

How to Install a Security Camera System by Allen & Jennifer Spears

Quite a few car wash operators are “hands-on” when it comes to installing and maintaining equipment and systems at their car washes, and security camera systems are no exception. More and more operators are installing their own camera systems these days because they not only want to know the system well enough to operate it and troubleshoot any problems that arise down the road, but to also get the equipment at a discount of up to 50%-60% by buying the equipment direct from the Manufacturer.

Some operators that have multiple locations have a Maintenance person or staff that can assist with the installation, or have a favorite electrician that can run the wiring and mount the cameras to make the job much easier, but there are quite a few car wash owners that do the entire job themselves. After all, it's not rocket science, and with a little help from the Manufacturer, should be as easy as Plug-N-Play. However, if you buy the equipment from a dealer that can't or won't give you the kind of assistance you will need for a successful installation, the project could turn into a nightmare. So here are some helpful tips and suggestions that will help guide you through the process.

First, buy the equipment from a Manufacturer that specializes in designing complete systems for all types of car washes. The Design Team will request a Site Plan drawing or sketch of your facility, and then talk with you about areas of particular concern and special design features or considerations that can affect camera installations or lens views. Once the design is complete, the manufacturer should provide the following materials:

- A completed Surveillance System design overlaid on your Site Plan that shows numbered camera locations as well as approximate mounting positions and angles.
- Pictures and specifications of each camera type and configuration as well as the Digital Video recorder and ancillary equipment.
- A complete quote that details the unit price of each proposed camera and component so that you can “pick and choose” what cameras or options to start out with initially, if you wish.







Once you have decided to purchase the system, the Manufacturer should then pre-build and assemble everything possible before the system ships to you. For example, all of the cameras should be pre-assembled and mounted inside housings. They should be pre-wired with “pig-tails” for video and power, so that they are ready to mount with no additional work needed. They should also be numbered to match the design plan layout so that you know exactly which camera goes where at a glance. This is extremely helpful because many of the cameras will look identical from the outside, but may well have different lenses installed for a particular camera location. Lastly, before the system goes out the door, the manufacturer should hook up all the cameras to the DVR and test the system for at least 24 hours to ensure that everything is in working order and operating correctly before delivery to the customer.

Before the system is delivered, it is a good idea to decide where the Digital Video Recorder (DVR) will be placed, as well as the power supply cabinet for powering the cameras. Both of these components should be within a few feet of each other because the wiring from each camera will split off to each box, and both components will need to be plugged into an Uninterruptible Power Supply (UPS) to provide battery back-up in case of power failure, and to protect the system from power line surges and fluctuations. In fact, most manufacturers require a UPS be used in order to qualify for Warranty protection.

When the equipment arrives and you are ready to start installing the system, place the DVR where it will reside, then mount the camera power supply nearby. Place the Monitor where it will sit, and connect the supplied cable between the video output on the back of the DVR to the video input connector on the monitor. Next, plan out the routing the wiring will take from the control equipment to each camera. Remove the knock-outs on the side, top or bottom of the power supply where the wires will enter the cabinet.

Now you're ready to run your wiring. Anything existing (chases, conduit, or pass throughs) are a life savor. The least amount of holes you have the drill the better. Now, on average, a first time installer or do-it-yourselfer, will take 1 hr. to install each camera. This will obviously depend on type of camera, type of cable, and where the cable has to be run through.

Experienced surveillance companies will have already predesigned the system and matched the cabling needed for each job. There are pros and cons to each type. Here is a general list for each.

Type of Cable	Pros	Cons
RG59U 	<ul style="list-style-type: none"> - easy to find - least expensive - available in Siamese - can be custom made - can use universal coax tools - can use it in conjunction with individual power wire if power and video are running to 2 different locations 	<ul style="list-style-type: none"> - can only go up to 600'
RG59U Siamese (RG59U / 18/2 PW) 	<ul style="list-style-type: none"> - only have to make one wire pull for both video and power wire 	<ul style="list-style-type: none"> - limited by video signal distance for 24V cameras and power signal distance for 12V cameras
RG6 	<ul style="list-style-type: none"> - can go up to 1200' - can be custom made - can use universal coax tools - can use it in conjunction with individual power wire if power and video are running to 2 different locations 	<ul style="list-style-type: none"> - more expensive - harder to find in Siamese style
Cat 5 Twisted Pair 	<ul style="list-style-type: none"> - with no powered baluns can go up to 1200' - with powered baluns you can go up to 2.4KM - use it when space is an issue (conduit) - some businesses already have some existing - good filter for noise interference from power 	<ul style="list-style-type: none"> - need gender changers on each end of the cable to change it from BNC to screw terminals and vice a versa - additional cost is normally between \$100 and \$200 per camera
Fiber Optic 	<ul style="list-style-type: none"> - extremely long range distances can be achieved 	<ul style="list-style-type: none"> - Very expensive - Only for the professional installer
18 gauge / 2 conductor power wire 	<ul style="list-style-type: none"> - Extremely inexpensive - Easy to work with - Works with 12V DC or 24V AC cameras 	<ul style="list-style-type: none"> - Will have to run two different cables, one for video and one for power

With that said there are two huge distinctions between cable types. Premade and Do-it-yourself from spools and a toolkit.

Premade cabling will come to the job site in a bag with the BNC connections (video side) and the 2.1mm connections (power side) already on the cabling. This type of cabling is normally only used for small format 12V DC cameras. This cabling is smaller than standard Siamese. It is normally RG58U coax and around 22 gauge 2 conductor power wire. Custom Premade cable is pre-cut to length at the manufacturer's warehouse to whatever length is needed for each camera. Standard Siamese is what is used for this type. Both of these types are very convenient. They come in preset or pre-determined lengths and are ready to run. But with the ends already on them, they are very tough to run in conduit or small spaces, and you have to make larger holes to run them through walls. If this is the case or measuring each run of cable isn't practical, then spools of cable and a toolkit is the answer. Each run can then be cut to length on site and terminated when it is the easiest to do so. Siamese is the type to choose for shorter distances since you only have to pull one run per camera, and since power and video cabling is required for each camera it can literally cut the install time in half. Any reputable company will sell, or include with your order, a complete toolkit (crimper, stripper, connectors, cable ties, instructions, etc.) to make the install easier. Each job is different so ask the company you are doing business with to help choose the right cabling for each location. If you find the right company they will help you with every aspect of the design, from installation, to setup, and beyond.

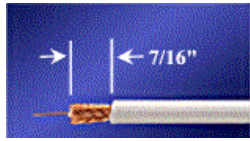
Good coax and/or power cable should be vinyl shielded and 95% copper on the conductive portions. There are a lot of cheap imitations out there and it will make a huge difference on signal quality. Since the cable is vinyl shielded running it in conduit is not required. But there are certain circumstances that it is suggested. Any outdoor camera with a knock out for the cable pigtailed will need to have rigged or flexible conduit run to it. That way it keeps all of the electronic components inside protected. If the leads on the camera will not make it all the way back through the wall to make the connection, a small junction box from any home improvement store will be needed. The wiring will need to be enclosed to keep it away from animals, people that might clip the cabling if it is low enough to be reached easily, and harsh weather (severe cold or severe heat). The wire (especially the coax portion) needs to be placed 2-3 ft. away from any lighting ballast so there isn't any noise interference on the video portion.

Splices in the cable (barrel connectors for coax and splices for power) need to be avoided if at all possible. It's just one more thing to check if something goes wrong and one more place to corrode if water/weather elements get to it. If this cannot be avoided make sure heat shrink is used to protect the connection as much as possible. Electrical tape can normally be used inside depending on circumstances, but only use heat shrink outside. Any outdoor camera lead needs to be run indoors and connected to the cable run, if at all possible. One more step in protecting the integrity of the signal.

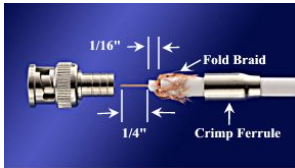
There are a few helpful hints on what to look for when getting tools for the install. Most cable strippers these days are universal for RG cable. This is good because you can use it on multiple jobs and not carry different tools. If only one type of cabling is being used, then a preset stripper can save time and hassle. That way the depth of cut is set when it arrives for the outer vinyl shield, and to the center conductor. A ratcheting crimper tool for connecting the two piece crimp on connectors is highly recommended. That way each time a crimp is made, the ratchet won't let go until it is fully depressed. The two piece crimp on connectors are also suggested over the twist on type. They give a much better connection and they will not have to be redone every few months, due to them falling off. Everyone is different so go with what you are comfortable using. Whichever way is chosen, make sure and get a few extras, since the learning curve on crimping cable takes a few tries to get it right.

All professionally built cameras and DVRs will have a BNC style connection.

Once you have run your cabling from the camera location to the DVR and power supply you are ready to terminate the cable.



1) Trim Cable as Shown



2) Slide crimp ferrule onto cable

3) Fold braid back and complete trimming the cable as shown. Trim center conductor end at 45 degree angle



4) Push connector onto cable

5) Fold braid back over crimp body (DO NOT MISS THIS STEP)

5) Push crimp ferrule up over braid and crimp body



7) Using universal crimp tool, crimp ferrule with appropriate hex

8) Crimp cable support with appropriate hex

Once both ends of the coax is terminated, the vinyl portion around the power wire will need to be stripped away, as will around 1/2" of the vinyl covering around each power wire. If Siamese cable is being used, then you'll need clip the power wire and coax apart to make the connections. Each cable is shielded by itself and melded in the middle. Clip in the middle and pull the two apart for easier install. This will need to be done on both sides of the cabling (camera side and control room side.)

12V DC camera wiring is polarity sensitive, but 24V AC camera wiring is not. This means the connection of a 12V camera has to be hot to hot and not to not. Regardless of whether the camera is 12V or 24V keep the wiring consistent, Positive to Positive and Negative to Negative. You'd be surprised how many cameras get damaged due to incorrect power voltage.

Each camera style is slightly different for the actual power connection portion. Most Rugged Domes for example will have terminal blocks on the power portion of the camera lead. So the power wire is plugged into each block screwed down, wrapped if necessary and that's it. Prebuilt cameras sometimes have the same block termination on the camera end and sometimes they are just bare wires. If they are bare wire then use power splices or some kind and wrap the connection. Superbullets and most small format 12V cameras will have 2.1mm connectors. Make sure the company you are dealing with sends you everything you need to change that 2.1mm connector over to bare wire if you are using spools of cable. You do not want to have to clip the power lead off the camera end, it can become a warranty issue if you ever have a problem with the camera.

You click on the BNC connector clockwise to the video portion of the camera and wire the power portion as stated above. Once you have connected the cabling to the camera side you are ready to go back to your control room where the DVR and power supply cabinet are located. You click the BNC connector clockwise onto the video inputs on your DVR. Then you will need to wire each camera individually into your power supply cabinet. Make sure the power supply unit is turned off for each connection made. Using an individually fused power supply is very valuable. If you have a small power surge it will blow the fuse and save the camera. The power supply boards should be marked as whether they are 12V DC or

24V AC and mixed units are common these days. Just make sure you match the requirements of the camera to the right board on the power supply.

If you turn on the power supply and a camera doesn't come immediately then you want to turn the power off and verify your voltage again. After the installation process the last thing you will want to do is pay more money to replace a damaged camera due to incorrect voltage.

Testing the cameras prior to mounting them is invaluable. Any reputable company will do this prior to shipping, but no matter how well they are packed, shipping damage does occur.

Now you're ready to start mounting the cameras. Keep in mind that it really doesn't matter if you run the wire first or mount the cameras. Sometimes if you have to feed the wires coming out of the camera through a wall, then it might be best to mount the camera and feed the cables through before running the rest of the cables.

When choosing a mounting location for each type of camera and location, rely on the system Manufacturer to inform you of the best vantage points that will result in the view you need to have with the particular lens provided. After that, it's up to you to make sure that the mounting location is sturdy and strong enough to hold the camera type you are mounting. Sturdy metal building crossmembers or masonry walls are perfect for mounting purposes, but flimsy metal or vinyl sheeting may not have the strength to hold a larger camera.

Once a suitable mounting position is chosen, Unfasten the mount from the camera and use it as a template for marking the holes that will be drilled. Then, drill the necessary holes needed for the fasteners (and inserts if in masonry), and fasten the mount securely to the substrate. Then attach the camera to the mount, make your wiring connections and you are ready to initially test the camera.

Go to the camera power supply cabinet and make the final connection to power the camera you just installed. Make sure the video connector is attached to the correct input on the back of the DVR, and turn on the power to the equipment. Now you should be able to see the camera on-screen of your monitor. If you do not see the camera, make sure all of the connections are correct and all of the components have power. Your manufacturer should assist you every step of the way, and can be invaluable in troubleshooting any problems you may have.

Assuming you can now see the picture from the camera, it is time to finish correctly aiming and tightening all the mounting hardware to complete the installation of each camera. If the camera has a fixed lens that cannot be manipulated or altered, you're finished, but if the camera has a Varifocal, or manually-adjustable lens, it will be necessary to remove the camera cover and fine tune the zoom and focus control rings on the lens so that you can see what you need to see and the picture is in sharp focus. It is sometimes helpful if you remove the system monitor and video cable and carry it and an extension cord with you to the camera location. Unplug the video portion of the cable from the camera and plug the camera end into the monitor so that you can quickly configure the lens right on the spot, and you can see the picture without having to run back and forth to the DVR location. Again, the Manufacturer should provide a connector to "patch in" the monitor at the camera for this purpose.

Once you have the desired camera configuration you want, reconnect the original video wire, replace the camera cover and move on to the next camera location. Repeat this process until all of the cameras are installed.

A good Manufacturer will pre-program your DVR to automatically begin recording immediately with all of the settings pre-configured to your wishes. They should also guide you through putting your system on the Internet or Network as well. Make sure before you buy the system that it comes with at least a two year warranty and the technical support is unlimited for the life of the system. The technical support is extremely important because if there is a problem or you need guidance of any type, really good support is vital. If the company you are considering will not provide this level of service, then move on to another company because poor support can easily leave you stranded.