

Low-Voltage Integrated Wiring

- Lighting Control Systems –
Comparisons and Planning
- Voice, Data and Audio/Video Installations-
Things to know and what to do
Including Planning, Wiring and
Termination



PEMBA Low-Voltage Integrated Wiring Guide
for New Construction



Pre-wire for today and the Future

Lighting Control & Automation Systems

- LiteTouch
- Lutron
- Centralite
- Leviton
- Lehigh

- Vantage
- Crestron
- Control 4

- Elan
- MyAmbience
- Russound

- HAI

- Strand
- Etc

Lighting Control Overview

- Astronomical time clock
- Multi button keypads to reduce multi gang wall clutter
- Various styles and colors of keypads
- Various modules to control different types of lighting
- Integrate to other systems via RS232 or Ethernet
- Low voltage wiring or wireless to keypads
- Controls wiring can be custom or UTP cat5
- Strategy varies: whole house lighting control, whole house automation, or Room or device controls
- Local switch leg control and/or remote panels
- Design and Planning done much like a commercial job
- The number of lighting circuits and max wattage varies by system and their various device
- Connectivity varies: hardwired, RF, IR, Zigbee, network, etc

Lighting Control Overview

- **LiteTouch** (whole house)
 - Strong focus on Lighting Control and Reliability- LifeTime Warranty
 - Centralized Control with Hybrid keypads
 - Need only 1 processor
 - Programming is limited on by skill and creativity
- **Lutron Homeworks** (whole house)
 - Focus is energy management: Lighting, daylight and occupancy control-will add HVAC
 - Integrates with room and motorized shade controls
 - Has both a centralized and decentralized control system
 - Uses hardwired and RF communications
 - Menu driven programming
- **HAI**
 - Automated Security System
 - Control based on Contact Closure
 - Has good priced distributed audio and touchscreen and camera integration
 - Limited by record level programming

Control Systems Focus

Lighting Control

- LiteTouch
- Lutron
- Centralite
- Leviton
- Lehigh

AV & Lighting +

- Vantage
- Crestron
- Control 4

Automation & Security

- HAI

Theatrical Lighting

- Strand
- Etc

AV/TouchScreen

- Elan
- MyAmbience
- Russound

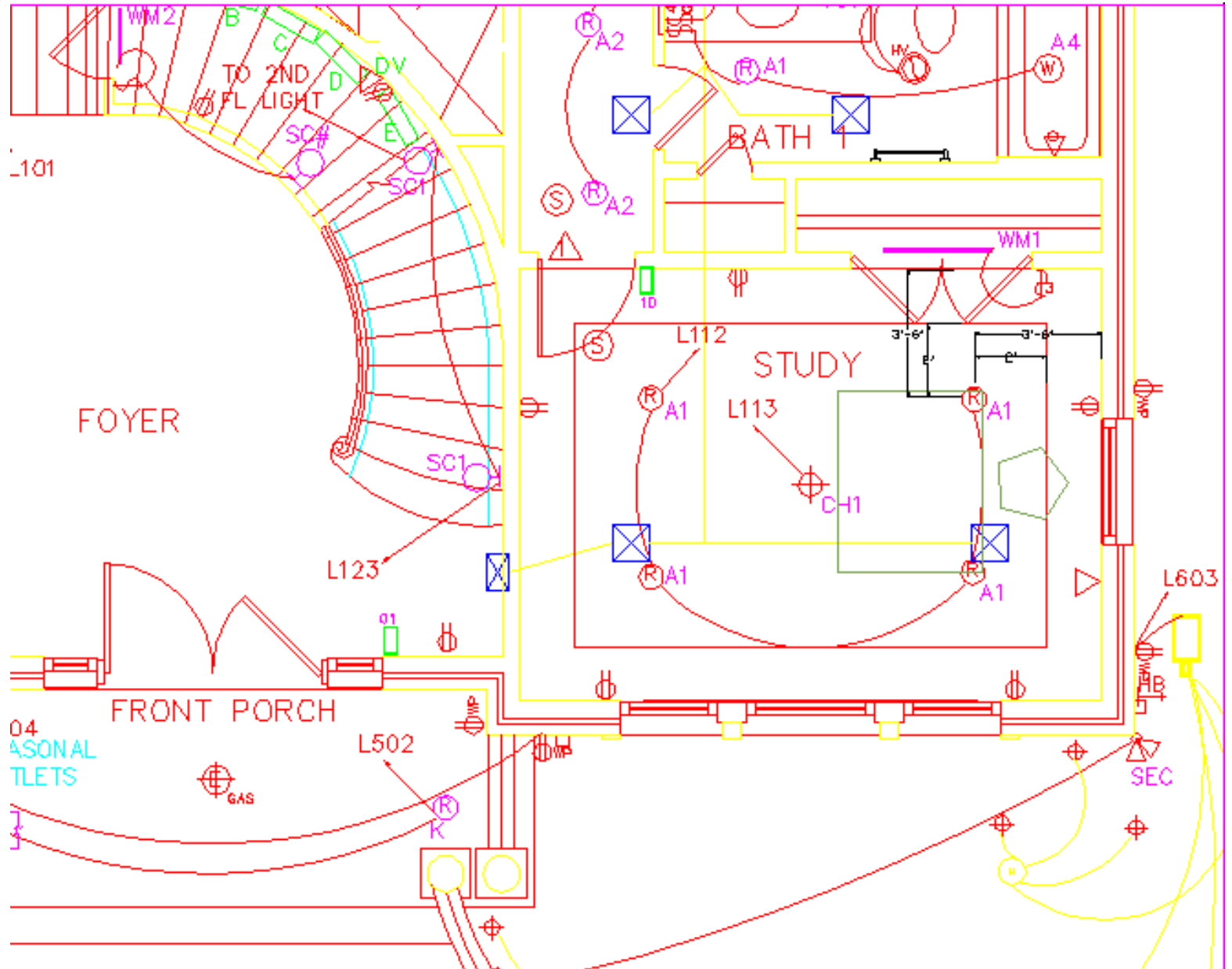
Savings from dimming

Effect of Dimming Incandescent Light Bulbs		
Dimming the light this much:	Saves electricity	Extends bulb life
10%	10%	2 times longer
25%	20%	4 times longer
50%	40%	20 times longer
75%	60%	More than 20 times longer

Typical Costs of Systems

- Room/Area Lighting Control: \$500 to \$3000
- Whole House Lighting Control: \$15,000 to \$50,000
- Whole House Automation: \$50,000 to \$250,000

Lighting Control Plan documentation



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Lighting & Automation

104 P Street
Belle Chasse, LA 70037

LiteTouch Load/Lighting Schedule

Enclosure Location: *All*

Job: Gharib Residence
Date: December 29, 2008 (02:18 PM)

Load Number	(Address)	Fixture Type	Load Type	Watts	Qty.	Total Watts	Module Function	Floor/Area	Load Description	Load Position
Christmas	(13-2)	PhantomCfl	<FL Switching>	<0>	1		<Switching>	0/Control	Christmas Variable	PhantomEnclosure.1.2
Dark	(13-1)	PhantomCfl	<FL Switching>	<0>	1		<Switching>	0/Control	Dark Variable	PhantomEnclosure.1.1
L101	(03-1)	SC1	<Incandescent>	<75>	1	75	<Dimming>	1/Foyer	Barrel Vault Sconce	Enclosure A.3.1
L102	(01-1)	CH2	<Incandescent>	<640>	1	640	<Dimming>	1/Dining	Chandelier	Enclosure A.1.1
L103	(03-2)	C	<Incandescent>	<75>	4	300	<Dimming>	1/Dining	Recessed	Enclosure A.3.2
L104	(03-3)	CC1	<Incandescent>	<180>	1	180	<Dimming>	1/Butler Pantry	Surface	Enclosure A.3.3
L104A	(09-3)	UC52	<FL Switching>	<40>	1	40	<Switching>	1/Butler Pantry	Under Cab 52"	Enclosure C.1.3
L105	(03-4)	FE	<Incandescent>	<75>	3	225	<Dimming>	1/Kitchen	Island Pendants	Enclosure A.3.4
L106	(01-2)	A1	<Incandescent>	<75>	8	600	<Dimming>	1/Kitchen	Recessed	Enclosure A.1.2
L107	(09-1)	UC	<FL Switching>	30	6	180	<Switching>	1/Kitchen	Ucab Fluorescents	Enclosure C.1.1
L108	(03-5)	CH3	<Incandescent>	<360>	1	360	<Dimming>	1/Bkfst	Chandelier	Enclosure A.3.5
L109	(09-2)	FL4	<FL Switching>	<128>	4	512	<Switching>	1/Garage	Fluorescent wraps	Enclosure C.1.2
L110	(03-6)	B	<Incandescent>	<50>	4	200	<Dimming>	1/Hall	GrazeColumnDownlts	Enclosure A.3.6
L110A	(04-4)	N	Incandescent	<50>	2	100	<Dimming>	1/Hall	Recessed Accents	Enclosure A.4.4
L111	(03-7)	A2	<Incandescent>	<75>	3	225	<Dimming>	1/Study Hall	Recessed Down	Enclosure A.3.7
L112	(03-8)	A1	<Incandescent>	<75>	4	300	<Dimming>	1/Study	Recessed Down	Enclosure A.3.8
L113	(01-3)	CH1	<Incandescent>	<480>	1	480	<Dimming>	1/Study	Chandelier	Enclosure A.1.3
L114	(04-1)	SC3	<Incandescent>	<120>	1	120	<Dimming>	1/Media Center	Wall Sconce at Entry	Enclosure A.4.1
L115	(04-2)	P	<L V Map Trans>	<50>	2	100	<Dimming>	1/Media Center	Statue Recessed Accents	Enclosure A.4.2
L116	(04-3)	C	<Incandescent>	<75>	2	150	<Dimming>	1/Media Center	Front Recessed	Enclosure A.4.3
L117	(04-5)	C	<Incandescent>	<75>	2	150	<Dimming>	1/Media Center	MiddleRecessed	Enclosure A.4.5
L118	(04-6)	C	<Incandescent>	<75>	2	150	<Dimming>	1/Media Statues	Rear Recessed	Enclosure A.4.6
L119	(04-7)	SC2	<Incandescent>	<75>	2	150	<Dimming>	1/Media Rear	SconcesOnBackWall	Enclosure A.4.7
L120	(09-8)	Fiber	<Fans>	<150>	1	150	<Switching>	1/Media Ceiling	Star Field Ceiling	Enclosure C.1.8
L121	(05-4)	Outlet	<Incandescent>	<180>	1	180	<Dimming>	1/Family Sofa	Outlet	Enclosure B.1.4
L122	(07-4)	SwOutlet	<Switched Outlet>	<25>	1	25	<Switching>	1/Kitchen	Coffee Pot	Enclosure B.3.4
L123	(08-2)	SC1	<Incandescent>	<75>	3	225	<Dimming>	1/Stairway	StairwaySconces	Enclosure B.4.2
L201	(07-1)	FFD	<Incandescent>	<150>	1	150	<Switching>	2/Foyer	Cove Fiber	Enclosure B.3.1
L202	(01-4)	CH4	<Incandescent>	<940>	1	940	<Dimming>	2/Foyer	Chandelier	Enclosure A.1.4
L203	(05-5)	A2	<Incandescent>	<75>	1	75	<Dimming>	2/Stairway	Recessed	Enclosure B.1.5
L204	(05-6)	A2	<Incandescent>	<75>	4	300	<Dimming>	2/Hall	Recessed	Enclosure B.1.6
L205	(05-7)	L2	<Incandescent>	<90>	4	360	<Dimming>	2/Great Room	Column Accent	Enclosure B.1.7
L206	(02-1)	L1	<Incandescent>	<90>	5	450	<Dimming>	2/Great Room	Per Down Lts	Enclosure A.2.1
L207	(02-2)	L1	<Incandescent>	<90>	5	450	<Dimming>	2/Great Room	Sealing Down Lts	Enclosure A.2.2
L208	(05-8)	L	<Incandescent>	<90>	2	180	<Dimming>	2/Great Room	Fireplace Accents	Enclosure B.1.8
L209	(02-3)	CH5	<Incandescent>	<940>	1	940	<Dimming>	2/Great Room	Chandelier	Enclosure A.2.3
L210	(06-1)	K1	<Incandescent>	<75>	5	375	<Dimming>	2/Master BR	Down Lts	Enclosure B.2.1
L211	(06-2)	B	<Incandescent>	<50>	2	100	<Dimming>	2/Master BR	Reading	Enclosure B.2.2
L212	(11-4)	Fan4	Fans	<150>	1	150	<Fan Control>	2/Master BR	Fan	Enclosure C.3.4
L212A	(10-6)	VENT NL25	Incandescent	25	1	25	Dimming	2/Master Bath	VNlight Light w/25watt resistc	Enclosure C.2.6

LiteTouch Enclosure Schedule

Enclosure Location: Electronics Room
 Enclosure Name: **A**
 Enclosure Type: 4 Module Enclosure Surface Mount

	DWG#	Fixture	Load Type	Watts	Zone	Description	Circuit
8 Channel Dimmer Part #: 08-2108-01 Module Address: 09 Total Wattage: 1760	1 - L155	Rec4"	Incandescent	100	1st*MASTER BEDI	READ DOWN LIGHTS	N/A
	2 - L150	COMBO REC/SM	Incandescent	150	1st*HALL TO POW	1 RECESSED OUTSIDE POW	N/A
	3 - L110	SC75	Incandescent	150	1st*DINING/PIANO	SCONCES ON EITHER SIDE	N/A
	4 - L210	Rec4"LV	L V Mag Trans	200	2ND FLOOR*THE#	3 RECESSED IN FRONT OF	N/A
	5 - L109	Rec4"	Incandescent	200	1st*PIANO RM	RECESSED DOWN LTS	N/A
	6 - L162	Rec6"	Incandescent	300	1st*MASTER BATH	BATH DOWN LIGHTS	N/A
	7 - L156	Rec6"	Incandescent	300	1st*MASTER BEDI	SITTING AREA DOWN LTS	N/A
	8 - L161	CH360	Incandescent	360	1st*MASTER BATH	BATH CHANDELIER	N/A
8 Channel Dimmer Part #: 08-2108-01 Module Address: 10 Total Wattage: 1750	1 - L160	Rec6"	Incandescent	75	1st*MASTER BATH	VESTIBULE BATH ENTRY	N/A
	2 - L104	SC75	Incandescent	150	1st*DINING	SCONCES ON SIDE OF ART	N/A
	3 - L168	REC MINI	Incandescent	200	1st*GREAT ROOM	GREATRM ENTERTAINMEN	N/A
	4 - L142	Rec4"	Incandescent	200	1st*DEN	RECESSED IN SHELVES	N/A
	5 - L159	SC75	Incandescent	225	1st*MASTER BATH	VESTIBULE VANITY SCONC	N/A
	6 - L204	CH300	Incandescent	300	2ND FLOOR*LIBR.	CHANDELIER OVER TABLE	N/A
	7 - L166	REC LENSED	Incandescent	300	1st*MASTER CLO:	6 RECESSED	N/A
	8 - L152	Rec6"	Incandescent	300	1st*MASTER BEDI	RECESSED DOWN LTS	N/A
Quad Dimmer Part #: 08-2134-01 Module Address: 11 Total Wattage: 2850	1 - L905	Rec4"	Incandescent	500	EXTERIOR SIDE*E	7 EAVE LTS ON LEFT SIDE	N/A
	2 - L910	Rec4"	Incandescent	750	EXTERIOR REAR*	25 RECESSED LIGHTS IN E	N/A
	3 - L912	Rec4"	Incandescent	600	EXTERIOR FRONT	30 EAVE LIGHTS FRONT AN	N/A
	4 - L913	Rec4"	Incandescent	1000	EXTERIOR REAR*	25 RECESSED LIGHTS IN E	N/A
High Power Relay Part #: 08-2210-01 Module Address: 12 Total Wattage: 700	1 - SH_GRP1	Shade	2-way Motor	400	First Floor*	4 shades	N/A
	2 - SH_GRP1	Shade	2-way Motor	400	First Floor*	4 shades	N/A
	3 - SH_GRP2	Shade	2-way Motor	100	First Floor*TV roo	curtain 1	N/A
	4 - SH_GRP2	Shade	2-way Motor	100	First Floor*TV roo	curtain 1	N/A
	5 - SH_GRP3	Shade	2-way Motor	100	2ND FLOOR*THE#	Shade/TV screen	N/A
	6 - SH_GRP3	Shade	2-way Motor	100	2ND FLOOR*THE#	Shade/TV screen	N/A
	7 - SH_GRP4	Shade	2-way Motor	100	First Floor*TV roo	curtain 2	N/A
	8 - SH_GRP4	Shade	2-way Motor	100	First Floor*TV roo	curtain 2	N/A

Wire Types

- LiteTouch module and control station
- Lutron Blue, Red, Pink
- Crestron
- UTP (unshielded twisted pair) Cat5,5e,6
- Coax RG59, RG6 (std and quad shield)
- HDMI
- Speaker Wire 16/2, 14/2, 16/4, 14/4

Wire Types (Audio/Video)



HDMI (high definition multimedia interface)- current the latest standard—best quality. It carries both audio and video



Component provides quality audio/video. Consists of Red, Green, Blue (coax) plus standard left and right audio cable



S-video is okay quality audio/video . It is two coax cables in one. You can use 2 coax cables instead of the specific S-video cable and can use Cat53 but won't be as good because of signal loss

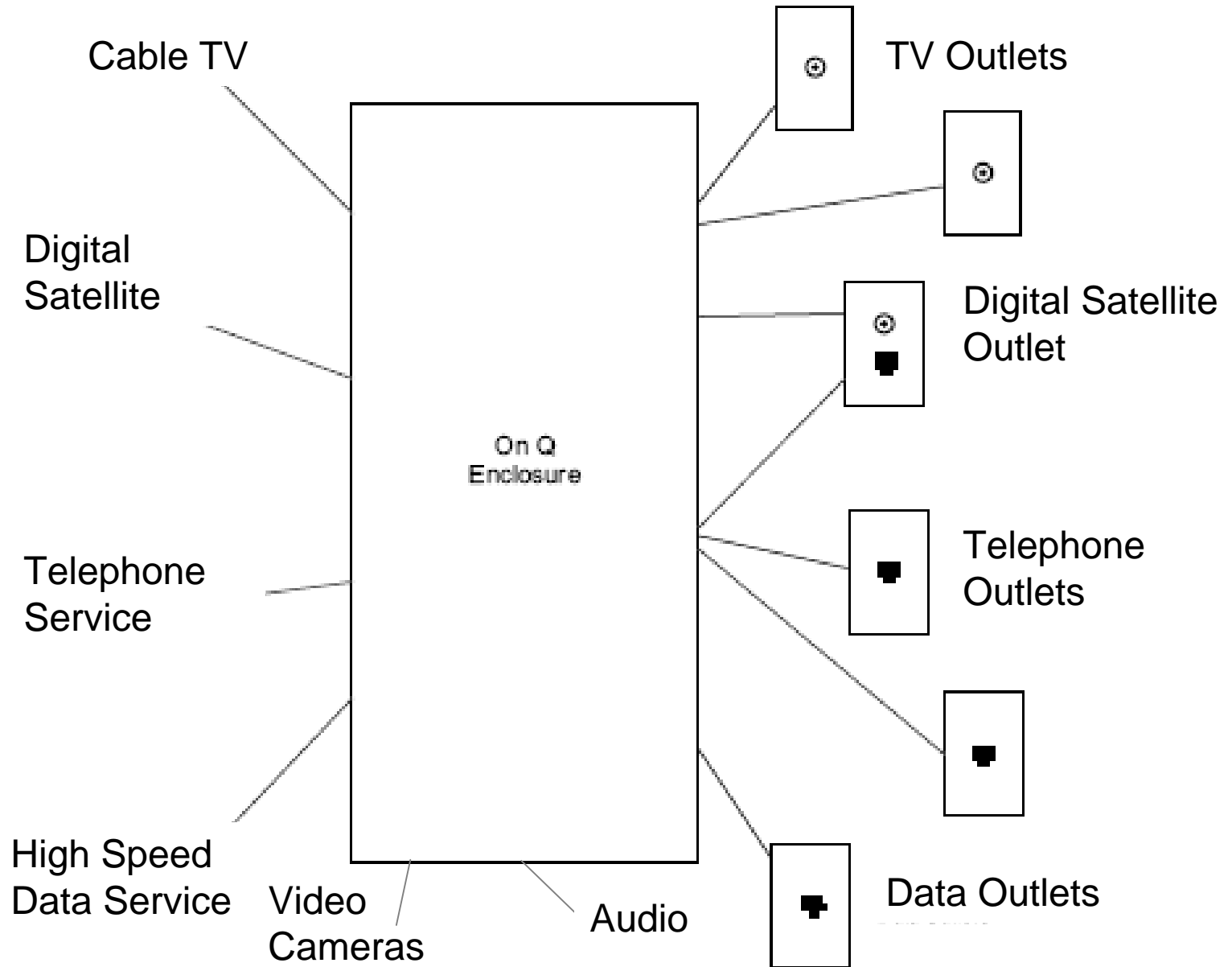


Composite video is basic audio/video (coax). Cannot handle HDTV.



Note VGA computer output is being replaced with DVI

Structured Wiring - OnQ



Enclosures for Every Application

- General Applications
 - > 14" – Production Homes
 - > 20" – Move-Up Homes
 - > 28" – Semi-Custom Homes
 - > 42" – Semi-Custom/Luxury Homes

Enclosure	Total Points	Average # Wire Runs
14"	2x2 (4)	1-20
20"	4x4 (8)	21-28
28"	5x5 (10)	29-42
42"	8x8 (16)	42+

Brackets/Modules	Total Points
Single Bay	1
Double Bay Angled Brackets Video Interface	2
Combo Modules	3
3 Bay	1x1 (2)
6 Bay	2x2 (4)
110v Power Strip	2x2 (4)
110v Surge Power Strip	2x2 (4)
120W Power Kit	1.2
240W Power kit	2.5

1 pt. = 3" x 6" (HxW)

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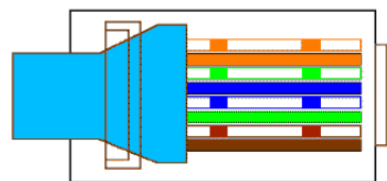


UTP (Cat5)

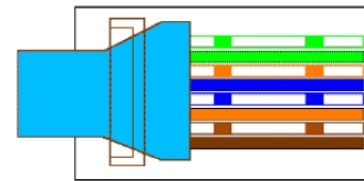


Terminating Wires

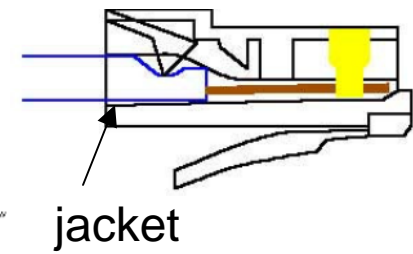
- Remove jacket and untwist 1 ½” of the cable.
- Use 110 punch down tool
- Make sure the jacketed portion of the cable is inside the jack
- Maximum of ½” of the wire will remain untwisted.
- The long lengths of wire that do not have pairs twisted will not carry the 100 mbps.



T568B
Colors
Locking tab is facing down or away from you in this view

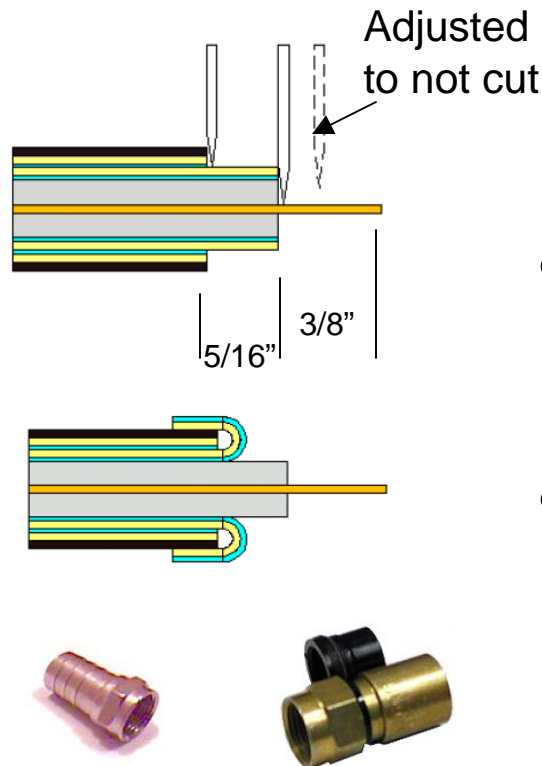


T568A
Colors
Locking tab is facing down or away from you in this view



Terminating Wires

Coax Cable

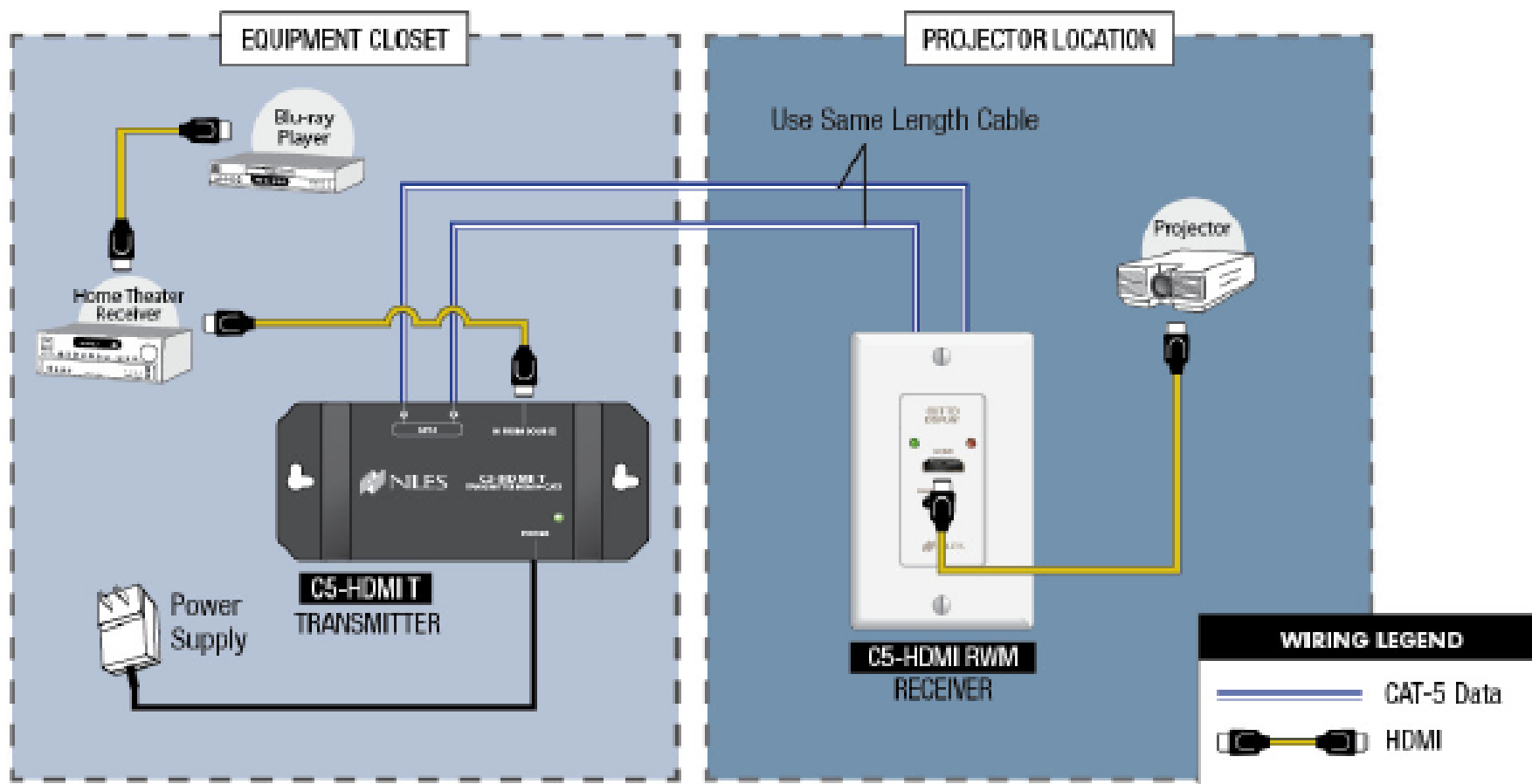


- Get a coax cable stripping tool
- Practice and set your tool based on the type and mfg of the cable
- The last step before terminating or installing the connector is to fold back the inner braided shield and inner foil shield on to the outside of the jacket.
- Make sure that after the stripping process there are no slivers or pieces of the shield touching the center lead.
- Recommend a compression fitting put on using a F-connector compression tool. Channel lock pliers can help to hold the quad shield

HDMI Cables

- Pre made HDMI cable vs Two cat5 cables of the same length with baluns
- Repeating A/V receivers VS Switching A/V receivers

APPLICATION: A/V RECEIVER TO TV



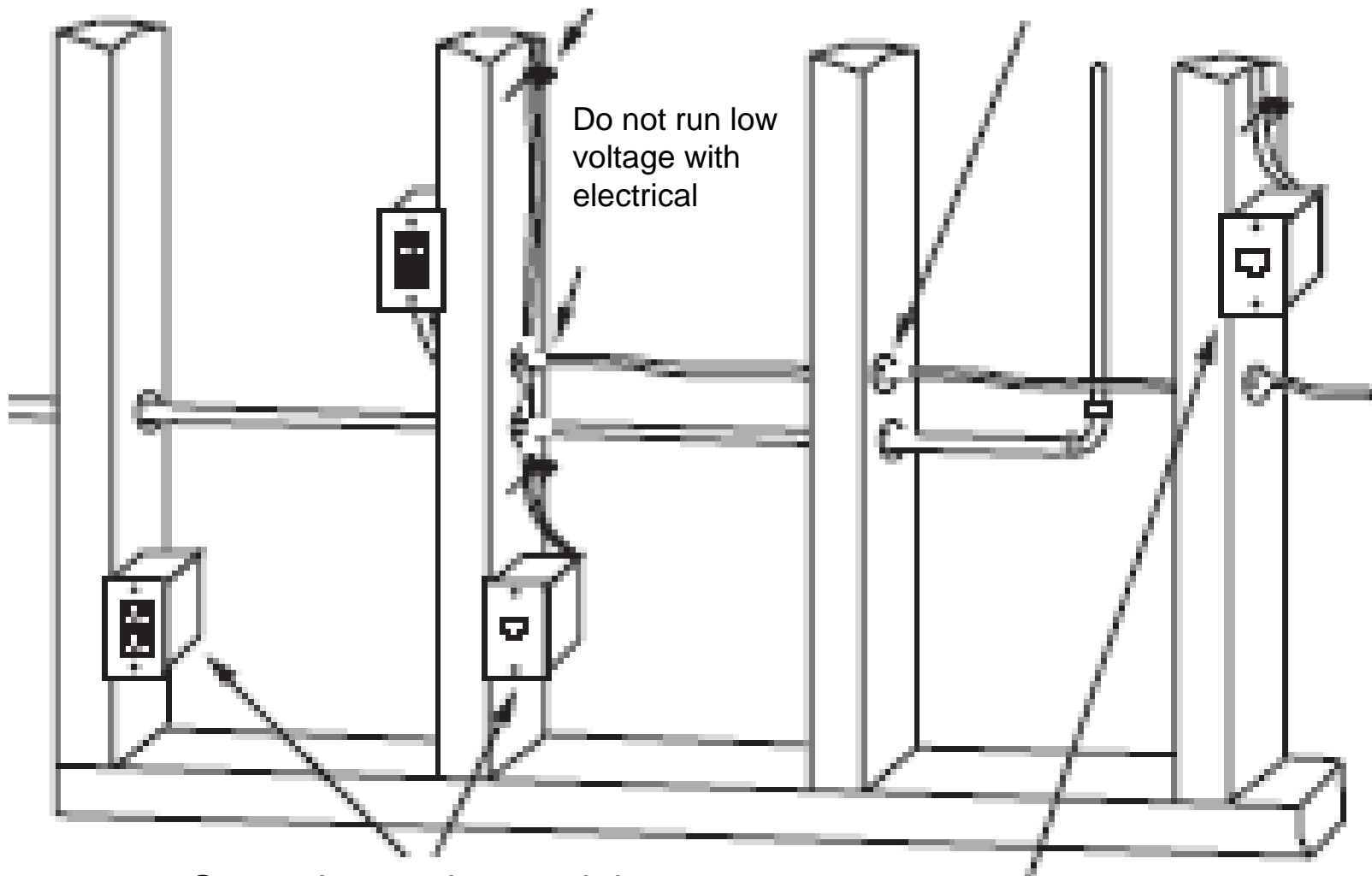
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Use plastic staples

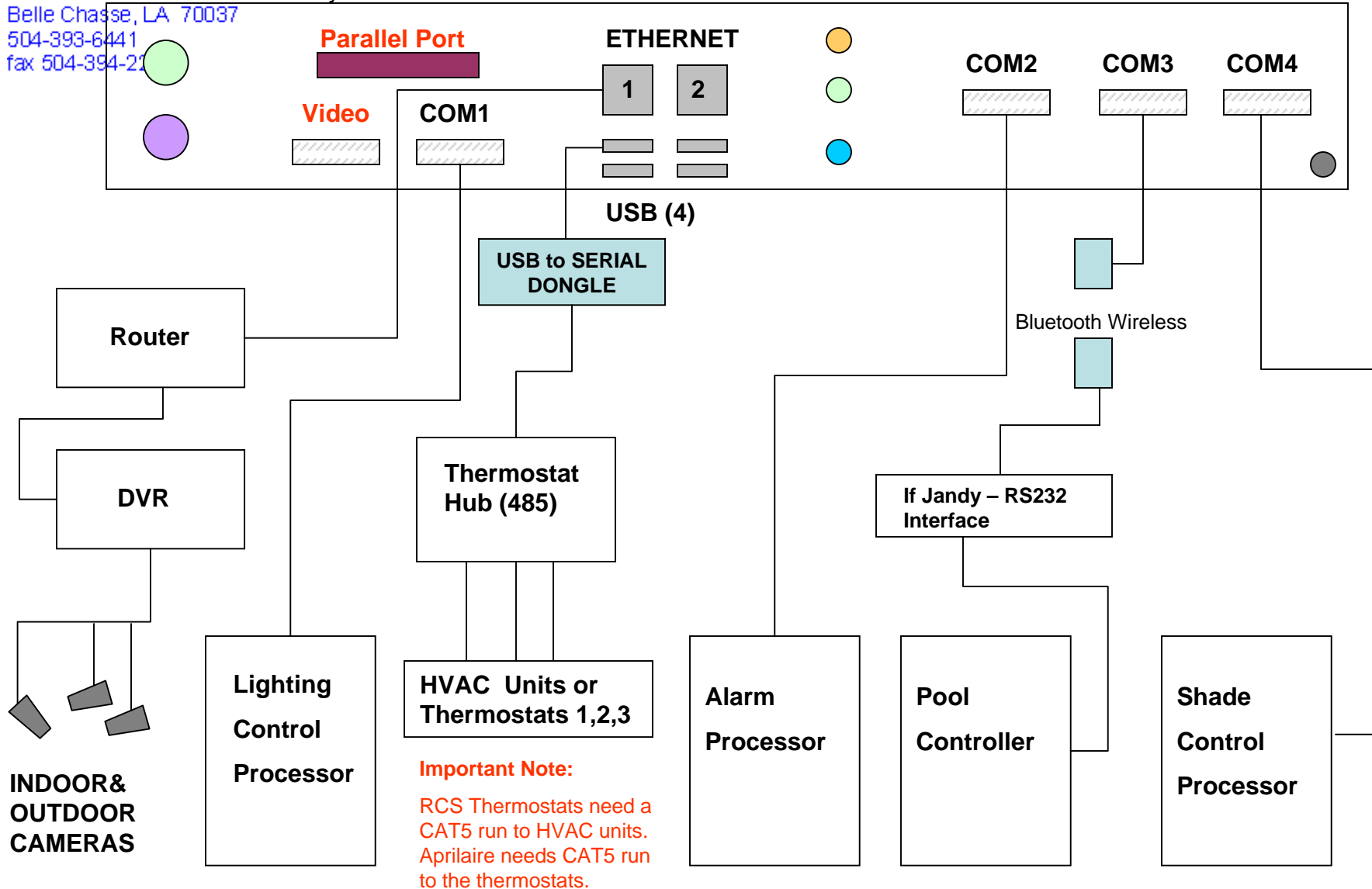
Cross electrical wiring
at 90 degrees. Do not
run parallel



Space Low voltage a joist
away from electrical

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MyAmbience Processor 12.7W x 10L x 2.8"D



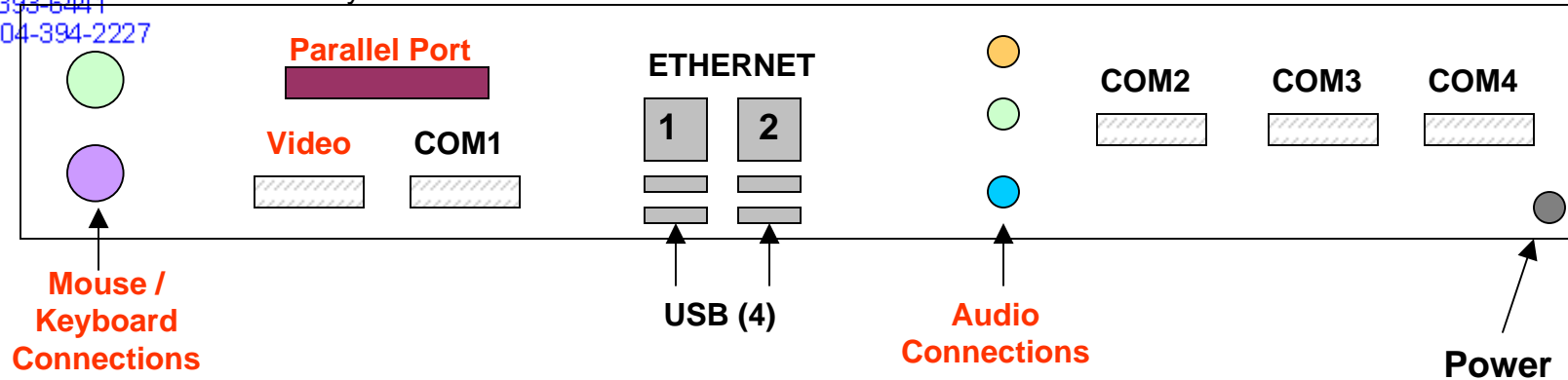
You can view cameras and control your home remotely via the internet

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MyAmbience Processor 12.7W x 10L x 2.8"D



- Power cord jack. 12VDC transformer plugs into outlet
- 4 COM ports for communication to other processors. MyAmbience has 4 DB9M straight through serial adapters for control and integration with other processors such as: lighting control, alarm, thermostat hub, pool controllers
- 2 RJ45 Ethernet connections. Use to put the processor on the network for connection to cameras, and to provide control or processors via a touch screen or remote computer.
- 4 USB ports – Can be used for additional Serial Ports using USB to Serial Dongle
- 1 25 pin – Not Used
- Venting is: Shelf Mount – Do not place anything directly on top. Leave at least 2" spacing. Wall Mount – Mount vertically so that side vent holes are top and bottom.
- Mounting options: - Shelf Mount or Wall Mount

Data/Network Connectivity Now and the Future

- Wireless routers are being used more than just computer connectivity to the internet
- Network integration is the direction for systems and device connectivity
- Wireless connectivity to TV media boxes
- Luxul Wireless: boosts wireless signals
- Remote control is becoming easier with the use of phone control

Summary

- Take the BEST leave the Rest! www.pembaserv.com
- For a copy of the presentation go to www.pembaserv.com (left side under presentations) or send an email to PEMBA@PEMBASERV.COM titled inspectors meeting presentation
- If you are interested in continuing education on Structured Wiring and Low Voltage Systems please sign the tablet at the front table.
- Please call us for help with any Lighting, Lighting Control, Structured Wiring, Automated Shade or AV Project.
- **THANK YOU FOR YOUR TIME**