with both male and female connectors, plug the female “socket” with silicone.
2. Route the lead back to center. Be sure to leave sufficient slack, so as to avoid stress during cable movement, particularly in Hanger applications.
3. Mount the INT2-XXLD “Hub/s” in a location that is both a) central to all the cables being collected and b) **accessible** to future service. Although it is best to group the cables per the side of the structure they are being collected from, it does not matters which cable goes into which 2-Wire input.
4. More than one INT2-XXLD Hub can be joined together on one 2-Wire Line, either when the bin has multiple hubs, or when joining from one bin to the next, so long as the CAP100 limit is not exceeded. In either case, INT2-XXXX Interconnect cables will be required to join from one hub to the next. N.B. When joining multiple dividers, an extra divider line is required to receive the male tab from the previous divider.

Interconnect Routing from INT2-XXLD Hub

1. If running Interconnect from one bin to the next, be sure to secure the lead cable, through conduit or to a steel cable, to avoid damage by wind etc.
2. If running to ground for read-out with a StorMax monitor, use the clips and self-tapping screws every 3-4’ (1 m), to secure the lead.
3. Run the lead to a convenient location for plugging into the monitor.
4. Both an INT2-GRND grounding cable and an INT2-DOCK-SHRT docking station are required when plugging two or more cables together.

Cable Tie-Down

Cables bottoms should be secured to minimize drift during loading and unloading, either by;

a. Tie-down with a breakable material no stronger than 25% of the cable breaking strength, which is 850 lbs. (385 kg) for the MDR2 cable, 2100 lbs. (950 kg) for the CDR2 cable and 2800 lbs. (1270 kg) for the HDR2 cable. This will enable the bottom of the cable to break away under load so as not to impose excess loads on the cable and/or roof support.
b. Free weights affixed to the bottom of the cable. Be sure the free weights are “slender” enough so as not to impose excessive additional load.

Do not

1. Tie cables together in a horizontal “ring”.
2. Tie cables down with a material stronger than 25% of the cable strength. The tie-down must be the weakest part of the system, providing a “break-point” for the system and protection for the cable and suspension structure.
3. Use a large weight on the bottom of the cable, as this will generate unnecessary loads on cables and suspension.